Internal versus external knowledge sourcing:
Evidence from telecom operators in Europe

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ABSTRACT
When do organizations turn to external modes of knowledge creation instead of using internal development of new capabilities? We draw on 25 field interviews of telecom firms in Europe. Our data provides support for the existing literature that suggests that the capacity of a firm to turn to internal versus external knowledge sourcing is contingent upon the knowledge gap between the needed knowledge and the firm’s knowledge, and the degree to which the needed knowledge is subject to market failure. Our data also provide evidence on the role of the social acceptance of the needed resources, the internal market failures, and the risk of knowledge depreciation in the choice of the firm to source knowledge within the firm or from external markets.

INTRODUCTION
When do organizations turn to external modes of knowledge creation instead of using internal development of new capabilities? Several literatures offer partial answers to this question. The resource-based view of strategy and the evolutionary literature argue that the extent of the gap between what a firm knows how to do and what it needs to know determines the choice between internal versus external sourcing of knowledge. In this view, organizations tend to carry out local search internally when there is a small knowledge gap, while firms tend to carry out more innovative search externally. Transaction cost economics, in turn, posits that the transaction costs of the targeted knowledge also play a role in this choice, with failures in external markets inducing organizations to search internally. Yet, we know little about knowledge creation and transfer in organizations (Argote, 1999). As Oliver (1997) notes, little research has focused on “how resources are developed, managed and diffused” (1997: 711). The goal of this paper is to identify systematic influences that lead managers to choose among internal and external mechanisms for creating, acquiring and integrating knowledge.

This paper provides empirical evidence of how European telecom operators choose between internal development of capabilities and external modes of knowledge acquisition. We focus
our analysis of external modes of knowledge acquisition on three modes: purchase contracts, alliances, and acquisitions (see endnote for definition). Most researchers have focused on single modes of change, emphasizing the specific roles of modes such as internal development (Szulanski, 1996, Galunic and Eisenhardt, 1996), purchase contracts (Anand and Khanna, 2000), inter-firm alliances (Doz and Hamel, 1998; Gulati and Singh, 1998), and acquisitions (Capron, Mitchell & Dussauge, 1998; Singh & Zollo, 1997) in their respective capacity to develop, acquire and integrate knowledge. However, this literature rarely addresses the drivers of choice among internal and external modes of knowledge creation.

The European telecom industry provides rich data for theorizing and conducting a detailed analysis of the processes by which firms change as they are challenged to acquire new knowledge and innovate in the face of fast moving industry changes. The telecom industry has faced intensive deregulation, price competition, telecom and IT convergence, foreign competition in the recent years. Firms in the industry have used multiple modes of change in the face of such pressures. As a result, they provide a useful empirical site for this research. Our analysis focuses on the telecom industry to control for the differences that exist across industry sectors.

One important way in which the telecom incumbents differ from other firms, particularly in Europe, is their historical inclination toward internal development and their reluctance to integrate external knowledge into the firm. Part of this behavior can be found in national protection, insulation from competition, the firms’ privileged status, and their endowments of strong engineering and financial skills. In spite of their administrative heritage that emphasized internal activities, today these firms are using a mix of internal development and external acquisition (contracts, alliances, M&As) in their efforts to change their businesses. This expansion of change modes provides grist to develop hypotheses about factors affecting the choice between internal and external modes of acquisition.

We conducted 25 field interviews at 12 European Telecom operators including British Telecom, France Telecom, KPN, Siemens, Enertel, diAx Telecom, Optimus Telecommunicacoes, Swiss Telecom, Concert (BT/MCI), Belgacom, Eutelsat, and Telia, with an average of two interviews per firm. These firms represent the major actors of the European telecom industry. We interviewed the executives in charge of the corporate development, who are highly knowledgeable about their firms’ choices.
Our data collection and analysis followed grounded theory building techniques (Glaser and Strauss, 1967; Miles and Huberman, 1984). We established a preliminary theoretical background before entering the field. The objective of the field work was to open the initial theoretical perspective and find new issues we had not thought of. The existing literature, which we review below, suggests that the capacity of a firm to turn to internal versus external knowledge sourcing is contingent upon the knowledge gap between the needed knowledge and the firm’s knowledge, and the degree to which the needed knowledge is subject to market failure.

We draw on our field study to enrich our initial model and develop new conceptual issues, among which the institutional and learning-based factors stand out. We blend this evidence with pertinent literature to develop inferences about the factors that lead firms to choose between internal and external sourcing of knowledge. What these case studies give us that other research cannot is an intensive investigation of processes that reveals the common patterns firms use to develop, acquire and integrate knowledge. We do not argue that the empirical results necessarily generalize to a larger and more diverse population. The value of the research lies, instead, in its capacity to provide detailed insights, to produce a grounded model, and to generate propositions for further testing.

Three key results emerge from our field interviews. First, our empirical data provide evidence that knowledge transfer inside the firm is qualitatively different from knowledge acquired externally. Telecom firms, in spite of initial preferences for internal development, turn to external sources not only when the needed knowledge is distant from the firm’s existing knowledge, but also when the needed knowledge conflicts with the firm’s existing knowledge.

Second, our data show that internal knowledge transfer often is as difficult as external knowledge transfer. Just as external knowledge sourcing faced substantial difficulties, organizations also met failures of their internal knowledge market that echoed those arising in external markets. The firms tended to be collections of social communities with low propensity for recombining internal knowledge for new uses across business units of the firm.

Third, we find that firms take into account the risk of knowledge depletion in their choice of internal versus external sourcing of knowledge. Our data suggest that knowledge internally created is perceived as being more likely to persist through time and be used as a platform for future knowledge development than external knowledge.
BACKGROUND: KNOWLEDGE GAPS AND MARKET FAILURES

The initial anchor point of our discussion draws on the resource-based view of the firm and transaction cost economics, and focuses on the properties of knowledge. Knowledge properties have two key dimensions, including knowledge gap and market failure. Different knowledge characteristics entail different choices of knowledge sourcing.

The resource-based view suggests that the choice between internal development and external modes of knowledge sourcing depends on the nature of the gap between the changing firm’s existing knowledge and the needed knowledge. Firms will tend to undertake internal development when they estimate that their current knowledge base provide the relevant skills to create the needed knowledge inside the firm. The resource-based view of the firm stresses the distinction between exploiting existing knowledge and exploring new knowledge (March, 1991; Koza and Lewin, 1998). When firms seek out knowledge that can benefit from their superior organizational or technical knowledge, they often prefer internal development rather than external modes of change. Conversely, when firms seek knowledge in areas in which they do not possess advantages, they will tend to turn to external modes.

