Organizational Capabilities: Some reflections on the concept

Gerd Schienstock

April 2009
Research Unit for Technology, Science and Innovation Studies (TaSTI)
University of Tampere

IAREG Working Paper 1.2.c
Organizational capabilities: Some reflections on the concept

Gerd Schienstock
Research Unit for Technology, Science and Innovation Studies (TaSTI)
University of Tampere
FI-33014 University of Tampere
gerd.schienstock@uta.fi

Abstract

Firms increasingly operate in a dynamic environment. To stay competitive in such an environment firms have to develop organizational capabilities and know-how that enables them to deal with core organizational problems. The concept of organizational capabilities understands organizational change as a continuous and open-ended process of organizational development. However, the concept is still very vague; there is little agreement on the few core organizational capabilities that firms have to develop to stay competitive.

This paper argues that firms cannot focus on technical capabilities only; they also have to develop capabilities to deal with social problems. Furthermore, an attempt is made to develop a concept of organizational capabilities based on the knowledge process within firms. Also, options of organizational embedding of the knowledge-based capabilities are discussed. It is argued, however, that for various firms different organizational capabilities become crucial. The fact that economic success depends on firms’ organizational capabilities makes their improvement a legitimate object of innovation policy. Nevertheless focusing on the distribution of best practice will hardly produce satisfying results; instead, public innovation policy has to take into account the diversity of firms and their specific needs.

Keywords: knowledge process, learning, organizational capabilities.
1. Introduction

Interested in long-term evolutionary processes, innovation research focused on a fairly high level of aggregation. Consequently firms that transform production processes and create innovations were widely considered a black box. Nevertheless, the private firm is the nexus of innovation processes; it is there that the final conversion of knowledge into new products, process technologies or services takes place and that new innovations are applied in the search for competitive advantages (Hauknes 2000). It is obvious that innovation research has to give more attention to the firm level of innovation processes (Dosi 1988, Hauknes 2000). To understand different innovation dynamics within firms, micro-economic research needs to focus on organizational aspects of innovation activities; innovation has to be studied as an organized process.

In the following, I will first discuss the need for a new understanding of organizational innovations focusing on a process perspective. The concept of organizational capabilities can be seen as such a process-oriented concept. Next I will clarify the concept of organizational capabilities. A key aspect of this concept is that it enables companies to deal with different types of organizational problems effectively. I have identified four general organizational problems for which companies have to develop capabilities: the production of the core output, the creation and acquisition of new resources, the balancing of vested interests, and the fulfilling of societal demands of various stakeholders. Such a broad concept of organizational problem has not been applied in empirical research so far.

The main part of this paper deals with the identification of techno-economic capabilities and their organizational dimension. I will first discuss several typologies of technological capabilities. However, companies need to develop additional capabilities besides technological capabilities for a coherent competition strategy. I will then discuss organizational aspects of dynamic capabilities, including ICT applications, organizational form, cultural patterns and human resources. Furthermore, I will develop a concept of capabilities in the knowledge process. Also, I will identify the shortcomings of various types of companies with respect to the development of organizational capabilities. At the end of the paper, I will draw some policy conclusion. My main argument is that innovation policy aiming at supporting companies in their development of organizational capabilities needs to take into account the particular shortcomings of the various types of companies.
2. The concept of organizational capabilities

2.1. Conceptualizing organizational innovations: From structure to process

Research on the micro-perspective of innovation has mainly explored the determinants of a firm’s propensity to innovation, focusing particularly on organizational structures and context (Pierce and Delbecq 1977, Wolfe 1994, Slappendel 1996). Although organizational structures cannot initiate or release innovative ideas, decisions or activities directly, they can still have an influence in such a way that the goals and values they reflect manifest themselves within those ideas, activities and decisions. The notion of a new organizational logic (Castells 2000, Powell 1990) argues that companies have to apply a common matrix of new organizational elements to be able to hold their own in global innovation-based competition.

The structural concept of organizational change is often linked with a direct approach of strategic intervention. This implies that an organizational design, \textit{a priori} specified by experts, is introduced by managerial hierarchies in a top-down manner. There is, however, plenty of evidence that organizational innovations do not occur as a planned and controlled top-down structural change (van de Ven et al. 1999). It is not possible to simply take an already existing organizational model out of a toolbox and implement it in a bureaucratic way. Instead, organizational change must be conceptualized as a continuous process of organizational renewal and learning; organizational practices are not static but in a continuous flux. As the Green Paper ‘Partnership for a New Organization of Work’ states, we can identify a shift from fixed systems of production to a flexible, open-ended process of organizational development (European Commission 1993). This is related to the fact that firms are confronted with a dynamic environment and have to be able to cope continuously with emerging new problems.

