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978-0-521-76877-1 - Strategic Management of Innovation and Design

Pascal Le Masson, Benoît Weil and Armand Hatchuel

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Strategic Management of Innovation and Design

There is now widespread agreement that innovation holds the key to future economic and social prosperity in developed countries. Experts studying contemporary capitalism also agree that the battle against unemployment and relocations can be won only through innovation. But what kind of innovation is required and what is the best way to manage, steer and organize it?

Grounded on experiences of innovative firms and based on the most recent design theories, this book argues that, instead of relying on traditional R&D and project management techniques, the strategic management of innovation must be based on innovative design activities. It analyzes and explains new management principles and techniques that deal with these activities, including innovation fields, lineages, C-K (Concept-Knowledge) diagrams and design spaces. The book is ideal for advanced courses in innovation management in industrial design schools, business schools, engineering schools, as well as managers looking to improve their practice.

Pascal Le Masson, Benoît Weil and **Armand Hatchuel** are Professors of Design and Management, Chair of Design Theory and Methods for Innovation at the Center for Management Science (CGS), MINES Paris Tech, Paris.

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Pascal Le Masson

Benoît Weil

Armand Hatchuel

Forewords by Paul Rivier and Marc Maurer

Afterword by Jacques Lacambre and Dominique Levent

Translated from *Les processus d'innovation* by Alison Bissery and adapted by the authors



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Foreword by Paul Rivier

It gives me great pleasure to preface this book on innovation. In 1994, a young student contacted me because he wanted to do a PhD thesis on innovation at Tefal. I agreed, but on the condition that he took an active part in designing new products. Vincent Chapel was more successful than I had ever imagined. He managed some very interesting innovations for Tefal and then went on to create several innovative start-ups, one of which is described here. Also, his PhD, directed by Armand Hatchuel, gave me the opportunity to get to know and appreciate the research presented by the authors of this book.

As a company director, the necessity for innovation seems quite natural to me. It is not just one priority among others, as all the rest depends on it. First, economic survival, of course, but also the social well-being of the personnel, which, in my view, is the main purpose of firms. In the different companies I have managed over the years, I have always personally committed myself to exploring all the possible paths for new developments. I believe this is part of a manager's responsibilities. If all we have to propose are efforts to increase productivity, we can hardly expect members of staff to be really committed to the firm. It was doubtless this frame of mind which encouraged us to adopt design reasoning and business decisions in favour of innovation. To my surprise, people often failed to understand this approach, despite our growth record and continued success over a number of years.

Had we invented a 'model', as the authors suggest? It is not for me to say. Nonetheless, as I followed the work with the Ecole des Mines team, I became convinced that, once it was correctly analyzed and studied, our experience could be of benefit to other firms. Very wisely, the authors methodically confronted our solutions with those found in other firms, including some outside France. Their efforts in modelling and generalization also widened the scope, as their propositions go well beyond our particular context and business sectors.

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Foreword by Paul Rivier

The notions of innovation field, repeated innovation, lineage, reusing knowledge and prudent strategy that the reader will discover in this book are perfectly in line with the spirit needed to innovate in the current competitive environment. I also greatly appreciate the efforts made to clarify notions such as R&D, project, rule-based design and innovative design, because misunderstandings can arise due to the standard language of innovation and are often obstacles to cohesive action within firms.

I leave it to the readers and to researchers to discuss these propositions in more detail.

I would like to say how much I have appreciated the discussions I have had with the authors over the years. This book is a precious contribution to our collective capacity for innovation. It provides the firms and the scholars concerned with a better understanding of the notions and methods, which are fully up to date and present a remarkable, effective step forward.

I still have the privilege of helping firms which have been through major difficulties but which, thanks to these same values and approaches, are returning to growth, to everyone's benefit and through their joint efforts. Innovation based on solidarity is the best solution for maintaining employment.

Paul Rivier,
former CEO, Tefal

Foreword by Marc Maurer

Innovation and competitiveness

The impact of globalization goes way beyond the issue of relocations of manufacturing plants. It throws firms into a new arena where competition is no longer based on product performance alone but also on the overall effectiveness of their innovation strategies. The authors' experience and the numerous discussions we had the privilege of taking part in over the past ten years enabled us to be involved in and put into practice many of the recommendations found here. The notion of organizing intensive innovation, the structuring of lineages of innovative products and the organizing of constantly evolving technological sectors have become management methods that place this 'RID' at the heart of the firm's strategy. One of its main advantages is to structure the long-term view whilst also giving the management sufficient confidence to manage the short and medium term.

