Nathan W. Hartman, Ed.D.

Dauch Family Professor of Advanced Manufacturing

and Head of Computer Graphics Technology

Director, Digital Enterprise Center

Co-Executive Director, IN-MaC

FALL 2019 DIGITAL ENTERPRISE CENTER SYMPOSIUM

BASELINING ORGANIZATIONAL TRANSFORMATION FOR INDUSTRY 4.0: HOW DO WE KNOW WHERE WE ARE?

Mission

The mission of Purdue University's Digital Enterprise Center is to promote and enable the digital transformation of the manufacturing sector through research and education at a high technology readiness level in partnership with industry.

The objectives of the Purdue Digital Enterprise Center are:

- Conducting research that promotes the digital transformation of the manufacturing sector, both in the U.S. and abroad.

- Promoting the evolution and use of model-based digital product data throughout the enterprise.

- Promoting the use and development of tools and practices that emphasize the concept of a "digital twin" for products.

- Promote the author/consumer communication model around the use of digital product data.

- Establishing industry partnerships that guide, support, and validate digital enterprise research and education activities.

- Enabling the creation of curriculum to support the next-generation manufacturing workforce.

- Enabling the adoption of digital enterprise methods and tools across industry sectors.

Industrial Partners

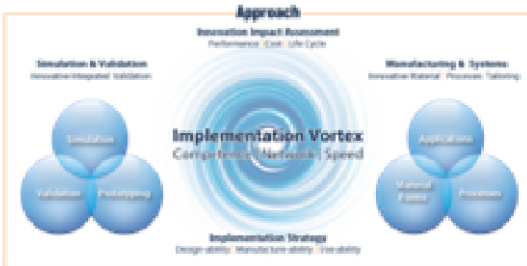# National, State, and Local

FEDERAL: DOE / INDIANA

Objective:

Taking next generation composites to high-volume manufacturing, addressing cost-effectiveness and environmental impact

Approach:

1) Composites Virtual Factory Hub

2) Prototyping & Validation Lab

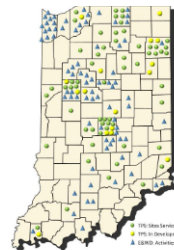3) Manufacturing Design Lab

STATE: INDIANA

N-MaC

Indiana Next Generation Manufacturing Competitiveness Center

Objective:

- Creating a stronger manufacturing ecosystem by supporting Industry – University collaborations

- Workforce talent support through accessible learning pathways

Approach:

1) Technology + Productivity Solutions

2) Research for Future Competitiveness

3) Education + Workforce Development

REGIONAL: WABASH HL

10 Indiana Counties make up the WHIN region

Objective:

- Provide a regional testbed to demonstrate advanced manufacturing capabilities and workforce development

- Cultivate a regional ecosystem to support business growth and global-competitiveness in the Wabash Heartland

- Boost "Internet of Things" platform through extensive connectivity and integrated sensor development
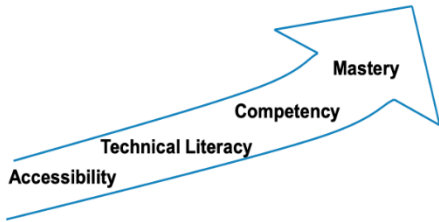
Approach:

$38,900,000 for community development efforts across the WHIN region
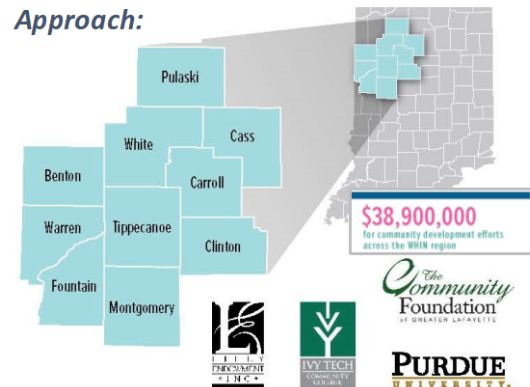
IN-MaC: Manufacturing Competitiveness

Indiana Next Generation Manufacturing Competitive Center

IN-MaC

"Creating a Stronger, More Capable Manufacturing Ecosystem"