Cohen and Levinthal (1990) argue that firms tend to undertake internal changes that build on their existing absorptive capacity, which is a business’s’ ability to evaluate and utilize particular knowledge. Several related arguments concerning operating routines (Cyert and March, 1963; Hannan and Freeman, 1989) and path dependent learning (Levitt and March, 1988) lead to a similar conclusion. Focusing on innovation, Dosi (1982) points out that businesses tend to develop new knowledge in areas closely related to their existing technological knowledge. Teece (1986) argues that inheritance of past routines implies that previous activities tightly constrain opportunities for learning, so that a firm is most likely to develop new knowledge in areas where it already has prior knowledge. The closeness between a firm’s existing knowledge and the needed knowledge, that is, the degree to which the needed knowledge will consist of routines that exist within a changing firm’s existing set of knowledge, will influence whether a firm uses internal development or external modes to obtain new knowledge. Therefore, a narrow gap between the needed knowledge and the existing knowledge will both increase the likelihood of novel resource reconfiguration and decrease the costs of implementation (Galunic and Rodan, 1998).

In a similar vein, Cuervo-Cazurra (1999) argues that firms develop knowledge internally once they have already achieved a competitive level close to that required for effective
competition. We expect internal development to take place not only in the presence of resource closeness but also if the changing firm has particularly strong existing resources that it can use to create the needed knowledge. A changing firm has greater incentives to develop knowledge internally when the firm has a strong competitive position in the targeted knowledge area.

The reverse side of the relevance argument is that firms will tend to turn to external sourcing when their existing knowledge is insufficiently relevant to the knowledge needed for a change. Many organizational theorists argue that businesses face substantial constraints to internal development. Nelson and Winter (1982) stress that a firm's irreversible investments and limited range of operating routines constrain its ability to develop and use knowledge within the firm. Cuervo-Cazurra (1999) argues that firms acquire knowledge externally when they face a large competitive gap. When the gap between the needed knowledge and the existing knowledge is high, we expect that the changing firm will be more inclined to resort to external modes in order to avoid opportunity costs associated with the time lag necessary to develop unfamiliar knowledge.

The acquisitions and alliances literatures show that managers will often search for targets or allies with strong knowledge that complement the acquiring firm’s weaknesses, planning to redeploy the stronger knowledge from the target (Capron, 1999) or use the ally’s strength (Inkpen and Beamish, 1997; Dussauge, Garrette, and Mitchell, 2000). In the foreign direct investment literature, data on foreign direct investment shows that firms with strong technological capabilities have less need to buy or ally with existing firms and are more likely to enter foreign markets through greenfield ventures (Hennart and Park, 1993). That is, greater resource strength relative to local firms favors the choice of internally developed greenfield investment rather than joint venture or acquisition.

In turn, the transaction cost economics literature posits that failures in external markets drive firms to create and transfer the needed knowledge inside the firm. Transaction cost theory suggests that the choice between internal development and external modes of knowledge sourcing depends on the extent to which the needed knowledge is subject to market failure that arise from the potential for opportunistic behavior. Sourcing knowledge from external partners meets frictions due to the difficulties to screen, trade, and transfer external knowledge into the firm. External markets include markets for “discrete” knowledge, markets for alliances, and markets for corporate control. These external markets are plagued with difficulties for evaluating, protecting, and transferring the needed knowledge. Although
the market for corporate control has been recognized as a way to trade knowledge subject to market failure (Wernerfelt, 1984), business acquisitions nonetheless face failures as acquirers find it hard to evaluate and post-integrate the needed knowledge embedded in targets.

When firms face high market failures in those external markets, they will prefer to turn to internal sourcing, all else being equal. Organizations have been recognized as providing a way to reduce knowledge appropriation risk through a more appropriate governance regime (also termed ‘institutional capabilities’, Liebeskind, 1996). In many instances, the intrinsic features of the needed knowledge can create appropriation hazards in the face of potential opportunism. Exchanging knowledge that rely on tacit, co-specialized and embedded routines will require the input of tacit, proprietary, knowledge from a number of different individuals and groups, each of whom must exchange some of her knowledge with other team members. The person or group who obtains proprietary knowledge has incentives to expropriate that knowledge for her own use or to leak it to competitors (Liebeskind, 1996:96). Knowledge that, in a regime where proprietary knowledge is secure, would be contracted out will be undertaken by the firm instead (Teece, 1986). Unlike exchanges on external markets, the particular institutional capabilities of firms protect resource value from appropriation more effectively than the market by aligning incentives among the contracting parties (Teece, 1986; Chi, 1994). Liebeskind (1996:94) notes that “Firms, as institutions, play a critical role of protecting valuable knowledge. Specifically, because property rights in knowledge are weak, and are costly to write and enforce, firms are able to use an array of organizational arrangements that are not available in markets to protect the value of knowledge”.

Organizations have also been recognized as vehicles for improving knowledge coordination through socialization mechanisms (Kogut and Zander, 1992). Some market failures arise from coordination difficulties, i.e., the need for ongoing cooperation by the provider and user of the needed knowledge. By cooperation by the provider and user, we mean active collaboration in the process of exchanging and reconfiguring knowledge. In this knowledge-based view, knowledge that embed cooperation of people within a firm are difficult to exchange through market transactions no matter how much risk a firm is willing to take and how much cost the firm is willing to bear. Organizations provide governance and socialization mechanisms for transferring embedded knowledge across firms because they act as social communities, which creates productive and administrative knowledge embodied in people, procedures, and organizational routines (Kogut and Zander, 1992).
As we noted earlier, market failures arise from several types of problems, including appropriation concerns and coordination difficulties. For the moment, we focus on internal versus external sourcing of knowledge. Yet, we also note that, among external modes of knowledge sourcing, exchanges characterized by a high degree of market failure require safeguarding and coordinating mechanisms that firms often find more possible to create via acquisitions rather than through discrete exchange or alliances. The acquisitions literature recognizes that acquisitions represent a means to acquire knowledge that face discrete exchange difficulties (Hitt, Hoskisson, Ireland, and Moesel, 1996; Capron, Dussauge and Mitchell, 1998). Nelson and Winter (1982: 65) note that acquisitions can bring whole packages of capability under unified control. Through acquisitions, firms both acquire unfamiliar new knowledge and learn how to use their existing intangible knowledge in new organizational settings and competitive conditions (Penrose, 1959: 126; Mitchell, 1994; Singh and Zollo, 1997).

In summary, the resource-based view and transaction cost economics provide baseline theories for the study of knowledge acquisition because they focus on the characteristics of knowledge and the market for the knowledge involved in the transaction. The resource-based view suggests that the narrower the competitive gap between the needed knowledge and the changing firm’s existing knowledge, the more likely the firm will use internal development rather than external modes to undertake a change. Transaction cost economies argues that firms will tend to undertake internal development when they face high transaction costs. However, these two research streams do not “sharply answer the critical questions of whether internal knowledge transfer is either easier or qualitatively different from internal knowledge transfer” (Eisenhardt & Santos, 2000).

