

# **Cloud Computing: Implications for the Industrialization of IT**

**Jonathan Murray**

***@Adamalthus***



# Agenda

- Introductions
- Cloud computing and the industrialization of IT
- Implications for developing economies
- Policy priorities for developing economies
- What comes next

# Key Takeaways

1. Cloud Computing = IT + Ford + Taylor + Lean Production for the digital era.
2. Enables encapsulation, re-composition and global distribution, of economically valuable services
3. Will both challenge and enable developing economies
4. The second wave of cloud is already emerging with profound implications

# Why Industrialized IT Is Needed

- Firm and sector level productivity has greatly improved as a result of investments in IT, but...
  - Growth in IT investment has lead to an exponential growth in IT system complexity
  - Increasing complexity reduces the efficiency of physical IT and human capital
  - Explosion in business demands on IT function
  - IT function productivity has not improved in decades

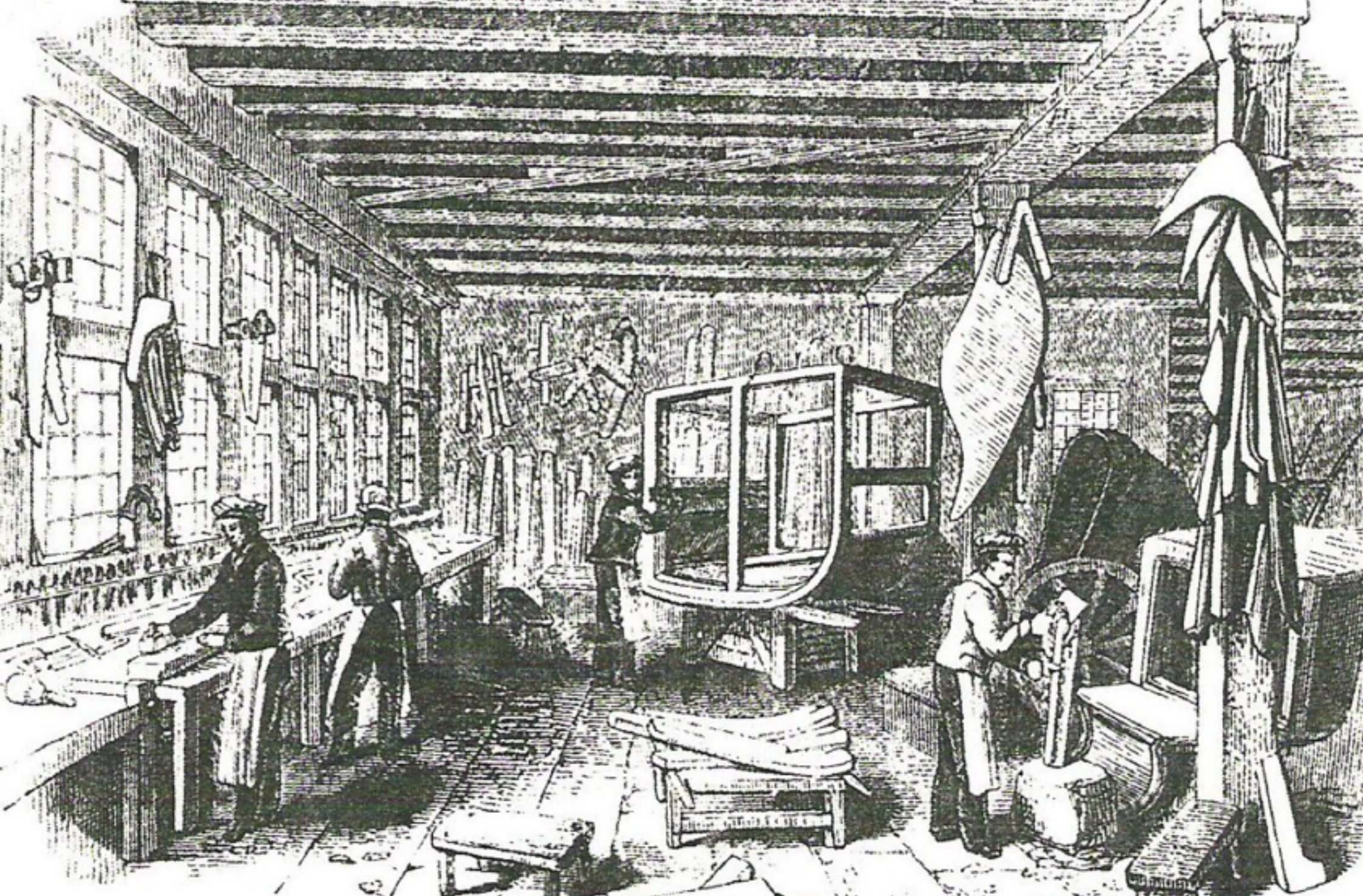
# Defining Cloud Computing

*Cloud computing delivers elastic computing resources - data storage, computation and networking - to users at the time, to the location and in the quantity they wish to consume, with costs based only on the resources used.*

- Highly scalable, deeply automated, massively efficient production management capabilities for IT service delivery
- Enabled by 'loosely coupled' computing service architecture, separation of responsibilities and management processes
- Born out of the economic needs of early large scale online web service providers: Microsoft, Google, Amazon, Yahoo etc.

