

**PROFITING FROM TECHNOLOGICAL INNOVATION:
BUILDING ON THE CLASSIC BUILDING BLOCKS**

Sonali K. Shah

University of Illinois, Urbana-Champaign

TEECE'S (1986) BUILDING BLOCKS

Central Question: *What determines the share of profits captured by the innovator?*

- Block 1: Strong appropriability regimes benefit the innovator
- Block 2: Complementary assets benefit the holder of the asset

When both are strong, bargaining power will dictate integration or contractual relationships between complementary assets and innovation

- Block 3: Industry life cycle stage: CA become increasingly important over the industry life cycle

key:


	Strong Legal/Technical Appropriability	Weak Legal/Technical Appropriability	
		Innovator Excellently Positioned versus Imitators with Respect to Commissioning Complementary Assets	Innovator Poorly Positioned versus Imitators with Respect to Commissioning Complementary Assets
innovators and imitators advantageously positioned vis a vis independent owners of complementary assets	(1) contract innovator will win	(2) contract innovator should win	(3) contract innovator or imitator will win; asset owners won't benefit
innovators and imitators disadvantageously positioned vis a vis independent owners of complementary assets	(4) contract if can do so on competitive terms; integrate if necessary innovator should win; may have to share profits with asset holders	(5) integrate innovator should win	(6) contract (to limit exposure) innovator will probably lose to imitators and/or asset holders

degree of intellectual property protection

market power of innovators/imitators versus owners of complementary assets

Fig. 11. Contract and integration strategies and outcomes for innovators: Specialized asset case.

ROADMAP

- Bring Teece's building blocks—complementary assets, appropriability regimes, and stage of the industry life cycle—together with a fourth building block—*the knowledge context in which the innovation was developed*—to explain observed patterns of entrepreneurial entry, performance, and relationships with established firms
- Highlight directions for future work
- Stimulate discussion

INNOVATIONS COME FROM VERY DIFFERENT SOURCES

- Tech startups stemming from three “knowledge contexts” have received attention in the literature