Until the 1990s, teams in charge of managing innovation – the R&D and marketing departments – were expected to deliver results whilst roughly keeping to the specifications, timetables and budgets. This operating method was often project-based; it brought new products onto the market in satisfactory conditions and helped to keep challengers at bay. In western countries, companies managed to maintain their growth and profitability. However, outsiders then started to improve their performance: they acquired technological capacities and were quick to learn, meaning they were able to almost catch up with the innovators, who were then obliged to speed up the rate of product renewals. At the same time, the growing number of new technologies that firms had to master led to an explosion in the financial burden of innovation, introducing the need for far more rigorous management of R&D resources. The management of innovation – in terms of both contributions and costs – is now an area where a firm's competitiveness is at play and where management methods have changed

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quite spectacularly. The good old recipes, where the CEO's intuition and the R&D managers' experience were sufficient for the firm to maintain its leadership, have been replaced by these far more structured methods, which use a more holistic approach to innovation.

The authors of this book, P. Le Masson, B. Weil and A. Hatchuel, have dissected a certain number of real cases. With a solid theoretical foundation, this comprehensive work provides a new formal framework for organizing Research-Innovation-Development. This book proposes a method which 'organizes' the interface between R&D (which delivers knowledge to the firm by consuming some resources), the market (the 'T' part) and the top management charged with organizing the strategic choices. This new method for managing RID puts into perspective a horizontal relationship between the technologies, at a given time, together with the notion of evolution over time. This helps optimize the synergies between projects and then build up the knowledge with a view to maximizing the results without consuming too many of the firm's resources. Those who take inspiration from this book and put its principles into practice will find it provides a powerful new competitive weapon.

Marc Maurer,
Head of R&D Centers,
Saint-Gobain Glass

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Acknowledgements

This book is the result of a research project which lasted several years. It is often hard to say when projects began, but in this case it is easy to put a date on it. In 1994, the Mines ParisTech (former Ecole des Mines de Paris) created an option (a specific curriculum of the Master's Degree) in Engineering Design and Management, a combination of teaching and research areas that was quite unusual at that time. Under Armand Hatchuel's responsibility, a team of teachers was brought together, including Benoît Weil, Jean-Claude Sardas and Christophe Midler. Pascal Le Masson joined us a few years later.

Our aim was to combine design disciplines (engineering and industrial), innovation and project management and, in the longer term, to lead the design sciences to the same level of maturity as the sciences of decision-making and programming. In a few years, the research programme gathered speed at an unexpected rate. Most areas of teaching were gradually reorganized around an inspiring and unifying theoretical core, the C-K (Concept-Knowledge) design theory (Hatchuel 1996; Hatchuel and Weil 2001, 2003), which is now taught in a number of establishments. The programme was also in line with a major preoccupation, the necessity of strengthening firms' innovation capabilities. The progress made in this area helped us build up precious partnerships with many leading firms. This book owes a great deal to this original teaching and research project, although it looks at only part of the areas covered by it.

Our thanks go first to the teachers in the Engineering Design and Management option, and in particular to Christophe Midler (CRG, Ecole Polytechnique), who was involved in the project from the start and made an eminent contribution to this research. To Maurille Larivière (StrateCollege Designers), who provided remarkable industrial design experience for our work. And to Blanche Segrestin, Franck Aggeri and Philippe Lefebvre (MINES ParisTech), whose contributions often served as references for our research. Our warm thanks also to all the students who took the Engineering

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Design and Management option and whose final-year projects were a source of progress and motivation for the teachers.

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Introduction: from R&D to RID

There is now widespread agreement that innovation holds the key to future economic and social prosperity in developed countries. Experts studying contemporary capitalism also agree that the battle against unemployment and relocations can be won only through innovation. It is *the* great challenge of the day and, for many specialists, the only possible solution to the problems facing western societies and to the current recession. Whether it is studied from a local or a global standpoint, innovation is the only way of satisfying the social, environmental and economic facets of growth, and of increasing levels of education whilst also creating value, jobs and purchasing power. It also seems to be the only way of reconciling, at least temporarily, employees, managers, consumers and shareholders.