If organizational change does not occur as a single event, which can be analyzed in isolation but has to be interpreted as an experimental process, which has no clear outlines and does not appear as an integral whole, the structural concept of organizational innovation becomes problematic. Instead, we have to develop a new understanding of organizational innovation based on a process perspective. Coriat distinguishes between the structural concept and a second approach “that essentially tries to appraise some new ‘organizational traits’ of the firms without really paying attention to the concrete means and patterns used to obtain them” (2001: 197). Different terms have
been used to characterize these new traits such as ‘core competencies’, ‘dynamic capabilities’ or ‘organizational capacities’\(^{27}\). In the following, I will focus on the concept of organizational capabilities.

**2.2. What constitutes an organizational capability?**

The concept of organizational capabilities is rather ambiguous. A basic assumption of the ‘capability view’ is that companies have ways of doing things and dealing with organizational problems that show strong elements of continuity (Dosi, Faillo and Marengo 2003). But firms are heterogeneous, they develop different organizational routines even if they belong to the same industry and produce similar outputs. Firm-specific ways of acting are based on organizational capabilities that have been gradually accumulated and shaped within firms. Organizational capabilities, we can conclude, enable firms to deal effectively in a firm-specific way with key organizational problems (Dosi, Nelson and Winter 2000). This contradicts what is termed the ‘positioning view’ developed by Porter (1990), which assumes that opportunities are exogenous, while they can actually be created by firms themselves on the basis of firm-specific capabilities. “Rather than opportunities determining the allocation of resources, the allocation of resources to develop competencies develops opportunities” (Nootenboom 1999: 88).

The capability approach is closely linked with the knowledge-based view of the firm. Organizational capabilities are identified with the know-how of a firm of performing particular problem-specific activities (Dosi, Nelson and Winter 2000). Core capabilities embody proprietary knowledge that is unique to a particular firm and superior to that of the main competitors. It is widely agreed that firms’ competitiveness depends on the development of only a few core capabilities. “Companies derive competitive strength from their excellence in a small number of capability clusters, where they can sustain their competitive edge. A fundamental implication of the approach is that ‘idiosyncratic capabilities’ persistently shape corporate performance” (Dosi, Faillo and Marengo 2003: 20).

Organizational capabilities are rather stable; they do not change rapidly. Organizational capabilities give a firm its distinctive competitive edge, because they have been applied and further developed over a longer period of time. The emphasis is on the accumulation of organizational capabilities and the fact that the options for further development at each point of time are sharply constrained by the

\(^{27}\) For an in-depth debate of the differences between various concepts, see Dosi, Nelson and Winter (2000).
heritage of the past. The fact that capabilities are firm specific makes them particularly valuable, because they are of a tacit nature and therefore difficult to transfer and to imitate.

Some scholars distinguish between capabilities as the wider concept, on the one hand, and the narrower concept of competencies, on the other hand. The notion of competencies has, as Dosi, Faillo and Marengo argue, a distinct meaning “confined to a scale of observation immediate between single routines and overall firm wide capabilities, capturing ‘chunks’ of organizational abilities identified in terms of performed tasks and knowledge-base upon which they draw” (2003: 9; underlining in original). Here I will follow the general practice of using the capability concept interchangeably with the competence concept.

2.3. Organizational problems and organizational capabilities

I have argued earlier that organizational capabilities enable companies to cope with different types of organizational problems in an effective way. Here I do not speak about problem-solving, because organizational problems cannot generally be solved once and for all; they remain a continuous challenge. But what are the main problems companies are confronted with? As there is general agreement that speaking of core competencies or organizational capabilities implies a fairly large-scale unit of analysis, we can refer to a small number of very general organizational problems only. Producing the significant output in an effective way can be mentioned as the first problem with which companies have to deal. If they cannot use their resources effectively they will hardly be able to stay ahead of their competitors and survive in an increasingly competitive market. However, companies cannot assume that they can survive on the basis of their current products, services and production technology, as they have to act in a dynamic and uncertain environment. The ability to adapt to a highly dynamic environment by accumulating new knowledge and transforming it into technological innovations can be identified as a second organizational problem companies are confronted with.

Referring to March’s (1991) terminology we can identify ‘exploitation’ and ‘exploration’ as the two key problems with which companies have to deal and for which they have to develop core competencies. Exploration is associated with the development of novel resources and experimenting with new alternatives, while exploitation implies the effective use of available resources. The former process may lead to the development of new strategies and knowledge in the long run, while the latter may result in high performance, not laying down the foundations of long-term survival.
A company not only pursues specific economic aims, it can also be viewed as an adaptive organic system affected by the social characteristics of its participants as well as by the varied pressures imposed by its environment (Selznik 1948). On the one hand, companies represent a system of vested interests and they are confronted with different demands particularly from employees, customers and investors. Long-term conflicts between various asset holders can result in poor social performance, which can threaten not only the achievement of economic aims but also the survival of the company. We can therefore identify the balancing or managing of conflicting interests of various asset holders as a third organizational problem. In addition, companies represent societal institutions; they have a public responsibility for problems resulting from their activities such as unemployment, transportation problems, environmental impacts or health damages and they have to legitimize their decision-making processes. Coping with various societal demands and being pressured to legitimize decision-making processes can be defined as a fourth organizational problem.