**Employee
Entrepreneurship**

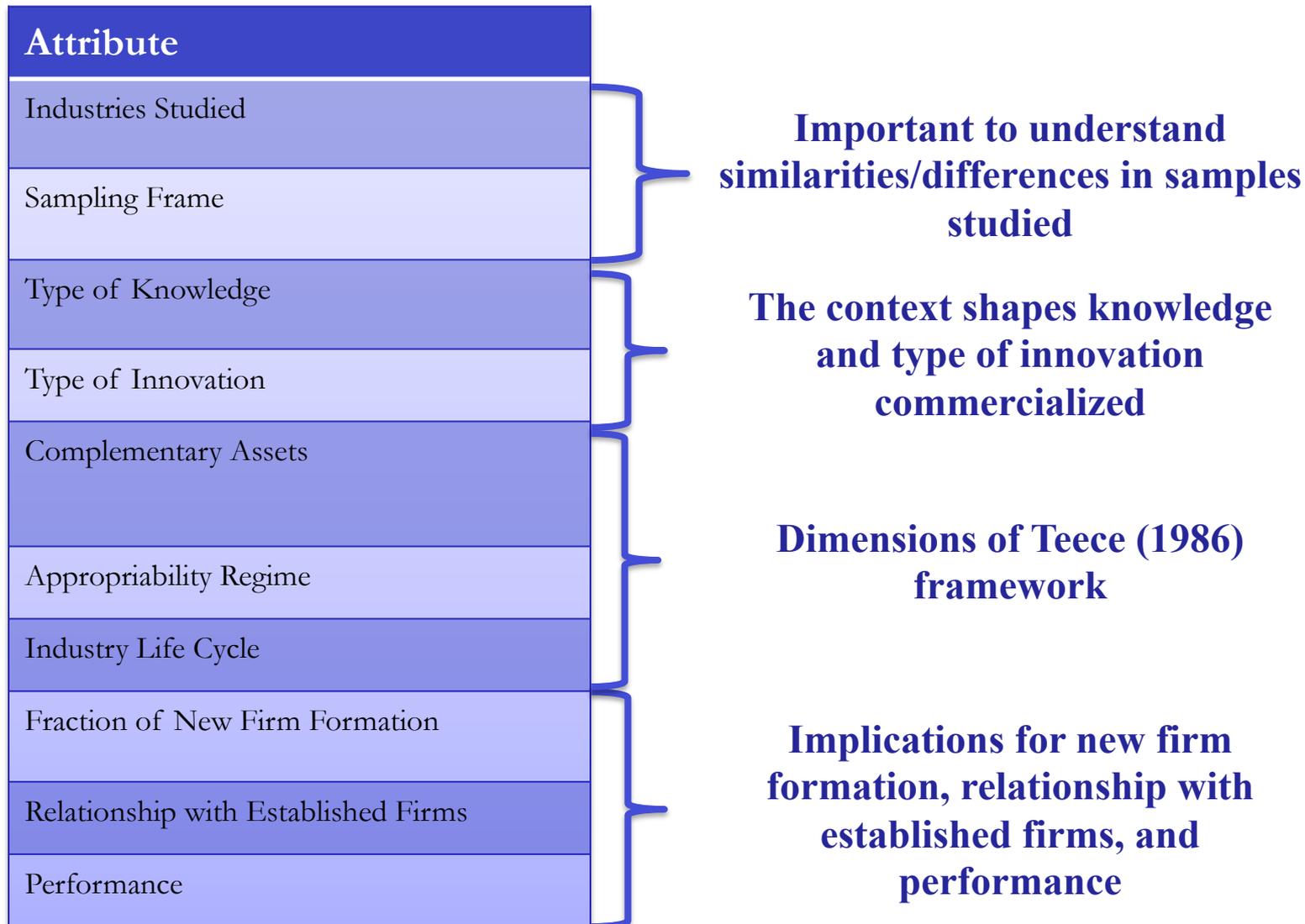


**Academic
Entrepreneurship**



User Entrepreneurship

LITERATURE REVIEW ON STARTUPS STEMMING FROM EACH KNOWLEDGE CONTEXT



LITERATURE REVIEW ON EACH CONTEXT REVEALS...

Attribute	EE	AE	UE
Industries Studied	High technology and professional services	High technology (bio-medical and IT)	High technology and end use (e.g. sports)
Sampling Frame	Comprehensive single industry longitudinal data	University technology transfer, and some longitudinal single industry data	Single industry histories; more qualitative in nature
<u>Type of Knowledge</u>	Technological, operational and market	Technological	Market (niche needs)
<u>Type of Innovation</u>	Product and process	Product	Product
<u>Complementary Assets</u>	Knowledge and social networks span across value chain activities	Individual status/ university reputation	Innovative brand, and user communities
<u>Appropriability Regime</u>	Strong and weak	Strong	Strong and weak; some have trouble enforcing patents
<u>Industry Life Cycle</u>	Growth, Late	Primarily Early	Early and Late
Fraction of New Entrants	25% to 85% of entrants	6% -57% of all entrants	34 -100% of entrants; but sampling frame may be skewing #s
Relationship with Established Firms	Compete or complement	Collaborate	Complement or no overlap
Performance	Outsurvive other startups	Not clear; Acquisition is a successful exit	Highly innovative, but survival varies

SO, HOW CAN THE KNOWLEDGE CONTEXT HELP US?

Working with these building blocks can provide insights into patterns of entry, competition with established firms, and performance

- Specifically, let's consider how complementary assets, appropriability regimes, and the stage of industry evolution might shape entry by firms stemming from the three knowledge contexts



PUTTING THE BUILDING BLOCKS TOGETHER

- Proposition 1: Access to complementary assets is a higher barrier to entry for academic and user entrepreneurship, relative to employee entrepreneurship
 - EE likely to possess knowledge of CA, as well as knowledge of how to build or recreate such assets (Campbell, et al, 2012); AE and most UE do not possess such knowledge (some exceptions, Malerba et al, 2013)
- Proposition 2: The strength of the appropriability regime is a higher barrier to entry for user entrepreneurship, relative to employee and academic entrepreneurship
 - UE intellectual property is often called into question and overturned based on the operationalization of the non-obviousness clause (PHOSITA); whereas EE and AE pass the operationalization based on their education, training, and experience
- Proposition 3a: The creation of altogether new industries, niche markets and technological discontinuities are more likely to be triggered by academic or user entrepreneurship, than by employee entrepreneurship
 - AE possess the knowledge to introduce novel technologies and UE possess knowledge to introduce novel features and functionality

