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CENTER FOR ADVANCED MANUFACTURING

US Advanced Manufacturing Strategy: A Team of Rivals Approach

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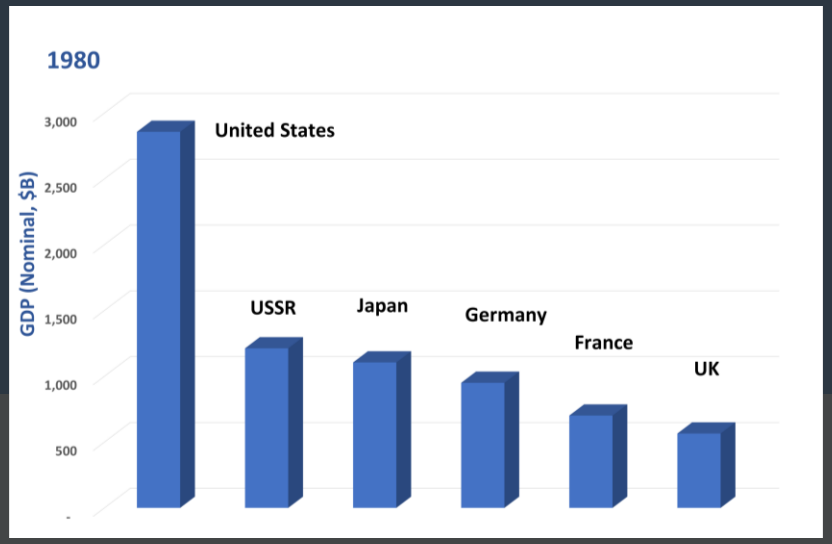
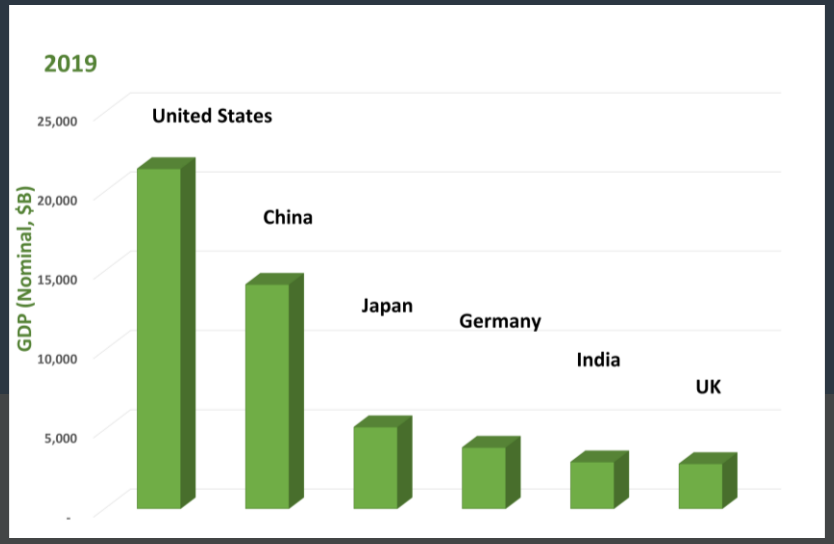
Standard View: The US has no Industrial Policy

Robert Reich (1982): "A Coherent Industrial Policy is a Practical Necessity"
- the US did not widely follow suggestion in 1982

Jared Bernstein (2020):
"The Time for America to Embrace Industrial Policy Has Arrived"





History of US (Federal) Industrial Policy

Timing (1775): Industrial Revolution and US Independence

Alexander Hamilton Report on Manufactures (1791)

"...Not only the Wealth: but the independence and security of a country, appear to be materially connected with the prosperity of manufactures"

Abraham Lincoln Land-Grant Universities (1862)

"...On behalf of the people, who have invested in these public universities their hopes, their support, and their confidence"

Vannevar Bush Endless Frontier (1946)

"...Founded on new principles and new conceptions, which in turn are painstakingly developed by research in the purest realms of science"

Principles: Free Enterprise, Education, Technology

Team of Rivals:

Many-Policy Industrial Policy Across Government

Public: Between States (50 Locations) and Federal Government (DC)

Public: Between Branches of Federal Government (DC)

Public: Between Agencies (Departments) of Federal Government (DC)

