INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATION & MANAGEMENT

IJRCM

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CONVERSATION OF INNOVATION IN BUSINESS: INDIAN INDUSTRY CASE STUDY

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ABSTRACT

Indian industrial atmosphere is characterized by hierarchical forms of industry organization, which are increasingly inadequate in modern sectors, where innovation relies on platforms and horizontal ecosystems of firms producing complementary products. Using this engineering analytical software illustrated two key sources of inefficiencies that this mismatch can create, all the while recognizing that hierarchical ecosystems have played a major role in Indian success in manufacturing -driven industries. First, hierarchical industry organizations can "lock out" certain types of innovation indefinitely by perpetuating established business practices. Second, even when the vertical hierarchies produce highly innovative sectors in the domestic market, the exclusively domestic orientation of the "hierarchical industry leaders" can entail large missed opportunities for other members of the ecosystem, who are unable to fully exploit their potential in global markets. India has to adopt legislation in several areas in order to address these inefficiencies and capitalize on its innovation: strengthening antitrust and intellectual property rights enforcement; lowering barriers to entry for foreign investment and facilitating the development of the venture capital sector.

KEYWORDS
Innovation, Business, Analytical Engineering software, Success in Business.

1. INTRODUCTION

India faces two interconnected challenges. The first one is common to all advanced economies: the rising competition from lower-cost countries with the capacity to manufacture mid-range and in some cases advanced industrial products.
Unlike – or to a significantly greater extent than – other advanced economies e.g. the United States, India also confronts a challenge posed by the global changes in the Industrial growth.
Therefore, it is striking that, as India trying to become more economically advanced, its strengths have continued to be in manufacturing. When it comes to engineering analytical services, it has either failed to produce competitive companies, or, when it has, these companies have failed to establish themselves in foreign markets.
In the current paper is that these weaknesses can be attributed to Indian hierarchical, vertically integrated and manufacturing-driven forms of industry organization, which are increasingly inadequate in modern sectors, where innovation relies on platforms and horizontal ecosystems of firms producing complementary products. Using this case studies we illustrate two key sources of inefficiencies that this mismatch can create, all the while recognizing that hierarchical ecosystems have played a major part in success in manufacturing-driven industries.
First, hierarchical industry organizations can "lock out" certain types of innovation indefinitely by perpetuating established business practices. For example, the strong hardware and manufacturing bias of Indian computer and electronics firms is largely responsible for the virtual non-existence of a standalone software sector. Second, even when the vertical hierarchies produce highly innovative sectors in the domestic market, the exclusively domestic orientation of the "hierarchical industry leaders" can entail large missed opportunities for other members of the ecosystem, who are unable to fully exploit their potential in global markets.
Accordingly, India is facing the challenge of creating a post-industrial exporting base. This in turns requires an environment conducive to innovation. Indian Government policy-makers are aware of the issue. Many have called for efforts to replicate Silicon Valley, and tried to use other successful strategy. These ideas, as interesting as they are, can only come to fruition decades from now. Silicon Valley is the product of over half a century of development. Its foundations include massive levels of high-skilled immigration, well-funded, cosmopolitan, dynamic and competitive private and public universities, a very liquid labor market, a vibrant venture capital industry, an
Enormous Pentagon R&D budget and the common law. Japan's chances of duplicating another Silicon Valley are therefore rather low.
There are however soft good and service industries in which India is *already* very strong, such as Wipro, Infosys. These are "low hanging fruits," which offer far better prospects for Indian industry internationally than competing with Silicon Valley. We argue that India has to adopt legislation in several areas in order to address the inefficiencies described above and capitalize on its innovation capabilities in these sectors: strengthening antitrust and intellectual property rights enforcement; improving the legal infrastructure; lowering barriers to entry for foreign investment and facilitating the development of the venture capital sector.

2. THE NEW ORDER OF INDUSTRIAL INNOVATION: ECOSYSTEMS AND PLATFORMS

The rapid development of computer-based industries since the second half of the twentieth century has spearheaded and accelerated the shift from vertically integrated, hierarchical industry structures to horizontal structures, composed of platform-centered ecosystems. While this change has been pervasive throughout most sectors of the economy, it has been most salient in technology industries with short product life-cycles. As a result, the nature of competition and competitive advantage has shifted *away* from pursuing quality through tightly integrated vertical "stacks" of components and *towards* building scalable "multi-sided platforms" (cf. Evans Hagiu and Schmalensee (2006).

Analytical Engineering software Industries: the quintessential ecosystem

Ecosystems are most simply defined as constellations of firms producing engineering software's consists complementary products or essential components of the same system. Today's such industry is the archetype of modern ecosystems. There are two critical components, the operating system and the solver, which are controlled by two companies –Romex,LS Dyna. Ecosystem leadership is defined by three elements: i) control of the key standards ; ii) control of the nature and timing (pace) of innovation throughout the industry and iii) ability to appropriate a large share of the value created by the entire ecosystem.
It is important to emphasize that the horizontal ecosystem that we know today has little to do with the structure of the engineering software industry at its beginning in the early 1980s. And even less to do with the structure of the computer industry in the early 1950s. At that time, each computer was on its own island. Only large corporations, government agencies, and universities bought mainframe computers, and they did so from a few large companies.