Summing up we can argue that companies have to deal with a number of organizational problems in a broader sense to achieve competitive strength, including not only economic but also social and ecological aspects. I suggest differentiating between four key organizational problems: using available resources most effectively to produce the characteristic output, creating and acquiring new resources in order to extent and improve the characteristic output, balancing vested interests of various stakeholders, and fulfilling societal demands. For these problems companies have to develop different kinds of organizational capabilities. In the following, I will concentrate on the concept of technological capabilities.

3. Types of organizational capabilities

3.1. Different typologies of technological capabilities

Research on organizational capabilities focuses mainly on ‘hard technology’. In general the recognizable purpose of technical capabilities is expressed in terms of significant technological outcomes like cars or mobile phones. This includes both efficient production of this outcome as well as continuous extension and improvement. Above I have differentiated between output efficiency/exploitation and innovativeness/exploration as two unrelated organizational problems.
with which companies have to cope. Therefore researchers often distinguish between static technical capabilities (Leonard 1995) and innovative technical capabilities (Rush et al. 2005). Static capabilities are associated with the ability to deal with routine problems that occur in the production process of the dominant output. However, static capabilities can become weaknesses if companies do not aim at expanding them by integrating new knowledge (Leonard 1995). Innovative capabilities, on the other hand, cannot be developed in a vacuum; they depend on companies’ existing knowledge resources. This suggests that companies cannot deal with exploitation and exploration separately; exploration has to be integrated into the process of exploitation.

Prahalad and Hamel (1990, see also Teece, Pisano and Shuen 1997) have introduced the concept of ‘dynamic capabilities’, which are fundamental to the dynamics of a firm's competitive edge. Dynamic capabilities are broadly “concerned with the firm’s ability to carry off the balancing act between continuity and change in capabilities, and to do so in a competitively effective fashion” (Dosi, Nelson and Winter 2000: 6). Dynamic capabilities thus reflect an organization’s ability to achieve new and innovative forms of competitive advantages despite path dependencies and core rigidities in the firm's organizational and technical processes.

Dynamic capabilities are linked to “the firm’s ability to integrate, build and re-configure internal and external competencies to address rapidly changing environments” (Boerner, Macher and Teece 2001: 109). This definition suggests that we can further distinguish between various subtypes of dynamic capabilities. Leonard (1995) has developed a knowledge-creation model based on the premise that knowledge-creation activities build up an organization’s core competencies. Due to the fact that in today’s environment conditions change rapidly, companies must be able to continuously create new technological knowledge internally. But companies cannot focus on the production of internal knowledge only; they also have to seek for complementary knowledge outside the firm. To be able to acquire new external knowledge companies have to develop ‘absorptive capacity’. This type of competence relates companies’ innovativeness to their ability to identify and exploit external sources of knowledge and related opportunities (Cohen and Levinthal 1990).

Still, to improve their competitiveness companies cannot rely on the creation or acquisition of new knowledge only. They also need to be able to combine newly created or acquired knowledge with the existing knowledge base of their components. The concept of ‘combinative competencies’ (Kogut and Zander 1992) sees the development of the ability to integrate and recombine new external and internal technological knowledge with the existing knowledge stock as a major challenge for companies to stay ahead of their key competitors. Naturally recombining the components of the existing knowledge stock without integrating new knowledge can also be seen as
Companies also need to be able to transform their knowledge into technological innovations. Dynamic capabilities are not limited to the development of the knowledge stock; they also include the application of knowledge in the production process. ‘Transformative competencies’ (Garud and Nayyer 1994) are characterized as a competence to recognize and exploit available in-house knowledge and related technological opportunities. By transforming technological knowledge into new product or process innovations companies can achieve a more long-lasting basis for competitiveness. Summing up what has been said above we can distinguish between the following elements of dynamic capabilities: ‘knowledge creating capabilities’, ‘absorptive capabilities’, ‘combinatory capabilities’, and ‘transformative capabilities’.

Whitley (2003) differentiates in a similar way between ‘coordinating capabilities’, ‘organizational learning capabilities’ and ‘re-configurating capabilities’ as sub-types of dynamic capabilities. According to Whitley, ‘coordinating capabilities’ focus on the gathering and integration of information about internal and external processes. ‘Organizational learning capabilities’ involve joint problem-solving and continuous improvement of production and related processes through incremental innovations. They are related to companies’ ability to codify, diffuse and apply new knowledge throughout the organization. ‘Re-configurating capabilities’ involve the transformation of organizational resources and skills to deal with rapidly changing technologies and markets.

Henderson and Cockburn suggest distinguishing between ‘component competencies’ and ‘architectural competencies’ (2000: 157–161). ‘Component competencies’ or local abilities and knowledge are fundamental to day-to-day problem-solving, while ‘architectural competencies’ are fundamental for integrating them effectively and for developing fresh ‘component competencies’, when they are required. We can argue that the ‘component competencies’ together form the knowledge base of a company, while the ‘architectural competencies’ enable it to use this knowledge base to create new knowledge by combining the existing knowledge components in a new way. Companies’ competitive strength depends particularly on their ‘architectural competencies’, which depend on their capability to recombine their existing knowledge to produce new products and services that can meet changing demands.