Private: Between Universities, Corporations, and Research Labs

Compare RRI and US Advanced Manufacturing (Industry 4.0) Approaches

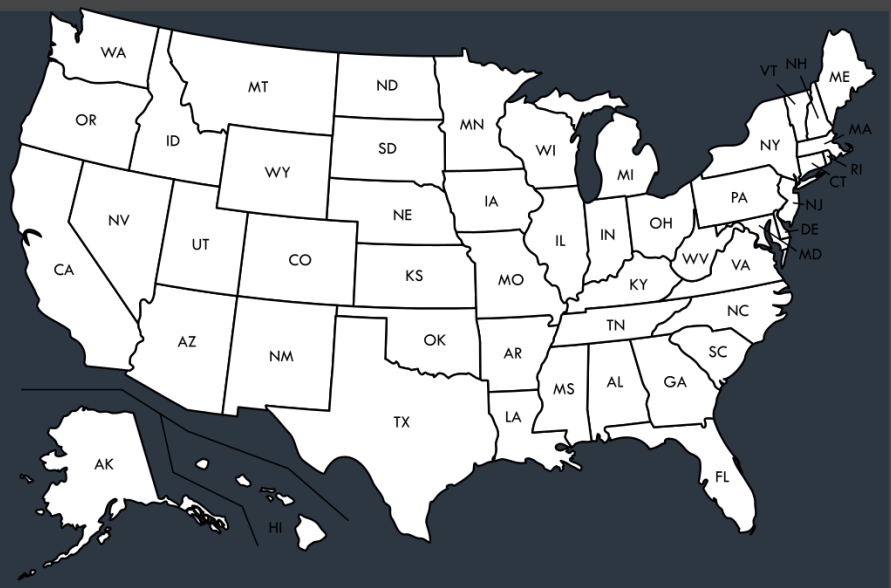
State-level Competition:

50 Individual “Experiments in Democracy”

Resources: 15%-35% of US taxes are State-level (including sales, property & income tax)

Base Operating Support for Public Universities:
4-Year STEM Education

Primary Public Support for Technical Colleges:
2-Year Workforce Education



Public Support (with Local/Cities) of Public Schools: K-12 Education

Economic Incentives for Location and Construction (ex. Municipal Bonds, etc)

Infrastructure and Zoning (Construction and Land-Use)

Inside US: Manufacturers (all companies) and people move. States compete

Co-Equal Branches: Executive & Legislative

US Budget: (annual)
Proposed by President & Appropriated by Congress
US Tax Rates: (periodic)
Proposed by President & Legislated by Congress

<u>Policies and Plans will Conflict between Branches</u>

example. 2018 budget proposed cancelling ManufacturingUSA institutes
- Congress increased funding in 2018

<u>Policies and Plans can Conflict or Overlap within Congress:</u>

ex. (1) Energy and Commerce Committee and (2) Science, Space & Technology Committee both deal with manufacturing innovation issues

US House of Representatives (Congress): Elected by districts in States
(Rebalanced every 10 years to reflect population ~750,000 people represented)

Executive Departments and Agencies:
Interlocking Missions & Spending

Commerce: “Weights & Measures”+“Interstate Commerce”

Defense: Purchases Manufactured Products for Security

Treasury: Federal Taxes (& Tariffs) with Fiscal Growth

Energy: 25% of Energy is used in Manufacturing

National Science Foundation, National Institute of Health and NASA: Scientific Innovation

Labor: Safe and Meaningful Work

Others: Environmental Protection, Agriculture, Interior, Trade Rep., and State

Long Term Data and Information Exchange (BLS, BEA, etc.)

President: Nominates (& Removes) Leaders, Coordinates between Agencies, Sets Budget Request Priorities, and Messaging/Communication

Private: Industries, Universities, and Labs
Cooperation and Competition

Private Sector Firms: Closest to the Market

Not Just One Manufacturing Industry:
Sub-Sectors (21) compete for Resources

Most Firms are Small Firms (<400 people)

Closest Alignment For Collaboration is within Sectors (Direct Competitors)
but Smart Manufacturing (I4.0) is Cross-Cutting Issue

Universities: Pipeline of Talent (shorter Job Tenure in US, Companies prefer not to train)

National Laboratories: Science and Technology gem of US Economy,
but historically viewed as structurally isolated

Public-Private Partnerships: Getting Best of Both to Address Needs in Each

Team of Rivals Principles:

No Individual or No Organization is actually in control of US Industrial Policy

All Policies need to have localized impact: even Federal Public Policies

Public Sector Manufacturing Policies is Often a Means to an End

Public Sector: Avoidance of "Picking Winners and Losers";
Rather, seed opportunity to accelerate innovation

Best Approaches Rise and Survive – others go away
NSF: Engineering Research Centers (ERC or I/UCRC) vs.
NIST: Advanced Technology Program (ATP) or Energy: Industries of the Future

