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International Strategic Alliances for Innovation in the Indian Biotechnology Industry

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Introduction

Innovation is increasingly crucial for firms to cope with rapid changes in technology, preferences of customers, increasing competition, shortening product life cycles, and growing product complexity. Innovations have in fact become the key to survival and growth (Tidd, Bessant, & Pavitt, 2001; Eiriz, Vasco, Faria, & Barboza, 2013). Owing to the limitations of internal knowledge resources, firms are moving beyond their own resources and seeking to acquire ideas from others (David & Foray, 2003). Collaboration and alliances have become popular as firms seek to

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achieve higher returns on R&D as well as operations (Hagedoorn, 2002). Alliances provide access to complementary skills and capabilities (Teece, 1986; Ahuja, 2000) and also bring economies of scale and scope.

While a great deal of work has been done on internal R&D innovations (Inkpen, 2002; Narula, 2004; Narula & Zanfei, 2005; Vega Jurado & Gracia, 2008), little has been done to understand the innovations in business models through alliances. This chapter focuses on those firms with an intent to build new business models by appropriating skills, technology, and other strategic capabilities from partners and to create a sustainable business model through such alliances.

In the emerging biotechnology industry, innovation is the key to survival and growth (Baum, Calabrese, & Silverman, 2000). We have specifically chosen to look at the Indian biotechnology industry for the first part of this research to study how business model innovations happen and how innovations happen in the biotechnology industry (Palnitkar, 2005).

Considering the importance given to the subject of innovation in recent journal articles and popular magazines (e.g., Ruef, 2002; Stuart, 2000; Vasco, Faria, & Barbosa, 2013), a study to understand alliances designed for future innovations is timely and relevant. Our belief is that the alliance and innovation constructs and their interrelationship will prove helpful and relevant for practicing managers.

In the biotechnology industry, survival depends directly on the capacity to innovate (Powell, Koput, Smith-Doerr, & Owen-Smith, 1999). In fact, almost all firms in this sector target innovation as a natural process. However, small firms have limited resources for technology and knowledge development (Damanpour, 1991). Now the growing trend among biotech firms in general is a move to acquire intellectual assets from external sources (Bowonder, Racherla, Mastakar, & Krishnan, 2005; Walker, Kogut, & Shan, 1997). In a survey of biotechnology firms, gaining access to a partner's R&D facilities and expertise was cited as one of the main motives behind strategic alliance formation (Forrest & Martin, 1992). Since the resources needed for innovation are so expensive and extensive, alliances have actually become the norm within the biotechnology industry (George, 2002).

In the Indian context, there have been studies on the R&D, knowledge base, market sales, commercialization, and alliance of bio-pharmaceutical firms (Ghosh, 2004; Ramani, 2002; Sandhya &

Visalakshi, 2000; Visalakshi & Sandhya, 1997). Also, using industry-specific databases, the structure of biotechnology firms in general has been analyzed in terms of the parameters of size, activity profile, product portfolio, R&D patterns, and alliances, among others. These studies did not specifically focus on the aspect of "alliances for innovation" in India and hence this study addresses a significant gap in literature. In the second part of the chapter, we focus on the success and sustainability of these strategic alliances.

Research Question

The notion of alliances as a vehicle for learning is present in a large stream of literature, including a significant body of conceptual and empirical work (Kale, Singh, & Perlmutter, 2000). Alliances may even generate knowledge that can be used by parent firms to enhance innovations in strategic and operational areas unrelated to the alliance activities (Khanna, Gulati, & Nohria, 1998). This type of knowledge is referred to as alliance knowledge.

We assume that organizational learning is both a function of access to knowledge and the capabilities for using and building on such knowledge (Powell, Koput, & Smith-Doerr, 1996). We also adopt the view that alliances are mixed-motive structural forms. As Inkpen (2002) suggests, in order to learn through an alliance, a firm must have access to partner knowledge and must work closely with its partner. Therefore, both collaborative processes and firm-specific factors must be understood. Our research seeks to determine the different factors which may optimize learning and hence innovation. As Inkpen (2002) commented on alliance learning research, "Now that there is a solid base of antecedents research, the next step is theoretical and empirical work that integrates the diverse perspectives and establishes some causal links across the variables". A deeper understanding of such causal links could allow firms to systematically structure and manage alliances that are optimized for learning and innovation.