Based on a process perspective of innovation Rush et al. (2005, emphasis in original) have developed a model of technological capabilities that includes the following principal components:

- “Initial awareness of the need to change and willingness to begin looking inside and outside the firm for possible triggers of change.
• Searching out triggers for change – picking up demand signals from the market or within the firm about changes needed or picking up signals about potential opportunities raised by new technological developments.

• Building core competencies – recognition of requirements for technology through a systematic and regular audit of its current competencies and a comparison of those, which it needs to develop or acquire in order to become or remain competitive.

• Development from these of a technology strategy – some clear idea of where to change and why – with some sense of priority.

• The exploration and assessment of the range of technological options available – making comparisons between all the options available, which can be achieved through some forms of benchmarking, feasibility studies, etc. And selection of the most appropriate option based upon comparison.

• Acquisition of the technology (e.g. through direct purchase or via some form of licensing collaboration, alliance, etc.); this is likely to involve extensive negotiation around price, specification, transfer of knowledge, property rights, etc.

• Implementation and absorption of the technology within the firm. This may involve extensive project planning and management activities and require configuration or both technology and organization to get a good and workable fit.

• Operation of the technology and learning about how best to use it.

• Learning through the process to develop internal capabilities, which will sustain technological development in the long term.”

This short overview shows the vagueness of the concept of technological capabilities. Scholars have developed very different concepts and typologies which hardly overlap. This is due to the fact that they are based on different theoretical approaches. The diversity of the conceptual basis of various typologies of technological capabilities can be seen as a major hindrance for comparative empirical research.

3.2. Other types of organizational capabilities
Most research on organizational capabilities focuses on the area of ‘hard technology’ but the concept does not need to relate to technology only (Dosi, Nelson and Winter 2000). One can actually argue that in many cases technological capabilities contribute less than other capabilities to a firm’s success. The authors themselves mention marketing and distribution as organizational field, where companies can develop specific capabilities as their main stronghold. Other scholars suggest differentiating between technological and organizational competencies (Coriat and Weinstein 2002), although the two types of competencies are clearly overlapping in the real world. Technological competencies “refer to shared pieces of scientific and technological knowledge concerning essentially ‘the structure of nature’ and routines concerning ‘how to handle it’”. We can speak of organizational competencies, when we refer to “shared pieces of knowledge and routines concerning the governance of coordination and social interaction within organization and with outside entities (customers, suppliers etc.), i.e. ‘how to handle people’” (Dosi, Faillo, Marengo 2003: 10).

Adapting Hauknes’ (2000: 43) classificatory scheme we can distinguish between five dimensions of organizational capabilities (see also Edquist and Johnson 1997), which can be expected to have many-faceted impacts on innovation efforts:

- selective or strategic capabilities which enable companies to adapt to a rapidly changing environment and to hold their own in a globalizing economy, in which innovation becomes the key competition criterion;
- organizational or integrative capabilities, which enable companies to cope successfully with the problem of combining organizational efficiency with organizational flexibility;
- technical or functional capabilities, which enable companies to perform and extent their characteristic output;
- capabilities and understanding of market and demand characteristics, which enable companies to profitably sell their products or services and to invade in new markets;
- ability to learn, absorb, transform and reflect on acquired information and experiences, integrating and cutting through all these.

Companies are heterogeneous and focus on the development of different organizational capabilities. Some companies aiming at technological leadership see their capability to accumulate new technical knowledge and transform this into new products as their main stronghold. Other
companies that are positioned in a highly competitive market may focus on developing core competencies in marketing and distribution. But there is general agreement that companies cannot focus on a single type of competencies only; to the contrary, coordination of various capabilities is the essence. For example, such coordinated development of various organizational capabilities is needed to effectively link technological options with market opportunities. All these capabilities or competencies together form the basis for high performance and business success (Hauknes 2000: 43).

3.3. Organizational aspects of core capabilities

While some scholars focus on identifying new capability clusters, others take up the argument that technical capabilities have significant internal organization. The ability of a firm to deal with a particular organizational problem is affected by organizational aspects (Kogut and Zander 1992). Dynamic capabilities can be nested in different forms. Among others they can incorporate routines or heuristics, as well as an incentive system, corporate culture, skills and technological applications. According to Leonard (1995: xiii) core capabilities consist of four main building blocks: people’s skills, knowledge embedded in physical systems, managerial systems and organizational models that support and reinforce the growth of knowledge as well as values that encourage the accumulation of different kinds of knowledge. I will briefly refer to all four dimensions.

An important aspect of organizational capabilities is that they are increasingly nested in ICT applications. Here we can refer to three main aspects of this technology. First, modern ICTs significantly increase companies’ capacity to efficiently generate and process knowledge-based information (Castells 2000). Second, modern ICTs connect companies with various databanks worldwide, which means that structured technological and scientific information becomes more easily available for companies. They can search on a world-wide scale for complementary technical and other knowledge needed to develop product, service or process innovations. Spatial and topical expansion of knowledge is countered with enlarged and accelerated mechanisms for its diffusion through modern ICT. Third, modern ICT also changes the communication between firms; it allows intensive interaction and knowledge exchange between increasingly specializing companies in network structures.

