

The following summary gives a brief account of the presentations of the:

**Workshop on the development of practical tools
for improving the innovation performance of firms**

Paris, 30 June - 1 July 1997

The workshop was co-organized by Canada (Industry Canada) and France (Ministère de l'éducation nationale, de la recherche et de la technologie), the lead countries of the work in the Focus group on the analysis of Innovative firms of the OECD's 'National Innovation Systems' project. The objective of the workshop was to review existing thinking, and to agree on a work plan for a project to develop practical tools for improving the innovation performance for firms.

In his opening remarks, *Ozzie Silverman* (Chairman of the OECD Committee for Science and Technology Policy [CSTP], Industry Canada) outlined the main questions the workshop had to address: (a) How to identify the characteristics of innovative firms?; and (b) How can policy improve innovative capacity and performance of firms? He stressed the fact, that, although some attempts have been made to develop analytical tools to identify and assist innovative firms, technology and innovation policy is still lacking comprehensive holistic tools which take into account recent developments in thinking about the nature of innovativeness. He AND *Alain Jolivet* (Ministère de l'éducation nationale, de la recherche et de la technologie, France, Co-Chairman of the meeting) expressed the hope that this workshop would be a major step in this direction by taking stock of existing knowledge about what constitutes an innovative firm. This result would already be a major input for the NIS project.

Deborah Dougherty (McGill University, Montreal) focused on identifying the organizational capacities for sustained product innovation. She defined the capacities as the orientations, understandings, frameworks, images that enable practice. Sustained product innovation involves the simultaneous development of multiple product innovations, while also managing mature business efficiently. As firms must adapt continually to changes in markets, technologies, and competition, occasional new products may not be enough to remain viable. The continued absorption and development of knowledge in technology, market and core operations domains depends on the organization's ability to differentiate these knowledge domains and integrate them into products, operating systems, businesses and technologies. Dougherty identifies the ability to bridge the tensions of differentiation versus integration as central to the continued knowledge development. Innovative "knowledge architecture" (capacity for organizing knowledge) develops and enhances the common referents of thinking and doing based on value to the customer.

Rather than finding a clear distinction between innovative and non-innovative organizations, the author constructs a continuum of innovative ability, from non-innovative to comprehensively innovative. The non-innovative organizations create new products in special task forces or venture units, outside the normal organizational system, geared to support the continued functioning of the system. Towards the more innovative end of the spectrum, organizations create a variety of product innovations and manage them in conjunction with the existing businesses. Their organizational capacities focus people's attention on creating value by solving customers' problems rather than on a specific product category or internal functioning in the abstract. The contextual nature of these frames of reference is fundamental: they deal directly with actual contexts of practice; the context of the organization's relationship with its industry and market; the context of the problem-solving abilities of each domain of knowledge; and the context of the customers' problems that products must solve. The organization's shared understanding of its relationship with its industry and market, its organizational identity, refers to what people perceive as central about their organization. This kind of identity permits employees to see innovation beyond

product categories or functional boundaries as temporary bundles of organizational skills to satisfy particular customers needs.

As for organizing the knowledge architecture, Dougherty suggests several alternatives to the traditional bureaucratic organizational models. Organizational 'sensemaking' (intersubjective understanding of the collective action) in innovative organizations preserves integrity of whole innovation process, organized as a hierarchy of processes versus a hierarchy of separate tasks. Their nature of an organization of a "negotiated order", explains why people are able to negotiate simple, comfortable connections with one another and work closely together. The relationships are personal (first-hand), directed at making the task more interesting for the other members of the team, and governed by the "law of the situation", or opportunity.

Yves Doz (INSEAD, Fontainebleu) addressed the question of the difficulties and challenges to management in managing complex knowledge. He described three different models to deal with geographically distributed knowledge: 'projection' - successfully transferring home base capabilities into different environment; 'integration' - exploiting capabilities and insights from different environments; and 'orchestration' - fusing multiple capabilities and insight from/into multiple environments. The respective national innovation systems would have different roles in each of the three modes.

