Strategic Planning for Collaborative Innovation: Insights and future research directions

Chaudhuri, Atanu

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Strategic planning for collaborative innovation: A decision framework and future research directions

Atanu Chaudhuri
email-atchaudhuri@iiml.ac.in
Indian Institute of Management, Lucknow

Abstract

Many organizations have started collaborating with external partners to have access to expertise, process know-how and technology but struggle to decide what kind of collaboration model to follow, how to choose the collaboration partners and how to share investments and intellectual property as part of the partnerships. This research outlines the entire decision making process during the strategic planning phase of collaborative innovation and identify areas of future research by conducting a literature review and by analysing a sample of 60 collaborative partnerships, collated from secondary sources.

Keywords: strategic planning, collaborative innovation, future research

Introduction

The cost of developing a new product has increased significantly over the years. At the same time, the risk of market failure due to intense competition, inadequately addressing the needs of customers, and missing the targeted period of launch has increased. Moreover, developing innovative products that create new markets might also require pushing the frontiers across multiple scientific disciplines, beyond the current core capabilities of many organizations. Acquiring such resources or developing a product from scratch can require a significant investment of time and capital, which may not seem justified. This implies that companies need to broaden their network in order to access technical ideas from multiple sources and involve innovation partners who will be willing to share investment risks and benefits.

The strategic planning phase of collaborative innovation involves specifying the intention and objective of collaboration, the scope of the collaboration, preliminary screening of potential partners, determination of investment mechanism, optimal level of investment and extent of IP sharing required followed by the final selection of partner(s) to maximize value for all the partnering organizations.

Many organizations struggle to decide what kind of collaboration model they need to develop, how to choose the collaboration partners and share investments and intellectual property as part of the collaborative partnerships. Hsuan and Mahnke (2011) noted that early mistakes in the design and management of outsourcing arrangements impact the long term success of those and posed the question that how can R&D managers know whether they are heading in the wrong direction or not. This clearly underscores the importance of the strategic planning phase of collaborative innovation.

Literature on planning in new product development focuses on portfolio selection, project selection, budget and timing (Anderson and Joglekar, 2005). The stream of literature has addressed individual decisions like choice of collaborative model, selection of partners,
determination of investment mechanisms but we have not across literature which outlines the hierarchy of all the decisions which need to be taken during the strategic planning phase of collaborative innovation and considers that entire decision making process.

Research on outsourcing of new product development focuses on the various motivations and drivers for innovation outsourcing (Calantone and Stanko, 2007; Holcomb and Hitt, 2007; Hsuan and Mahnke, 2011) and performance implications (Stanko and Calantone, 2011, Rese and Baier, 2011) Decisions taken during the strategic planning phase of collaborative innovation projects may have a significant impact on the overall performance of such projects. But, there is limited knowledge on how companies can take informed decisions during this phase as part of a unified decision making process to maximize chances of success in terms of the stated objectives of the firms entering into the collaborative arrangement.

The objective of this research is to bridge this gap in literature by first outlining the entire decision making process during the strategic planning phase of collaborative innovation and to identify areas of future research.

**Literature Review**

The critical decisions in the strategic planning stage of collaborative innovation involve choice of the appropriate model, selection of the collaboration partners and determination of investment mechanism and level of investment between partners. To deliver on collaborative innovation, the organization needs to create appropriate enablers for people, technology, finance and regulatory and risk management. Though, the above enablers will help in execution of the collaborative innovation projects, organizations need to prepare the groundwork for developing the above during the strategic planning phase.

We conduct a literature review of the critical decisions involved in the strategic planning phase of collaborative innovation and the enablers and develop a decision framework for the same.