Mastery

Competency

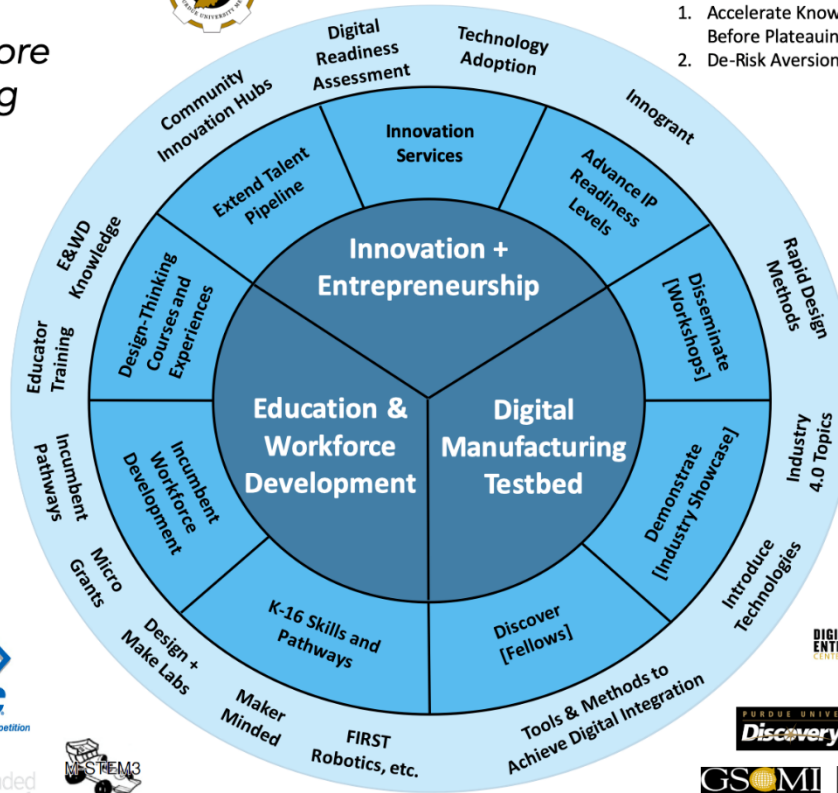Technical Literacy

Accessibility

"Invigorate Manufacturing Talent Pipelines in a Highly Accessible Manner"

Bridge to:
1. K-12 School Systems and their Communities
2. Collaboration with Stakeholders to Address Industry Priorities

WHIN · CATALYST Center for Advancing the Teaching and Learning of STEM · MEERCat Purdue · CLEAR Center for Literacy Education and Research · FRC FIRST Robotics Competition · makerminded Powered by alift · M-STEM3

TAP40

Central diagram labels:
- Innovation + Entrepreneurship
- Education & Workforce Development
- Digital Manufacturing Testbed

Outer ring labels:
- Digital Readiness Assessment
- Technology Adoption
- Community Innovation Hubs
- Innovation Services
- Innograant
- Extend Talent Pipeline
- Advance IP Readiness Levels
- E&WD Knowledge
- Design-Thinking Courses and Experiences
- Disseminate [Workshops]
- Rapid Design Methods
- Educator Training
- Incumbent Pathways
- Incumbent Workforce Development
- Demonstrate [Industry Showcase]
- Industry 4.0 Topics
- Micro Grants
- K-16 Skills and Pathways
- Discover [Fellows]
- Introduce Technologies
- Design + Make Labs
- Maker Minded
- FIRST Robotics, etc.
- Tools & Methods to Achieve Digital Integration

"Assist Innovators Jump the S-Curve"

Entrepreneurial Skills to:
1. Accelerate Knowledge, Develop New Competencies Before Plateauing with Status Quo
2. De-Risk Aversion to Escape Comfort Zone

THE "S" CURVE

PURDUE OFFICE OF TECHNOLOGY COMMERCIALIZATION · PURDUE FOUNDRY

"Advance Knowledge and Abilities to Overcome the Barriers to Industry 4.0"