METHODS

As we noted earlier, we conducted 25 field interviews at 12 European Telecom operators, with an average of two interviews per firm. Quotations from the interviews are in the boxes below.

We conducted the study in three phases. Phase one involved open-ended, moderately directive interviews. We used a two-part interview guide during this phase. In the first part, we followed guidelines for inductive research and were as descriptive as possible. In the second part, we examined issues pertaining to knowledge gap and market failure. Informants were not asked to fill out a questionnaire; instead, we used the questionnaire as a guide to
direct and structure otherwise open-ended interviews. Interviews were recorded and transcribed. In phase two of the field research, we formed an organized interpretation of the data and then traveled back and forth between the data and our working framework. As evidence amassed, expectations from the literature were retained or revised. In this stage, we went back to the institutional and embeddedness literatures, because a major theme concerning the institutional context emerged. Phase three focused on gaining construct validity by interviews with telecommunication firms, with industry experts, and academics.

TELECOM INDUSTRY CHANGES

Both network operation and service provision in the European telecom industry have been rapidly changing during the past decade. With respect to network operation, deregulation has brought about many changes. European Union and national regulators are increasingly forcing incumbents to “unbundle” and allow competitors to use the “local loop”, which brings on new attackers. Companies such as Video Networks, QSC or KPNQwest plan to build their own DSL (digital subscriber line) services directly and over incumbents’ networks. Meanwhile, national telcos as Belgacom, Deutsche Telecom, BT and France Telecom, spurred by such competition, are rolling out new offerings and investing heavily in DSL services (Beardsley, Raghunath, and Wilshire, 2000). Promising new technologies being developed include UMTS (Universal Mobile Telecommunications System), which is a third generation technology providing for mobile broadband communications at rates as high as two megabits a second – more than 100 times faster than today’s mobile communications. In the cable segment, telecom regulation has forced telecom incumbents in Germany, Ireland, the Netherlands, and Switzerland to separate and sell the cable properties they controlled. Many cable operators have upgraded their network to provide two-way broadband services via cable modem and propose interactive services. In the fiber backbone segment, the number of new companies offering pan-European and transatlantic pipes such as Interoute, Hermes Europe Railtel, Level 3, KPNQwest, Level 3 is staggering: proposed capacity is set to explode by 500 percent a year. Within each technology, companies are fighting to capture economies of scale and scope by assuming pan-European leadership.

Such competition in the access infrastructure segment has implications for the service provision segment of the industry. As the battle for the access infrastructure heats up, pure infrastructure providers run the risk of seeing value accrue not to themselves but to content providers and aggregators, potentially relegating infrastructure providers to the role of commodity bandwidth provider (Beardsley, Raghunath, and Wilshire, 2000). To prosper,
infrastructure providers must secure customer relationships by offering distinctive value-added services and content. The market for most enhanced services is highly competitive (Armstrong, 1998) and telecom incumbents are challenged by data-based firms with stronger IT competencies.

The changes and knowledge needed by the telecom operators reflect the substantive changes that are taking place in the telecommunications environment, in which regulatory, technical, competitive, and market transformations are affecting most or all aspects of telecommunications company activities. The desired changes emphasize four key aspects of Schumpeter’s (1934) change typology: products, production processes, markets, and organization. Most strikingly, changes in the telecom industry entail more than changing a firm’s resource endowment; it also means transforming the firm’s organization and processes needed to integrate new knowledge. Accordingly, knowledge creation goes beyond the notion of specific knowledge exchange and includes the notion of overall firm change process.

The firm has gone through a major internal restructuring including processes, interaction with clients, profit/loss responsibility. The major goal of this restructuring is to be more customer-oriented, more transparent and to develop accountability.

We want to be a knowledge-sharing organization so that we can provide integrated products in a timely fashion.

In face of increased competition, we need to be much faster at changing our core business. We are too much technology/product driven, while we need to be more customer focused.

Organizational challenges are recruiting, fast decision making processes, higher customer flexibility, we need to be more customer driven. Processes need to be defined based on customer needs and on the required delivery time.

Accordingly, needed knowledge tends to emphasize R&D, technical (IT), marketing (customer orientation, market knowledge) and managerial skills. For many telecom incumbents, the telecom and IT convergence brings about a drastic reshuffling of their competencies.

Our current skills are based on traditional specialized engineering skills, while we are looking for engineers with a general view of network architecture and with broader responsibility. We also need sales and marketing people more specialized in internet and carrier products.

There is a huge gap between the skills we need to deliver an integrated offering in the ICT business and our current competencies. To deliver such an integrated portfolio, we need 80% IT competencies versus 20% traditional telecom competencies.
Managerial skills also include change process skills, such as skills to foster internal entrepreneurship, or skills to manage alliances and acquisitions.

| We need to develop an entrepreneurial spirit and risk taking attitude. We need to develop a capability of managing joint ventures and acquisitions. |
| We need “horizontal competencies”; skills that are not related to specialized know-how; we need to develop a more reactive organization through a decentralized approach. In our firm, we have a culture based on consensus; we are therefore slow at making decisions. |

The description of the changes and knowledge needed suggests that creating new knowledge encompasses issues pertaining to knowledge exchange (i.e., the transaction level) and also to the firm’s overall configuration in terms of processes, systems and culture, suggesting that firms have to shape appropriate social contexts to be able to develop, acquire and integrate needed knowledge.

**EMPIRICAL EVIDENCE**

Beyond the classic formulation of knowledge gap and market failure, three key dimensions emerge from our field study: 1) the social acceptance of the needed knowledge, 2) the presence of internal market failures, and 3) the risk of knowledge depletion.

**From knowledge gap to social acceptance**

As we saw earlier, the resource-based view argues that the greater the knowledge gap between the needed knowledge and the changing firm’s existing knowledge, the more likely the needed knowledge will be sourced externally rather than internally. Respondents viewed the gap between their knowledge base and the needed knowledge as a primary determinant of their choice between internal versus external knowledge sourcing. One criteria for deciding on internal development versus external modes of acquisition is how far the needed knowledge is from the changing firm’s existing knowledge.

The concept of knowledge gap includes closeness (familiarity with the needed knowledge) and strength in the needed knowledge area. The concept fits with the notion of competitive gap; when the changing firm achieves a high competitiveness level in a knowledge area, it tends to develop knowledge internally in that area, achieving better coordination and protecting the value of their knowledge. Conversely, when the changing firm is far away from the competitive level in the targeted knowledge area, it is likely to use acquisitions or links to other firms to develop the needed knowledge. Not only do firms need to be familiar with the needed knowledge, they also need to reach a certain competitive threshold to
develop internally or to be able to hire the needed people to develop internally that knowledge. A competitive threshold provides appropriate skills for developing the needed knowledge as well as market legitimacy vis-à-vis the customer and the labor market. Firms with weak reputations in certain knowledge areas may have to turn to external modes to improve the customer or supplier perception of their knowledge profile. When the gap between the needed knowledge and the changing firm’s knowledge is wide, firms tend to acquire a critical mass of the needed knowledge through alliances or acquisitions. The quote below suggests that when firms are very far away from this competitive threshold, they will turn to the ultimate external mode, i.e., acquisitions.