**Choice of type of Collaborative Innovation**

Governance of the collaboration i.e. whether it needs to be hierarchical or flat and participation in terms of how open or closed the collaboration needs to be can be a possible means of determining the type of collaborative innovation model. Pisano and Verganti (2008) call the four types of collaborative models emerging out of this understanding as elite circle (hierarchical and closed), consortium (flat and closed), innovation mall (hierarchical and open), innovation community (flat and open). But these collaborative models do not explicitly capture the business objectives of the firm, seeking to collaborate. Key dimensions of partnerships for collaborative innovation also vary by business objectives (Chesbrough and Schwartz, 2007). Type of partnerships will depend on whether the objective is to improve processes to reduce costs or shorten time for development, enhance performance of products or enhance innovation capability by seeking new technology to develop the products or seek new markets for the products. Some studies on R&D outsourcing focus on matching the outsourcer’s needs and the desired capabilities (Hagedoorn 1993, Holcomb and Hitt 2007). Collaborative innovation goes beyond outsourcing for specific needs in R&D and hence will require a thorough analysis of matching the needs with capabilities. From the context of strategic planning for collaborative innovation, an organization needs to decide whether it needs expertise within a single discipline or domain of technology or it needs process or technology expertise spanning different technological disciplines. Its search for partners will also be guided by the above. Hence, analysing the intention of collaboration and the span of innovation required can be the starting steps for organizations to identify the potential
collaborators, the capabilities required and the extent of involvement of partners. As a next step, Chesbrough and Schwartz (2007) suggest classifying the various R&D capabilities into three distinct capabilities—core, critical and contextual. Core capabilities are the key sources of the company’s distinctive advantages and value added. Critical capabilities are vital to the success of the product or service but are not the core capabilities of the firm. A contextual capability is needed to complete or deliver the offering but does not provide differentiation. Billitteri et al (2013) report through a survey of Italian biopharmaceutical industry, how developmental stage of the product/technology, object of the agreement, the existence of previous collaborations between firms and the number of products marketed by the biotech company are able to influence the selection of a specific governance form.

An organization needs to determine whether it wants to enhance its core capabilities, acquire critical or contextual capabilities through a potential collaboration. The organizations then need to determine the capabilities required of the potential partners as well as its own capabilities in assessing the solutions provided by the partners. The potential uncertainty of technology and commercialization, which the collaboration is trying to mitigate along with level of trust also influences the choice of governance form. All the above considerations will guide the organization to the governance mode and the nature of participation in the collaborative partnership.

Selection of collaboration partner

Emden et. al. (2006) develop a process theory of partner selection for collaborative new product development alliances. The authors show that technological alignment triggered the partner evaluation process followed by strategic and relational alignment phases. But, this research does not consider the different relative importance of technology, strategic and relational alignments while selecting partners for collaborative innovation. For example, process solution seeker type of partnership will have limited emphasis on strategic and relational alignment compared to technology seeking partnerships.

Hacklin et. al. (2006) develop a decision support system for strategic venture partner selection by estimating compatibility benchmark, relevance and complexity of the issues involved using the knowledge of key respondents within the organization. Feng et.al. (2010) use individual and collaborative utilities of partners to select partners for co-development alliances. Wang and Lin (2006) consider the problem of selecting partners across the design chain for performing specific functions like defining product specifications, designing a product component, prototyping and testing. Chen et al. (2010) recognize the need of considering the different motivation of organizations for entering a strategic R&D alliance and develop a methodology for R&D partner selection which captures different motivations as well as their intensity using linguistic variables. Dell’Era and Verganti (2010) suggest that companies should manage carefully a balanced portfolio of collaborators rather than focusing on characteristics of individual external parties while developing a collaborative innovation strategy.

While there are papers which outline different methodologies to select strategic collaboration partners for R&D, there is a need to understand the relative importance of technological, strategic and relational alignment related performance measures for collaborations with different objectives.
Determination of investment mechanism and level of investment

Ensuring equality of benefits amongst collaboration partners is considered to be an important factor for the success of collaborative product development projects (Littler, 1995). Bhaskaran and Krishnan (2009) study the effort, revenue and cost sharing mechanisms for collaborative product development and show that investment sharing is more attractive for new product development projects with significant timing uncertainty while development sharing or innovation sharing is most suited for projects which face product quality uncertainty, partnering firms are similar and when costs of integration can be controlled.

Many collaborative R&D projects seek to develop both new products as well as a new market. Amaldoss and Rapoport (2005) examine how the number of networks competing to develop a product, the number of alternate technology platforms and market sensitivity to product development expenditures affect investment of partnering firms. Their results show that in equilibrium, when the number of either competing networks or technologies increases, companies will tend to direct their investments more towards market rather than market. Allowing firms to individually compete in the market while they continue with their joint development will not help attenuate the above underinvestment for product development.

