Chapter 14
Research and Development, Innovation and Marketing: How to Convince Internal and External Stakeholders of Technological Innovations

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Contents

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14.1   Introduction

"Today, maybe more than ever before, the survival of companies depends on gaining sustainable competitive advantages by offering continuously innovative products and services. This is why firms invoke the term 'innovation' nowadays as a badge of honour to inspire and mobilise their workforce and to attract investors. Many, however, overlook the fact that the implementation of innovations imposes changes, which can be misunderstood or provoke resistances" (Brem et al. 2009).

This chapter is based on articles published in a special issue of the International Journal of Technology Marketing (2009) on how to convince internal and external stakeholders to support technological innovations through improved knowledge management. First, we provide a theoretical framework for innovation with the goal of highlighting how basing knowledge on the technology life cycle and nature of the markets can improve the innovation process. Next, the perspectives of the various stakeholders are used to manage their respective expectations effectively. Guidelines for efficient management of stakeholders and for conducting multi-sector and open innovations are presented.

14.2   Innovation Processes and the Management of Knowledge

Technological innovations are at the intersection of market opportunities and new scientific and technological advances. They require a series of activities with the goal of acquiring value with the use of the innovation (Sherif and McGourty 1996). Innovations are essential for developing a competitive advantage and have to be managed efficiently and effectively from concept to commercial launch. Once an invention is conceived (Utterback 1971), it must be implemented (Roberts 2007) and becomes an innovation when it is commercialised (Hauschildt 2004). This requires organisational cohesion and the contribution of people within and outside the firm (Nayak and Ketteringham 1994). Only with successful innovations can companies increase their competitive advantage and generate growth.

Before looking at the challenges of knowledge management at each phase, let us consider first the various innovation categories in terms of market orientation and technology status.

14.2.1   Innovation: Technology and Market Orientation

In order to build a common understanding some fundamental considerations will be introduced. Dealing with technology means handling different stages of knowledge acquisition, each stage having its special requirements for the management of duties and responsibilities.

According to Specht (2002), technology management is concerned with converting knowledge into hardware, software or service that can be commercialised. In contrast, the focus of R&D management is the generation of that knowledge. Management of technology is thus market-oriented because it focuses on customers and competitors (Narver and Slater 1990). The learning capacity of an organisation parallels its ability to absorb the lessons from past decisions to define new courses of action. The literature demonstrates that learning affects positively customer satisfaction and loyalty (Kohli and Jaworski 1990), alliances and partnerships (Emden et al. 2005), long-term client relationship (Santos-Vijande et al. 2005), teamwork (Bunderson and Sutcliffe 2003), employee self-efficacy (Martocchio and Hertensein 2003), and managerial decision-making (Celuch et al. 2002). Thus, both market-orientation and learning are important for a company's long-term performance (Zhang 2009).

Innovation management is a subset of technology management in that it comprises "a systematic planning and controlling process, which includes all activities to develop and introduce new products and processes for the company" (Seibert 1998, p. 127) or, in short, the dispositive constitution of innovation processes (Hauschildt 2004). Following Thom (1980), these innovation processes can be divided into the stages of "idea generation", "idea acceptance", and "idea realization". These are the main innovation steps in terms of processes; however, these stages strongly depend on the type of innovation as well.

14.2.2   Innovation Types

The literature on different types of innovations is quite extensive, ranging from Rogers (1962) to Garcia and Calatone (2002). Although a variety of definitions exists in the literature, the model of Abernathy and Clark (1985) takes into account the changes in technology and market structure to propose four categories of innovations, as shown in Fig. 14.1:

1. *Radical innovations* embody a new technology that results in a new market arrangement. These innovations incorporate a new technology and cause market discontinuities at the macro (world, industry or market level) level and/or at the micro (enterprise) level. Examples include the steam engine, the telegraph, electronic amplification and cellular telephony.
2. *Architecture innovations* blend existing technologies to create a new product and service and satisfy unarticulated needs that have not been met by the legacy technologies. The World Wide Web, hand-free handsets or smart phones are examples of architectural innovations that blend existing technologies.
3. *Platform innovations* correspond to a quantum leap in performance due to a shift in technology within the existing market structure. Typically, these innovations require large capital investments and are complex to develop. Examples are the development of jetliners to replace propellers in commercial aviation and the
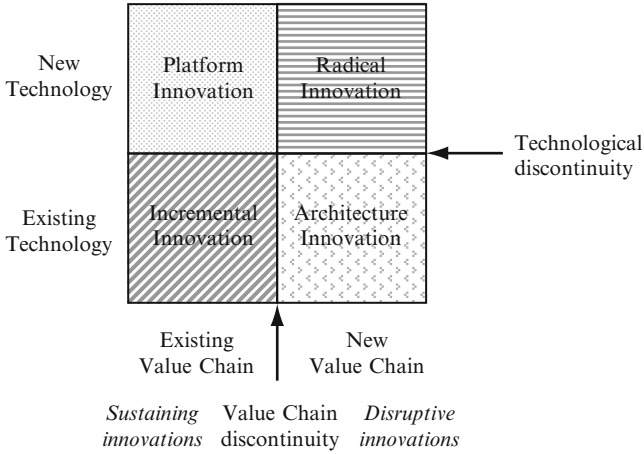
Fig. 14.1 The four categories of innovations (Sherif 2006, based on Abernathy and Clark 1985)

transition from analogue to the second generation (2G) of digital cellular telephony.

4. *Incremental innovations* provide new enhancements, or improvements to existing technology within the existing market structures. Most industrial innovations fall within this category. Examples today include new digital automotive controls systems and health foods.

This categorisation helps decision-making because each category requires a different type of knowledge management (Adams 2009). Incremental and platform innovations preserve the existing market structure and its value chains. They are sustaining innovations. Disruptive innovations, whether radical or architecture, change the market structure and its value chain or value network, so that some or most of past knowledge may not apply to the new situation.

Generally speaking, innovations face various degrees of uncertainties in technologies, in financial and human resources, in the markets. Adams (2009) has mapped the four categories of innovations into a portfolio based on the level and type of uncertainty, as shown in Fig. 14.2.

It should be noted that complex products combine several technologies, each of which is at a different point of its life cycle. Furthermore, the same technology can be perceived differently by organizations according to their position within the value chain. Some of the factors that influence organization perception are (1) whether the technology is implemented in equipment or services; (2) whether the technology significantly impacts an organization's core business and engineering competence; (3) whether the technology is emergent or mature. This perception varies by industry sectors and individual companies.

For example, digital photography is a platform innovation for camera manufacturers, while it is an architectural innovation for mobile handset manufacturers, because camera manufacturers did not need to reconfigure their value chains much,

Fig. 14.2 A portfolio of innovation processes (modified from Adams 2009)
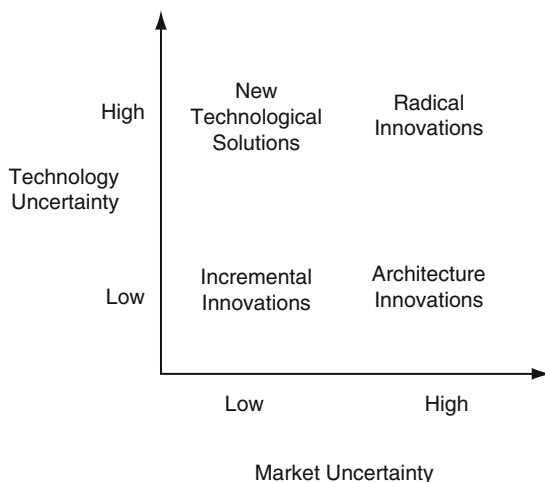
even though it was a discontinuous technology. However, mobile handset manufacturers had to realign their value chains to embrace digital photography technology into their products. This technology was not discontinuous by the time handset manufacturers adopted it and applied it in their products.