The main issue is how to manage the resource gaps? Should we do it by ourselves or acquire other firms? One of the main criteria for deciding on acquisitions is how far is it from our current skills.
We went for a long time for internal R&D, but we did not have these competencies. Then we try to bring these competencies through alliance. Now we do acquisitions to fasten R&D. There is a pattern. We realized that we needed to reach a certain threshold of competencies before we could run effective internal development, or be an attractive and/or effective partner within an alliance.
We have key advantages to address the SME segment in terms of technological capabilities, supplier leverage, brand name, trust, customer base, and customer and contact (on average, 20 contacts a year). However, the main obstacle is the customer perception of what we do; for them, we are a telephone company.
Acquisition allows us to get the head start; so not only to get the technologies, but also to make the market aware of our presence and to be taken seriously in the data environment.

Moreover, our field data also indicate that the degree to which the needed knowledge conflicted with the changing firm’s existing knowledge base was a primary determinant of the choice between external and internal knowledge sourcing. The lack of social acceptance of the needed knowledge leads firms to turn to external sourcing modes. External sourcing of knowledge, notably acquisitions, provides not only a means to acquire specific knowledge, but also provides an organizational «template» for change and breaking inertia, vested interest and routines into the changing firm.\[i\]

When possible, a firm will use internal sourcing for knowledge with features that allow the firm’s existing routines to function smoothly. The fear of breaking the existing routines is a powerful force tending to hold organizations on the path of relatively inflexible routines. This inertia implies that, in order to preserve their routines, people in place within the firms are more likely to develop internal resources that fit the current systems, that is, resource that tend not too be too disruptive. In sum, internal development is more likely to maintain an
intra-organizational truce as it builds incrementally on existing routines, and is more appropriate to develop knowledge that reinforce the existing systems than disrupt them. Conversely, when the changing firm needs knowledge that conflicts with its existing routines, it will turn to external modes of knowledge sourcing to gain access to knowledge that internal people would not or could not develop within the firm.

There are two types of technologies: the circuit technology for voice traffic and the packet technology for data traffic. For a long time, most research funds were devoted to the dominant activity, the circuit technology, but internet development challenges this logic. The major issue is the intellectual blinders that most engineers face as we move to intelligent networks; it is hard for most of our engineers to think beyond their circuit technology background to be able to adjust to this emerging business. Solutions to deal with increasing data traffic would be to add, in parallel, a separate network that is better adapted to data traffic or to upgrade the existing network to integrate both voice and data traffic.

In many telecom incumbents, data traffic department used to be a marginal subsidiary compared to the powerful voice traffic department ruled by circuit technology engineers. The boom in data traffic has raised internal political problems due to the vested interest of the people in place. In some firms, investments and resource allocations towards data technologies have been postponed or limited due to this internal competition.

We do not have resource problems in the basic technological field, but the boom in data traffic raises internal political and resource allocation issues, because we used to manage the data traffic in a separate subsidiary at the periphery of the core business.

You buy those people for their culture. So, actually you don’t want to integrate them into your culture, generally speaking. You want to migrate your own people to that culture. It means: 1) major reorganization for the telcos, 2) they will release part of their own people to migrate to this new service, and 3) put acquired people in key customer facing position in your own organization.

I am not sure the right way to go about it. If you reorganize your existing company from top to bottom, you have organization troubles for three years at least. I think what is important to do is that you take small bites. You ask yourself: « Which are my most important customer segments? Where am I going to have the highest degree of competition? Where I am going to be the most vulnerable? ». The answer is always the major international customers. So, create an organization for these major international clients, and separate it from the rest of the organization. Acquire to extend your services offering, and the people you acquired are hopefully much more customer oriented than you are and put them in charge of this new organization.

The notion of ‘intellectual blinders’ mentioned by one respondent is closed to the notion of ‘cognitive sunk cost’, defined as ‘the social and psychological costs associated with altering firm habits and routines’ (Oliver, 1997: p 702). These cognitive sunk costs are especially prevalent when the needed knowledge disrupts the familiar routines, or changes the patterns
of resource allocation or power distribution. Oliver (1997) argues that a firm’s historical cultural and political context, along with the psychological costs associated with organizational change, can constrain knowledge redeployment. Ginsberg (1994:158) notes that “strong institutional pressures abide in the evaluation of current resource allocations and in hindering acceptance of knowledge deployments”. At the individual level, employees may have to learn new skills, and power may shift to new individuals and groups within the organization subsequent to knowledge redeployment. Both vulnerable employees and powerful vested interests are likely to oppose such change. The presence of cognitive sunk costs will lead managers to reinforce the existing knowledge position and make knowledge redeployment less likely. At the organizational level, potential violation of corporate traditions, norms or culture may dampen knowledge redeployment. Knowledge that a firm has accumulated over long periods acquire a taken for granted character within the firm that makes them resistant to knowledge changes (Oliver, 1997).

The notion of social acceptance complements the notion of knowledge gap because it involves non-rational, emotional components of the firm’s capacity to develop internally new knowledge. Internal development of knowledge that builds on new routines meets institutional barriers. The needed knowledge may not necessarily be very far away from the existing skills of people, but they violate corporate traditions, break their working routines, and disrupt the organization by bringing about internal competition. Conversely, when routines require significant change, and particularly if the needed change conflict with the existing routines, the use of external modes of knowledge acquisition tends to be more appropriate. The core reason is that the firm will have less need of immediately attempting to adjust existing routines in the face of substantial resistance. Instead, the firm can attempt to obtain knowledge that consist of new routines from outside the firm and only then undertake the inevitable process of adjusting existing resources. This argument closely parallels Abernathy and Clark’s (1985) and Tushman and Anderson’s (1986) notion of competence destruction, which arises when changes will tend to reduce the value of existing resources. The starting point argument concerning competence destruction is that firms will tend to avoid changes that involve substantial competence destruction. An extension of the argument, though, is that the presence of competence destruction will influence the mode of change of firms that attempt to change despite the potential for competence destruction. As we noted above, most often firms will search externally in such cases, rather than undertake the immediate risk of attempting to change existing routines.
In summary, previous research has argued that institutional pressures constrain knowledge redeployment. Our research provides evidence that institutional pressures also influence the choice between internal versus external knowledge sourcing. We find that the more the needed knowledge conflicts with the changing firm’s knowledge base, the more likely the changing firm will turn to radical external modes of knowledge sourcing, especially acquisitions. The core reason is that the firm will have less need to immediately attempt to adjust existing knowledge in the face of substantial resistance. Instead, the firm can attempt to obtain knowledge that consists of new routines from outside the firm and only then undertake the process of adjusting existing resources.