In many collaborative innovation partnerships, one of the participating firms tends to be a leader as it may have more decision-making power or experience in the domain specific area of knowledge creation. Sammadar and Kadiyala (2005) determine the resource sharing conditions in which organizations will be motivated to collaborate as well the resource sharing conditions in which such collaborations will be successful in such a leader-follower game. The authors consider two scenarios—one in which the collaboration involves only current knowledge creation efforts and the other in which the collaborators have already invested in past knowledge creation. There is a need to determine optimal investment and innovation effort sharing mechanisms for different kinds of collaborative partnerships for example consortium, elite circle etc.

Organizational enablers for collaborative innovation

People

Leadership team of the organizations to be involved with the entire collaborative innovation program and communicate the need for collaboration with external partners and the potential value it will generate for the organization and its employees, and monitor progress and commitment of partners. How open innovation professionals operate largely determines the success rate of open innovation teams (Larsson et al., 1998). Team-based collaboration may become difficult while interacting outside the organizational boundaries. Many organizations face challenges when their employees have to collaborate outside their normal work settings (Swink, 2006).

Factors influencing collaborative knowledge creation include group efficacy, social cohesion, learning climate, power distribution, team stability etc. (Du Chatanier et al., 2009). For collaborative and open innovation to succeed, the corporate culture should emphasize teamwork and network building both within and outside the organization. If a culture of internal collaboration is absent, it will be far more difficult for employees to accept external ideas (Dickson et al., 2011).
Technology

Dodgson et al. (2006) report the use of simulation, virtual reality and rapid prototyping tools which enable technologists at Procter and Gamble (P&G) to explore new ideas and integrate market information while working in geographically dispersed teams both within and outside organizations.

Finance and Regulatory

Financial performance needs to be considered while evaluating different proposals for collaborative innovation, keeping in mind the company’s existing portfolio and current pipeline of products and services. But, companies tend to evaluate these proposals using the metrics used for evaluating in-house R&D projects. Many times, the distinction between sustaining or disruptive innovations are also not considered while evaluating proposals. Thus, the finance function becomes more of an approving authority for innovation proposals rather than playing active role in the creation of the proposal and alternatives.

The finance team needs to work with the leadership team to develop a performance management system for collaborative innovation projects and the applicable investment mechanisms. The finance and legal teams will also need to work with the R&D group to create applicable contracts with the collaborators, wherever required, considering IP rights and other legal issues to ensure that there is equitability in terms of rewards and risks shared by the partners. Processes should be created so that the finance function and the internal project team can track the progress of the project (Dickson et al., 2011). Collaborative innovation also results in unique challenges related to protection of proprietary knowledge and loss of control over the product development process.

Risk Management

Risk Management of collaborative innovation projects involve identifying the types of risks and developing a process to assess and mitigate those risks. Risks can be related to technology, commercialization and intellectual property related as well as not meeting performance objectives in terms of cost, time etc. Such collaborative alliances require extensive interaction and cooperation but can also result in loss of critical organizational knowledge.

Jordan and Lowe (2004) studied collaborative alliances in the aerospace sector and remarked that the nature of the project, the characteristics of the knowledge exchange and the social relationships developed between those involved in alliances play an important role in determining both the nature and extent of firms’ knowledge protection activities. Slowinski et al. (2006) outline how organizations should try to protect know-how and trade secrets in collaborative R&D partnerships. The authors highlight the challenges associated with non-disclosure and joint development agreements and emphasized the role of understanding the organizational issues, tracking the portfolio of projects and employee training to protect the intellectual assets.

Decision Framework for Strategic Planning in Collaborative Innovation

An analysis of collaborative intent and scope will help organizations in deciding what type of collaborators it will need eg. suppliers, customers, external experts, innovation intermediaries and whether it needs single or multiple collaborators and solution providers. The firm has to decide whether it needs to select the best solution or can it afford to have good enough solutions. At the same time, it needs to assess its capability in evaluating solutions provided by collaborators, define its role in the collaboration and the degree of
involvement it expects from the collaborator. Together, the above factors will help the organizations in determining the governance mode of collaborative innovation it needs to pursue.