The implementation of modern ICT is closely linked with other changes taking place in companies. The effect of modern ICT is likely to increase, if accompanied by a cluster of complementary changes, new organizational and management systems in particular. Modern ICTs, as the OECD
(2000: 55) argues, differ from some other general-purpose technologies insofar as their successful integration requires significant organizational adjustments. These technologies are not external factors, but they develop within organizational practices. They penetrate all work processes, “not as an exogenous source of impact, but as the fabric in which such activities are woven” (Castells 2000: 30). We can therefore characterize modern ICTs as ‘enabling technology’ (Schienstock 2001). ICTs open up opportunities to create new organization forms that are crucial to the development and application of dynamic capabilities, such as flat hierarchies, extension of functional tasks, cross-divisional cooperation and co-production of knowledge in innovation networks.

When organizational innovations are introduced together with modern ICTs, they form new paths of acting. But they do not affect the way workers act directly, as workers’ perceptions, interpretations and understanding are strongly influenced by cultural elements. In order to enable and facilitate information exchange, knowledge sharing, interactive learning and collaborative innovation activities companies have to develop a strong trust-based organizational culture together with new flexible organizational forms (Murry and Willmott 1995). Quality circles, total quality management or carrier planning systems can be seen as key elements of a trust-based organization culture.28

---

28 When I talk about strong trust relationships, I refer to identification-based trust resulting in moral involvement, which can be distinguished from calculus-based trust (Lewicki and Bunker 1996)
Organizational innovations in connection with technical innovations and cultural change also affect the skills and competencies of the workforce. One has to highlight the central role of ICT enabled organizational change in a cluster of complementary and mutually reinforcing organizational innovations to understand the shifts in skill demands (Bresnahan, Brynjolfsson and Hitt 1999: 1-2). The lack of skilled personal is often seen as a factor seriously limiting companies in the development of their organizational capabilities. The concept of ‘skill-biased techno-organizational change’ (see Bresnahan et al. 1999) argues that organizational innovations combined with complementary use of modern ICTs creates considerable demand for adapting human capital. In this respect ‘soft skills’ such as ‘social skills’ or ‘learning skills’ are mentioned as particularly important.

Technological capabilities, we can conclude, require technological applications, but also organizational arrangements, human skills and cultural elements in order to be put at work. But firms differ significantly in the way they develop and incorporate technological capabilities. Some companies focus on the development of the skills of their workforce, while others develop new technological applications or organizational arrangements to improve their technical capabilities. It is because of these different approaches that capabilities develop in a firm-specific way. In addition, while the development of particular paths of each of the four dimensions is crucial, focusing on partial and often ad hoc incremental changes is not enough. The aim of developing core capabilities implies a shift from ad hoc to more integrated organizational change strategies in the four interlinked dimensions. The more tightly integrated the change process of all components is the more unique and sustainable is the competitive advantage.

3.4. Capabilities in the knowledge process and their internal organization

The knowledge-based view of the firm, which interprets firms as knowledge carriers, suggests taking the knowledge process within the firm as conceptual basis for analyzing firms’ organizational capabilities. There are different concepts of distinguishing between various functions of the knowledge process. Here I suggest distinguishing between knowledge imagination/anticipation, knowledge creation, knowledge acquisition (including knowledge absorption), knowledge diffusion and integration (including knowledge re-combination), knowledge application (including knowledge transformation) and knowledge commercialization as key functions of the internal knowledge process for which companies have to develop core
capabilities. I add the ability of firms to reflect on their knowledge process and to adapt their strategies and structures to the lessons learned as further core capability. In the following I will briefly describe the various capabilities.

- To be able to produce knowledge that is compatible with general trends in technological development and, to avoid wrong investments, firms have to be able to imagine and anticipate future trends and the dynamics of technological development (capability to imagine and to anticipate technological change).

- Companies must be able to develop internal knowledge, as this knowledge, being unique and difficult to copy, gives them a competitive edge (knowledge creation capability).

- To be able to produce valuable knowledge internally companies have to specialize. This means that companies increasingly depend on complementary knowledge created outside. Therefore companies must be able to search for, identify and absorb such complementary knowledge (knowledge acquisition capability).

- Innovation processes become increasingly complex and the relevant knowledge is often distributed throughout the whole company. Innovation processes therefore demand the diffusion and integration of a great number of knowledge sources and continuous reconfiguration of various knowledge elements (knowledge diffusion and integration capability).

- While the development or acquisition of new knowledge and/or the re-combination of various knowledge elements is a precondition for innovation activities, companies also need to be able to apply their new knowledge in production processes and to transform this knowledge into new product, process or service innovations (knowledge application capability).