Accordingly, we propose the three following propositions:

Proposition 1: The greater the gap between the needed knowledge and the firm’s existing knowledge, the more likely the firm will source the needed knowledge from external markets rather than within the firm.

Proposition 2: The lower the social acceptance of the needed knowledge by the firm, the more likely the firm will source the needed knowledge from external markets rather than within the firm.

Failures of internal versus external markets

As predicted by transaction cost economics, our data show that failures of external markets are important determinants of choice between internal versus external knowledge sourcing. External markets can include markets for « discrete » knowledge, markets for alliances, and markets for corporate control. These external markets are plagued with difficulties to evaluate, protect, and transfer the needed knowledge.

One source of market failure arises from appropriation concerns. Respondents recognize that issues related to patents and property rights represent a key influence of the choice of using internal versus external knowledge exchange. Appropriation concerns are commonly associated with the intangible nature of the knowledge exchanged; respondents fear that they will not control the intangible aspects of the knowledge exchange, which make them vulnerable and very much dependent on the seller of that knowledge. Some sellers of knowledge recognized that providing codification of knowledge decreases their capacity to extract value from it. Incentives to maintain the degree of intangibility are high for the seller.

Another source of market failures arises from coordination issues that stem from the embeddedness of the needed knowledge in their organizational context. Transferring that knowledge usually requires ongoing cooperation between the seller and the buyer so that the
purchasing firm will be capable of reproducing an appropriate context in terms of culture, processes, and incentive systems to get the value from the newly bought knowledge. Knowledge, when transferred outside of its original setting, loses part of its value because firms are not capable of providing a suitable home for the transferred knowledge. Reproducing this context or adjusting knowledge to the buyer’s context requires a tight coupling between the seller and the buyer, which is not easily enforceable through external markets. Alliances and acquisitions are seen as a way to reduce the coordination issues without eliminating them.

When we buy a technology off the shelf, we try to work hard on the patent issues. We are also afraid of not controlling the intangible aspects of the technology exchange.

In order to bring the voice competencies into the data world, if you do not control the entity where you bring that know-how into, you weaken yourself. Because we will give up on our core competencies and make our partner stronger. This alliance was more a shopping of core competencies than collaborating.

We need to control the technology. We need to have intellectual property rights; we also need to command and understand the technology. So we need to have data business know-how in house, so that we can develop our own products. Because let’s say in a joint venture like the ones with Firm X, Firm X has always been in a data world, they have created their wealth and have their core competencies in the data world. We come from the voice environment, and so even in a 50/50 JV, we are the weaker technology partner; although we have the financial resources, we have the junior role in the technology role, and we have to change that.

Although firms have differential abilities to overcome appropriation and coordination issues, respondents stress that the main differentiating factor that contributes to reducing the extent of market failure to exchange the needed knowledge was the level of internal knowledge in the targeted knowledge area. A minimum internal threshold helps the exchange of knowledge through market mechanisms. Attaining this internal threshold provides the changing firm with “qualitative insights” to command the intangible aspects of the transaction in terms of capacity to specify and enforce contracts. This internal threshold also limits appropriation and coordination difficulties because the changing firms have both stronger integration capacity and the capacity to disembed the needed knowledge from its context. One respondent stressed that the stronger the capabilities of the buying firm in the targeted knowledge area, the less likely the selling firm can ‘hide’ parts of the knowledge to be transferred. The interviews suggest that the more knowledgeable about the needed knowledge the changing firm is, the greater the scope for disembedding and trading through market the needed knowledge.
It is also clear that the more data skills you have, the less intangible this know-how becomes. The more qualitative insights and feelings you have, the more you reduce the risk of not commanding the intangible aspects of the technology you buy. Once again, to effectively acquire a technology on the market, you need to reach this threshold, this minimum internal level of competencies to be an effective and attractive buyer.

As an IT provider, with an IPO, which is not knowledgeable, we tend to provide the software off the shelf without the manual, otherwise nothing is left to us to do. In fact, some operators have very bright skills in IT, in such cases, we are not so useful, as very quickly they can get our competencies; there is nothing we can hide.

In the case when we do not manage to acquire resources from other firms, we experiment internally; we experiment, fail, learn; we develop the strategy by doing ourselves, by refining our practices within a very loose framework.

In sum, the observations suggest that market failures vary with the level of internal knowledge of the changing firm in the needed knowledge area. The further away the needed knowledge is from the changing firm’s knowledge, the higher the perceived degree of intangibility and risks associated with appropriation, coordination and quality of the needed knowledge. A threshold of internal competencies has to be attained for the firm to be able to source knowledge from external sources. When this minimum threshold is not reached, transaction costs are too high and external sourcing may be very ineffective. This leads to refine our first proposition.

Accordingly, we propose the two following propositions.

Proposition 3: The greater the needed knowledge is subject to external market failure, the more likely the firm will source the needed knowledge within the firm rather than from external markets.

Proposition 4. The relationship between knowledge gap and internal knowledge sourcing follows a inversely-U shaped relationship; the firm sources knowledge within the firm rather than from external markets at a low or high level of knowledge gap; the firm turns to external sourcing at a moderate level of knowledge gap.

Our field data show that organization also met failures in their internal markets. Knowledge that reside within firm is hard to leverage and redeploy into new uses or units for both motivational and knowledge reasons. The notion of internal market failures echoes the notion of external market failure because an organization, being defined as a social community, faces costs pertaining to screening, trading and transferring knowledge inside the firm.
Many telecom incumbents are plagued with a ‘history of not sharing knowledge’ among organizational subunits within a firm. The weak redeployability of internal knowledge fits with the notion of internal stickiness (Szulanski; 1996). Sources of internal stickiness are commonly divided in two general classes: (1) a set of agency-based factors which determine the motivation of internal people to share resources (Lenox, 2000), and (2) a set of knowledge-based factors (i.e., causal ambiguity, tacitness) that influence the degree to which two units can share knowledge effectively (Szulanski, 1996).

We found that both incentive system and learning capacities mitigate internal stickiness. Incentive systems influence the extent to which the people are willing to carry out ‘transversal collaboration’.

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We have a long history of not sharing knowledge. To overcome this culture, we have developed systems of incentives to improve transversal collaboration. For example, each consultant in the knowledge management unit has the obligation to share and report knowledge (for example, through workshops) in at least three different services among our 23 services. The people receiving the knowledge assign scores to the learning they receive and describe how they can use this new knowledge.

