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Executive Roundtable for Materials Growth

Hosted by: Growth Arc Advisors LLC

Contact: Kendall Justiniano or Dr. Agarwal with follow-up questions for your organization.

Summary

Dr. Agarwal began her career as an economist, studying drivers of economic growth. She migrated to strategy as she realized that *firm choices* were underpinning these economic growth effects. And as her strategy work developed, she has added the dimension of personal entrepreneurship and leadership seeing that *individual decisions* ultimately underly firm choices. This progression has informed her strategy viewpoint by including employee mobility and knowledge transfer as a part of the dynamics she studies.

Rajshree's work in strategy has focused on growth as it pertains to industry evolution. Following on the work of her advisor Michael Gordon who characterized the growth of new industries, Rajshree has studied the early stages of new industry growth and sought to understand the players and key dynamics underpinning these periods.

Contrasting to other strategic frameworks as either too static (e.g. Porter's 5 forces) or overly focused on new entrants (e.g. Schumpeter and Christensen - creative destruction), Rajshree's work looks at the dynamics of economic growth more holistically, and her work has developed unique insights as a result.

- Markets are first platforms for collaboration, and viewing them solely through a competitive lens underemphasizes key activities necessary for new industry growth. As such, partnering becomes a crucial capability of growth firms.
- Established firms have a critical role to play in developing and integrating new technology, contrary to the disruptive innovation frameworks which emphasizes their inertial tendencies.
- How firms approach the learning function, i.e. the filling in of knowledge and removal of uncertainty is critical aspect of how firms develop and succeed during such periods.
- Finally, individual mobility is a crucial feature of knowledge development and knowledge transfer in developing industry ecosystems.

Observations on New Industry Development

As Rajshree studied numerous examples of industry development, she observed several features.

First, there is an incubation period that many times extends much earlier before first commercialization, characterized by a dynamic, vibrant ecosystem of activity. That ecosystem includes a diverse and growing set of players, including incumbent firms, established firms from adjacent industries, and of course firms or institutions that develop some form of radical new technology.

There are both science push and demand pull dynamics at play. Networks with clusters of firms form with diverse sets of firms making these up. Utilmate firm roles evolve out of both internal capabilities and these collaborative relationships.

A key frame for thinking about industry development is through the large amount of uncertainty during the nascent stages and how firms and firm networks contribute to knowledge development. Initially, knowledge development centers on linking a technology solution with a market need. Subsequent knowledge is built up around integration of the solution into existing components, institutions, and delivery channels. In addition to recognizing the development of a solution underpinned by new technology, this perspective acknowledges the significant amount of work done to integrate solutions into supporting infrastructure and institutions.

Rarely does a radical technology commercialize from scratch on its own. Markets then can viewed as first *platforms for collaboration*. This interdependence becomes an enabler or a bottleneck depending on how it is handled by firms. And within this framework there is significant role for *established* firms to play, both as integrators and as commercializers, leveraging their downstream assets to help bring new solutions to market.

Contrary to their characterization as primarily inertial, established firms therefore have a key role to play. They have significant technology that must be integrated with radical new technologies. They also have downstream delivery channels in place. So they can and do play a critical integrative function. In fact, Rajshree's work indicates that up to 70% of knowledge created in new industries, is created by *established* firms, whether incumbents or adjacent firms.

Example Analysis - Bionic Prosthetics

During the session, Rajshree reviewed data from several example industries, most comprehensively, the bionic prosthetics industry.

Bionic prosthetics, contra conventional mechanical prosthetics, use AI, electronic controls, and neural links to significantly upgrade motor skills and dexterity. This is a radical new industry with the nexus of radical technology in the control systems employed. At the same time, other components rely both on existing technology and require integration or augmentation to adapt them to the new technology. Examples of these existing components include materials, bio-mechanical components, and an understanding of the bio-mechanics involved.

Rajshree et al. mapped the development of this industry and noted a significant amount of diversity and function in the firm ecosystem that developed. This included inventors - both user-inventors, employee inventors and academics - incumbent firms (examples), and established firms from other industries (Honda, Samsung, Kobe Steel). In addition, she noted the role of individuals as they moved through the ecosystem transferring critical knowledge.

Rajshree related example stories from the industry of Liberty Mutual, an early adjacent firm committed to lowering healthcare costs of prosthetics, Hugh Hare - double amputee, academic at MIT, and finally founder of iWalk; Kobe Steel as they supported an ecosystem of firms in Japan; Department of Defense as they seeded grand challenges to aid veterans in need, and others.

Implications for Strategy

This narrative of new industry development emphasizes the collaborative and networked aspects of the industry and the interdependence of firms required to integrate radical technology and to reconfigure existing technologies for the industry to take hold. This requires analysis and thinking about which firm capability to focus on, where to create alliances, and where to invest to build internal competence. Rajshree referenced Capron and Mitchell's "Build, Borrow or Buy" framework as helpful in thinking about how to place your firm within such a collaborative ecosystem.

