From the Structure of the Value Chain to the Strategic Dynamics of Industry Sectors

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Some stylized facts, revisited: Industry Life Cycles
(Utterback & Abernathy, 1978; Klepper, 1996)

1. When an industry first forms, numerous firms enter, but the number of entrants eventually declines ("era of ferment")

2. Number of producers grows to a peak and then declines (after emergence of "dominant design")

3. Eventually, market shares stabilize; Diversity of products rises with the number of producers, then falls

4. Over time, producers devote more resources to process relative to product innovation

5. Most product innovations come from recent entrants
...and the (implicit) assumptions

1. Industries’ boundaries are stable – they do not, e.g., dis-integrate

2. Innovations happen in that “integrated part” (product or process)

3. Entrants are in that “one segment”

...underlying examples are quite specialized and old
   Manufacturing;
   1900 - 1980, pre *massive IT* investments of 1990s

...no competition between integrated vs specialized firms
   Eg, IBM vs. Microsoft and Intel
So, if this is the case, what do we have to do?

- Revisit the assumption that “an industry” is a given
- Look for changes in vertical structure
  - Take sectors as our focus
  - Sectors = Groups of related industries
- Go beyond the firms-in-an-industry paradigm
  - New empirical investigation
  - And an opportunity to develop new theory
  - (though there is a lot of theory out there yet untested!)
Breakthroughs come in strange places: Grove’s structural change story

1980- “Vertical Silos”

1995- “Modular Cluster”

“Only the Paranoid Survive”
How can we study industry architecture evolution?

- Metrics: Market capitalization; sales; value added...
  - Per segment (and new, unbundled, or separate segments *do emerge*)
  - And by firm in each segment (to study stability *within* segments)
- Use “Layer maps” to give stylized view of a sector
  - Snapshots and over time
  - Extending work of Fransman (on telecoms) and Grove (on computing)
  - Similar to Fixson and Park’s market share maps
Working from Compustat to get real layer-map data
... Not for the faint of heart!

- Take a sector, and consider the basic “constituent SIC / NAISC” codes
  - 4 to 6 digit codes to compose the entire “ecosystem” as it evolves
  - Work with industry experts to construct the sectors’ list
- Tabulate the results in terms of “verticals” and “horizontals”
  - Objective: see how profit shifts from vertical to horizontal layers
  - ...and how much “churn” there is within layers
- Map “Top N” Companies each year
### How the map works

#### Computer Industry

<table>
<thead>
<tr>
<th>NAICS</th>
<th>SIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>541511</td>
<td>Custom Computer Programming Services 7371 Computer Programming Services</td>
</tr>
<tr>
<td>511210</td>
<td>Software Publishers 7372 Prepackaged Software (mass reproduction of software)</td>
</tr>
<tr>
<td>454110</td>
<td>Electronic Shopping 5961 Catalog and Mail-Order Houses (electronic shopping web sites)</td>
</tr>
<tr>
<td>541519</td>
<td>Other Computer Related Services 7379 Computer Related Services, NEC (except computer systems consultants and disk conversion services)</td>
</tr>
<tr>
<td>541512</td>
<td>Computer Systems Design Services 7372 Computer Integrated Systems Design</td>
</tr>
<tr>
<td>334611</td>
<td>Software Reproducing 7372 Prepackaged Software (mass reproduction of software)</td>
</tr>
<tr>
<td>3341</td>
<td>Electronic Computer Manufacturing 3571 Electronic Computers</td>
</tr>
<tr>
<td>334112</td>
<td>Computer Storage Device Manufacturing 3572 Computer Storage Devices</td>
</tr>
<tr>
<td>334113</td>
<td>Computer Terminal Manufacturing 3575 Computer Terminals</td>
</tr>
<tr>
<td>334119</td>
<td>Other Computer Peripheral Equipment Manufacturing 3577 Computer Peripheral Equipment, NEC (except plotter controllers and magnetic tape head cleaners)</td>
</tr>
<tr>
<td>334412</td>
<td>Bare Printed Circuit Board Manufacturing 3672 Printed Circuit Boards</td>
</tr>
<tr>
<td>334113</td>
<td>Semiconductor and Related Device Manufacturing 3671 Semiconductors and Related Devices</td>
</tr>
<tr>
<td>518111</td>
<td>Internet Service Providers 7375 Information Retrieval Services (internet service providers and internet access providers)</td>
</tr>
<tr>
<td>518112</td>
<td>Web Search Portals 8999 Services, NEC (internet web search portals)</td>
</tr>
<tr>
<td>518210</td>
<td>Data Processing, Hosting, and Related Services 7374 Computer Processing and Data Preparation and Processing Services</td>
</tr>
<tr>
<td>533420</td>
<td>Office Machinery and Equipment Rental and Leasing 7359 Equipment Rental and Leasing, NEC (office machine rental and leasing)</td>
</tr>
</tbody>
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What a map looks like... Computers, 1979
COMPUTERS: The Movie

Starring
Bill Gates
Andy Grove
Steve Jobs
And 5 CEOs of IBM
Grove was right!

It was the End of the Verticals

They ALL disappeared!
Does this always happen?
CAR WARS

Starring
Taiichi Ohno
Shigeo Shingo
Lee Iacocca
Jurgen Schremp
And 5 CEOs of GM
In the beginning (1984)
AoM Symposium on Industry Architectures
Philadelphia, PA, August 7, 2007

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The industry turned over, but value stayed with the verticals

It’s not about modularity (sob!)

But it’s not about stability either!
Telecomm is yet another story...
So what do our maps tell us?

- They challenge the standard “life cycle of industries” theory
  - Theory is NOT UNIVERSAL
  - Causal explanations based on mass production technology, pre-IT
- Industries dis-integrate (computers)
- But dis-integration is not inescapable (autos)
- Sometimes different architectures survive side-by-side
  - Semiconductors: Fabless and integrated co-exist, each focusing on a different niche (Strojwas dissertation)
  - Telecomm, maybe (too early to tell)
- Sometimes an industry will integrate (bike drive trains)
- We need to study what *underlies* these vertical evolutions
Wanted: Better Theory and More Data

Starring

[Your names here]