People in the technical areas are more likely to share their experience; they like scientific research and tend to have a strong community of interest, although the not-invented-here syndrome can be present. People in the commercial areas tend to be more competitive; each SBU is striving for its profit and is not ready to share information with a potential competitor. This attitude is linked to the culture of each activity. For example, we have “the salesman of the month”; but we do not have the scientist of the month!

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The respondents stressed information-based factors that inhibit knowledge sharing and learning, in particular the lack of initiatives and institutional mechanisms to communicate effectively and diffuse knowledge across units. Such mechanisms include active internal labor markets, job rotation, resource allocation processes, tolerance for experiments, transversal committees, and internal consulting services.

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In the past years, we have developed many initiatives to improve added value in products and services. The way we carried out these activities had much to do with combining corporate knowledge and ideas in a cross-functional way. Nowadays we should call these activities knowledge management activities. We have developed a knowledge management initiative task force, which is an internal joint venture between our research center and our applications unit. This taskforce employs 325 consultants from our highly trained staff. The objective is to manage knowledge across units.
To develop an innovation and sharing knowledge culture, we have created interactive workshops, knowledge maps, skills inventories, Best Practices databases, intranet chats, and discussion groups.

The respondents viewed these ‘knowledge management’ activities as important to develop the learning capacities of the organizational units to share knowledge. Knowledge management activities also help firms understand what existing knowledge is available internally that could be used for developing future knowledge development. These findings fit with the literature on intra-firm social networks (Hansen, 1999; Tsai, 2000) and on recombination skills. An emerging stream of literature, the recombination literature argues that firm can undertake Schumpeterian innovation internally by recombining knowledge in novel ways (Henderson and Clark, 1990; Galunic and Rodan, 1998. The knowledge recombination literature challenges simple organizational inertia arguments and explores the antecedents of the likelihood of such recombination.

This discussion lends itself to the notion of internal market failures. In practice, internal market failure can take many forms, such as inappropriate incentives systems and knowledge-sharing mechanisms (e.g., informal personal ties, formal reporting relationships, internal labor market, and job rotation). When a firm enjoys substantial knowledge linkages across units of the firm, it will have more opportunities to draw knowledge from internal sources and recombine it into novel configurations. Hansen (1999) shows that the existence of strong ties across units facilitates intra-organizational transfer of complex knowledge. By contrast, when such linkages are rare, the firm will have greater need to turn to external modes if it wishes to attempt to change.

In sum, we have evidence that the capacity of redeploying internal knowledge is an important driver of the choice between internal development and external modes of knowledge acquisition. When firms choose between internal versus external modes of knowledge acquisition, external availability of knowledge from the markets or other firms seems to be a primary factor of consideration, while internal availability of the changing firm’s knowledge tend to have a taken for granted character. In most interviews, the respondents stress how difficult it is to gain access to, transfer and recombine existing knowledge that resides within the firm. These results challenge the idea that the firm is a social community where learning and coordination takes place more easily than market transaction. Our data suggest that many
firms are collections of social communities across which knowledge transfer may not be as
easier than knowledge transfer from external markets.

Accordingly, we formulate the following proposition.

Proposition 5: The more the needed knowledge is subject to internal market failures,
the more likely the firm will source the needed knowledge from external markets
rather than within the firm.

Knowledge depreciation risk

Previous research has emphasized the risk of knowledge depreciation and organizational
forgetting (Argote, 1999; Dierickx and Cool, 1989). Our data suggest that firms often take
into account the risk of knowledge depletion in their choice of internal versus external
sourcing of knowledge. Knowledge internally created is more likely to persist through time,
to diffuse across units, and to be used as a platform for future knowledge development. By
contrast, knowledge acquired externally depreciates more quickly than internally developed
knowledge and is less likely to be transferred across units and used as a platform for future
development.

Knowledge acquired externally is not as embedded into the firm’s routines and culture as
knowledge developed internally. Acquisitions entail high turnover and routine disruption that
favors organizational forgetting (Argotte, 1999). The effect of acquisition on post-acquisition
target turnover has been extensively documented in the literature (Cannella and Hambrick,
1993; Walsh, 1988). If knowledge is embedded in individuals, then the turnover of
performing departing members affect organizational memory and routines (Argote, Eppler,
Rao and Murphy, 1997). Similarly, if knowledge is embedded in organizational structures
and routines, then the alteration of those routines during the post-acquisition phase challenges
their efficiency to store, maintain and transfer knowledge to the recipient. Transferring the
acquired knowledge to the recipient and across units of the recipient is a key issue,
particularly when the external source of knowledge is perceived as a competitor. Acquisitions
can also provide rapid growth of the acquirer that can disrupt its own repositories of
knowledge. Last, resistance from the recipient firm’s staff and the Not Invented Here
syndrome reduces learning accumulation at the recipient.

Knowledge management is going to be more and more important. It should not be the
case that if an employee leaves the company, no one within the company can take
over his function because of lack of knowledge and skills.
Overall, there is a high level of turnover across firms; one of the challenges for our firm is to keep people, to ensure more stability. Internally developed know-how is more likely to be integrated within our organization and used as a platform for future development.

Knowledge depreciation has implications on the choice of knowledge sourcing. Internal development commonly provides a less disruptive way of acquiring and embedding knowledge in the firm than external knowledge sourcing. We hypothesize that knowledge that has been developed internally should be more likely to persist, diffuse and provide a platform for future development than externally sourced knowledge.

At the same time, we note that firms are not equally skilled at scanning, transferring and leveraging knowledge from external sources (what we term “importation skills”). Incumbent firms with strong internal cultures are more concerned with their future use of acquired knowledge because they have not in the past developed experience to scan, transfer and leverage knowledge from external sources into their own organization. Internally-focused telecom firms do not have strong competencies to scan their external environment. Respondants recognize the need to develop “a strategy of networking with external partners with different knowledge”. Our data support evidence that firms that benefit from strong external resource linkages are more inclined to using external market to acquire the needed knowledge than using internal development. External ties derive from a firm’s position in an external community of inter-organizational and inter-personal networks (McEvily and Zaheer, 1999). We also find that weak external ties prevent exarcebate appropriation and coordination difficulties. Firms that have not been used to sharing knowledge with external partners have a lower propensity to share resources in the context of external modes of acquisition. In conjunction, many respondents stress their lack of competence to share knowledge within an alliance through mechanisms such as staff rotation and committees.

The lack of “importation skills” influences the extent to which firms can transfer and leverage effectively externally sourced knowledge. There is frequent recognition that firms must undertake internal changes such as developing new reward systems and coaching processes, if they want to acquire external knowledge. The adaptation of the changing firm to receive and retain new knowledge is harder when the changing firm’s internal knowledge is not close to the needed knowledge. This adaptation difficulty is even more severe when the needed knowledge conflicts with the changing firm’s knowledge.
A key issue is the impact of the imported skills on our internal skills, our people. It is difficult to balance imported skills with our internal people and context.