He described the integration of different types of knowledge ('existential' - tacit, holistic, 'experimental' - subjective, contextual, 'technical' - codified, objective) residing in different places as an iterative process involving awareness, access, appropriation, assimilation, accumulation, allocation, and anticipation. Each of these steps has its own typical difficulties, which have to be managed in distributed roles between 'entrepreneurs' (the ones that create/identify opportunities and pursue them), 'integrators' (the ones who commit the corporation to selected opportunities and provide impetus and support) and the 'architects' (the ones who set the strategic and organizational context for fostering opportunity development in the organization).

The main argument of *Marian Jelinek* (College of William and Mary, Williamsburg), in her comparison of cognitive approaches to innovation in high-tech and mature industries firms, was that the firms must move from their emphasis on stability, rooted in the century of bureaucratic history, to something akin to "real-time" innovation capability, constantly alert to possible innovation. High technology firms were among the first to use non-bureaucratic organizations to speed their product development cycles in response to rapid technology development; time is "an awesome fact" governing market place success or failure. But, high technology firms were not alone. In a broad array of industries, dispersed organizational power, double loop organizational learning, and organizational entrepreneurship have been identified as methods to increase responsiveness. Such rapid response has become a central competitive strategy. "Real-time Organizations" are those who succeed in responding "in real time" to the challenge of change.

Such organizations depend upon factors that traditional organizations largely ignore, namely shared cognitions, shared culture and constant interaction to assure control. Rather than stabilizing boundaries or procedures, tasks or rules, rapid-response organizations insist upon frequent communication to the affected parties. They create consensus values and goals for performance, defining performance in terms far broader and longer-term than traditional organizations, and render them far more salient, visible and explicit. Real-time organizations respond "real time" as new data information occurs, without the necessity of referring every decision up the hierarchy, and without gathering work in loads and ten planning and scheduling work. They do by referring authority to decide and to act to those closest to the problems.

Mature industries, the site of most economic activity, face special challenges to innovation. Environmental change must evoke changes in managers' "cognitive maps", the interpretive schemes by which they make sense of the world, if managers and their organizations are to produce organizational change. These recognitions are central to innovation in mature industry firms, but often more difficult. The main difference from exemplar high technology industry is that mature industry firms have not traditionally anticipated need for innovation. Jelinek believes that the solution for mature industries lies in stimulating innovation as an inescapably joint activity centred on creating the understanding necessary to stimulate change. The process has to be recognized as social, complex and iterative. Vigorous debates and multiple perspective must be encouraged along with the guarantee of some baseline security amidst new efforts, reasonable continuity with the past.

Benjamin Coriat (Université Paris XIII) aimed at highlighting different forms of organizations and modes of coordination developed by coalitions and networks of players, assessing their efficiency in achieving the objectives set by the projects, as well as the way such organizations and networks manage risks and uncertainties.

He identified an important feature of the successful innovative behaviour – its relational context dependency. Characteristics specific to the governance structure play a distinct role in the building and sharing of a specific form of rent – the relational rent, that reflects the quality of the relational network of stakeholders involved in the project or innovation activity. So, the objective is to identify the types of the most efficient coalitions and modes of coordination of innovative activity and incorporate this analysis into the study of existing or non-existing national innovation systems.

By synthesizing prior research **Henk Volberda** (Erasmus University, Rotterdam) proposed a dynamic approach to understanding and investigating the managerial capabilities and organizational resources that are likely to enable a firm to renew, augment, and adapt its core competence over time. In highly competitive environments, a core competence can become a core rigidity, as firms develop core rigidities together with highly specialized resources to enhance profits at the price of reduced flexibility.