In the face of such unanimity, governments in developed and in emerging economies have set up various incentive schemes designed to promote innovation, including special subsidies and aids for investment in R&D. Initiatives such as the EU common policy aimed at ‘building a knowledge-based economy’, notions such as ‘lifelong learning and key competencies’ and even the ‘information society’ all translate the same imperative for innovation. But is enough being done to meet the challenge?

A great deal of research has been carried out by firms and government departments, but what do we actually know about innovation? For instance, do we know which factors enhance a firm’s innovation capability and whether financial incentives guarantee effective innovation? Can we use the traditional views of innovation to build the innovative firms and regions of the future? Are the current R&D organizations and the traditional engineering and marketing methods suited to a high pace of innovation? Do we have a set of management principles that can be taken as ‘best practices’ for managing innovation? It has to be said that, thanks to past and present interest in innovation, scholars from different disciplines (management, social studies, economics, etc.) have learned a lot about the importance of innovation and the stakes involved,

but we still understand little about the relationships between ‘knowledge’, ‘innovation’, ‘growth’ and ‘research’.

These are the issues we sought to address in the research project described in this book. In the course of our work, we made use of a number of international experiences in industry, together with new theoretical frameworks. Our first observation was that innovation has changed! Our second was that organizing an innovation process is neither simply a question of how much is spent on R&D, nor of better dialogue between the different functions and departments. Innovation needs more than just a good dose of courage and good forward planning. But above all, our observations led us to believe that fundamental, long-term changes are in store and that all organizations and professions must be prepared to face them. Actually, bearing in mind industrial and entrepreneurial history, this is not really surprising: innovation always involves more than just ‘good ideas’. Each of the great industrial revolutions was linked to new forms of innovation, either in content, functions or organizations.

Innovation-based capitalism therefore faces a new challenge. The actors are aware of the stakes involved in innovation, but now they must be convinced of the need for a radical change in the place and the role of innovation in firms. And this change must be carefully prepared and organized. The following propositions clarify our point of view and sum up the general outline of the book:

1. Innovation is now *intensive*: it is systematic, repeated and oriented, instead of random and episodic. In its new form, it has become a major driving force for contemporary capitalism and it will determine the conditions of international economic competition in the future.
2. An intensive innovation process is *not the same thing as either research or development*, or traditional R&D, conceived as cooperation between the two. It is essentially based on *innovative design* activities, whose specific principles of rationality, efficiency, organization and management will be explained throughout this book.
3. Firms must make room for *innovative design and its organization* in their strategies and structures.
4. These wide-reaching changes can be expressed by a simple formula: *the transition from R&D to RID*. The new ‘I’ between research and development refers to the functions and competencies of innovative design. It is neither simply another structure or body, nor a simple coordinating function. It has an original, specific mission. We will see how innovative design activities are not only exploratory but *activate*, throughout the

firm, an *innovation-oriented metabolism*, i.e. a collective capacity to continually and simultaneously recreate *sources of value* (products, concepts, patents, environmental and social values, etc.) and new *competencies* (knowledge, expertise, rules, functions, etc.).

The transition from R&D to RID entails a drastic change in the way firms are managed and has economic, social and ecological impacts as it concerns all the different dimensions of innovation. The change is not confined to large international groups but affects all organizations. In fact, it could have the same universal thrust as Taylorism and Fayolism at the beginning of the twentieth century.

Before going any further, it is worth pausing for a moment to think about what we mean by ‘innovation’, as its different forms can be somewhat disconcerting.

1 Innovation, a victim to fashion?

Everything involves ‘innovation’ today, and its omnipresence emphasizes its natural ambivalence. It is such a vague, well-worn notion that it tends to leave people perplexed or to prompt an ironical smile.