"Public-Private Partnerships" Shared support and benefit

Tolerance of Individual Failure Learning and sharing of lessons

Themes: Technology Innovation, Education (Workforce) and Entrepreneurship

"**Americans** will always do the right thing, only after they have tried everything else."
-Winston Churchill

Comparison with RRI organizing Principles

	US Structure
1. Business Model	Economic Growth & Labor Growth (jobs)
2. Structures	Many: the Strongest Approach Should Rise
3. Operation, Coordination & Behavior	Distributed and Ad-hoc Coordination, at Best
4. Competitive Advantage	Talent, Technology, Taxes (local) and Transportation
5. Target Market	Create next market – Revitalize todays markets
6. Value Creation	Increasingly Information based, even in Manufacturing
7. Competitive Strategy	Varies between Rivals
8. Evaluation	Growth & Jobs: Americans will “Vote with Their Feet”
9. Method of Product & Solution	Innovation Culture and Place Based
10. Innovation Policy	Dynamic Partnership and Fierce Competition
11. Education System	4-Year Universities and 2-Year Colleges

Global Cooperation & Competition

- Example: MP3

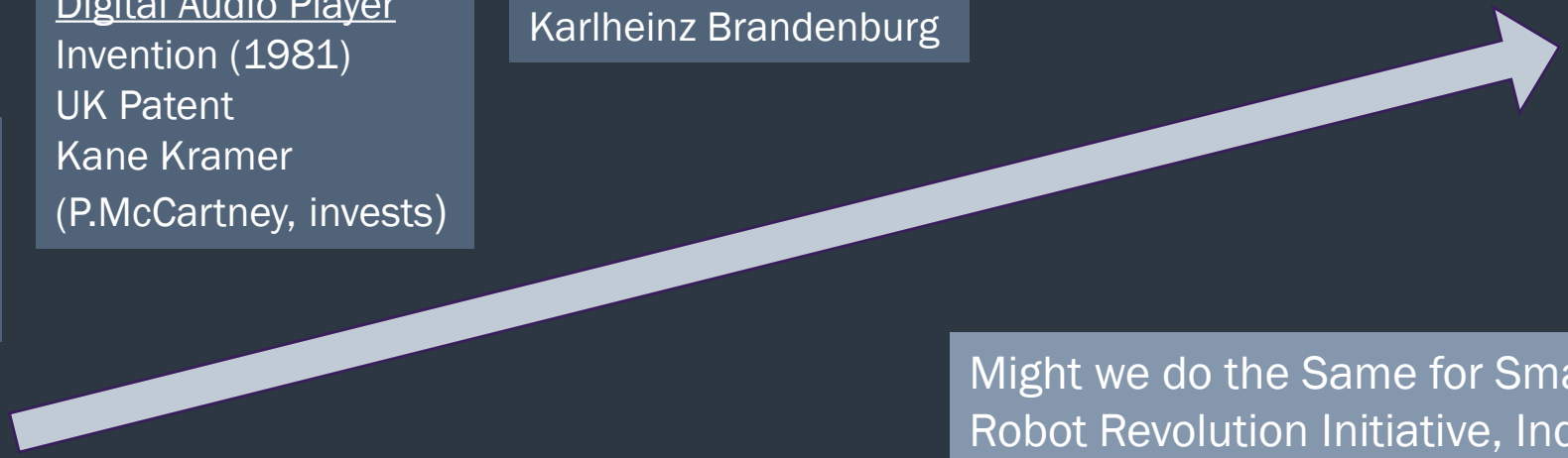
Sound Digitization
R&D (1970s)
Lincoln Labs (MIT)
and elsewhere

Digital Audio Player
Invention (1981)
UK Patent
Kane Kramer
(P.McCartney, invests)

MPEG (.mp3)
Standard (1995)
Erlangen/Fraunhofer
Karlheinz Brandenburg

MP3 Player
Product (1999-2004)
Panasonic, Sony, Samsung
Apple (iPod)
Asia: Manufacturing

Music Platform
(2004-now)
~~Napster~~, Apple Store,
Amazon Music, Spotify
Music as Service



Might we do the Same for Smart Manufacturing, Robot Revolution Initiative, Industrie 4.0 ?

Possible Case: Plattform Industrie 4.0 Asset Administration Shell (AAS) standard (2019)

Our National Manufacturing Policies could be Complementary and Mutually Beneficial

Shared International Challenges

Promote Prosperity and Growth of All of our Economies
Sustainability of All of our Environments
Common Technical Standards to Avoid Duplication
Stability and Safety for All of our Communities
Create Positive National Impacts on Qualify of Life

Thank You