Gateway to:
1. IN-MaC SME Consortia
2. Leading Purdue Centers and Institutes

CMME · DIGITAL ENTERPRISE CENTER · Manufacturing Design LABORATORY · WHIN · ROBOTICS ACCELERATOR · PURVAC Purdue University Regional Visualization and Analytics Center · Discovery Park · LyoHub · PRISM Production, Robotics, and Integration Software for Manufacturing & Management · GSMI GLOBAL SUPPLY CHAIN MANAGEMENT INITIATIVE · RESEARCH CENTER FOR OPEN DIGITAL INNOVATION PURDUE UNIVERSITY

IN-MaC: Education and Workforce

Indiana Next Generation Manufacturing Competitive Center

- IN-MaC creates a stronger, more competitive manufacturing ecosystem for Indiana and the nation. Programs Highlights:
  - Micro-Grant program provides funding to organizations that implement manufacturing initiatives. Impact to over 34,000 youth (K-12), post-secondary students, and incumbent workforce across Indiana.
  - Design and Innovation Studios implemented within manufacturing facilities and K-8 schools across the state of Indiana.
  - Trained 76 high school educators in an advanced manufacturing program who have impacted more than 2,280 students.
  - Tech Adoption program serviced 82 manufacturing sites across Indiana with 121 jobs added or retained.
  - Invested in five industry consortia with 26 paying industry members

- TA: Sites Serviced
- TA: Active Projects
- E&WD: Activities
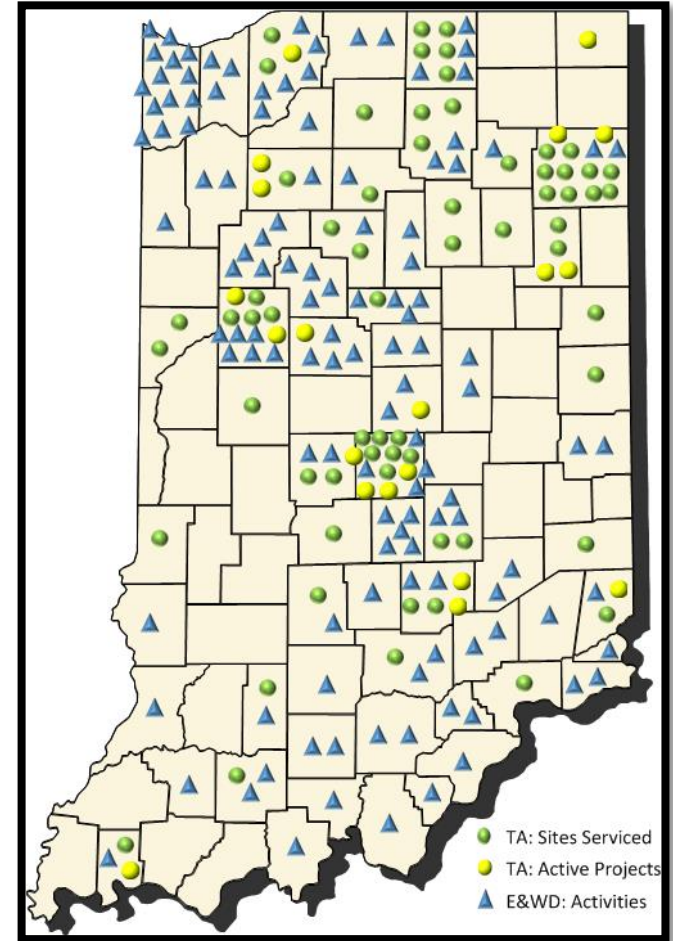
TA: Technology Adoption
E&WD: Education & Workforce Development