This chapter attempts to identify *the firm-specific factors which optimize the internalization of new skills and capabilities and increase the possibility of recombining these skills and capabilities to generate the innovation required for competitive advantage*.

Methodology

The population of the current study consists of biotechnology firms in India and their alliances. The selection of organizations that fall into the category of biotechnology firms is as per the definition of the Department of Biotechnology, New Delhi. The list of the biotechnology firms for survey and further investigation has been primarily derived from the latest *Directory of Biotechnology Industries and Institutions in India* brought out by Biotech Consortium India Ltd (BCIL), Department of Biotechnology, New Delhi. The Directory contains alphabetically arranged list of biotechnology firms in India along with their brief profile. The profile contains details about the firm's operational sector, state, establishment year, products developed, alliances, and so on. Then companies profiled with alliances in the directory were contacted to understand whether they were having alliances as per the definition and scope mentioned in Chap. 2 of the directory. Those who confirmed that they are having such alliances were targeted as the possible data point.

The list of companies used for sampling accounted for more than 70 % of the biotechnology revenues in the year 2005–2006. The number of alliances according to the BCIL directory itself is more than 200. More than 50 % of the total alliances in this industry consist of the sampled companies. The surveyed sample consists of seven out of top ten companies by revenue and four out of top five companies by alliances. This sample was representative of the population of Indian biotechnology industry.

Quantitative data were collected and subjected to analysis. After testing the hypotheses, the samples used in the quantitative survey were scrutinized further to find those that best matched the context targeted by our research question. Five companies were selected, and the top management representative who was highly knowledgeable about the firm's alliances was then approached for a detailed interview. Following these five interviews, the most appropriate case was selected for a final round of interviews. This company had many alliances, but the interviews investigated one specific alliance that was extremely relevant to our research question. Triangulation of the facts was carried out by means of a separate interview with that firm's Chairman and Managing Director (CMD). These interviews provided supportive evidence

for the research hypothesis as well as significant insights to explain the results from the quantitative survey method.

Sample Description

Table 8.1 About the survey

Total number of firm-alliances	50
Total number of firms	21
Number of firm-alliances with more than 5 years in existence	26
Number of firm-alliances with less than 5 years in existence	24
Lowest level of employees interviewed	Middle management and Alliance Head
Total number of senior management participated	19
Total number of middle management personnel as Alliance Heads	4
Number of top management personnel participated	27
Number of bio-pharma samples	27
Number of bio-agri companies	3
Number of bio-services companies	20

Interviews

Table 8.2 Interviews

Total number of interviews conducted	6
Total number of companies	5
Minimum level of the interviewee	General Manager & Alliance Head
Highest level of interviewee	CMD
Minimum time for interview	38 minutes
Maximum time taken for interview	2 hours 15 minutes
Place of interviews	Interviewee's office

Data Collection

Data were collected through a single observer key informant response (Sethuraman, Anderson, & Narus, 1988). A key informant is a person (or group of persons) who has unique skills or professional background

Table 8.3 Advantages and disadvantages of using key informants

Advantages	Disadvantages
Information concerning causes, reasons, and/or best approaches from an "insider" point of view	Time required to select and get commitment may be substantial
Advice/feedback increases credibility of study	Relationship between evaluator and informants may influence type of data obtained
Pipeline to pivotal groups	Informants may interject own biases and impressions
May have side benefit to solidify relationships between evaluators, clients, participants, and other stakeholders	May result in disagreements among individuals leading to frustration/conflicts

related to the issue/intervention being evaluated, is knowledgeable about the project participants, or has access to other information of interest to the evaluator. A key informant can also be someone who captures the essence of what the participants say and do. Key informants can help the evaluation team better understand the issue being evaluated, as well as the project participants, their background, behavior, attitude, and any language or ethnic considerations. They can offer expertise beyond the evaluation team. They are also very useful for assisting with the evaluation of curricula and other educational materials. Key informants were surveyed individually for this research. The advantages and disadvantages of using key informants are outlined in Table 8.3 above.

This study used responses from only one side of the collaborative arrangement. Given that the CEO or the Alliance Head is the final arbiter of the resource allocation in this situation, we focused on responses from the CEO or the Alliance Head.