Innovation is often synonymous with fashion, gadgets or illusions, witness expressions such as ‘umpteenth reform’, ‘so-called novelty’, ‘patch-up job’, etc. It is true that the notion has little substance if nothing is done to explain its content or the economic and social value it creates. The notion of ‘innovation’ *does not mean anything in itself*: the same innovative proposal will be assessed differently by any two observers. However, the same thing can be said of ‘research’: a new truth is not necessarily interesting. When companies began to set up research laboratories about a hundred years ago, there were always debates about the value of the research produced. It is interesting to study the mechanisms of innovation only because *the question of the value of the innovation is an integral part of it*. This means that the more a productive activity is innovative, the greater the need for methods to assess its value. This can be seen, for instance, in cultural or artistic creation where the critics are fully involved in the production process. Similarly, the most active consumer organizations are found in the most innovative markets (automobile, IT, etc.).

Innovation is always associated with change, uncertainty and risk. Unpleasant surprises can be found lurking in ambush behind the most brilliant ideas. By definition, innovation is unsettling and upsets people’s

habits. However, this implies that innovation is unintended and comes out of the blue, whereas in reality it can be intentional, prepared and organized to anticipate risks. This is the case for explorers, in sports or in science, who are all the better prepared and all the more organized in situations where they do not know what they are going to find. So it is not innovation as such that merits study but the ways and means, methods and mechanisms that design, elaborate and form the innovation process. Without such considerations, the term ‘innovation’ loses its substance and ends up provoking a mixture of enthusiasm, confusion and suspicion.

Commercial, technical or industrial innovations that create value are hardly a recent phenomenon. More than 200 years ago, during the Industrial Revolution in Britain, there were already debates about the advantages and disadvantages of ‘industrial progress’; and the *Belle Epoque* before the First World War saw the birth of the car, Taylorism, electricity, bureaucracy, industrial design, underground rail systems, etc. But by now, in a civilization that has already undergone four or five major waves of social or technical change, are firms not used to innovation? Do they not already have well-organized, well-managed R&D departments, at least the largest among them? Everything seems to confirm a simple idea: there is nothing less innovative than talking about innovation. In which case, *why write yet another book about it?*

Why another book?

There were several reasons for undertaking the research project presented in this book. In the past twenty years, there have been great changes in the pace of innovation in the workings of contemporary capitalism and in its content. We put forward the idea of an emerging *innovation-intensive capitalism*, which obliges all organizations to invent functions based on innovation. Starting from this assumption, we developed a research strategy that differed from the usual orientations in several respects:

We did not study innovation, as such, *as a problem or a phenomenon*, but all the activities and organizations which, over the course of time, have been set up to *generate, direct and evaluate* innovations.

We therefore focused on the *design activities*, i.e. the activities used to conceive and formulate innovations. Traditionally divided into R&D, engineering and industrial design, these activities had increasingly been studied from different perspectives. It became more and more common for the notion of ‘design’ to be mentioned as a central

resource for management thinking, yet no *adequate theoretical framework* emerged until recently.

Our approach *calls into question the central notion of R&D* and paves the way for developing a theory on *innovative design activities*, a major challenge for business history and theory.

Intensive innovation: constantly questioning the identity of objects

Contrary to a commonly held idea, innovation is not a natural, almost random phenomenon to be found in practically all organizations and firms.¹ Whether it takes the form of a new technique, new aesthetics or new work organization, innovation is above all *the result of the activity of communities that determine its form and its conditions of acceptability*. The history of architects, engineers, industrial designers and researchers illustrates this point. Although the need for innovation has taken different forms depending on the era or the sector of business, each time it has led to the emergence of new ‘innovation professionals’ with their own means of analysis and experimentation and with their own principles of action.

Intensive innovation: value creation through competition

In less than half a century, the process of generating innovations has become the major competitive playing field for contemporary capitalism and a vital source of sustainable development for contemporary societies. We will see in Chapter 1 that, as far as firms are concerned, it is a question of surviving in an innovation-intensive capitalist system. In societies that are used to regular changes in projects and lifestyles, it is even the fundamental way of creating value because, whether the value is judged on the basis of profits or on the progress achieved in terms of human, ecological or social development, it always requires innovative activities. This is one of the lessons to be learned from recent work on the role of innovation in sustainable development.² We must therefore stress a fundamental point in our work: innovation itself is not a new question, *but its place, scope and content have changed* and it is now characteristic of competition. Innovation has become intensive.

¹ Despite their sophistication, economic models of endogenous growth that try to take innovation into account still model the birth of innovations as random sequences.