Contingent on the type of collaborative innovation, the organization either needs to pre-screen partners to join the collaboration or evaluate solutions provided by the collaborators and reward them. For collaborative models, where the firm does not need to screen partners but need to evaluate the solutions provided by the solution providers either through the innovation intermediary or own on their own, it will need to determine the appropriate reward for the solution providers while considering any Intellectual Property Rights (IPR) sharing which may be required. For collaborative models which require shortlisting of partners, the firm first needs to screen the partners followed by determining the mechanism of investment and IPR sharing, estimating the efforts required by itself and its collaborators and quantifying the benefits to be generated from the collaboration. This will help design optimal collaboration contracts. The uncertainties which the collaboration seeks to mitigate along with the level of trust between partners will also influence the governance mode. Hence, there will be a feedback loop after partners are selected and the investment mechanisms are determined back to the governance mode decision. The flow chart depicting the above decisions is shown in Figure 1.
Organizational competence required for strategic planning for collaborative innovation

The literature review and the above decision framework help us in identifying the following competencies required by an organization for strategic planning of collaborative innovation:

People
- Top management commitment
- Culture of external collaboration

Process
- Choice of the type of collaborative model
- Selection of collaboration partner(s)
- Contract design
- Risk Management
- Participation of finance in the planning process

Technology
- Support to share information across different functions and with collaboration partners
- Support to collect, sort and select ideas

Secondary Research
Due to paucity of academic literature consisting of case studies and examples of collaborative innovation across industries, we conduct a systematic secondary search using ABI-Inform and Google search. We used the following key-word searches “collaborative innovation”, “collaborative innovation and industry, where the industry included automotive, consumer goods, pharmaceutical, high technology, biotechnology, industrial products. This search was conducted for conference proceedings, reports, magazines and trade journals. We supplemented this search by google searches. The objective of this search is to supplement the academic literature by building a repository of partnerships between firms for collaborative innovation and document the collaborative intent or stated objectives of the partnerships, whether it involved single or multiple technologies, and whether the collaboration was amongst firms within the same industry, across industries or with innovation intermediaries. The above search of collaborative innovation in different organizations over the last decade resulted in 60 such partnerships. 124 organizations participated in these 60 collaborative innovation partnerships and they were drawn from firms in automotive, consumer products, high technology, industrial products, chemicals, pharmaceuticals, biotechnology, aluminium, aerospace and defence, packaging and other industries along with some innovation intermediaries and academic institutions. Figure 2 shows the percentages of organizations from different industries as represented in our database and the percentages of different collaborative intent in the above partnerships. This database is by no means exhaustive and is a result of our limited search process. Nevertheless, it provides us with a useful sample to develop insights about what kind of innovation partnerships are prevalent in different industries and what specific objectives were the firms trying to achieve through those collaborations.

Out of the sample of collaborative innovation partnerships in our database, 33.3 percent are between firms within the same industry, 50 percent are between firms across different industries, 11.7 percent are with academic institutions and 5 percent are with innovation intermediaries. Note, we removed such partnerships from our database which did not provide details about specific objectives of the partnerships. Many of the partnerships between innovation intermediaries and their clients do not carry the names of the organizations which used their services. Hence, we removed those from our database. We also analysed the collaborative intent of the firms in forming the partnerships. Results are shown in table 1. Creating new products and markets seem to be the dominant motive across industries except academic collaborations where
technology development is the primary motive while in collaborations involving pharmaceutical
companies, developing new products as well as technology development are the prime objectives.