In the case of the Short Messaging Service (SMS), both handset manufacturers and service providers in the wireless telecommunications industry perceived it as an incremental innovation. To provide SMS functions, handset manufacturers just needed to improve the handset design and function for sending and receiving text without affecting the way they conduct their business or organize their value chains. For service providers, it was another service that could be offered on their existing networks and equipments (Sherif and Seo 2009).

Furthermore, Bunn et al. (2009) have shown how Intelligent Transport Systems (ITS) are architectural innovations at the system level because they combine a variety of products, services and organizational processes at different levels of maturity. To underline this fact and to highlight the marketing complexities involved, they denote these innovations as "multi-sector innovations". In these innovations, the complexities are increased because of the tension among the interests and perspectives of the various parties, particularly those coming from distinct industrial sectors.

14.2.3 Management of Knowledge

Knowledge management as a process has several objectives:

1. To select and develop the appropriate technology.
2. To define the market most receptive to the technologies being developed.

3. To spread the knowledge gained to all those involved in the innovation.
4. To generalize local knowledge in a form that can be used in a generic way within the firm or its customer.
5. To provide a framework to integrate new information so as to improve the innovation.

Adams (2009) distinguishes three aspects of knowledge management: identification of the types and sources of knowledge, the methods of knowledge acquisitions and the governance of knowledge flows both within and among organisations.

Incremental innovations are used to solve relatively well-defined problems that build on existing customers and technological platforms. As a result, working with users to gain contextual information on performance parameters and functional/technical preferences is possible in this case.

Similarly, new platform innovations rely on deep knowledge of the existing market structure. In this case however, a completely new technological platform is developed to improve on some performance parameter significantly (speed, volume, quality, power consumption, etc.). Users' input is less useful here because they are not familiar with the platform under development. Therefore, in that category of innovations, technologists must lead in the search for new ideas and in experimentation. In other words, the classical marketing tools of interviews concerning user preferences and wants and needs provide less information than in the case of incremental innovations.

In contrast, new architecture innovations depend on the re-use of existing technologies or a combination of existing technologies to meet latent needs and preferences of potential new users. Very often the resulting solution may change the ways in which the markets function and/or are regulated. The success of these innovations depends on technology intermediaries that have a wide knowledge of trends and are in contact with multiple application areas. It also depends on market savvy to identify unexpressed market needs and to identify opportunities.

Finally, radical innovations require the widest possible knowledge acquisition to digest and integrated basic research, technology trends as well as need-oriented and environment-oriented knowledge. The high levels of uncertainty call for much experimentation and learning by trial and error. In addition, training and education of all the stakeholders are important aspects of the innovation management. This is why radical innovations are few and in between and depend on long-term commitments to support the experimentation and research.

Knowledge management covers additional areas such as technology performance, systems performance, and service performance. Some aspects of knowledge management are firm-specific and may give that firm a competitive advantage. Aspects that are general to the industry and are common across several firms are typically within the purview of standardization activities.

There is another type of knowledge, namely, tacit knowledge or know-how that is embedded in the firm organization as a whole, or in a few key experts. Tacit knowledge is based on the cumulative experience that has been developed over the years and that is exchanged implicitly or explicitly through direct contacts at the

working level. This tacit knowledge is quite useful in sustaining innovations but may hinder disruptive innovations.

14.3 The Challenge of Convincing Internal and External Stakeholders

The term "innovation" is nowadays used in almost every context in daily life. There is almost no company that does not use it within its internal and external communications. Many, however, forget that innovations can provoke resistance to change. Therefore, stakeholders, whether internal or external, need to be permanently engaged to understand the reasons for change and to help define what should be changed and who should carry the necessary changes.

14.3.1 Stakeholder Perspective

The concept of stakeholder, which can be traced back to Barnard (1938), entered the academic world with Freeman (1984). Freeman (1984) defines stakeholders as "any group or individual who can affect or is affected by the achievement of the organization's objectives", encompassing both internal and external stakeholders. In other words, a stakeholder is a party-at-interest that can be affected, either positively or negatively, by an innovation.