\* <http://www.adamalthus.com/blog/2013/03/01/a-short-guide-for-the-perplexed/>

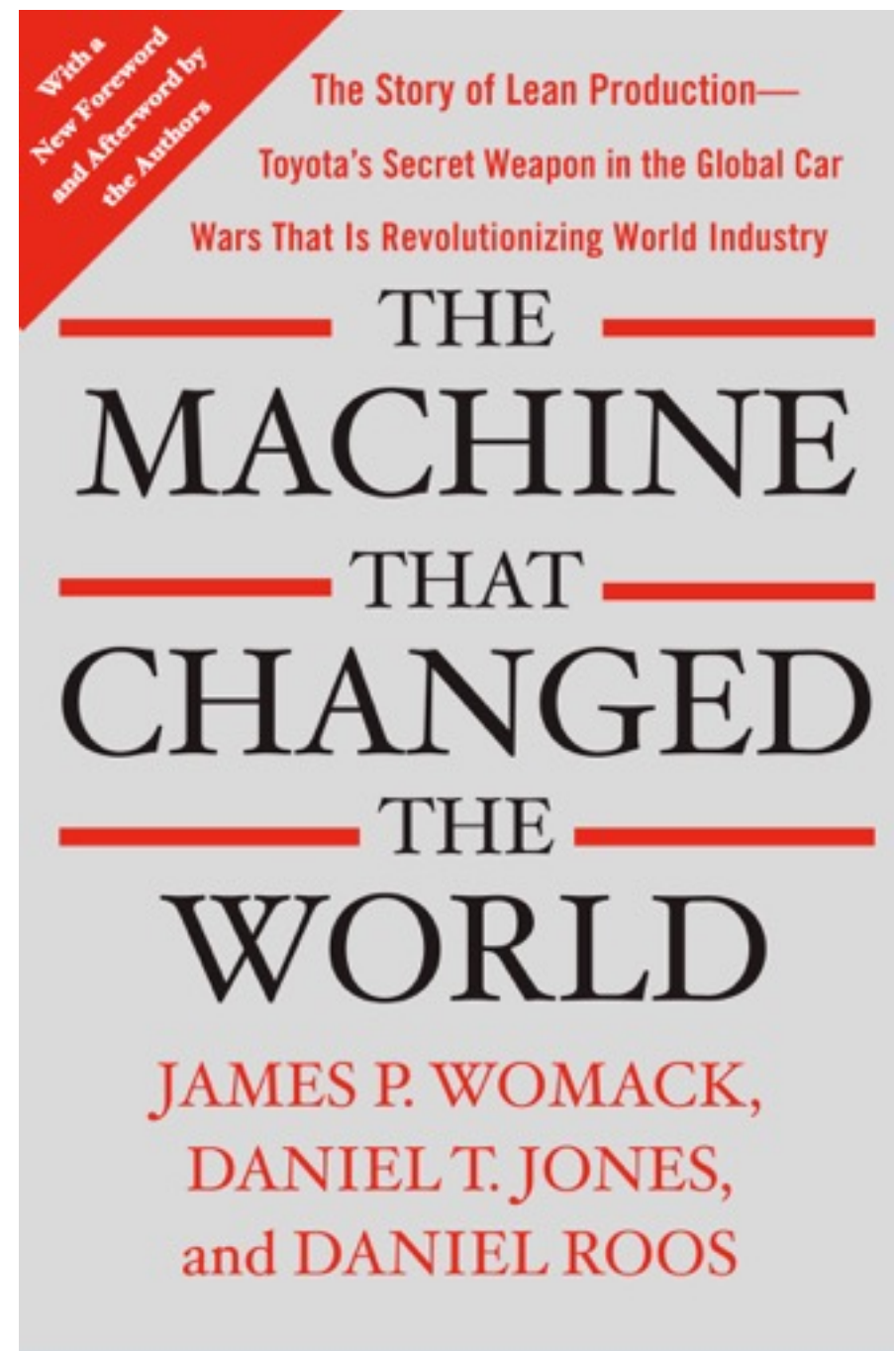
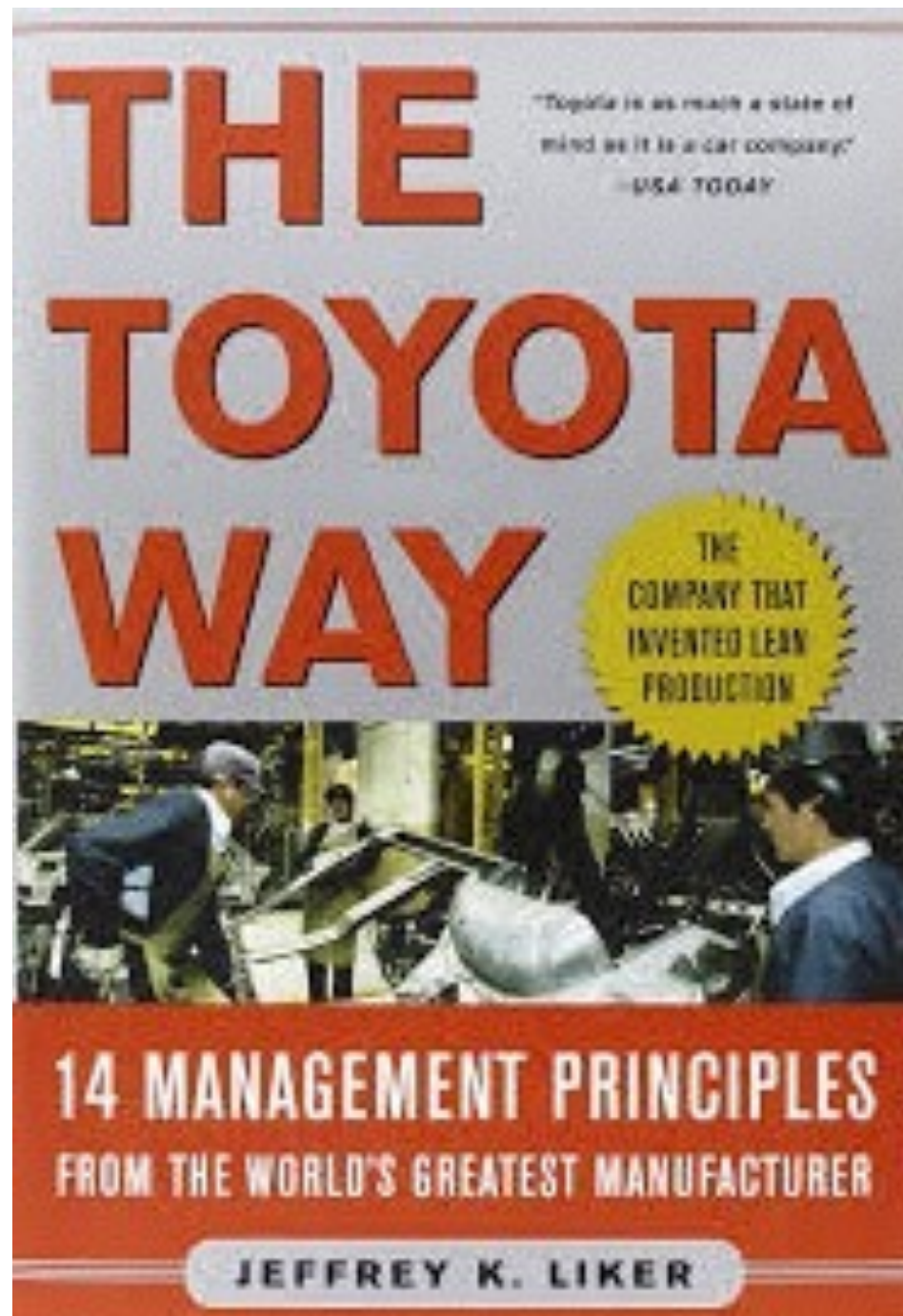










