

# Manufacturing in the age of AI and 3D Printing



Automation Alley



Life is 1% inspiration, 98%  
perspiration, and 2%  
attention to detail



## Tom Kelly

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Tom Kelly is a globally recognized expert on Industry 4.0 and its impact on business. As executive director and CEO of Automation Alley, a Michigan-based nonprofit Industry 4.0 knowledge center with a global outlook and a regional focus, Tom is often tapped to share his visionary leadership and expertise about the digital transformation of manufacturing.

As executive director and CEO, Tom has been instrumental to the success of Automation Alley's Industry 4.0 initiatives, designed to help businesses jumpstart or accelerate a digital path to strategic success, including Integr8, the global Industry 4.0 conference; the 3D printing network Project DIAMOND; and the formation of the World Economic Forum's US Center for Advanced Manufacturing.

Tom serves as co-chair to the World Economic Forum's Global Network of Advanced Manufacturing Hubs and is a member of the Additive Manufacturing Coalition Steering Committee, Fraunhofer Technology Advisory Board and Michigan Manufacturing Technology Center Board.

# Automation Alley



- Non-profit Digital Transformation Insight Center (I4.0)
- 2300+ members throughout the state of Michigan
- 2000+ manufacturers



- In partnership with the World Economic Forum
- Dozens of U.S. multinational corporations
- National and global influence



- Distributed, independent, agile, mfg on demand
- Over 300 mfg's on network growing to 600+
- Democratized mfg that keeps smalls in charge



## **What do we believe? Manufacturing will rapidly evolve...**

- Software First/ AI First Mindset
- 3D Printing/ Additive
- Distributed Manufacturing

## Software First Mindset

- From Process to IP
- Business Models are changing rapidly
- AI is leading the way – beyond machine learning
- Uber – NETFLIX – Amazon – Tesla all examples of software first



## 3D Printing/ Additive

- Business Models are ripe for rapid change
- DFM to DFAM
  - Process to IP
- AI is leading the way – beyond machine learning
  - What happens when mfg/process knowledge is free and ubiquitous and can flow anywhere in the world instantly?
  - ...when the marginal cost of energy trends to free?

## Distributed Manufacturing

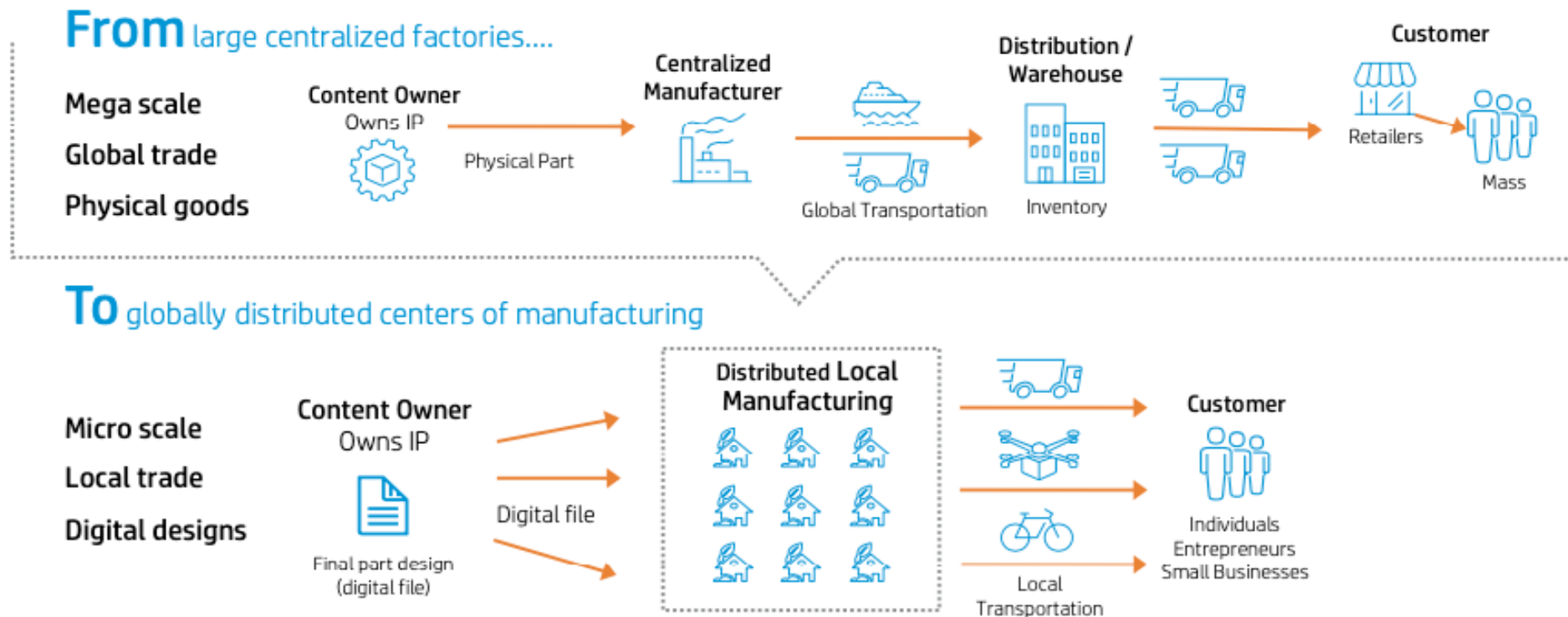


Figure 5: Distributed Manufacturing Supply Chain



Manufacturing is reshoring

We believe it will begin to look much different from traditional manufacturing

Software first  
Additive  
Distributed



Note: Seasonally adjusted annualized rate  
Source: U.S. Census Bureau, via the Federal Reserve Bank of St. Louis