- Whether a new product or service is successful depends on its acceptance by the market. Therefore companies need to develop the competence to anticipate market developments and to react to changing demand patterns (commercialization capability).

- Companies must be able to reflect on their knowledge process and to adapt their strategies and structures to the lessons learned (general learning capability).

It can be further argued that capabilities have significant internal organization. In the following I
present some organizational dimensions in which the various competencies can be nested\(^ {29} \).

**Imaginative/anticipatory capabilities:** one’s own foresight activities and use of external foresight activities, creation of a vision/mission, establishment of creativity teams, brainstorming

**Knowledge acquisition capabilities:** reading relevant literature and searching the web for new technical solutions, exchange of staff with universities/research institutes/firms, consulting and exchanging knowledge with experts, membership in expert committees, acquisition of patents

**Knowledge production capabilities:** R&D investment/R&D personal, use of simulation technology to create new knowledge, suggestion schemes, continuous improvement process, use of creativity techniques, innovation-oriented climate, participation in trans-organizational R&D networks, diversity of human resources

**Knowledge diffusion capabilities:** trans-functional design teams, establishment of bridging roles, internal networks, establishment of a knowledge map, tutorship, mentoring systems, knowledge capture strategy, knowledge sharing culture and incentives, change of positions, job rotation, multiple communication system, intra-firm electronic data exchange, automated storage and retrieval systems, written project evaluation and distribution of lessons learned

**Knowledge application capabilities:** internal benchmarking, team organization/project organization, establishing change agents, performance-related salaries, decentralized quality control, personal development system, responsible autonomy, workplace development, computer-added design and engineering, multi-skilling

**Knowledge commercialization capabilities:** customer files, market analysis, round table with customers, customer value, customer satisfaction services, e-commerce

**Overall learning capabilities:** entrepreneurial climate and leadership, knowledge management system, extensive further training, external benchmarking, total quality management, human resource management

\(^ {29} \) It is not always clear where to subsume the various organizational dimensions. For example, trans-functional design teams are established to both create and diffuse new knowledge.
4. Different types of firms and most crucial organizational capabilities

Firms do not compete by striving to do the same thing most efficiently, but by trying to be different: to offer differentiated products on the basis of firm-specific capabilities (Nooteboom 1999: 795). It is hardly surprising when research has consistently shown that firms and particularly SMEs differ widely in terms of their technological capabilities (Rush et al. 2005: 4). In the following firms are sorted into four broad archetypes based upon the extent to which they are aware of the overall need to change and the degree to which they are aware of what changes are needed and how to go about the process of change. The four types include the unaware or passive firms, the reactive firms, the pro-active firms and the entrepreneurial firms (see also Rush 2005).

Passive firms are unaware of the need to develop their technological capabilities. They do not realize that changes are taking place in their environment, which can threaten their survival. Instead, they interpret their organizational environment as tranquil and simple, which causes them to leave their products, process technologies and services unchanged. Reactive firms are to some extent aware of the changing environment and they understand that they have to react to these changes. But they behave in an adaptive manner either because they see it beyond their ability to influence the process of technological change or because they do not interpret external change as threatening their survival. Reactive firms do not search for new knowledge externally, but they may develop some new knowledge internally mainly through learning by doing. They may also aim at increasing their transformative and commercializing capabilities to produce and sell their current products and services more effectively.

Proactive firms do not assume that their current products, services and production processes will enable them to compete successfully and survive in an increasingly turbulent environment. They understand that they have to create new advantages by producing, gathering and accumulating new knowledge to improve their innovation capabilities. They therefore focus to a great extent on the development of knowledge-producing and knowledge-acquiring capabilities. They also aim at improving their transformative and commercializing capabilities as well. Nevertheless, they do not prepare for fundamental changes.

Entrepreneurial companies distinguish themselves from proactive ones by the fact that they prepare for very radical changes. They do not limit possible changes to the technology path in which they are involved but realize the need to develop a knowledge base for a new and very different
technological path. Developing anticipatory and imaginative capabilities is therefore very crucial in order for them to have some ideas about future technological trends. Naturally entrepreneurial companies also have to involve in further developing all their other organizational capabilities to be able to actively shape discontinuities and fundamental breaks. Table 1 shows the most crucial capabilities of different types of firms.

Table 1: Type of firm and most crucial capabilities

<table>
<thead>
<tr>
<th>Type of firm</th>
<th>Most crucial organizational capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passive firms</td>
<td></td>
</tr>
<tr>
<td>Reactive firms</td>
<td>Knowledge application capabilities, commercializing capabilities</td>
</tr>
<tr>
<td>Proactive firms</td>
<td>Knowledge creating capabilities, knowledge acquisition capabilities, knowledge distributing capabilities</td>
</tr>
<tr>
<td>Entrepreneurial firms</td>
<td>Capabilities to imagine and anticipate knowledge development</td>
</tr>
</tbody>
</table>

5. Policy implications

The market failure concept has been the principle rationale of traditional innovation policy. The basic argument is that, leaving R&D to the market will lead to under-investment in this field, which can have negative consequences for countries’ competitiveness. Therefore governments are legitimized to compensate for the market failure by funding R&D. The market failure concept is closely connected to the so-called linear innovation model, which assumes some kind of automatic transformation of new technological knowledge into new products, services and process technologies. Consequently innovation policy focuses primarily on the creation of new technological knowledge. However, the fact that policymakers hardly have a superior understanding of new technological trends puts traditional technology policy at the risk of focusing on less welfare-improving technologies.