A second implication is that alliance management is a potentially critical capability for any firm involved in new industry development. Managing alliances requires careful attention to their selection and establishment, particularly on win-win principles. So important is the win-win framing in alliance selection that Rajshree suggested that partners be chosen with a critical eye toward values alignment of the partner rather than simply on strategic competencies. Subsequent to establishing alliances, ongoing management is crucial for successful outcomes. Alliances, even if well-established, often fail due to lack of continued coordination and communication.

Recommendations for established firms playing in new industries are to first disabuse the notion of incumbents as *necessarily* inertial. Firms should consider specifically leaning into the "integrator" role among a network of partners, given that they have significant advantage for this role over other players in the ecosystem. For established firms too, innovation is a critical competence, whether the firm is integrating, reconfiguring components or has a stake in the radical technology. That means harnessing the innovation potential of your employees internally. Failure to do so may see the best and most committed to the new industry defect to other firms if they can't find an outlet for their creativity internally. Finally, consider that traditional management measures used for business optimization, including such metrics as near-term profitability, are not good metrics in contexts of uncertainty.

For entrants, recognizing that radical technology shifts don't materialize a new industry on their own and that other players may have significant resources at their disposal, means that understanding entrant positions of power in relationships, and getting the right partnerships in place is crucial for success. Knowing the source of your innovation, either addressing an unmet need or technology can be a helpful distinction. For addressing unmet needs a path of building up niche applications to achieve scale can be successful. For new technical discoveries, embodying the discovery in a component system to sell is a better option, if it can be done. Also, entrants must recognize a key source of critical industry knowledge can come from employees who move from established firms to the entrant firm, bringing with them crucial industry knowledge.

Individual choice dynamics

A distinctive component of Rajshree's research looks at the choices made by individuals within and across firms in developing industries. In that sense, traditional strategy is overly economic- or market-focused, and the impact of individual choices is often overlooked. Several key insights have been develop from this focus on individual decisions.

First, executive mobility is a critical aspect of ecosystem development. Entrants are often staffed with knowledgable executives from established firms, and this can provide crucial knowledge transfer to the entrants. Second, the mindset for collaboration, so crucial as industries develop, starts at the individual level. A win-win mindset from individuals becomes a crucial component of the company value system. This mindset provides the strength to the relationships to deal with changes, conflicts and unexpected shifts as the industry develops.

Finally, the purpose aspect of motivation is a crucial one in entrepreneurial careers, and especially in nascent industries. Mobility and purpose drive individual choices in addition to profit outcomes, and considering purpose in organizational culture development is a key consideration.

Materials Specific Discussion

Rajshree's insights, and the group in attendance made for interesting industry-specific discussion. Both bioplastics and plastics recycling were discussed. Rajshree pointed out the criticality of integrating new bioplastic technologies with current downstream processing technologies like molding and extrusion, as well as the end-use application development. Also the pitfalls and challenges of alliance development, especially with strong established firms, was discussed. Finally, the ever-present issue of developing scale economics vs. the niche approach was also discussed.

Be sure to register for Roundtable membership to get live seats with access to discussion participation.

About Rajshree Agarwal PhD

Dr. Rajshree Agarwal is the Rudolph Lamone Chair of Strategy and Entrepreneurship, and Director of the Ed Snider Center for Enterprise and Markets at the University of Maryland. She studies the evolution of industries as fostered by the twin engines of innovation and enterprise.

She is one of the most higly cited researchers in Strategy & Entrepreneurship, and included in the top 2% of scholars list worldwide.

Dr. Agarwal's scholarship provides insights on strategic innovation for new venture creation and firm renewal. An author of more than 60 studies, her research has been cited more than 10,000 times, and funded by grants from the Kaufman, Rockefeller, and National Science Foundations. She is currently the co-editor of the Strategic Management Journal.

She is a senior contributor at Forbes, and has been featured in the Washington Post, USA Today, and Time. Her op-eds have had over 100,000 reads.

Dr. Agarwal has a Ph.D. in Economics from SUNY Buffalo.

About Growth Arc Advisors LLC

After a 30 year career as an executive in the chemical industry, founder Kendall Justiniano started Growth Arc Advisors to help chemical business leaders implement the new thinking required for changing fundamentals. We're experienced industry operators who know the old playbooks, their gaps, and the new pages required.

The firm delivers customized engagements for Materials Executives in 3 key areas:

Commercial Effectiveness: increasing growth revenue through proven next-level commercial practices, including digital sales & marketing.

Strategy: helping clients navigate threats generated by sustainability, digital, and global demand shifts.

Innovation: accelerating return on innovation through focused investment.

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