## The Rapid Pace of Change: Additive: Cars



### McLaren Senna

- Conventionally manufactured by McLaren, a brand with a 37 year history in racing vehicle production and 50 years of racing experience.
- **Laguna Seca Lap Time**

1:27:62 (2nd in world)



## The Rapid Pace of Change: Additive: Cars



### Czinger 21C

- Manufactured in Industry 4.0 using generative AI design and additive manufacturing.
- Founded in 2019 by a father and son team.
- First production car.

### Laguna Seca Lap Time

1:25.45 (World Record)  
(More than two seconds faster!)

## Czinger 21C Exploded View

- Over 350 additively manufactured components





## The Rapid Pace of Change: Additive: Rockets



### Traditional Rocket (NASA Atlas V)

- Over 100,000 parts
- 24 Month Build Time
- 48 Month Iteration time
- Global supply chain dependent on geopolitical risks



## The Rapid Pace of Change: Additive: Rockets



### Relativity Space 3D Printed Rocket

- Less than 1,000 parts
- Two month build time
- Six month iteration period
- Done by a startup with an integrated vertical supply chain

## The Rapid Pace of Change: Ford Motor Company

### Print on Demand General Stores

- \$750M Stores Inventory in North America
- Looking to print in-house 10% of all stores inventory (\$75M stores reduction)
- 35 MarkForged Printers internet enabled
- Intended to be fully automated
- Capable of receiving print orders from anywhere



## The Coca Cola Y3000 – Flavor of the Future Created by AI

- Coca Cola surveyed the market for trends in flavor preferences.
- Inputting this data, AI formulated a flavor combination based on what the market deems as "futuristic."

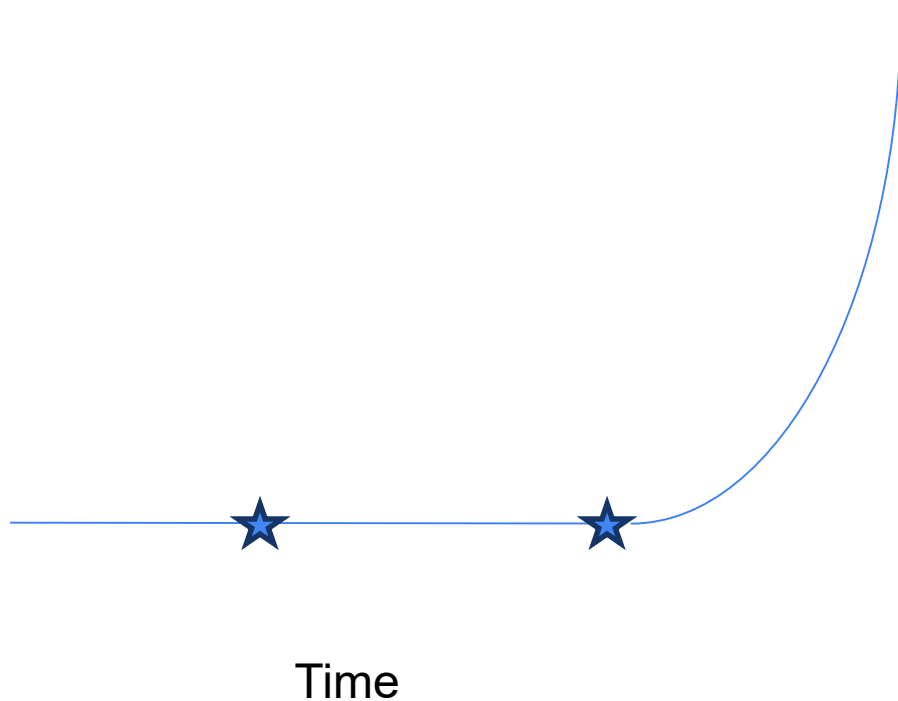






**Yes, technology is advancing but the critical question is -- Where are we?**

Market  
Adoption



## Project Diamond

- Distributed Independent and Agile Manufacturing On Demand
- 300+ strong network on the way to 600+, all within 30 miles of each other
- Established in October 2020 through CARES ACT funding grants
  - Printed PPE for Ukraine
- The network enables manufacturers to print for individual needs or link together to fulfill larger orders at competitive prices
  - Incremental fixed cost trends to zero





## Project DIAMOnD



- Never had a 3D Printer
- Never engineered anything
- Prints his own OEM parts for his machines now
- No supply chain issues
- \$\$\$\$ to \$
- Lead time – overnight



Air and Liquid Systems, Inc.

- Used many overseas \$99 SS valves for corrosive environment
- Prints valves in carbon fiber
- Better performance
- No inventory or supply issues
- \$2/part

## **Additive Four Frameworks for Mass Adoption**

- Global ID (Business Model)
- DRM (Digital Rights Management) (Business Model)
- Digital Product Recipes (Technical)
- Quality and Certification Framework (Technical)

# Thank you!

[www.automationalley.com](http://www.automationalley.com)



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