As important is the fact that traditional innovation policy widely ignores the firm level. It assumes
that new knowledge and technological change is brought to the companies from outside. The realization that technological change is primarily produced within companies has caused a new innovation policy approach to emerge. What is termed the ‘innovation-enabling policy approach’ (Schienstock 2004) puts the firm in the forefront and sees the improvement of companies’ innovation and learning capabilities as legitimate object of innovation policy.

The assumption of the innovation-enabling policy approach is that public intervention, which relies on launching large research programmes and focuses on supporting the development of particular technologies, cannot compensate for shortcomings on the company and institutional levels. Therefore conditions-enabling innovation policy pays attention not only to market failures but also raises the question of where and how any market-based system is likely to produce other areas of systematically weak performance in terms of innovation (Edquist 2001).

Smith (1997) has proposed a typology of additional failures that are related to other aspects of innovation systems: failures in infrastructure provision and investment, transition failures, lock-in failures and institutional failures. Another concept of additional failures has been suggested by Arnold and Touriaux (1997), which includes capability failures, failures in institutions, network failures and framework failures. To surmount these failures, governments must take a variety of different policy actions. The identification of other failures beside market failure clearly indicates that conditions-enabling innovation policy has a much broader agenda than a market failure based technology policy.

The various failures mentioned above address three levels of intervention: the firm level, the inter-firm level and the institutional level. But although encouraging, initiating and stimulating change on the firm level is a valid policy option, policymakers’ instruments to support innovation activities on the firm level are very restricted because they cannot intervene directly in business strategies and restructuring processes. It is also important that innovation policy takes into account the specific deficiencies of various types of firms and applies different policy measures. For example, the main problem of passive firms is that they are unaware of the need to adapt to a changing environment. Therefore innovation policy has to give priority to making passive firms aware of the environmental dynamic and the pressures of change and to becoming more actively involved in innovation processes.

The main problem of reactive firms is that they do not invest in the development of capabilities that enable them to develop new products or services. Here innovation policy needs to focus on adding

---

30 It is often difficult to distinguish between failures in institutions and framework failures, as institutions are often interpreted as part of the framework conditions (for an extensive debate, see Smith 1997).
to companies’ knowledge to help the body of knowledge within firms to reach a critical mass. This can be achieved by initiating and supporting further training programs within companies. The main deficit of pro-active firms is that they do not have a long-term strategy for survival in a highly dynamic environment. Here innovation policy has to encourage firms to prepare for radically new innovations. This calls for a fundamental change of the production and organization model. A new organizational model needs to increase the effectiveness of the whole knowledge process within firms. Policymakers can support such developments by giving high priority to organizational innovations including the intelligent use of modern ICT, organizational arrangements that support learning, an organizational culture that encourages entrepreneurship, and a systematic development of human resources.

A major challenge to entrepreneurial firms is to prepare more systematically for future developments. Innovation policy can support such a strategy by encouraging firms to conduct their own foresight activities or to make use of external future-oriented information. A long-term future-oriented development strategy has major implications for the development of organizational capabilities. A holistic restructuring process is needed, which aims at systemically developing all organizational capabilities in an integrated fashion. Initiating and supporting reflexive benchmarking (Schienstock 2004) can be seen as a key element of innovation policy. Reflexive benchmarking enables firms to learn from others, not by copying ‘show cases’, but by gaining a better understanding of one’s own solutions, their strengths and weaknesses, when seen in light of what others do and what options they see. The idea of such a policy is not to achieve homogeneity but to enable learning from diversity.

The stimulation, support, and creation of organizational networks can be seen as the core of the innovation-enabling policy approach. It is argued that while policy makers do not have superior understanding of market circumstances or technological information; they do enjoy superior coordination abilities across diverse organizations (Metcalfe 1997: 274). However, the argument that governments should actively support cooperation and networking among firms and with other organizations due to the positive effects of inter-organizational linkages on learning and innovation is confronted with some opposition, because it ignores the fact that the effects of networking can also be negative.

One argument is that supporting the formation of networks between firms undermines competition, because network partners often aim at monopolizing knowledge and establishing access barriers to exclude possible competitors. Nooteboom (1999: 794) argues, however, that vertical or lateral cooperation hardly harms competition; but he suggests that policymakers should aim at keeping
networks open and fighting entry barriers. In addition, integration in the form of networks may have
another advantage: it hinders mergers and acquisitions, which are often seen as having a negative
impact on innovation activities.

