Industry Evolution: Implications for Strategy, Innovation and Entrepreneurship

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An evolutionary theory of economic change
RR Nelson, SG Winter - 2009 - books.google.com
This book contains the most sustained and serious attack on mainstream, neoclassical economics in more than forty years. Nelson and Winter focus their critique on the basic question of how firms and industries change overtime. They marshal significant objections to

Impact on knowledge

Deliberate learning and the evolution of dynamic capabilities
M Zollo, SG Winter - Organization science, 2002 - pubsonline.informs.org
This paper investigates the mechanisms through which organizations develop dynamic capabilities, defined as routinized activities directed to the development and adaptation of operating routines. It addresses the role of (1) experience accumulation,(2) knowledge

51, 532 cites just for the top 5 scholarly work!

Appropriating the returns from industrial research and development
RC Levin, AK Klevorick, RR Nelson, SG Winter... - Brookings papers on ..., 1987 - JSTOR
To HAVE the incentive to undertake research and development, a firm must be able to appropriate returns sufficient to make the investment worthwhile. The benefits consumers derive from an innovation, however, are increased if competitors can imitate and improve on

Understanding dynamic capabilities
SG Winter - Strategic management journal, 2003 - Wiley Online Library
Abstract Defining ordinary or 'zero-level'capabilities as those that permit a firm to 'make a living'in the short term, one can define dynamic capabilities as those that operate to extend, modify or create ordinary capabilities. Logically, one can then proceed to elaborate a

In search of useful theory of innovation
RR Nelson, SG Winter - Research policy, 1977 - Elsevier
Abstract This essay presents an overview of the prevailing theoretical literature on innovation, probes the adequacy of existing theory to guide policy regarding innovation, and sketches some directions for more fruitful theorizing. The focus is on the vast interindustry

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Behavioral Theory of the Firm

Biological Evolution

Austrian Economics

Industrial Organization
Gort & Klepper 1982

External Information
- Entrepreneurial rents from exploiting discoveries
- High Profit Margins
- Low Entry Barriers

Internal Information
- Complementary Assets
- Increase in Barriers to Entry & Survival
- Less efficient firms exit

No unique equilibrium number of firms, rather historical events from preceding stages drive the number of producers.
**Entrepreneurial Regime**
- Schumpeter Mark I
- “Widening” information
- Entrepreneurial entrants

**Routinized Regime**
- Schumpeter Mark II
- “Deepening” information
- Established firms with existing routines

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**Fig. 1. The five stages of new product industries.**
Firm Evolution

Industry Evolution
Gort and Klepper (1982)

Birth of Capabilities
Helfat & Lieberman (2002)

Industry Lifecycles and Firm Performance
Agarwal, Sarkar & Echambadi (2002)

Biological Evolution

Behavioral Theory of the Firm

Austrian Economics

Industrial Organization
Bringing firm and industry evolution together...

Diversifying entrants

Birth of Firm “X”

Birth of New Industry

Birth of Firm “Y”
Helfat and Lieberman (2002)

- Teece (1986) distinction between
  - Core and complementary capabilities
  - Generalized and specialized capabilities

Table 4 Pre-entry resources and capabilities

<table>
<thead>
<tr>
<th>Core versus complementary resources and capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core resources and capabilities: Knowledge required to create a product or service</td>
</tr>
<tr>
<td>Examples: Technological knowledge, Knowledge of customer needs</td>
</tr>
<tr>
<td>Complementary resources and capabilities: Resources and capabilities needed to profit from core resources and capabilities</td>
</tr>
<tr>
<td>Examples: Finance, Marketing and sales, Distribution and logistics, Customer service</td>
</tr>
</tbody>
</table>

Specialized versus generalized resources and capabilities

<table>
<thead>
<tr>
<th>Specialized resources and capabilities: Resources and capabilities that are more specialized to particular settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intangible resources Examples: Relationships with buyers, suppliers, Brand name, Patents and trademarks</td>
</tr>
<tr>
<td>Functional area resources Examples: Marketing, Research and development, Distribution</td>
</tr>
<tr>
<td>Market-specific knowledge Examples: Industry conditions, Country or regional conditions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Generalized resources and capabilities: Resources and capabilities that can be applied in a broad range of settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>General organizational capabilities Examples: Transfer of knowledge, Management of multiple businesses (single location or geographically dispersed)</td>
</tr>
<tr>
<td>Mode of entry capability Examples: Acquisition, Joint venture</td>
</tr>
</tbody>
</table>