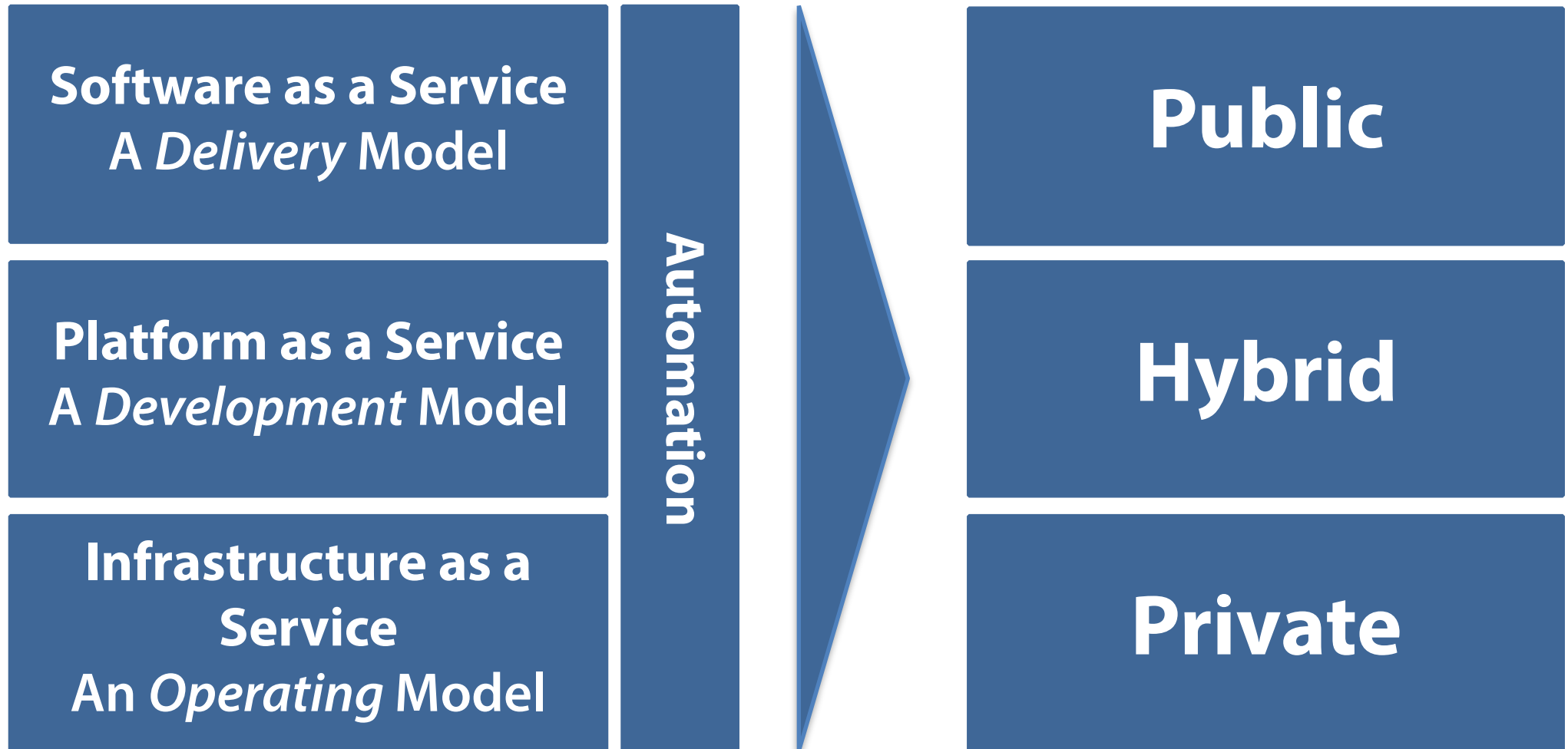




# Cloud Computing is Not

- The Internet
- The web
- Just Storage
- Amazon Web Services

# Cloud Computing\* = Industrial IT Production



\* <http://www.adamalthus.com/blog/2013/03/01/a-short-guide-for-the-perplexed/>

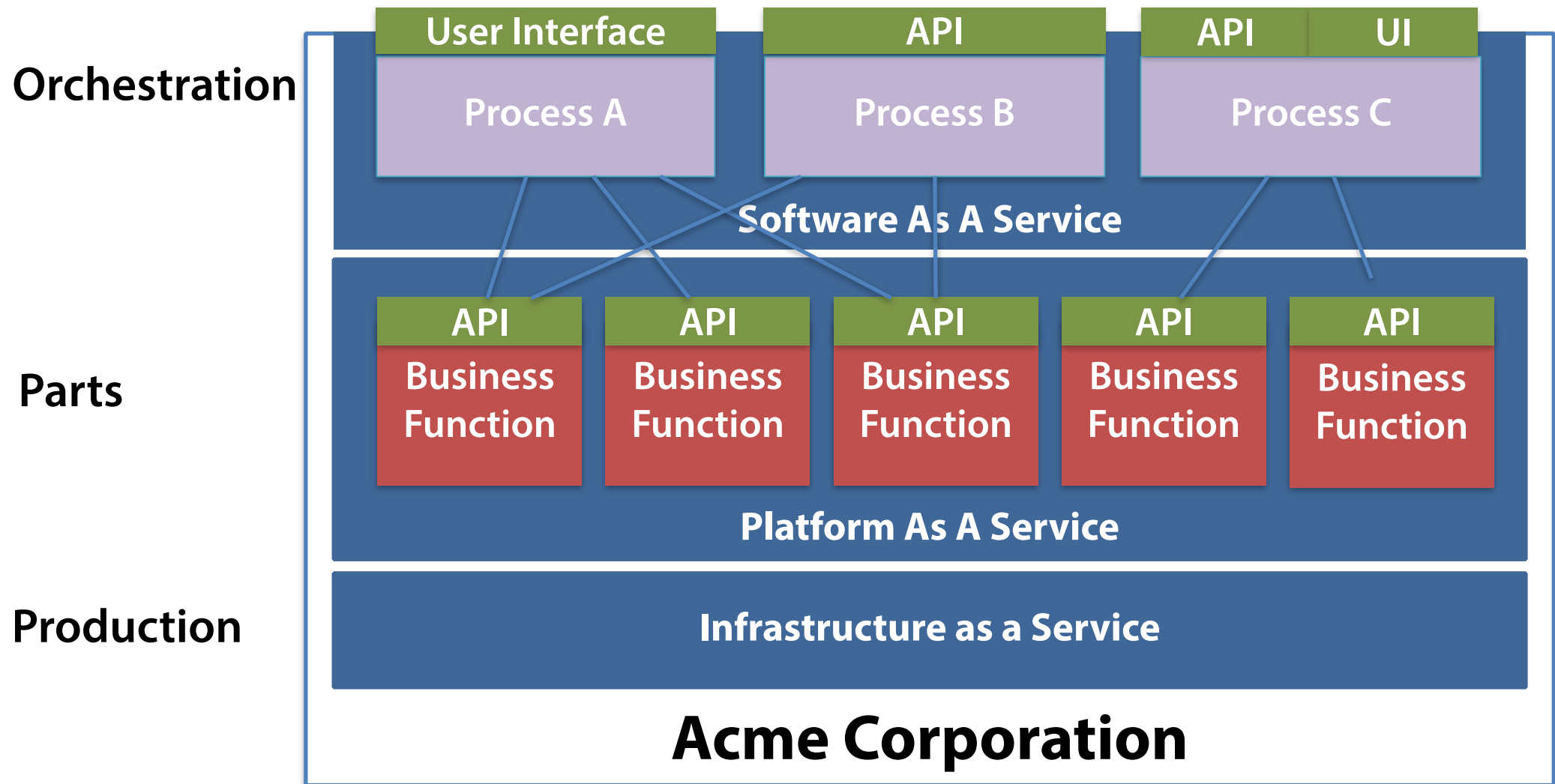


# Benefits of Industrialized IT

- Highly efficient utilization of physical IT and human capital
- Accelerated Time-to-Value
- From discreet to continuous production processes
- Decomposition of IT/Service value chains
- Abstraction and encapsulation of services
- High velocity, low cost experimentation
- Rapid innovation and efficiency improvement cycles