Findings

Growth Potential/Opportunities

In the cases studied, the alliance managers were of the opinion that immediate opportunity creates a strong impetus for learning from the partner. If

opportunity is visible, firms enter into an alliance to shorten learning time. Even when a firm commitment for alliance agreement is possible, firms do not take the initiative until opportunities are quite visible (Sarkar, Echambadi, & Harrison, 2001). One Managing Director described how a competitor sat on a licensing agreement for a year and canceled the deal without recognizing the future opportunity. Later the competitor's Managing Director regretted his lack of vision. The ability to recognize the urgency of opportunities seems to be a function of domain knowledge and expertise.

Technological Competence and Learning Capacity

High levels of technological competence and learning capacity (Cohen & Levinthal, 1990) were identified as important by many CEOs. The nonavailability of highly qualified human resources thus poses a problem to the Indian biotechnology industry. One of the general managers pointed out that "if the level of technological competence between the two parties is very high, then the knowledge transfer is quite low". A higher level of technological competence fosters the internalization of knowledge and skills with less effort.

Risk-Taking Ability

The ability to take risk is one of the major moderators in the context of learning for innovation (Simonin, 1999). If the opportunity is clearly visible, any decision-maker can make a rational choice. But when opportunities are not so evident, the risk taker may eventually become a winner. The problem with a risk-taking attitude, as pointed out by one of the alliance managers, is the chance of losing the partner's trust over intellectual property issues if the technology is not so easy to protect from being copied. The partner may view with suspicion the other firm's risk-taking initiative to learn. This may lead to lesser sharing of partner knowledge. "Once the IP issues are amicably settled and the agreement is reached, the partners may share knowledge quite easily", said one of the Managing Directors. So this moderating factor can have nonlinear type of relationship with learning for innovation.

Organizing Cost

When the organizing cost, which consists of time and other resources, exceeds the initial target, top management's attention would be diverted to cost control initiatives. This has an adverse effect on learning intent. As attention gets diverted, the internalization initiative takes a back seat. This was noted during interviews by several top management representatives. But knowing how to measure the cost of organizing alliance comes through experience, as one alliance manager pointed out. So keeping a tab on this issue becomes extremely difficult.

Structure and Propensity for Change

Burns and Stalker (1961) defined organic and mechanistic structures and their relation with innovation explored. The organic structures, having characteristics of flexibility, fluidity, and informality, were associated with a firm's plan for making innovations (Guimera, Uzzi, Spirro, & Amaral, 2005). The mechanistic structure was associated with innovation through external means. But here the question was how the structure of the alliance would impact the individual firm's learning for innovation.

Several insights were gleaned from our research. First, an alliance may go through different kinds of structures over the course of its life cycle. The IP-related uncertainty necessitates having a formal, rigid, and stable structure during the initial years of the alliance. Once IP issues are discussed and settled, then an organic structure becomes a possibility. A top management representative suggested the possibility of having an S-curve relationship between organicity of structure and internalization of knowledge. However, all the interviews stressed the need for an organic structure with certain activities such as recombination of knowledge to create further ideas. However, according to the top management experts interviewed, generating an application-oriented solution again required a formal, stable structure within the firm.

The Intensity of the Exchange: Communication

The intensity of knowledge exchange is an important factor in the innovation process that needs to be separately understood and measured. With the evolution of information technology, firms can now have a mechanistic structure and yet manage through open and informal communication. "The importance of open communication is very high when you have an idea which gives an 'Aha!' feeling", opined one of the alliance heads. The informal exchange is also important considering the fact that many ideas evolving in an innovation process may be not worth putting into formal channels. "But it gives a lot of satisfaction to the scientists", noted another CEO. Many indicated the necessity of having a very formal network to ensure smooth and reliable information dissemination. So the importance of maintaining an open, informal communication channel along with a formal mechanism nurtures the innovation process when this route is chosen.

Internalization and Reduction in Dependence

Internalization and dependency reduction emerged as the dominant factors leading to innovation when the strategic intent was to learn through an alliance.

Firm-specific factors that affected internalization were (a) learning capacity, (b) technological competence, and (c) the ability to take risk. The interviews highlighted the necessity of a high learning capacity for the whole team and a high technological competence for at least a few in the alliance team from the learning firm's side to attain a high degree of internalization.

Governance Cost

The governance cost and its relation with internalization, was well established. Most of the interviewees asserted that governing cost was a good indicator of how successfully the intended outcomes had been achieved.

When the governing cost was higher than expected or planned, top management's attention was diverted to cost control measures and learning took a back seat. This result was therefore pertinent to planning and executing the alliance for learning.