² See the study on sustainable development policies proposed by Aggeri *et al.* (2005).

Today, innovation concerns more than ongoing industrial improvements or the updating of techniques and practices, or even fundamental research that might find applications without targeting them. The word ‘intensive’ implies that innovation covers more than just technical or aesthetic progress. All the visible or invisible characteristics of a product or service are potential fields for innovation. For instance, when the notion of ‘service’ was emphasized in the 1980s, an object’s accessibility and ease of use were focused on as examples of innovation spaces. Similarly, the fact that car safety has become a key issue does not mean that today’s drivers are more worried about accidents than their counterparts were in the 1950s. Above all, it means that the car manufacturers have decided to compete on this particular front and to let the consumers know about it with their continual references to Euro NCAP stars. As a result, consumers have increased their demands for enhanced car safety measures. The relationship between the notion of innovation and the notion of needs is complex: today’s innovation will be tomorrow’s need and vice versa. For firms, the challenge consists in being better than their competitors at navigating between the innovations and the needs.

In practice, this inevitably involves introducing new functions or new value spaces, which then stimulate the development of new techniques, which in turn give birth to new aesthetic qualities or new functions. In this way, intensive innovation extends and generalizes an inventive, self-producing, self-strengthening mechanism, whose most striking effect is first to question and then to renew the actual identity of given objects or values.

A key notion: the versatile identity of objects

For many firms, innovation is focused on products or services *with a relatively stable identity*. In general, these firms target well-identified customers and make regular improvements to products’ known characteristics and functions. For example, computer manufacturers try to increase speeds and storage capacity because they know that their customers are expecting this. However, when they introduce networking functions, they are making *a significant change to the object’s identity*. What was considered an advanced computer yesterday may be seen as a simple terminal tomorrow. New user patterns can also emerge: for example, the recent introduction of the MP3 format allows users to use their computers to download, store and exchange music, thus changing the way computers are apprehended as objects.

Contrary to what is often said, this is not only a question of nomad technology. As early as the fifteenth century, the first watches were nomadic objects, too. However, their identity could not be changed as it can today: they could strike the hour, mark the days and years or be hidden away in magnificent casings, but they could not be turned into walking libraries.

The specific characteristic of innovation-intensive capitalism is precisely that *it questions and then accelerates the renewal of the identity of objects*. It obliges firms and consumers to explore and discover new functions and new uses. *As employees or as consumers, everybody must take into account unknown technologies and be prepared to develop or to appropriate them*. Intensive innovation is therefore not just about changes in production methods or new goods. Traditional language does not account for the permanent need to build new systems of knowledge and of exchange and therefore fails to address the issue of the intense collective work involved in redesigning *the markets, competencies and user values that characterize contemporary capitalism*.

Recent history of computers, mobile phones or even household electrical goods provides particularly good examples of this new form of capitalism. Over the years, the functions offered by these devices and the ways in which they can be used have become more and more inventive. In the past forty years, the very nature of computers has changed; in less than ten years, the internet has completely upset communication systems worldwide; in five years, the mobile phone has become a commonplace accessory. In the latter case, the introduction of camera and video functions is one of the most striking examples of drastic changes in an object's identity. In short, the omnipresence, versatility and ambivalence of innovations are an inescapable feature of the changes in the identity of objects inherent to innovation-intensive capitalism.

More fundamentally, people are not used to thinking about the identity of objects and how this identity can change. This can be a dramatic source of social exclusion when common, practical knowledge becomes obsolete. Moreover, the greater part of our classic culture, both scientific and philosophical, is based on stable object identities: a house is always a house, a chair always a chair. Consequently, the great wealth of classic thinking does not provide mental or cognitive models to help us examine variations in the identity of objects. This is one of the key points we will be addressing, by proposing *design theories that enable us to study objects with unstable identities*.

Financial capitalism and innovation capitalism: avoiding the pincer effect

Even when firms are aware of the vital need for innovation, the global context makes their task difficult. They are caught in a *pincer effect* (Hatchuel 2004b): on the one hand, they need to enhance their innovative activities by stepping up capacities and resources, but on the other, they need to meet the demands of *financial capitalism*, i.e. the system that emerged from the recent globalization of capital markets. This system will no doubt be regulated more strictly after the recent crisis, yet financial efficiency will continue to be an important criterion for management: not only must firms meet stricter demands for returns on investment but they must also face up to competition from low labour cost countries. They are already competing in terms of production, but everything points to the fact that in the future they will also be *competing on the innovation processes as such*. Financial capitalism means that firms not only have to optimize the volume of innovations and the investments dedicated to them but also ensure that *the innovation processes are relevant, original and profitable*.