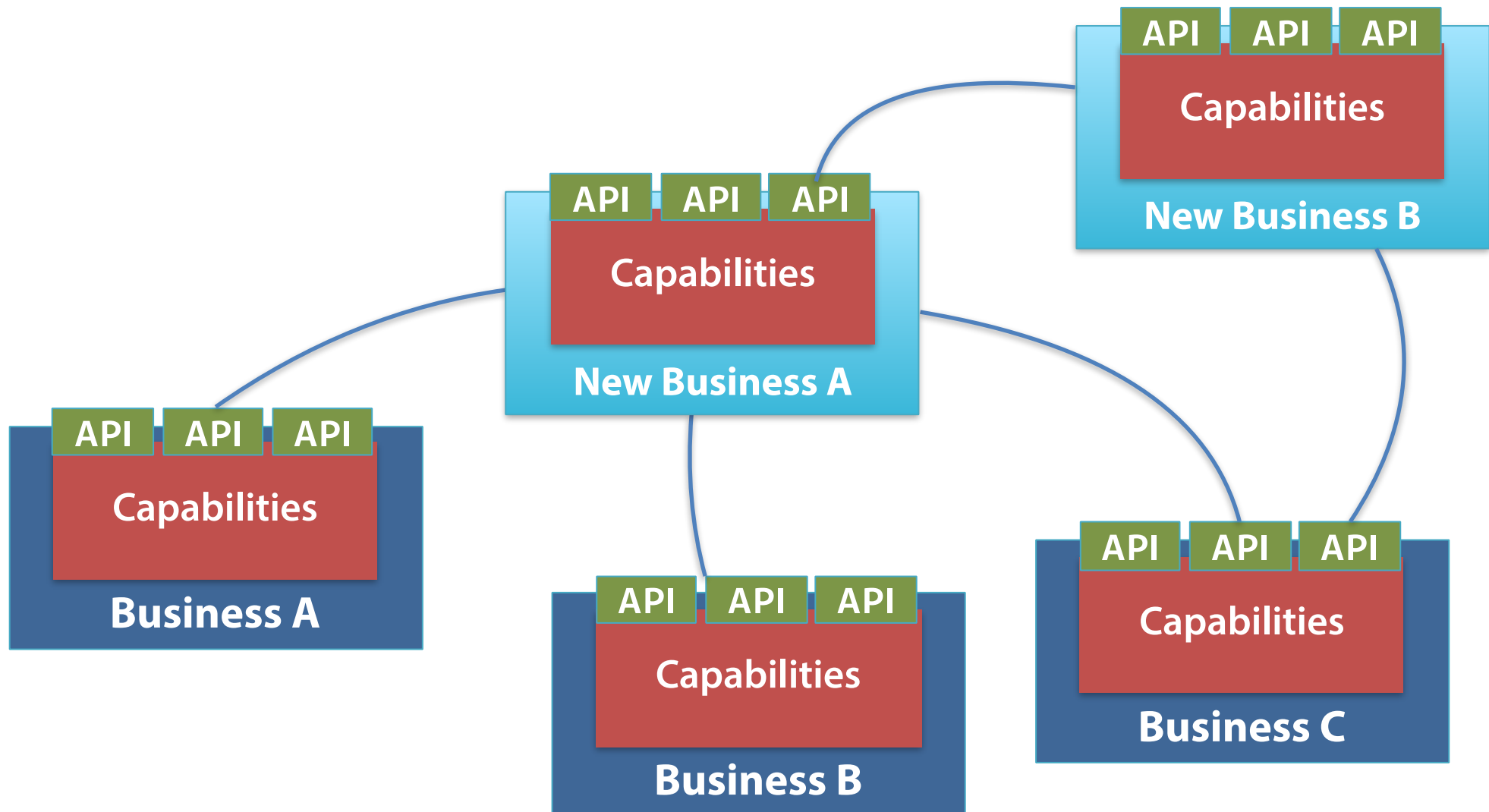
# The Composable Enterprise\*



\* <http://www.adamalthus.com/blog/2013/04/04/the-composable-enterprise/>



# Enabling A Platform Economy



<http://www.adamalthus.com/blog/2015/01/08/the-metaform-the-platform-of-everything/>



# **Implications for Developing Economies**



# Developing Economy Opportunities

- Maximize return on limited IT capital investments
- Maximize value of limited technical skills/resources
- Access to global markets for inputs and outputs
- Participation in global value chains
- Investment shift from low value infrastructure to high value services
- Improve productivity of industrial base
- Expands market opportunities and lowers barriers to entry for local IT supplier ecosystem



# Importance of 'Data Gravity'\*

- New cloud services are 'gravitationally' attracted to large economically important datasets
- Economics and speed of wide-area network data transfer still limiting factor for cloud services
- Early services and policy interventions that incubate large in-country dataset 'attractors' are critical

<http://blog.mccrory.me/2010/12/07/data-gravity-in-the-clouds/>

# Openly Available Production Tooling





# Old Challenges Overcome

- Means of production now openly available
- Source skills and component services globally
- Local production capability solves for latency and international bandwidth issues
- Reduced technical infrastructure skill requirements
- Lower capital investment threshold

# Old Challenges Remain, New Arise

- Means of production now openly available to everyone