Although stakeholder analysis is a typical project management tool used for identifying and developing the total project team (Milosevic 2003, pp. 330–335), Bunn et al. (2009, p. 133) state that "stakeholder theory has yet to have much impact in marketing". In fact, they identify three main characteristics of the scholarly marketing research: the emphasis on the stakeholders (e.g., shareholders) demands on enterprises, the relation between the enterprise and its individual stakeholders and ethical controversies and social responsibility of stakeholders.

Because stakeholders differ in their "values, needs and concerns" (Freeman 1984; Clarkson 1995), the influence of key stakeholders must be analysed and understood. Mitchell et al. (1997) and Milosevic (2003), for example, provide tools to assess their influence so that conflicts between the enterprise and the influential stakeholders during the innovation process can be managed.

14.3.2 Internal Stakeholder Involvement

Internal stakeholders are those influential parties within the enterprise. They include the idea generator, the project team, the project sponsor, the life-time

support personnel, the headquarters of the firm, the stock holders, etc. Many studies have been concerned with top-down innovations and have focused on overcoming employees' resistance to new ideas (Bond and Houston 2003). In contrast, the management of technology literature stresses that innovative ideas can arise from within. Bottom up innovations, however, do not emerge by accident but depend on a nurturing environment to support the exploration of alternatives and to benefit from mistakes and apparent failures to open up new directions for innovations. Integrative structures, open communication, multiple structural linkages (both inside and outside the organization) encourage innovations (Sherif and McGourty 1996). One possible way to stimulate these ideas is to bring different communities of practice together across organizational boundaries (Tidd et al. 2005, pp. 359, 361). Also, the technology capability of the firm is an essential factor to deal with the added complexities. This is why the long-term survival of a bottom up innovation depends on its congruency with the overall strategic thrust of the firm and its ability to meet the requirements of that innovation (Sherif and McGourty 1996).

The following provides an analysis of the challenges of internal stakeholder involvement, company politics and internal communication during the innovation process.

14.3.2.1 Challenges and Effective Problem Management

In a top-down approach, changing mindset and refocusing the organisation energies requires the articulation of a new vision and a shared organizational commitment o the long-term (Tidd et al. 2005, p. 470). In this case, front-line personnel are important stakeholders because they are the contact points with customers. They need to be trained and motivated to support the launch strategy and overcome the resistance that some external stakeholders may offer. In other words, "a successful new product launch requires firms to thoroughly inform their front-line personnel about the features of the new product and related changes both for internal processes and in the market situation" (Talke and Salomo 2009).

In any company, resources, whether material, financial or personnel, are limited and different groups and departments vie for them. This leads to the concept of the "product champion", well recognized in the literature on new product development (NPD) as a person with political clout guiding the technology inventor through organization politics to gain acceptance of the innovation (Chakrabarti 1974; Tushman and Nadler 1986; Howell and Higgins 1990). A particular challenge at the strategy level is to bring back a successful innovation to the main stream of the firm. Another concept is that of the innovator who uncovers interesting problems to solve, proposes solutions to these problems and develop products for commercialisation based on these solutions (Price et al. 2009). The role of a product champion is less conspicuous in incremental innovations, where most of the changes are in the form of feature enhancements.

A more beneficial way to look at the problem is to consider the main roles that are necessary to manage an innovation. The main roles are (1) the inventor or idea generator, (2) the product champion or the corporate entrepreneur, (3) the functional manager, (4) the boundary manager (or "gatekeeper") and (5) the mentor or coach. The inventor or subject matter expert promotes a technical solution. The product champion also called the promoter of power has the corporate resources and competence to make decisions and enforce them (Witte 1973). The boundary manager or the process promoter (Hauschildt 2004) has strong knowledge of the organization and can help resolve interorganisational issues that may prevent the project team from accomplishing its mission. The functional manager provides the human resources to the development of the product and may also act as the project manager. Depending on the complexity of the product development and the nature of the nature of the organization, all these roles can be carried exclusively by the same person or can be shared in different combinations among several individuals.