Yet, very few companies systematically organize their alliances. This is first a failure to rigorously organize and measure the given firm's activities and performance related to the alliance. Second, companies often fail to recognize performance patterns across their alliance portfolios—patterns concerning particular deal structures, types of partners, or functional tasks. A failure to spot and fix recurring problems can be costly. Finally, only a few senior management teams know whether the alliance portfolio as a whole really supports corporate strategy.

Inkpen (1996) noted that the cost of knowledge creation is an important issue when we aim to learn through alliances. The decision to initiate knowledge creation efforts should be balanced by the cost. In many cases, early estimates are exceeded because the partners fail to consider the expenses of coordinating their activities or the value of senior management's time. As the organizing cost of an alliance increases, the attention of alliance managers shifts to controlling those costs instead of learning for innovation (Inkpen & Ross, 2001).

When the alliance mechanism stabilizes with respect to financial and relational matters, it releases more time and effort to learning from the other partner.

The study revealed that structural organicity has a positive effect on internalizing knowledge. Organicity has long been associated with innovation (Burns & Stalker, 1961; Damanpour, 1991). It has generally been expected that the flexible, fluid organic structure would be better suited to innovations.

The revolution in information technology and its possible use in the innovation through alliance mechanism was another area targeted by the study. The qualitative study revealed the importance of having an open communication channel to support a free flow of ideas across the alliance while keeping the option of a formal mechanism to ensure smooth flow of certain information. The availability of suppliers and customers and the possible worth of the targeted innovation had a bearing on the internalization process, as revealed by top management representatives.

The horizon can be varied according to the vision of the top management representatives who pursue this innovation path.

Strategic Intent and Choice of Governance Form

From our study, it was understood that strategic intent was closely related to the choice of governance form. If both internalization and dependency reduction were essential parts of the objectives, a joint venture was not found to be optimal form. One Managing Director observed, "if the partner had a mechanism to generate innovations, taking over that firm could kill the innovation process". She compared the situation with that of killing the golden goose. If sharing of knowledge and generating innovation was acceptable to both the partners, a joint venture could be considered ideal. If the strategic intent was to learn about a particular platform so that the target firm would generate its own innovations internally, a contractual relation could have been more appropriate.

Conclusion

The success of an alliance meant for innovation was found to be a function of the variables discussed above. From the factor analysis of those variables, two factors emerged. We have called these factors the "Capability to Explore" and the "Opportunity to Exploit". The "Capability to Explore" was determined by learning capacity, technological competence, and risk-taking ability. The "Opportunity to Exploit" is determined by growth potential and governing cost. Loading these factors into a 2x2 matrix (shown in Fig. 8.1) offers different factor combinations and a practical understanding of how the "alliances for innovation" strategy can be operationalized.

The qualitative research further led to spillover results. Many interviewees linked the relationship between alliance success and the partners' complementary strategic intents. They also mentioned the role of operational compatibility between partners. We have structured these dimensions into the framework given in Fig. 8.2. When partners exhibit high strate-

Opportunity to Exploit			
	High	Improvements	Innovation
	Low	Status quo	Invention
		Low	High
		Capability to Explore	

Fig. 8.1 Exploration and exploitation

Operational Compatibility			
	High	Opportunism	Successful Continuation
	Low	Unsuccessful Termination	Troubled Alliances
		Low	High
		Strategic complementarities	

Fig. 8.2 Compatibility and complementarity

gic complementarity and operational compatibility, it leads to a successful alliance (Masanell & Yoffie, 2005; Microsoft and HP Alliance, n.d.). At the other end of the spectrum, operational incompatibility and conflicting strategic intent would lead to unsuccessful alliance and its eventual termination. When complementary intentions are high and operational

compatibility is low, firms continue the relationship for long-term benefits. However, these alliances could have operational issues and disputes. When complementary intent is absent, firms exhibit opportunistic behavior.

Our study has some limitations. First, in our study, we have collected the data concerning perspectives of the partner who gets into the alliance with innovation intent. However, it would have been valuable if we could get the perspectives of the other partner as well. But gathering such information was extremely challenging with many partners originating from different countries. Second, because there are only a limited number of firm-alliances, the results may not be generalizable. Third, the context chosen was the Indian Biotechnology Industry. So the results may be applicable to choose similar contexts and not to others. The effect of life cycle stage of alliance can be explored through a longitudinal study.

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