On the basis of paradoxical tensions between core upgrading and core building, Volberda distinguished four generic mechanisms by which multi-unit firms accumulate and dissipate new skills and capabilities to match firm-level distinctive competencies with industry-level sources of competitive advantage: selection, hierarchy, time and networking. Selection assumes that the scarcity of resources and competition forces the firm to select only ventures where the contribution of firm competencies co-evolves with the industry-level sources of competitive advantage. Hierarchy mechanism, in turn, assumes that by balancing the various managerial activities of hierarchical levels, the multi-unit firm is able to exploit existing competence as well as to explore new competencies. The network mechanism deals with the tension between core upgrading and core replacement in a network perspective. Believing that the friction between exploitation of existing competence and exploration of new competencies cannot be solved within the firm, it outsources the problem to others and uses the competencies that the firm does not own, but which it can use from time to time.

While selection and hierarchy consider core renewal and core upgrading occurring contemporaneously, the time mechanism resolves the conflict with time separation. Temporal separation means that periods of exploitation (stability) alternate with periods of creativity (revolution). Consequently, the process of strategic renewal is seen as a dynamic alternation between preservation and recreation. In the period of change, there is a radical transformation across the whole organization. Whether the change from maturity to dynamism is long-cycled (evolutionary) or punctuated, is in part conditioned by perspective, the central premise being cycling through, where renewal can both precede and follow stability. Some firms fail to follow these waves and turn into rigid and chaotic forms. Those

who succeed oscillate between planned and flexible modes, without overshooting and becoming too rigid or chaotic.

Dominique Guellec and *Genevieve Muzart* (OECD/DSTI) addressed the empirical question of how innovative firms are captured by current innovation surveys, and what new approaches are being proposed to generating better new comprehensive indicators of innovative activities, along with proposals to use indirect data sources. The guidelines for the innovation surveys are set in the so-called “Oslo Manual”. Innovation surveys have been carried out in most OECD member countries since the early 1990s. A second coordinated round (CIS-2) is currently under way in European countries, under the leadership of Eurostat, and the authors provided the workshop with a sample of the CIS-2 core questionnaire. The summary of the results from the previous innovation surveys were also presented. The results showed the huge diversity of innovative strategies of firms, which are only partly displayed by size and industry.

Innovation surveys aim at measuring innovation output and various aspects of innovation activities performed by firms: types of innovations (process vs. product); proportion of sales/exports due to innovation products; resources devoted to innovation; objectives of innovation; sources of information; cooperation for innovation; actors hampering innovation. Most countries are preparing surveys on the services industries. Since organization and human resources management in the services industries is even closer to capturing the innovation process than in manufacturing, the results of these surveys are expected to make variable contributions to understanding the non-technological aspects of innovation.

The speakers also mentioned projects on designing new science and technology indicators, assessing “innovative and absorptive capabilities of firms”. The challenge is to design indicators which discriminate between innovating and non-innovating firms, or which explain the innovating/non-innovating choice. For example, some of the proposed indicators are: intensity of various obstacles to innovation, of various aims, for different categories of enterprises. The role of these factors will be assessed in relation to other factors, and to the characteristics of the firm size, industry). The knowledge acquisition of the firm will be inquired in the same way.

Jean-Paul François (Ministère de l’Industrie, SESSI) presented the design and the preliminary findings of 1997 survey on Innovation Capabilities in French Industry among 5,000 French industrial enterprises. It was designed using an interdisciplinary approach attempting to combine the viewpoints and objectives of sociologists, students of management, and economists.

The concept of capabilities as defined by each discipline was reviewed first. Importantly, it was noted that in both management and economic approach firm’s capabilities are peculiar to it (distinctive or specific capabilities), an argument against the simplification of the “representative firm”. The main objective was to draw up a list of firms’ capabilities that assist and promote technological innovation. The focus then shifted to measuring these capabilities in statistical terms, and in particular on the most effective form of questionnaire.

Another distinct feature of this presentation is that, unlike in most studies, innovation is taken as an outcome, both in itself and in relation to profitability, the capabilities that the firm needs for innovation to occur and prove as profitable as possible. The discussion is pursued at some length if it is legitimate to try to reduce varied circumstances in which innovation occurs to a single overall list of capabilities. The survey assumed the approach of identifying formulas made up from a finite number of items, either combining or interacting.