Gurtner and Dörner (2009) focus on the dynamic nature of the management structure. They start with the four-phase innovation process that Dörner et al. (2009) have proposed which consists of (1) idea generation, (2) concept development, (3) product development and, (4) product launch and market penetration, as shown in Fig. 14.3. They then argue that each phase requires different management skills. In fact, it is well known in the project management literature that the leadership style should match the project phase, the innovation type and the technology maturity (Sherif 2006). At the start-up phase, the emphasis is learning and experimentation and a transformational leadership is useful for both radical and architectural innovations. Information must be disseminated in an efficient and timely manner to improve the coordination among parallel activities and to allow early identification of unknown interdependencies. In disruptive innovations, in particular, new knowledge is generated at a rate that can overwhelm hierarchical distribution channels. During product development, the emphasis is on platform innovations to improve the performance of the product or service to be commercialised. The organisation changes to become networked (typically in the form of a matrix structure) and combine technical and marketing expertise. Finally, after the product is launched and commercialised, the objective is to respond quickly to market conditions and to reduce production and distribution costs, through incremental innovations and transactional efficiency.

Each phase has different objectives. For example, "the stimulation of creativity" is the main goal of the first phase; the main goal of the second phase is the transition from creativity management to management of production, including building coalitions and communicating with stakeholders. Institutionalisation is the main aim in the third phase and getting the front-line employees on board is the target of the fourth phase. As a result, of the communication tools will different in each phase.

Figure 14.3 gives examples of communication tools for each phase. As teams become global, linguistic and cultural differences affect the tools used and whether the communication will be verbal or written.
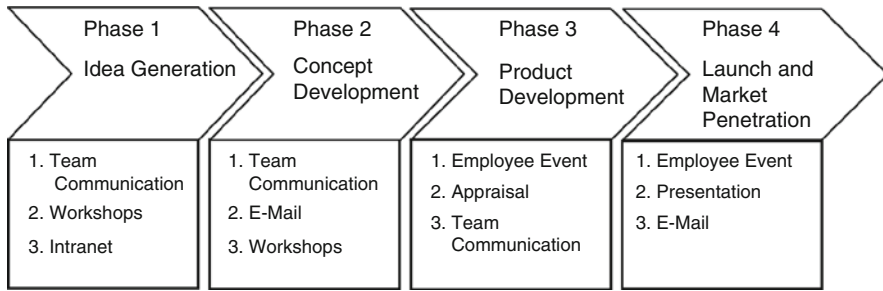
Phase 1	Phase 2	Phase 3	Phase 4
Idea Generation	Concept Development	Product Development	Launch and Market Penetration
1. Team Communication 2. Workshops 3. Intranet	1. Team Communication 2. E-Mail 3. Workshops	1. Employee Event 2. Appraisal 3. Team Communication	1. Employee Event 2. Presentation 3. E-Mail

Fig. 14.3 The 4 × 3 method of internal communication in the innovation process (Dörner et al. (2009))

14.3.3 External Stakeholder Involvement

The Porter Model for the forces driving industry competition includes external factors, such environmental and regulatory changes, customers and suppliers and the rivalry among firms (Porter 1980). The literature on stakeholder management has addressed the resistance of customers and external market players (Hallikas et al. 2002; Montaguti et al. 2002) as well as other actors in the firm's environment (Kochan and Rubinstein 2000). Yet, external stakeholders can be a source of incremental innovations as well.

Porter's framework, however, does not consider explicitly potential rivalry among firms in an unrelated industry, which is important in architecture innovations, where the market is restructured. For example, digital compression technology affected many industries, such as movie and music production and distribution. Also, the anticipated market could suddenly disappear to due regulatory conditions. In fact, Hauschildt (2004) demonstrates how market players and the firm's broader environment affect successful launch strategies. Furthermore in a networked environment, other externalities have to be built. For example, cellular telephony took more than 40 years to take off because of technological and regulatory hurdles concerning the allocation of the same frequencies everywhere and due to technological limitations on the battery size and weight, the size of the handsets, quality of signal transmission, etc.