Economic drivers of vertical crumbling and environment structures

While at first glance it may seem that every step of vertical crumbling in the Engineering software industry was a strategic decision involving real tradeoffs that could have gone either way, there is a clear sense in which the process of vertical disintegration was inevitable due to technological and economic factors beyond the control of any single actor. And this process has occurred (or is occurring) in many other technology industries.

There are three fundamental forces driving vertical disintegration. First, rapid technological progress leads to economies of specialization.

The second important factor in the evolution of technology-based industries is modularity and the emergence of standards (cf. Baldwin and Clark 1999).

The third and final driver of vertical disintegration is increasing consumer demand for product variety. The vertically integrated model works well for one-size-fits-all solutions.

Thus, ecosystems are the natural consequence of vertical disintegration. They have become the most efficient market-based solution to the problem of producing complex systems in a large variety of technology-intensive industries, satisfying a large variety of end user demands and maintaining a sufficiently high rate of innovation throughout the system. It is important to emphasize however that not every industry will move towards horizontal, platform-centered ecosystems.

3. HISTORICAL BACKGROUND ON INDIAN'S INNOVATIVENESS

In order to achieve a better understanding of innovation ways, it is helpful to provide a short historical perspective on their evolution.

Opening to foreign traffic

Britain, as the leader of the Industrial Revolution, entered the industrial age on its own terms. India & Japan had a radically different experience. To preserve their hegemony over the country, the House of Tokugawa, which established the Edo shogunate (1600-1868), banned almost all foreign trade after the 1630s. Despite its isolation the country was not backward. It possessed a well-functioning bureaucracy and a good transportation network; there was no banditry, and literacy was high by the standards of the age.

Authorized systems

A second factor with a significant bearing on innovation is the lawful system. In new industries where the absence of laws governing businesses leads to officials opposing their veto to new projects on the grounds that they are not specifically authorized by existing regulations. Thus entrepreneurs, and businesses in general, are more likely to face legal and regulatory hurdles in code law jurisdictions where adapting the law to new technologies, new financial instruments, and other innovations, is more cumbersome.

4. CASE STUDY

The following case studies are designed to illustrate the two key types of inefficiencies which result from the mismatch between prevailing forms of industrial structures (vertically integrated and hierarchical) and the nature of innovation in new economy industries such as software and the Internet, where building horizontal platforms and ecosystems is paramount.

First, the vertical structures can stifle some forms of innovation altogether (e.g. software). Second, they can limit valuable innovations to the domestic users. From these case studies, we can draw some lessons on the steps which India could take to enhance its capabilities to harness its strong innovative capabilities.

4.1. Analytical engineering Software

Given the degree of high-technology penetration in the Indian e economy and the international competitiveness of the engineering Software, the weakness (indeed, the non-existence) of Indian packaged software industry looks puzzling. Indeed, engineering software production has historically suffered from chronic fragmentation among incompatible platforms provided by large systems integrators

There are two root causes for this peculiar situation: a strong preference for customized engineering software development by suppliers and customers.

These two factors have perpetuated a highly fragmented, vertically integrated and specialized computer industry structure, precluding the emergence of modular systems and popular software platforms (e.g. Romax,PTC). In turn, the absence of such platforms has thwarted the economies of scale needed to offer sufficient innovation incentives to independent software developers, which have played a critical role in the development of the IT industry in the United States.

The dominance of customized systems and its origins

Rapidly, engineering software development companies found it profitable to lock-in its customers by supplying highly customized software, often free of charge, which meant that clients had only one source of upgrades, support and application development. Over time, many of the former U.S. partners were forced to exit the industry due to intense global competition from IBM. However, their licensees remained and perpetuated their incompatible systems.

The new industry became prominent with the workstation and PC revolutions in the early 1980s, which brought computing power into the mainstream through smaller, cheaper, microprocessor-based machines. An important consequence was the great potential created for software/hardware platforms, which a handful of companies understood and used to achieve preeminence in their respective segments.

The prevalence of closed, proprietary strategies prevented the economies of scale necessary for the emergence of a successful, standalone engineering software industry. No single computing platform became popular enough with users to provide sufficient innovation incentives for packaged application software.

Government policies

The second important factor which has shaped the evolution of engineering software industry is the longstanding bias in favor of hardware over software.

Other factors

Comparative studies of the U.S. and India engineering software industries also mention several other factors that further explain the phenomenon described above. One is the relative underdevelopment of the venture capital market for technology-oriented start-up companies in India compared to the United States, where venture capital had widely supported the emergence of successful small and medium-size software companies.