**Figure 2: Profile of collaborative innovation partnerships**

**Table 1: Collaborative intent by industry (percentage of collaborations)**

<table>
<thead>
<tr>
<th>Industry</th>
<th>Process enhancement</th>
<th>Create new products/markets</th>
<th>Enhance product performance</th>
<th>Technology Development</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automotive</td>
<td>33.33</td>
<td><strong>50.00</strong></td>
<td>16.67</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Consumer Goods</td>
<td>8.33</td>
<td><strong>33.33</strong></td>
<td>16.67</td>
<td>25.00</td>
<td>16.67</td>
</tr>
<tr>
<td>Hi Technology</td>
<td><strong>47.37</strong></td>
<td>15.79</td>
<td>15.79</td>
<td>21.05</td>
<td>0.00</td>
</tr>
<tr>
<td>Industrial Products</td>
<td>10.00</td>
<td><strong>60.00</strong></td>
<td>10.00</td>
<td>20.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Aerospace and defence</td>
<td>50.00</td>
<td>0.00</td>
<td>50.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Pharmaceutical</td>
<td>12.50</td>
<td><strong>37.50</strong></td>
<td>0.00</td>
<td><strong>37.50</strong></td>
<td>12.50</td>
</tr>
<tr>
<td>Academic</td>
<td>33.33</td>
<td>0.00</td>
<td>0.00</td>
<td><strong>66.67</strong></td>
<td>0.00</td>
</tr>
<tr>
<td>Bio Technology</td>
<td>0.00</td>
<td><strong>66.67</strong></td>
<td>0.00</td>
<td>0.00</td>
<td>33.33</td>
</tr>
<tr>
<td>Healthcare</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>25.00</td>
<td>75.00</td>
</tr>
<tr>
<td>Chemical</td>
<td>14.29</td>
<td><strong>42.86</strong></td>
<td>14.29</td>
<td>14.29</td>
<td>14.29</td>
</tr>
<tr>
<td>Aluminum</td>
<td>0.00</td>
<td>0.00</td>
<td><strong>66.67</strong></td>
<td>0.00</td>
<td>33.33</td>
</tr>
<tr>
<td>Innovation intermediary</td>
<td><strong>100.00</strong></td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
Further analysis reveals that 21.67 percent of the collaborations report improving cost efficiency as one of the objectives while another 21.67 percent developing sustainable solutions as one objective while 11.67 percent indicate reducing time for development as an objective. Note, many collaborations which consider developing new products and markets as the primary intent also consider enhanced product quality and performance as one of the outcomes of the collaborations.

Findings from Literature Review and Secondary Research: Directions for Future Research

Analysis of literature reveals that there is limited research on understanding how the strategic decisions for collaborative innovation may vary depending on the collaborative intent and scope of innovation. Determining the optimal investment sharing and IP sharing mechanism depending on the collaborative intent, scope of innovation and the type and degree of uncertainty involved for different governance modes can be a potentially rich area of future research.

Similarly, the influence of the organizational enablers on the above decisions and on the overall performance of the collaborative innovation with respect to stated objectives is a relatively unexplored area of research with one exception being Tsai (2009). Hence, potential areas of research can be to identify the critical success factors for collaborative innovation, to develop capability-maturity models for the same and to empirically validate the role of organizational competencies and contextual variables on the success of collaborative innovation. Similarly, risk management for collaborative innovation projects has not been addressed in literature.

There is potential to assess, measure and develop risk mitigating plans for different types of collaborative innovation projects. Role of product architecture and information exchange models like design structure matrix in mitigating risks in collaborative innovation can also be potentially explored. This research has not dealt with the operational decisions involved in managing a collaborative innovation project. Such decisions and the processes designed to manage the project in terms of sharing of information, conduct of reviews etc are expected to influence the outcomes of such projects. Involvement of multiple partners, potentially across geographies, and from different industries as well as the level of uncertainty involved pose unique challenges in managing such collaborative partnerships. There is a potential to develop path models to identify the strategic and operational competencies required for the success of collaborative innovation projects.

Secondary analysis of collaborative partnerships shows that objectives vary between partnerships amongst firms, universities and innovation intermediaries. Hence, choice of selection of partners, determination of optimal investment mechanisms as well as the organizational enablers in terms of managing people, processes and technology, and risk management are expected to show some differences. The same organization might engage with different types of collaborators. It is important to bring out the similarities and differences in managing such partnerships and to identify the critical success factors for such collaborations.

References

Billitteri, Carolina, Lo Nigro, Giovanna and Perrone, Giovanni (2013). Drivers influencing the governance of inter-firm relationships in the biopharmaceutical industry: an empirical survey in the Italian context, Technology Analysis and Strategic Management, 25(1), 107-126
Chen, Sheu Hua., Wang, Pei Wen ., Chen, Chien Min., Lee, Hong Tau. An analytic hierarchy process approach with linguistic variables for selection of an R&D strategic alliance partner, Computers and Industrial Engineering, 58 (2), 278-287