14.3.3.1 Effective Innovation Management

In an organization that is serving an existing market with an existing technology, any change will face obstacles. One insidious problem arises from the methods of performance assessment which may favour the status quo or are a disincentive to teamwork and collaboration. In the case of radical ("breakthrough") innovations, in particular, there is a need to take into account their long gestation time.

As indicated above, a major focus of the literature has been to overcome customer resistance to non-incremental innovations. Talke and Salomo (2009)

have shown that the so-called four Ps (Product, Price, Place and Promotion) are indeed important and that the launch strategy and launch tactics contribute positively in overcoming obstacles related to external market parties. In architecture innovations, segmenting the market based on a thorough analysis of potential customers to focus on the segments that would most likely be attracted to the new product directly improve its market performance. Furthermore, "positioning activities – composed of thorough analyses of buying criteria and competitor products, including related dynamics, as well as alternative positioning planning – contribute positively to new product market success" (Talke and Salomo 2009).

Talke and Salomo (2009) have also shown that external parties in the product ecology, such as suppliers, dealers and producers of complementary products, need to be recruited to support a disruptive innovation. In other words, the market perspective should be extended beyond customer management and the four P's to include the management of relationships and interactions with other external stakeholders. In other words, it is not possible to deliver a successful disruptive innovation without a major strategic re-orientation of the whole value chain.

The more radical the innovation is, the larger the uncertainties that external stakeholders face concerning the strategic and financial value of investments (Turnbull et al. 1996). This is because of the lack of information on the various characteristics and benefits of the innovation. Imagining new user's needs is indispensable because breaking new ground implies that there will be a scarcity in technical, managerial and marketing skills. Lack of experience with the technology or with the market can lead to unrealistic expectations about cost and/or performance, particularly that the users' requirements and profiles are not defined. This means that experimentation with its lots of mistakes is part of the environment and that technology transfer is a key part of the activities.

The uncertainties and information deficit have to be reduced whenever possible. The results of Talke and Salomo demonstrate that a positive performance of launch activities directed at convincing potential customers and other market players. Firms which address the uncertainties of stakeholders relevant to the new product launch, like suppliers or political and legal parties, through more proficient interaction with these stakeholders are more successful in the marketplace (Talke and Salomo 2009).

In summary, external stakeholders have an important role to play in the innovation process. An effective management strategy of external stakeholders has to look at both the customer and beyond.

14.4   Management of Multi-Sector and Open Innovations

In this section, we discuss the challenges that new developments in the innovation process, notably multi-sector and open innovations, pose to the management of innovations.

14.4.1 Multi-Sector Innovations

Bunn et al. (2009) define multi-sector innovations as those that "emerge over a long period of time and require the involvement and adaptations of numerous stakeholders from government agencies, non-profit organisations and commercial enterprises as well as society in general". An example of multi-sector innovations is the development of the Intelligent Transport Systems (ITS) described above. Another is the cross-enterprise business integration, such as for international trade or e-government initiatives.

A particular challenge in developing effective management strategies of stakeholders in multi-sector innovations is the number of complex cross-relationships. In this case, the social networks approach is a useful tool to understand how the various stakeholders are networked and how their relations have influenced the outcomes (Wasserman and Galaskiewicz 1994; Rowley 1997). Bunn et al. (2009) argue that the value of network analysis is that it "produces an alternate view, where the attributes of individuals are less important than their relationships and ties with other actors within the network".

The use of social networks has an explicative value of past events and can help learn from past experience but it may also lead to a faulty narrative (Taleb 2007, pp. 62–84). With the necessary precautions, however, they offer insights on what was used to convince the stakeholders in a given situation. The density of network (the proportion of possible connections that are present) can assist in interpreting behaviours and making predictions (Granovetter 1985). In addition, Granovetter (1973) has highlighted how "weak ties" that bridge actors across groups contributes to the shaping of opinions. This idea was developed further by Burt (1997), arguing that the social capital of individuals depends on the centrality of their position in a given network.