Digital Manufacturing Enterprise Testbed

Indiana Manufacturing Institute
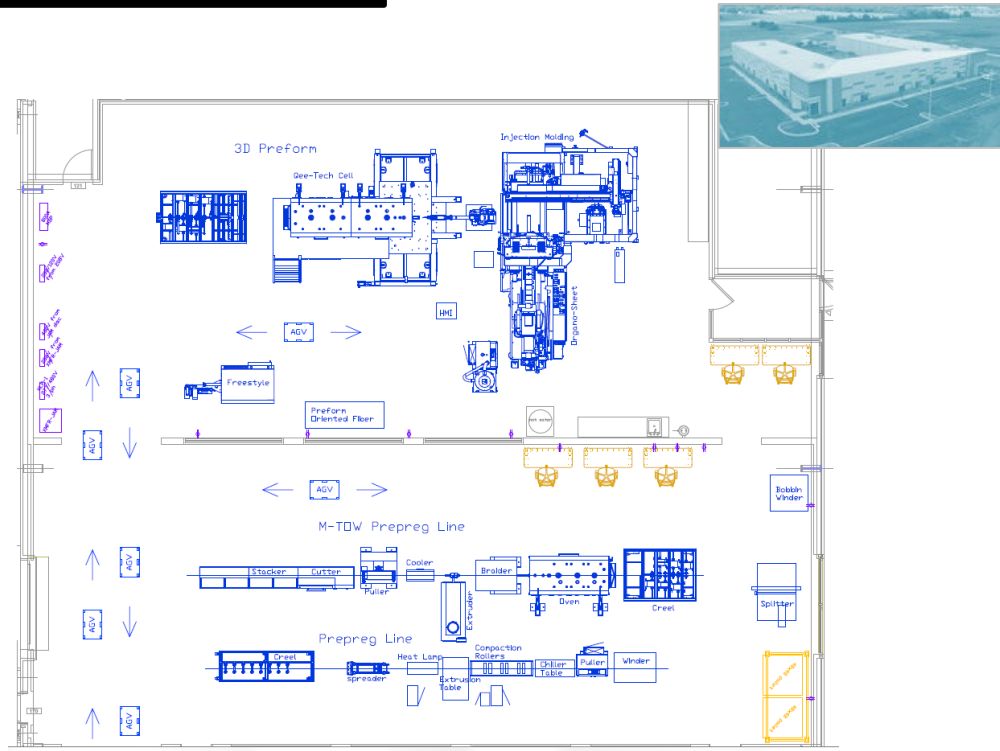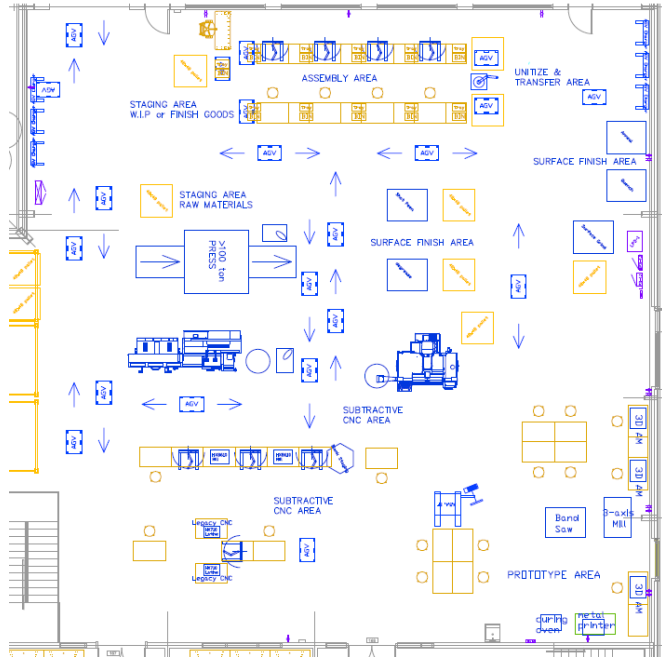
- Metal machining
- Additive prototyping area
- Use of AGVs and automated material handling
- Metrology and surface characterization
- Workforce education activities as needed

- Polymer and composite fiber
- 3D composite additive
- Injection molding
- Predictive cost modeling
- Workforce education activities as needed

Digital Disruption

DISRUPTION

"disruptive technology shifts will not only upend industries, but will introduce revolutionary change to even the most staid industries."

FACTS

"…since 2000, 52% of Fortune 500 gone bankrupt, been acquired, or ceased to exist as a result of digital disruption."

FUTURE

"Digital transformation forces wholesale change to the foundations of an enterprise — from its operating model to its infrastructure, what it sells, and to whom and how."