We lack the internal ability to develop alliances. It is not so much the skills per se but the attitude. We lack the internal ability to develop alliances. A lot of seniors still think that we should do everything and do not see alliances as a way to enhance capabilities.

While PTOs are very good at bringing external consultants, they are not good at bringing into new people for the implementation phase; even if they do bring new people, the probability of these new people to succeed, to break into the culture is low.

You can get external knowledge as long as you manage to attract and integrate the outsider. From my own experience, I can tell you it is a major hurdle. I could not break into the firm X’s culture. I always felt as an outsider.

No sole part within our firm can mobilize the knowledge that is necessary to provide integrated services. We need both internal and external partners. We want to develop a strategy on networking that consists of selecting partners with new and/or different knowledge;

The main goal is to support our firm in an external network and to support organizational change within our firm. The expected benefits include learning faster (joint product development, joint commercial approach); creating a strong community that knows its members, has a common goal, and shares knowledge for a mutual benefit; achieving quick introduction in client environments.

In sum, the quality of “importation skills” influence the perception of the risk of the acquired knowledge depreciation. The greater the importation skills of the firm, the lower the perceived risk of depreciation of externally sourced knowledge, because the firm has developed corporate expertise to protect, transfer and leverage external knowledge. The quality of “importation skills” varies with the environmental dynamics that the firm faces. In the stable and moderately competitive environment that telecom incumbents used to face, the firms developed few importation skills as they did not recognize the need to source externally knowledge and reconfigure their internal knowledge with that external knowledge. In the more dynamic environment that telecom suppliers and mobile telecom firms now face, firms have needed to quickly reconfigure their knowledge with externally sourced knowledge, thereby developing skills at combining internal and external knowledge.

However, is knowledge accumulation always beneficial? In some cases, we found that the benefits of knowledge accumulation and persistence of routines should not be taken for granted. The firms that face the most dynamic, fastest moving segments of the telecom
industry are used to rapid turnover, aggressive acquisition and divestiture programs, and agile knowledge recombination. These firms do not necessarily want to embed the acquired knowledge into the firm, because they must keep adjusting themselves to gain temporary competitive advantages. Organizational learning and forgetting is a dual objective that these firms often pursue. Importation and integration of externally acquired knowledge in such cases remains relatively superficial as firm need to exhibit rapid reshuffling of their knowledge. This idea is in line with recent work on high-velocity environments (Brown and Eisenhardt, 1997). Eisenhardt and Martin (2001) argue that in highly dynamic market, “dynamic capabilities necessarily rely much less on existing knowledge and much more on rapidly creating situation-specific new knowledge”.

In sum, the nature of the environment moderates the relationship between knowledge depreciation and choice of internal versus external knowledge sourcing. In highly dynamic environments, firms will be less concerned by the risk of knowledge depreciation of externally sourced knowledge; in moderately dynamic environments, firms will be more concerned by the risk of knowledge depreciation of externally sourced knowledge.

Accordingly, we propose the three following propositions.

   Proposition 6: The more the needed knowledge is subject to depreciation risk, the more likely the firm will source knowledge within the firm rather than from external markets.

   Proposition 7: The greater the importation skills of the firm, the lower the perceived risk of depreciation of externally sourced knowledge.

   Proposition 8: The risk of knowledge depreciation is more likely to lead to internal knowledge sourcing in moderately dynamic environments than in highly dynamic environments.

CONCLUSION

The purpose of this paper is to investigate when firms turn to external modes of knowledge sourcing instead of using internal development of new capabilities. We draw on field interviews of telecom firms to extend initial reasoning of the resource-based view of the firm and transaction cost economics.

Our data provides support for the existing literature that suggests that the capacity of a firm to turn to internal versus external knowledge sourcing is contingent upon the knowledge gap between the needed knowledge and the firm’s knowledge, and the degree to which the needed knowledge is subject to market failure. Our data also suggests a subtle interplay bewteen internal knowledge and market failure, as firms with a minimum level of internal
knowledge threshold are less vulnerable to market failures than firms that do not reach this threshold.

These factors only provide partial answers to our research question. Our field interview reveal institutional, embeddedness and learning factors that turn out to be as important as the resource- and transaction-based determinants. We stress three implications of our data.

First, our empirical data provide evidence that knowledge transfer inside the firm is qualitatively different from knowledge acquired externally. Telecom firms, in spite of initial preferences for internal development, turn to external sources, not only when the needed knowledge is distant from the firm’s existing knowledge, but also when the needed knowledge conflicts with the firm’s existing knowledge. The firm’s institutional context (internal competition, vested interest, corporate tradition, taken-for-granted practices, cognitive sunk cost) extend the resource-based explanations of the mode of knowledge sourcing.

Second, our data shows that internal knowledge transfer is not systematically easier than external knowledge transfer. Organizations also met failures of their internal knowledge market. Internal transfer also meets failures that echo those found in external markets. Our data suggest similarity between internal and external knowledge transfer processes, with similar difficulties in screening, trading and transferring knowledge. These results imply that firms may not be unique in their ability to efficiently transfer knowledge. Firms can be seen as a collection of social communities, with an heterogeneous propensity for recombining internal knowledge across those different communities. When firms face high failures in their internal markets, they will turn to external sourcing.

Third, we find that firms often take into account the risk of knowledge depletion in their choice of internal versus external sourcing of knowledge. Our data suggest that knowledge internally created is perceived as being more likely to persist through time and be used as a platform for future knowledge development than external knowledge. This accumulation is often beneficial, but is less needed in highly dynamic environments, when accumulation may create undesirable inertia. In such dynamic environments, firms may emphasize external to internal sourcing both to increase the speed and flexibility of change.
REFERENCES


APPENDIX : INTERVIEW QUESTIONNAIRE

The following questions were used during the interviews. They were used as a guide to gather data and generate discussion. The first set of questions was open-ended and covers issues pertaining to the types of targeted competencies, the modes of changes used, the drivers, and the outcomes of the four modes of change. The second set of questions focused on the notions of resource gap and market failure.

PART I

BACKGROUND

Industry changes and firm strategy
1. What technological, competitive, market, and financial challenges are your firm currently facing?
2. In regard of these challenges, how has your strategy evolved over the past years?
3. More specifically, what role will your firm play in the telecom business?
4. How do you define the telecom business?
5. Which service markets do you plan to enter in the next three years?
6. In which services does your firm want to be a major player?
7. In each of these services, who are the main players?
8. In each of these services, how important is the time to market entry? Why?
   In each of these services, what other firms and/or industries have the potential to enter that market?
9. Could you specify how these challenges are changing the way you operate your business?