The combination of financial capitalism and innovation capitalism is a *formidable challenge* for all the current management doctrines and may prove to be an impossible equation for many firms. In some cases innovation capability will be sacrificed for short-term financial constraints, thus leading to slow suffocation; in others, the opposite scenario will prevail, with bankruptcy or unfriendly takeover bids around the corner. The solution is difficult but unavoidable: firms must *build new strategies combining innovation and financial considerations*. The art of management consists in the art of compromise, but if managers are to find original, value-added solutions, they must be able to control the different elements involved, reorienting them or shifting their emphasis as and when necessary. A wide range of management tools is now available for the financial aspects, but the same does not apply for innovation activities and functions, for which no appropriate tools exist. It is therefore difficult to combine a financial approach that can be controlled and measured, and an innovation approach that lacks the tools required to understand and manage it. Innovation capitalism hence runs the risk of being restricted and stifled by financial capitalism.

In our view, the pincer effect of these two aspects of contemporary capitalism leaves no doubt whatsoever about *the urgent need for research to identify the systems and practices required for strengthening innovation capabilities and activities*.

2 In search of a 'model firm' for innovation

Since the Second World War, several streams of research have addressed the question of innovation. A great variety of issues has been studied from a number of angles, each raising its correlative questions. For instance, innovation in terms of economic policy with questions about government incentives; as a risk for citizens, with questions about whether this was acceptable; as a commercial challenge, with questions about the best markets for the new products; as a technical challenge, with questions on the sort of research to be done and the experts to be consulted; and as a problem of creativity, with questions on where to find creative people and how to train them. And, of course, there were those who thought that innovation was and will inevitably continue to be unorganized. In short, in the past half a century, the different schools of thought have accumulated studies and work papers, fighting each other's ideas or ignoring them along the way. This book adopts an alternative stance.

Innovation as a management object: techniques and organizations

Our aim is to identify collective cognitive techniques that can be used to *manage, steer and organize innovation as an object*. We are concerned with everything that makes collective bodies aware of their innovation capabilities and enables them to increase their pace of innovation whilst keeping an eye on its general direction and the way it evolves over time. Despite constant efforts from economics, management and sociology, up until now academic research has made little progress in this respect.³

Silence from the major consultants

There is one particularly clear sign of the gaps in this subject: although there is an evident need to innovate, even the largest organization specialists and consulting firms seem very timid in their offers of services and hardly communicate at all on these issues. Apparently elementary questions such as how the innovation process can be addressed, which principles to use for action and management, whether innovation is the same thing as applied

³ As shown in a recent overview of international research (Hage and Meeus 2006).

research or whether R&D activities are sufficient to build an innovation policy receive only prudent answers.

The current situation will not surprise those who know the world of industry. Innovation has been a driving force in industrial expansion for the past two centuries, *but doctrines have not been fully developed regarding the way it works and how it is managed and implemented*. In fact, innovative processes have often been developed secretly or at least in an unauthorized fashion, even in the most advanced organizations, with what is now commonly called ‘skunk work’.

There are theoretical, historical and cultural reasons for these shortcomings that we will come back to later. Nonetheless, the idea of studying firms’ capability to innovate and their management methods comes up against a sizeable obstacle that has tended to go unnoticed: for several decades now, we have not had a ‘model firm’ that managers, experts and employees all accept as the prime example of uncontested best practices in terms of innovation. This situation is very different from other periods and from other issues in the management sciences.

Management without a model?

After the Second World War, the major American firms embodied the most rational, most efficient organization model. Japanese firms then overtook them in the 1980s, demonstrating their supremacy in terms of flexibility and quality in the manufacturing industry. It must be said that Japanese production methods had an enormous impact on industrial executives and managers at that time, despite the fact that they used a variety of sometimes debatable methods that were not always applicable in other cultural contexts. During this period, Toyota was unanimously accepted as an example to study and sometimes to copy. Several authors even started referring to Toyotism, like Fordism in the past.