- By 2018, 20% of all business content will be authored by machines and more than 3 million workers globally will be supervised by a "roboboss"

- By 2020, more than 35 billion things will be connected to the Internet

- By 2025, the skill gap is expected to grow to 2 million. In 2011, 600k jobs were unfilled due to the slip gap

www.ipxhq.com

Source : Gartner Analysis and Deloitte University Press

Digital Disruption Another Way

Changing form ←→ Changing platform

physical
local

digital
cloud

3D

2D

1D

Analog → Digital → Reduced → Distributed

1980s   1990s   2000s   201x
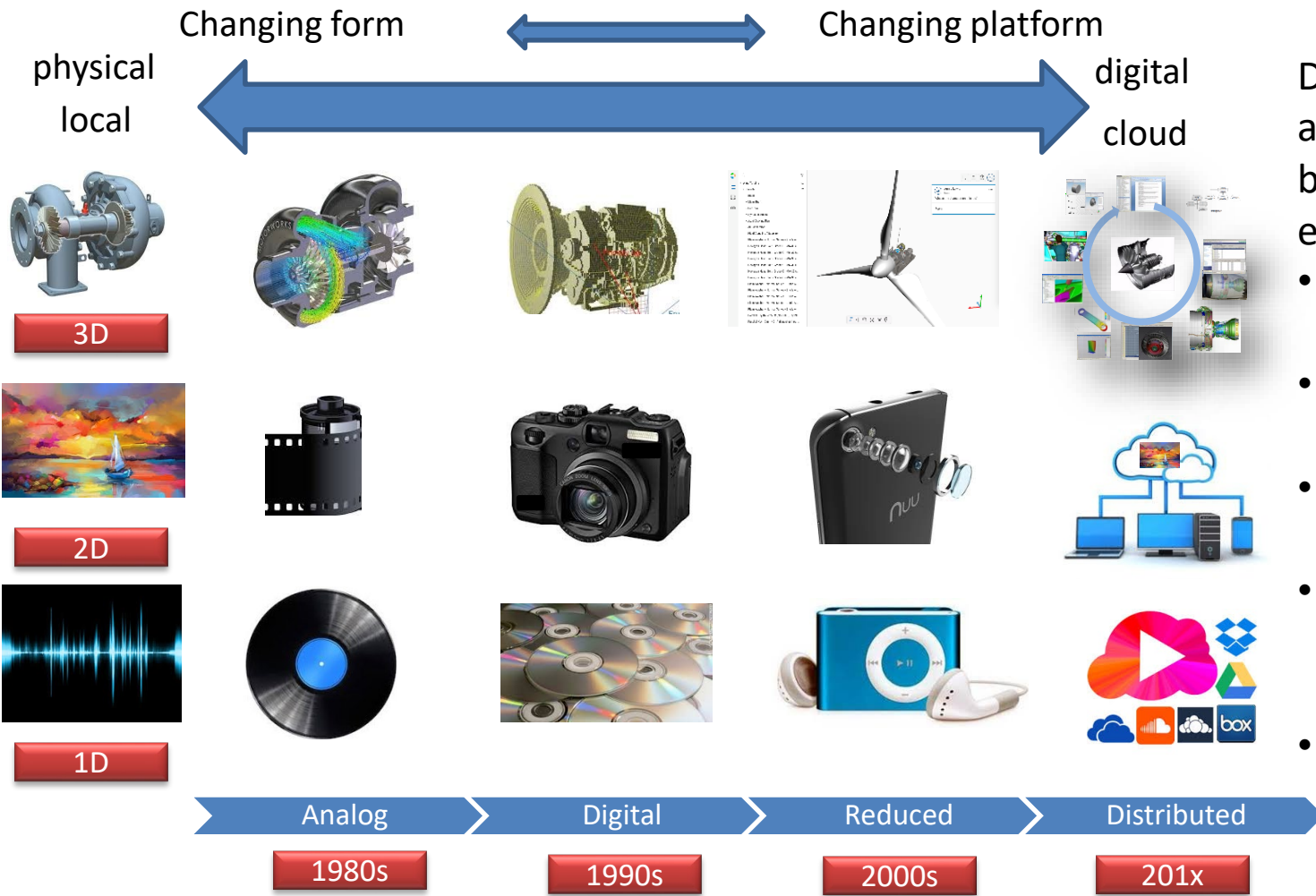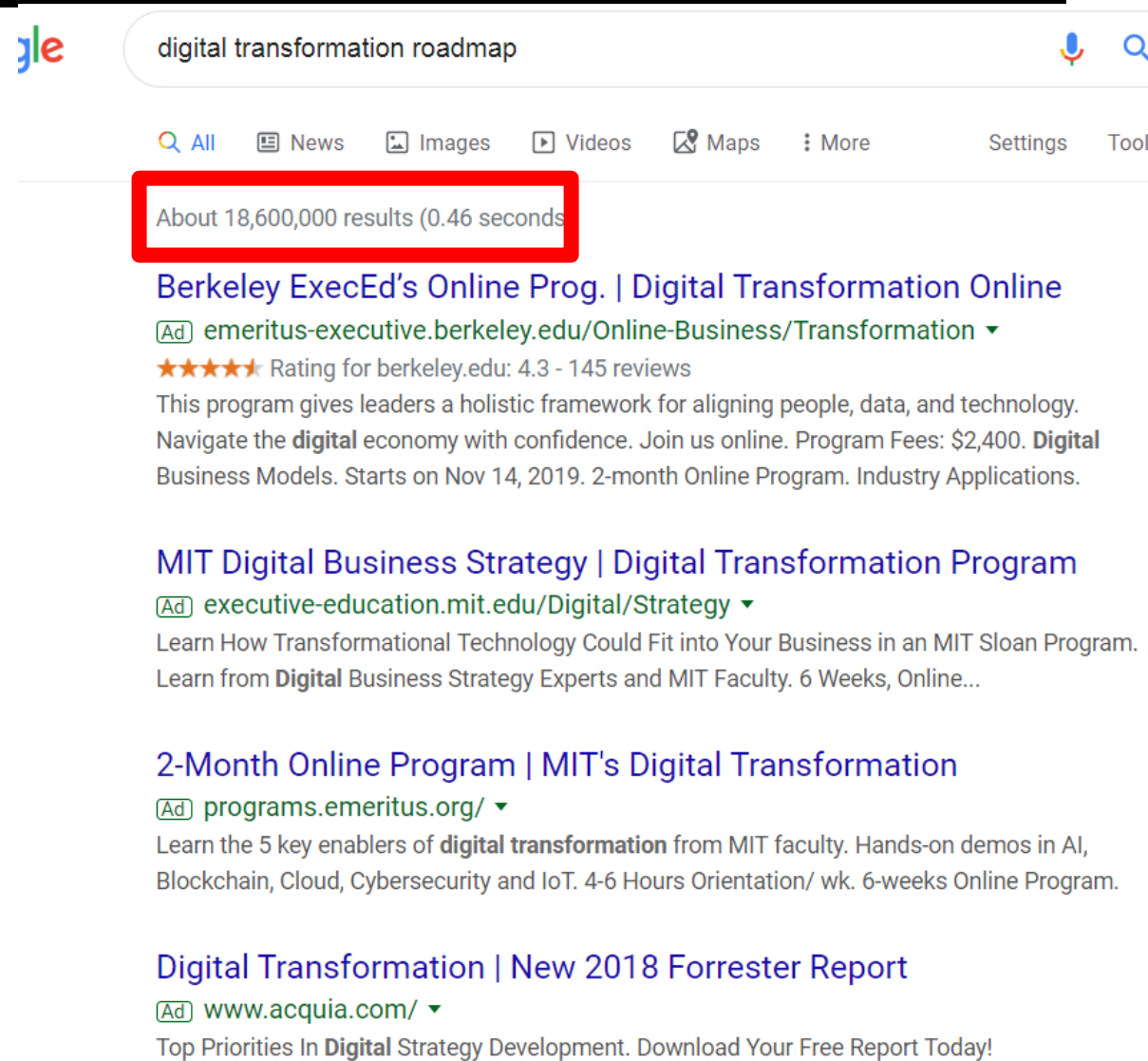
Digitalization allows for new business models to emerge:

- Mass customization
- Economic quantity: 1
- Product as a Service (PaaS)
- Precision application of resources
- Intelligent support services

So, why can't we get this right?

- "Building a successful…"

- "The ultimate…"

- "5 steps for…"

- "Master your digital future…"

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www.purdue.edu/digital-enterprise-center