The most general results of the survey show that the number of capabilities increase with the size of the firm. Large firms face new problems in acquiring capabilities to manage internal interactions –

“managing human resources from the standpoint of innovation”, whereas very large size is a manifest advantage for the capability to manage external interactions of both knowledge and markets. Among other findings, François noted that the affiliates of groups, particularly of foreign groups, have the greatest capabilities. The rarer the capability is in global terms, the more belonging to the group is a decisive advantage. Another point made, concerned the fact that firms that are innovative in terms of products have the greatest capabilities. However, three quarters of capabilities are not codified and externalization of capabilities remains limited, meaning that industrial firms outsource less than 10 percent of their innovation capabilities.

Alexander Gerybadze (University Hohenheim) concentrated on the issues of managing competencies across institutional boundaries (competence alliances as opposed to competence-based teams within firms), using the example of German and Swiss firms. Technological capabilities are distinguished from technological competencies, the latter are defined by the author as “the ability to deploy complex bundles of resources in a directed, value-enhancing mode, based on customer requirements and key success factors”. This concept thus pre-supposes a broader technological context in which the firm operates.

He looked at the process of technology diffusion within the relevant industry group, a life cycle for the technology from its embryonic stage, to becoming a pacing, then a key technology, and finally the base stage – widely used and a basis for the competition in the industry. Technology strategies must be based on the valuation of a company’s technology and competitive position. If both of them are strong, the company assumes technological leadership; if its technology position is strong while its market power is medium or weak, its best strategy is to find a technological niche or enter a technological joint-venture. In case of strong market position, but weak technology potential, the best option is acquisition of a technological unit. Technological context is created by the “build-or-buy” or “keep-or-sell” decisions, that extend managing technological competencies beyond institutional boundaries.

Testsuo Tomiyama (University of Tokyo) outlined the requirements for an innovative firm in the ‘post mass-production paradigm’, whose emergence will be a major challenge for technology policy. Innovative firms of the future will be those that achieve ‘zero-waste outputs’ with ‘minimum level of inputs’. Technology policy clearly has a role in this respect by getting prices right (internalising external effects), setting incentives and supporting R&D in this direction in order to reduce *muri* (risk), *mura* (deviation), and *muda* (waste).

G.T. Peterson (Partners and Innovation, UK) informed the workshop about an upcoming self-help guide for industrialists who wish to improve their innovative potential. The guide is being developed for the European Commission by Partners in Innovation Ltd. that leads a consortium that includes CIRCA GROUP (Ireland) and ESSOR-EUROPE (France). The aim of the guide is to provide a comprehensive analysis of company performance in a variety of innovation-related areas, along with a guide of best practice and sources of support for innovation. The guide will be supported by a comprehensive IT-based assessment package.

The guide will be structured in three main sections: 1) innovation basics, that will deal with innovation process in general and illustrate its potential through a series of case studies; 2) the assessment system, which will analyze companies’ replies to a series of key questions, e.g., innovation culture, use of technology, organizational effectiveness. The format of this section will be different for management, CEO’s and staff. Final results will indicate the spread of answers across the organization; 3) support measures for innovation, which will be a comprehensive listing of major sources of support and advice on innovation in the member states and at Commission level.

The overall “Best Practice” benchmark model used in the guide focuses on three areas governing an approach to assessment: culture for innovation; business practices; and effective organization. The model focuses on the value of self-assessment as the basis for commitment to sustained change, and on questionnaire formats to obtain the optimum measurement of current practices. Creating a culture for innovation means developing ways to enable managers to create and sustain an innovative vision/purpose around customer-driven value, and to establish sound processes for deployment of strategies and plans. Another important area is improving the processes and results in the organization concerned with innovation in issues such as Customers, Suppliers, Products/Services, Technology and Finance. Finally, the model assesses if the organization fosters sustained learning by individuals and teams, further develops its effectiveness by making the best use of knowledge and information, has a flexible structure and is responsive to change. This treats issues such as training, team working, continual improvement, communication and organizational structure. The analysis concepts used in the Guide aim at providing information for managers to support preparation of sound action plans in the short, medium and long-term.