- Raises demand for higher level, business process, service and user experience design skills.
- Amplifies need for affordable, reliable, high-speed network access
- International bandwidth still limits global reach and quality of service delivery
- Pay-as-you-go cost model requires sustained revenue flow



# Policy Priorities in Developing Countries

- R&D or technology investment tax credits to incentivize digital 're-tooling' of industrial base
- Higher level business process, service and user experience design skills development
- Broadband network access more critical than ever
- Development of competitive landscape for local full service cloud provision - Not just data-centers
- Incentivize regional cloud service aggregation for skills pooling and economies of scale
- All public data available through cloud service APIs



# What's next



# Emerging Technologies

- *Openstack* - OSS standard for local IaaS provisioning
- *Docker + Kubernetes/Mesos* - Reducing skills required and time to deliver applications and services at scale
- *Amazon Lambda* - Data/Event driven code execution
- *Apache Storm, Spark, Mahout* - Industrial strength OSS real-time BigData processing and machine learning
- *BitCoin Blockchain* - Fabric for secure, trusted and anonymous distributed service execution.

# Emerging Opportunities & Challenges

- Internet-of-Things (IoT) requires entirely new data-processing architecture
- How can deep, machine-learning be used to benefit developing economies
- How will developing economy labor market adapt to the displacement caused by combination of automated cloud services, IoT, machine-learning/AI and robotics?