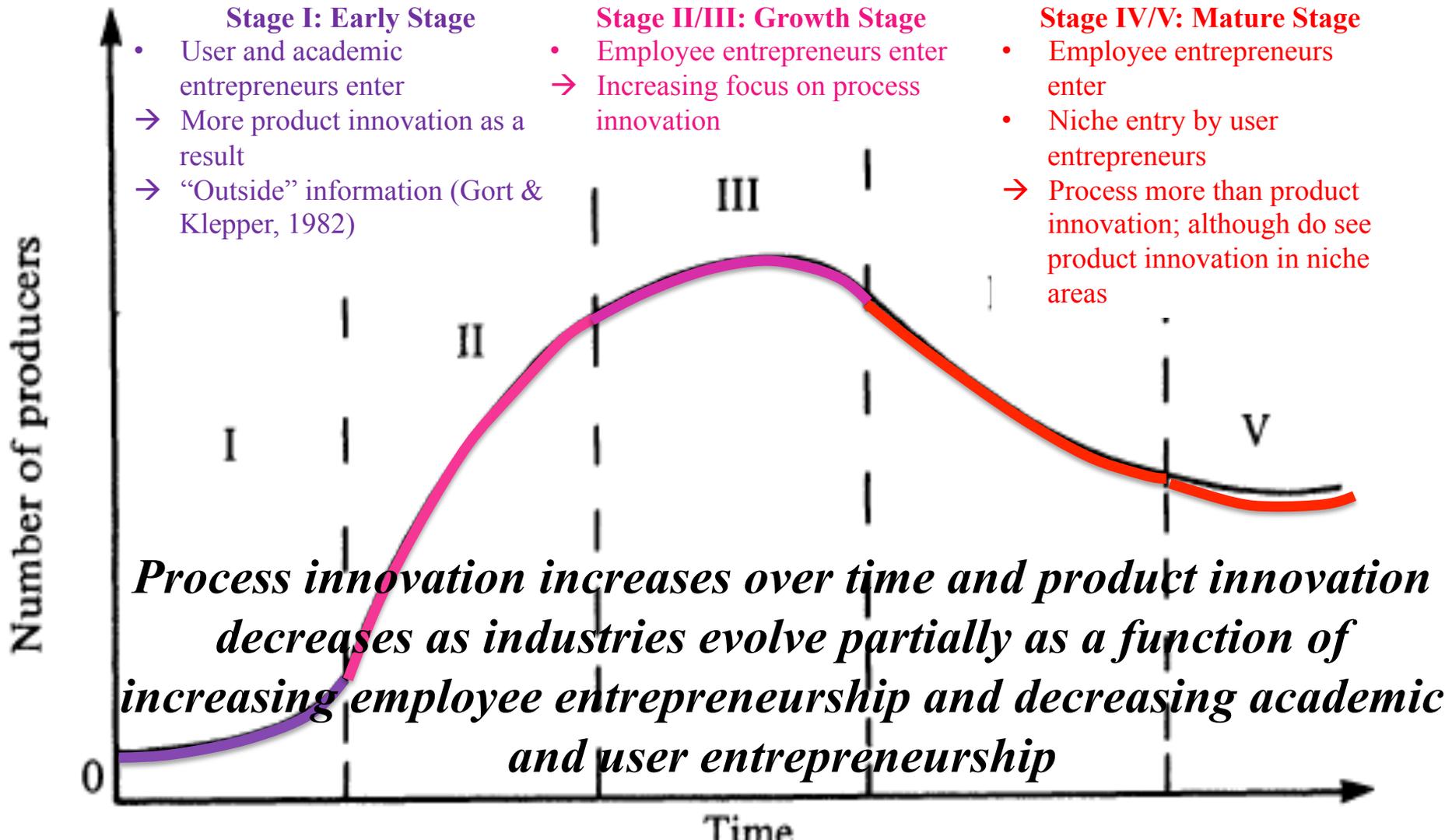
NOW, LET'S BRING *CHANGES* IN CA & AR OVER THE ILC INTO THE MIX

- Availability and importance of complementary assets *increases* over the industry life cycle (Stigler, 1951; Gort and Klepper, 1982; Teece 1986)
- Strength of appropriability regimes also appear to *increase* over the industry life cycle
 - Uncertainty around patent scope is resolved (Merges and Nelson, 1990; Jaffe, 2000)
 - Returns from intellectual property rights increase (Hall and Ziedonis, 2001; Jaffe, 2000)

NOW, LET'S BRING *CHANGES* IN CA & AR OVER THE ILC INTO THE MIX

- Strengthening complementary assets and appropriability regimes over the industry life cycle:
 - Proposition 3b: Favor employee entrepreneurship relative to both academic and user entrepreneurship
 - Proposition 3c: Favor academic entrepreneurship over user entrepreneurship.
 - Proposition 3d: Cause user entrepreneurship to occur in niche markets that are left unattended by existing firms

WHO ENTERS OVER THE INDUSTRY LIFE CYCLE?



BENEFITS: THE KNOWLEDGE CONTEXT AS A FOURTH BUILDING BLOCK IN OUR TOOLKIT

- Integrative framework that builds on Teece (1986) that relates firm formation to four factors: complementary assets, appropriability regimes, industry evolution, and heterogeneity in knowledge context
- Industry evolution: we attempt to provide an explanation of the dynamics of the industry life cycle based on underlying shifts in complementary assets and appropriability regimes. Possible explanations for:
 - Gort & Klepper's (1982) observation that the information sources in an industry shift from external to internal over time
 - Patterns of increasing and decreasing rates of product and process innovation over time
- High technology entrepreneurship: rather than focusing on relative importance, we highlight the *unique roles* played by employee, academic, and user entrepreneurs

NEXT STEPS

- Continue to improve our understanding of industry dynamics. *Fortunate to have very solid building blocks with which to work!*
 - Examine employee, academic, and user entrepreneurs together
 - Most studies examine just one knowledge context, a few examine two
 - Currently connecting insights from largely disconnected literatures/studies designed for very different purposes
 - Variety of outcome variables to be examined: innovation, job creation, etc.
 - Hybrid knowledge contexts. Focused on pure forms here to gain some traction:
 - Knowledge contexts comingle
 - Some founders have careers that span multiple knowledge contexts
 - Teams

We knew that we were just scratching the surface of the potential. The more we worked together, the sooner we'd go faster. We all could visualize the future and knew that we had a long way to go.

- Larry Stanley, user entrepreneur