David Brown (Arthur D. Little, UK) covered a wide range of topics on modelling innovation and learning in SME concentrating mostly on the practical aspects of managing risk and innovation in SMEs, and using and improving the diagnostic tools for enhancing innovation. He expressed concern that, although a lot has been done to understand innovation in large firms and high-tech SMEs, innovation dynamics in most SMEs is poorly understood. SMEs face more challenges to innovation due to information and financing problems, reluctance to engage outside help, shorter time scales, increased risk, and the ability to demonstrate commitment to sustained learning. He warned, however, that information provision through linkages to the public sector science base, universities, etc., is not as effective as hoped. Brown identified the best channels of disseminating information to SMEs: analysis of supply chain sources; trade media and exhibitions; and learning from peers. Another fallacy is using large company models of innovative behaviour for modelling large SMEs practices. Ownership and risk-sharing patterns are different in small and medium companies, SMEs generally have higher risk aversion.

To aid in the learning process, a number of mechanisms were proposed. External position assessment includes benchmarking against external peers, against “best practices” for specific functions and holistic models of good practice; assessing technology markets and overall business environment. Such a SWOT(strengths, weaknesses, opportunities, threats) analysis can be very potent in linking a firm’s internal competencies and capabilities into the opportunities and threats presented by the external environment position assessment, or self-assessment procedure with the help of a facilitator, forces the company at all levels to discuss its perceived strengths and weaknesses, competencies, skills, knowledge, technology, resources and aspirations.

In the next part of his presentation, Brown provided an overview of the existing diagnostic tools for enhancing innovation in SMEs. He identified the following types of IMTs: generic diagnostic; auditing and benchmarking tools; tools to address specific themes/ technical issues facilitated or based on a series of workshops with the consultant acting as a facilitator and discussion leader. Such tools represent short interventions, 1-5 days of advisor time; they are relatively cheap in time and cost. They use the following approaches – graphical visualization, questionnaires, workshops, consultant assessments, creativity/visioning sessions. Brown analysed some IMT experiences of the European countries in comparative perspective.

At the end of the presentations by academics and practitioners, the rapporteur, *Wolfgang Polt* (OECD/DSTI Secretariat), summarized the main messages of the workshop with an eye to *policy conclusions*. He came back to the main questions the workshop addressed: (a) How to identify the characteristics of innovative firms?; and (b) How can policy improve innovative capacity and

performance of firms? From the different contributions, several criteria to characterize innovative firm behaviour could be drawn, namely:

1. whether an organization has the capability to act 'real-time' or not (Jelinek)
2. flexible as opposed to either rigid or planned or chaotic (Volberda)
3. able for 'strategic re-invention' vs. conservative (Doz)
4. links to markets and customers as well as internal links/teams (Dougherty)
5. management able to innovate by applying the appropriate 'mechanism' (Volberda)

Practically all presentations warned against the repetition of the pitfalls of standard micro-economic theory, namely, against the concept of the 'representative firm' and stressed, what turned out to be their main common theme: the *context dependency* of successful innovative behaviour. These include:

6. geographical and historical context ('national innovation systems') (Doz)
7. shared market context (customer needs) (Dougherty)
8. sectoral context (Jelinek)
9. relational context (Coriat)
10. time context (e.g., life cycle) (Volberda)
11. broader context of (warranted) societal development (Tomiyama)
12. shared technological context ('technological systems') (Gerybadze)

While policy hardly can influence the internal structures, processes and behaviour of firms, it can have influence via the shaping of contexts:

The *geographical context* of a 'national innovation system' can be influenced by the provision of science and technology infrastructure and education, thereby attracting foreign direct investment of firms trying to profit from the innovative environment. In looking at the *sectoral context*, one observes that also firms in 'mature industries' have and build their activities upon intensive knowledge bases. Policy should take this into account by not focusing exclusively on 'high-tech' firms and industries, but also address actual or potentially innovative firms in mature industries. In providing a legal framework (e.g., in the field of IPRs), in lowering the transaction costs for and in encouraging cooperation between firms, policy can positively influence the *relational context* of firms - as is being tried in the United States, Japan and the European Union. By defining the *societal development context*, governments naturally and often consciously influence the innovative behaviour of firms (e.g., by defining 'missions' like the development of 'zero-waste-technologies', by changing relative prices for 'merit goods' etc.).