Integrative or reconfiguration capabilities (Helfat and Raubitschek, 2000)
...and incorporating people in the mix

- Biological Evolution
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- Industrial Organization
- Human Capital Theory
- Firm Evolution
- Industry Evolution
  Gort and Klepper (1982)
- Deliberate learning
  and DC
  Zollo & Winter (2002)
- Birth of Capabilities
  Helfat & Lieberman
  (2002)
- Industry lifecycles and Firm Performance
  Agarwal, Sarkar & Echambadi (2002)
- Entrepreneurial Spinoffs
  Klepper (2002)
Early Stage
- User and Academic Entrepreneurs
- More product innovation as a result
- “Outside” information
- Complements or collaborators to established firms

Stage II/III (Growth Stage)
- Employee Entrepreneurship
- Increasing focus on process innovation
- Competing with established firms

Stage IV/V: Mature Stage
- Employee entrepreneurship
- Niche entry by user entrepreneurs
- Process more than product innovation
- Competitors, collaborators and complements

Knowledge context of entrepreneurs
Agarwal and Shah (2014)
But what about markets?

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Economic History

Biological Evolution

Behavioral Theory of the Firm

Austrian Economics

Industrial Organization

Human Capital Theory

Technology Evolution
Rosenberg (1982)

Firm Evolution

Industry Evolution
Gort and Klepper (1982)

Markets for technology
Arora, Fosfuri and Gambardella (2001)

Deliberate learning and DC
Zollo & Winter (2002)

Birth of Capabilities
Helfat & Lieberman (2002)

Industry lifecycles and Firm Performance
Agarwal, Sarkar & Echambadi (2002)

Entrepreneurial Spinoffs
Klepper (2002)
A rich evolutionary tradition

• Within and across levels of analysis
• But critical questions remain!
  – At the intersections of “enterprise” and “markets”
  – For under-examined “time” and “place”
Digging deeper into individuals and cognition

Deliberate learning and dynamic capabilities

Knowledge contexts of individuals

- Decision making across career life-cycles (Individual evolution)
- Within vs. across variance among individuals in different knowledge contexts
- The role of “selection,” not just “treatment” of individuals into contexts
An “industry” may represent smaller clusters that co-evolve in an ecosystem.
Markets for products, capabilities and corporate control

• How might the “monolithic” view of industry evolution be modified to encompass the “ecosystem” view?
  – Role of integrated vs. modular firms?
  – Extent of competition and cooperation among firms?
  – Concept of dominant design: just about product design, or also about organizational/ecosystem design?

• What about competition in adjacent markets?
  – Google and Apple were once allies, now fierce competitors
  – How do industries evolve if there is multi-market competition?
What we still don’t know…

• Typical industry evolution context starts at instance of first product commercialization

• So, where do industries themselves come from?
  – The “nascent” stages of industry evolution
    • Inception period from “technological shock” to first product commercialization

• What types of firms enter, and what do they do?
  – Investment, sense making activities
  – Internal development, alliances and acquisitions
Classic “industry evolution” trend in Agricultural Biotechnology

Moeen and Agarwal, (2017)
Incubation period of Agricultural Biotechnology

Moeen and Agarwal, (2017)
Market creation and industry emergence

• Implicit assumption, given that much of firm/industry evolution literature has focused on developed countries context:
  – Potential use (demand) or technology (supply) will be the impetus for market actors to invest in industry emergence

• But what if markets don’t exist, as in contexts lacking commercial institutions?

• Who/what are the triggers?
  – Public (non-profit) and private investments
In summary

- Glorious evolution of thought in the last 35 years...
  - Systematic integration of rich scholarly traditions to answer questions core to strategy, innovation and entrepreneurship

- ...which sets the stage for the next generation of research
  - Need for both a deep dive (focus on individuals and cognition), and a wide lens (focus on markets)