This gap, however, has been recently narrowed due to policies designed to improve the availability of venture capital to technology firms. Another factor is the Indian system of "life time employment" for regular employees of large businesses, which results in low labor mobility and is quite compatible with the "closed garden" approach to technological innovation. By contrast, high labor mobility has been a crucial driving force behind the technological innovation, which is based on spillovers, transfers, cumulative inventions and a high degree of modularity. The latter model seems to have been more appropriate for creating a vibrant software industry. "Life time employment" is losing ground, but the top managerial ranks of large Japanese corporations remain dominated, and often monopolized, by those who have been with the company since they joined the labor market.

5. DISCUSSION AND STRATEGY EXECUTIONS

As we have noted, Indian industry is surely capable of innovation but it operates in an environment that is not conducive to mobilizing the innovative capabilities of soft goods and service sector businesses, especially in the international arena. Fundamentally, this stems from a mismatch between the country's vertical and hierarchical industrial organizations and the horizontal, ecosystem-based structures prevailing in "new economy" sectors.

As we have argued in section 2 however, the latter have been the far more effective form of "industry architecture" for driving innovation in most of today's technology industries, on which services and soft goods rely.

This mismatch makes the current organization and performance of some Indian sectors appear as stuck in inefficient equilibria. Indeed, one important common denominator across the three industry case studies presented above is the prevalence of self-reinforcing mechanisms which have locked the corresponding sectors into highly path-dependent structures. The weakness (or, more precisely, virtual absence) of analytical engineering software industry has been perpetuated by large system suppliers which have locked their customers from early on into proprietary and incompatible analytical engineering software systems; as a result, these customers have always found it in their best interest to deepen the customization and rely on the same suppliers for more proprietary systems. Absent any external shock (or public policy intervention), it is hard to see a market opportunity for potential Japanese software companies.

The second aspect that needs to be emphasized is that the hierarchical forms of industrial organization that prevail in some Japanese sectors are *not* uniformly less innovative than the more horizontal modes of organization. By subordinating everyone to the "ecosystem leaders" (i.e. the companies at the top of the industry structure) however, hierarchical structures can create large inefficiencies by preventing companies at lower levels of the hierarchy from capitalizing on their innovations outside of the vertical structure – in particular, in global markets.

Strategy measures to from industry structures

Extrapolating from the above case studies, there are several initiatives which Indian policy-makers could take to remedy the issue of inefficient industry structures.

First and also part of the legal system remedies is enforcement of intellectual property rights (IPRs). This is perhaps the key institutional ingredient for innovation, especially in the soft goods sector. For many businesses in these industries IPRs are their main asset, in some cases their only one. Indian's weak IPR regime undermines the balance sheet of innovative companies, makes it harder for them to obtain financing, and diminishes their bargaining power.

First, despite recent improvements, Indian remains deficient in the enforcement of anti-trust. Monopolies and oligopolies are particularly nefarious in industries where there is a need for constant and fast innovation. The self-reinforcing mechanisms we described earlier (augmented by the importance of established, long-term relationships in India) creates high barriers to entry in most Indian industries which protect incumbents and make it harder for India e innovators to succeed.

Second the development of new industries based on ecosystems which are not defined by hierarchical relationships requires a strengthening of the legal system in other fields beside antitrust. In the more flexible and non-hierarchical ecosystems which define many of the innovative industries we have discussed, there is a need for effective third-party enforcement.

Finally, a necessary policy measure is to further open the country to foreign investment. The difficulty which foreign investors face in India deprives Indians innovative companies of equity partners and business partners, further locking them into domestic ecosystems which may stifle their development. It also makes it harder for Indian companies to succeed overseas, since foreign investors could help them capture markets outside of India.

6. CONCLUSIONS

India presents a unique case of industrial structures which have produced remarkable innovations in certain sectors, but which seem increasingly inadequate to produce innovation in modern technology industries, which rely essentially on horizontal ecosystems of firms producing complementary products. As our cases studies of shows two potential sources of inefficiencies that this mismatch can create. First, the Indian hierarchical industry organizations can simply "lock out" certain types of innovation indefinitely by perpetuating established business practices: this is the case with software, an industry from which India is almost entirely absent. Second, even when the vertical hierarchies produce highly innovative sectors in the domestic market is the exclusively domestic orientation of the "hierarchical industry leaders" can entail large missed opportunities for other members of the ecosystem, who are unable to fully exploit their potential in global markets.

We have argued that improving Indian's ability to capitalize on its innovations will require certain policy measures, aiming to alter legislation and incentives that stifle innovation: strengthening the enforcement of antitrust and intellectual property rights, strengthening the legal infrastructure, lowering barriers to entry for foreign investment. On the other hand, private sector initiative is also critical, which requires the development of the venture capital sector, a key and necessary ingredient for stimulating innovation in modern industries.

Understanding the nature of the new innovation-producing ecosystems which have developed in industries associated with the new economy will help Indian policy-makers and managers develop better ways for business to take advantage of its existing strengths to expand innovation beyond the industrial sphere into the realm of internationally-competitive enterprises.

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