Again the diversity of firms and their specific needs have to be taken into account. A major
challenge for innovation policy is to make passive firms aware of the fact that cooperation within
organizational networks can have a positive effect on their performance and particularly on their
capability to be innovative. Encouraging re-active firms to become a member of innovation
networks by providing particular incentives can be seen as a legitimate object of innovation policy.
For proactive firms, having access to newly created scientific knowledge is highly important.
Therefore making access to external knowledge easier for firm by connecting them to the wider
matrix of knowledge generating institutes must become a high priority of innovation policy. Public
network policy designed for pro-active firms has to support cooperation between firms and with
universities and research institutes as well as the co-production of knowledge within such extended
networks. Entrepreneurial firms aiming at becoming technology leaders have to have access to the
latest knowledge available, which is seldom produced within their own region but is distributed
worldwide. This means that innovation policy needs to go beyond supporting the development of
local networks; instead, it is decisive that companies become key nodes within globally organized
innovation networks.

Innovation policy focusing on the firm and inter-firm level must inevitably be supported by a policy
that encompasses the wider context (Hollingsworth 2000, Metcalfe 1997: 290). This means that
innovation policy has to include institutional aspects. One can identify the provision of resources,
the regulation of activities and guiding and influencing firms’ aims and strategies as core functions
of institutions. While firms, together with their suppliers and customers, are the primary actors in
the process of generating technological innovations, their activities need to be supported by the
accumulation of knowledge, skills and competencies in supportive institutions. Focusing on the
development of a dense institutional setting that can provide highly valuable knowledge and other
resources can be seen to be a key element of innovation policy. Of particular importance is the
development of scientific and educational institutions, which can produce highly valuable scientific
knowledge and human resources. To adapt the legal framework to the needs of a dynamic,
innovation-based economy can be seen as another important part of institution-oriented innovation
policy. And policy makers can guide the development of firms and their innovation activities by
stimulating innovation culture and by creating a vision of long-term future regional development.
But again, the various types of firms may demand the development of specific institutions,
depending on their particular shortcomings.

6. Conclusions

Traditional organizational research based on a structural approach represents a static perspective; fixed structural arrangements are implemented to serve long-term goal. But due to the fact that together with the globalization of the economy the organizational environment becomes increasingly complex and dynamic companies are continuously confronted with new problems. Such a situation requires a new organizational renewal approach. Companies can no longer aim at achieving long-term organizational solutions by establishing particular organizational structures in a top-down manner. Instead, they need to focus on the creation and continuous development of firm-specific organizational capabilities that enable them to cope with organizational problems in a much more flexible way.31

However, the application of the concept of organizational capabilities is not undisputed in empirical research. In the literature we can find a number of other related concepts that are not clearly distinguished from the ‘capability concept’ as, for example, ‘core competencies’ or ‘organizational capacities’. In addition, the great number of organizational capabilities or core competencies mentioned in the literature indicates that scholars have not been able to clearly enumerate many general organizational problems companies have to deal with and for which they have to develop dynamic capabilities. One may actually question whether it is possible to identify general problem-solving capabilities independent of the specific problems at hand which do not lack substance.

Current research on organizational capabilities is mainly concerned with the field of technology development and application. However, firms’ success and survival does not depend upon the development and application of technological capabilities only, as important are other capabilities such as commercialization capabilities, strategic capabilities or management capabilities. Even more important is their coordinated application. In addition to economic challenges, companies are also confronted with additional problems: how to balance and manage conflicting interests and to fulfil societal demands. These are core organizational problems which capability research has widely ignored so far.

Although there is general agreement that organizational capability represents a key concept in analysing a company’s performance, little empirical research has been conducted in this field.

31 The organizational capability concept is not undisputed, however. Some scholars argue that associating success in dealing with a particular organizational problem with the capability to do so represents a tautological argumentation (Moldaschl 2006).
Naturally this is partly due to the fact that the measurement of organizational capabilities appears to be very difficult both conceptually and in practice (Rao and Singh 2001). Statistical studies have explored the building of dynamic capabilities through sustained financial commitments to R&D programs (Helfat 1994, 1997), but there is general agreement that dynamic capabilities cannot be built simply by spending on R&D or making analogue investments (Dosi, Nelson and Winter 2000: 16). To identify statistical proxies for various types of organizational capabilities, allowing also further exploration of the link between capabilities and organizational performance remains a major challenge to empirical research.

In addition, analysing the relationships between firms’ organizational capabilities and the regional/national environment is seen as a key target of empirical research (Rao and Singh 2001). On the one hand the question arises how environmental factors influence companies’ attempt to develop, maintain and advance their organizational capabilities. On the other hand, the understanding of capability creation and maintenance within firms is fundamental to the understanding of economic and social progress on the regional or national level (Dosi, Nelson and Winter 2000). Capability research, it can be concluded, is far from satisfying; a lot more conceptual as well as empirical work needs to be done in the future.
References


238.


Teece, D. J. (1992) ‘Competition, cooperation, and innovation: Organizational arrangements for regimes of rapid technological progress’, in Managerial and Decision Economics 10 (Spring, Special Issue), 1–25.