Bunn et al. (2009) build on all these ideas to propose an ecosystem that sustains multi-sector innovations. The idea is to mix stakeholders with a short-term focus with those with a long-term focus over the lifespan of the innovation development.

As stated, multi-sector innovations cannot be tracked easily, as they emerge over time. However, it is possible to anticipate and manage the innovation process using the various tools discussed in this chapter.

14.4.2 Open Innovations

Open innovation is a paradigm that Chesbrough (2003) has popularised based on the proposition that firms can and should use internal as well as external technological ideas and exploit all market channels available to them, whether internal or external to the firm. The basic premise is that the boundaries between a firm and its environment have become more permeable and that the locus of an innovation is more a network than an individual company (Powell et al. 1996). Furthermore, in a networked environment, knowledge is distributed and proprietary research and

development has to be complemented by inputs from other parties through licenses or joint programs.

Planning for open innovations could be greatly facilitated by providing some structured framework for the front-end activities and by agreeing on common purposes, shared set of expectations and a decision-making structure. A university environment can provide a neutral ground where the various shareholders' expectations can be balanced (Bourgault and Bendavid 2010).

Open innovation depends on the collaboration of suppliers, vendors and customers with service providers. With the associated exchange of ideas, there is a risk that proprietary information and trade secrets be divulged. This is particularly important for information communications through letters, e-mails, or casual conversations. It is important to ensure that all the interests of parties involved be protected; for example, the proprietary information from one vendor must be blocked from going to another competitor. Typically, during contract negotiation, the legal team inserts language with respect the obligation of each party to keep the other parties' information in confidence. The team may also insert some language corresponding to the rights of the developed work or to any potential patents that might ensure. However, these considerations cover essentially what can be described as codified knowledge. Also, in government or military contracts, it is possible to retain control of the technology by insisting that it not be sold to other parties without the funder's permission. Such an approach is typically too expensive in commercial environments (Sherif 2006).

A logical consequence of open innovation is the formation of virtual project teams, particularly when specialists are not in the same geographic area and do not report to the same authorities. Virtual teams face a number of challenges regarding training, information sharing, confidence building, etc. that may affect the performance of the team. Standardisation is particularly useful in the case of open and multi-sector innovations to provide a uniform and predictable structure to the intense interactions among internal and external stakeholders.

It should be noted that the practice of internal networking, subcontracting, strategic alliances, franchises, etc. has been around for a while. The implicit assumption in the organization of regional clusters is that such collaborations are worth nurturing. Open innovations however, relies on the capabilities that modern telecommunication networks offer to collaborate at a distance. This has required changes to stakeholder management with respect to leading, communicating, learning and knowledge sharing.

From a study of an Intelligent Utility project in the Danish energy sector, Goduscheit (2009) concludes that "anchoring the project on a strategic level intraorganisationally" in all organizations is necessary. This is to ensure that the project enjoy sustained support by senior managers of each organisation and to promote the sense of ownership at the operational level. In other words, open innovations face the challenge of remaining relevant to all organisations, both at the strategic and the working levels. Matching the composition of the support network with the project objects is also an important aspect that planners need to consider.

14.5   Conclusions

The chapter presented approaches to convincing internal and external stakeholders of the worth or pursuing a specific innovation. The main lessons to managers are as follows:

- All innovations are not alike. Incremental innovations typically require relatively small investments of capital but a large commitment of individual labour. This is different from innovations that require substantial financial investment and teamwork and/or a transition to a new technology. The types of stakeholders that need to be convinced differ in each case.
- Phase-specific governance of the innovation is a decisive factor of success. The governance covers the characteristic of the leadership, internal communication, risk management, learning and education, etc.
- Convincing customers and external stakeholders requires informed and motivated front-line personnel.
- In new structures of innovations such as multi-sector and/or open innovations, the front-end process may be helped by a semi-formal organization lead by universities or other neutral organizations.

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