Some more generic policy conclusions (i.e., policies that would be appropriate for all types of contexts, but not necessarily insensitive to context), would be:

13. the 'self-application' of management theories that aim at increasing the innovative capacity of firms to: (a) public enterprises; and (b) public institutions in general;
14. the provision of knowledge about 'good practice' in innovation as a public good.

The final two presentations focused on the next steps of the Focus Group towards a goal of a better understanding of the innovative firm and the development of new tools.

Deborah Dougherty (on behalf of Industry Canada) attempted to draw together recent developments in thinking about what makes firms innovative, and to stimulate discussion on which capacities are key to innovative performance. She described four levels of innovativeness, from a Level

Zero non-innovative firm to the firm which is comprehensively innovative. A Level One firm was defined as one with the capability to manage the generation of innovations to successfully develop new products and process. This can range from management of the development of single products in an isolated environment to management of a family of related innovations. Innovation is facilitated by an application of commonly understood structures and routines. By Level Two, the firm has the capability to adapt to a changing environment (The Learning Firm). It re-evaluates assumptions underlying strategy, products and processes and questions their on-going appropriateness in the face of a changing environment. The Level Two firm will respond to opportunities and threats and adapt through building on core technical competencies and existing structure and culture. At Level Three, the firm has developed the capability to strategically reposition the firm. It can change the firm's relationship to the competitive environment by creating new core technical competencies, strategic focus and culture.

At each level, analysts have a pretty clear idea of the characteristics of the firm. However, while behaviours are well understood, firms still have difficulty adopting these "best practice" behaviours. This leads to a conclusion that there are underlying capacities that drive innovative behaviours, and that a better understanding of those capacities may be key to developing tools which will help firms become more innovative. Based on discussion, it would seem these capacities should: recognize the comprehensive nature of innovation, and be based on a wide range of existing knowledge about what constitutes capacities for innovation; recognize that the ability to balance apparently conflicting considerations is key to innovation performance; provide a stronger focus on knowledge, learning, and organizational and behavioural concepts; and, recognize that there are different levels of innovativeness and that firms can move through those levels.

Ozzie Silverman (Industry Canada) closed the workshop with a proposal for a work plan to develop next generation innovative tools that could recognize the comprehensive nature of innovation; be based on a wide range of existing knowledge about what constitutes capacities for innovation; and, recognize that the ability to balance apparently conflicting factors is key to innovation performance. These tools should provide a stronger focus on knowledge, learning, enabling capacities, and organization and behavioural concepts and recognize that there are different levels of innovativeness and that firms can move through those levels. Finally, they should go beyond traditional assessment based on "best practice" and provide guidance to assist firms in moving to new levels of innovativeness and influence their behaviour.

A multi-phase approach was suggested, with the first phase being to build on the findings of the workshop, and further develop the conceptual framework for new tools. Subsequent phases include tool development, testing, evaluation, and implementation. It was suggested that interested countries could join together in financing Phase One work, which would: compile a broader understanding of existing academic work and tools; further define the underlying capacities that underpin the innovative firm; develop a profile of the capacities at different levels of innovativeness; develop criteria to place the firm on a range of innovativeness, and identify gaps and barriers to innovation; develop ways and means to guide firms to move to a more innovative state; and, evaluate the need to tailor the tool for firms of different sizes, stages in life cycle or industrial sectors. Mr. Silverman noted that follow-up work could be discussed on October 9, 1997 in Paris, following the meeting of the CSTP.

In their closing remarks, *Ozzie Silverman* (Industry Canada) and *Alain Jolivet* (Ministère de l'éducation nationale, de la recherche et de la technologie, France) reconfirmed their belief in the importance of the project and their willingness to continue to jointly lead the Focus Group.