Needed capabilities
1. In general what skills does your firm need in order to deliver a competitive service in the near future?
2. More specifically, could you describe the knowledge and skills your firm has and which knowledge you intend to develop:
   - To be more customer-oriented?
   - To face the technological convergence?
   - To manage the changes in the nature of the relationship with your competitors?

MODES OF CHANGE

Practices
1. How do you intend to develop needed competencies?
2. Considering the above mentioned skills, how has your firm been able to attract and develop these skills through the following possible mechanisms:
   - Internal development: internal training, internal product development, hiring new people
   - Acquiring specific knowledge on the market (e.g., license, software packages, consultants)
   - Setting up an alliance/joint venture business
   - Acquiring a company or business unit
3. To what extent were the needed skills or capabilities present in labor markets, asset markets, or other firms?
4. Does your firm have some regular pattern of using one of this mode, or these modes alternately? Is there any sequential process; for example, does your firm tend to use acquisitions after internal development has failed?
5. Do you use repeated practices for managing one or more of these four modes of change?
6. Does the corporate office have a particular orientation towards one of these modes? From what level of the organization do such initiatives for change emerge?

Drivers
1. Why did your firm used external modes of resource acquisition instead of internal development?
2. Could you think of some factors that would lead you to prefer an acquisition over an alliance?
3. Could you think of some factors that would lead you to prefer an acquisition over a purchase contract?
   *These first three questions will be adjusted according to the mode that the firm uses most for creating new knowledge.*
4. What types of capabilities are acquired through acquisitions, alliances, purchase contracts and internal development?

**Outcomes**

1. How effective have these different mechanisms been in building the needed skills? What types of situations suit particular mechanisms? Under what conditions would you expect a particular mechanism to be most successful?
2. What have been the challenges and pressures for your firm associated with these mechanisms? Under what conditions would you expect a particular mechanism to cause most stress?
3. What types of costs are associated with each of these mechanisms (i.e. production, transaction, development, opportunity)?
4. What aspects in this process of building new skills, do you consider to be very unique about your firm?
5. Which mechanism bears the highest potential for competence building?
6. Which mechanism bears the highest potential for failing to develop new competencies and/or destroying existing competencies?
7. In the market segments that you have chosen not to enter, what are the primary reasons why you did not enter that market? What mechanism to acquire skills were considered and why were they not used?
8. If any, what company have you used as a benchmark in the whole process of building new skills?
9. What additional steps in this change process does your firm tend to take in the near or further future?

**PART II**

**KNOWLEDGE GAP**

1. What types of needed capabilities are associated with internal development?
   - in terms of closeness with your existing capabilities
   - in terms of relative strength of your existing capabilities
   - in terms of conflict with your existing capabilities
2. Do you have relevant in house capabilities (in research, marketing, or management) to develop the needed capabilities?
   **Example**: Technological convergence
   - Do you have relevant in house research capabilities to develop data networking technologies and increase the diversity of the product offerings?
   - Do you have the supporting organizational skills to accompany the development of data networking technology?
   - Do you have the marketing skills to market a ‘one stop’ shopping concept and develop branding?
   **Example**: Customer care
   - Do you have relevant marketing capabilities to develop competitive offerings?
   - Do you have the supporting organizational skills to develop a customer-oriented organization (for example, information system)?
   - Do you have the marketing skills to market a ‘one stop’ shopping concept and develop branding?
3. What organizational changes, if any, have been necessary to enable your firm to build these needed capabilities?
   - Organizational Structure
   - Information Exchange
   - Human Resources
   - Strategic Planning Process
MARKET FAILURE
1. When you choose a particular mechanism for acquiring skills, to what extent do you take into account the effect that mechanism will have on protecting the value of skills that you know have or might develop in the future?
2. When you choose a particular mechanism for acquiring skills, to what extent do you need to balance trade-offs between protecting the value of existing skills and developing new skills? In your experience, do some mechanisms provide greater or lesser ability to both protect and develop skills than others?
3. Would you consider to buy technologies/needed capabilities off the shelves?
4. If you buy a technology/needed capabilities off the shelves, would you be concerned by some property rights issues, or issues related to the intangible nature of the technology/capability transfer?
5. Could you think of some safeguarding mechanisms that would allow you to protect your knowledge in a purchase contract?
6. Would you consider acquiring the needed capabilities through an alliance?
7. If you acquire the needed capabilities through an alliance, would you be concerned by some property rights issues, or issues related to the intangible nature of the capability transfer?
8. Could you think of some safeguarding mechanisms that would allow you to protect your knowledge in an alliance?
ENDNOTES

1 We define the four modes of change as follows:

1. Internal development refers to the changes that a firm undertakes internally by recombining its own existing resources or developing new resources on its own. Examples of internal development include internal training, internal product development, hiring new staff, building new plants.

2. Purchase contracts refer to contracts where a firm buys distinct resources from a third party. Examples of purchase contract include purchasing off-the-shelf technologies and services, technology licensing, one-shot transaction, purchasing knowledge and consulting services.

3. Alliances and joint ventures refer to the formation of ongoing relationships with another organizational entity, such as a firm or a university, in which the two organizations retain strategic autonomy but agree to work together for a period of time. Examples of alliances include equity and non-equity joint ventures, R&D and marketing partnerships, and multi-party consortia.

4. Acquisitions refer to the majority control of another firm or entity. Acquisitions encompass both acquiring entire corporations and acquiring individual businesses from ongoing multi-business corporations.

The four modes group together on several dimensions. We refer to the first mode as an internal mode of change and the latter three modes as external modes of change. The three external modes comprise two sub-classes of resource exchange, discrete resource exchange (purchase contract) and inter-organizational resource exchange (alliances and acquisitions). At the outset, we note that internal and external modes of change often occur in combination, because a firm may require several sets of resources with different characteristics in order to undertake a change. Similarly, the market environment may have multiple influences on change modes. In our study, hiring new people is part of internal growth. The three external modes refer to knowledge acquisition from a third party, i.e. to inter-organizational modes of exchange.

ii We note here that appropriation and coordination forms of market failure tend to arise jointly, as the same factors that give rise to the need for ongoing cooperation typically also create appropriation hazards. Should a non-opportunistic setting exist, however, the need for cooperation would influence the mode of resource exchange (Kogut and Zander, 1992).

iii Our discussion of change draws most directly on Schumpeter (1934). Changes are resource transformations that entail development of new products, new productive processes, new markets, or new organizational structures. We assume that firms are aware of their need for change and initiate a search process for new resources that would be viable in the prevailing environment. We refer to firms that have initiated a search process for new knowledge (resources) as changing firms. Such searches may arise at many levels of firm performance. Many firms engage in a search for new markets, products, productive processes or structure when their current performance is below their aspiration level (Nelson and Winter, 1982).