There is no equivalent in the field of innovation today. Innovation is seen as a survival strategy, *but there is no firm that everybody can immediately copy, imitate or simply use as an inspiration* and a reference for its innovation capability and for its methods. Of course, there are companies that are often mentioned for a particular, successful innovation: 3M for the Post-it, Sony for the Walkman, Renault for the Scenic, Apple for its iPhone, etc. However, the literature and above all the actors in the field have great difficulty relating these success stories to organizations, processes or procedures that they can copy or adapt. Similarly, the current ICT giants such as Microsoft, eBay and

Google are often given as examples of innovative firms, but there is no really stimulating or inspiring body of management doctrine rigorously associated with the action of these heroes of the moment.

What explains this lack of a model? One possibility is the state of firms. After all, even a quick survey of private or public companies – including the most advanced ones – is enough to realize that they can easily describe their project management systems, that they often have an R&D team and a protocol for new product launches, but *very few of them can describe their innovation process with any conviction or precision*. However, a completely different assumption can also be put forward for there being no best practices for innovation: could the lack of a model be due to *researchers' analytical frameworks and observation methods*?

The researcher's 'analytical glasses'

Putting innovation aside for the moment, let us look at the question in more general terms: *how do researchers recognize original management models*? To do so, they must be capable of:

- identifying *original practices* and being able to recognize them as such;
- interpreting these original practices in a *theoretical framework* that explains their originality, conditions of effectiveness and contingency criteria.

Returning to the field of innovation, what theoretical frameworks are available to complete these two steps?

Previous research on innovation has continued to rely too heavily on the functional divisions of management (strategy, R&D, audit, operations, HR management, etc.) and on the frameworks of contemporary economic and sociological thinking. The best research on innovation has been in the form of criticism. In management, the debate has focused on the contrast between 'mechanistic' (bureaucratic) structures and organic (adhocratic) structures (Burns and Stalker 1961), monodextrous and ambidextrous firms (Tushman, Anderson and O'Reilly 1997), closed and open forms of innovation (Chesbrough 2003), etc. In economics, the issue of innovation has given rise to fundamental criticism of the classic theories on markets and growth, but no appropriate analytical frameworks have yet emerged for economic action. In our view, this difficulty stems from the persistence of *a microeconomy built exclusively on production functions*, whereas innovation, as we shall see throughout this book, is based on 'design functions' (Hatchuel and Le Masson 2006). In sociology, research on innovation has above all stressed the need to mobilize networks of multiple players and very

diverse institutions.⁴ Overall, these studies have a major impact: they correct the fact that the traditional models in economics, management and sociology are too narrow, as they were originally built by observing bureaucracies, civil services, large factories or markets where there was relatively little innovation or, in any case, that were not well suited to innovation-intensive capitalism with its rapid renewal of object identities.

Yet it seems that we still know little about the reasoning, the collective learning processes or the management tools that can be mobilized to help communities increase their capability to innovate.

A discovery-oriented research methodology

These observations led to the specific *research approach* described in this book. Generally speaking, management researchers try to identify the principles of organization found in ‘best practice’ firms, but this implies that the latter are easy to identify. The fact that no one company is acknowledged as a reference in the area of innovation meant that our research followed a somewhat original path as *it had to look for the empirical facts and for the theory at the same time*. We can distinguish between three phases in our work: empirical discovery, theorization identification and intervention enrichment.

- a) **Empirical discovery: original practices.** A series of long-term ‘intervention research’ projects (David and Hatchuel 2007) enabled us to highlight *original practices*, particularly well adapted to innovation. Some of the firms studied and accompanied from the inside (Tefal, Avanti, Saint-Gobain Sekurit, Saab Aerospace, etc.) proved to be particularly *original in their ways of managing innovation*. These firms were ultimately chosen for this study because they had managed to maintain strong innovation capability, sometimes over several decades, even though they were not always particularly well known for this.
- b) **Theorization identification: modelling innovative design.** The original practices were then theorized, formalized and analysed to highlight the reasoning behind *innovative design activities* and their organization. The theoretical models were based on the *C-K design theory* (Hatchuel 1996a;

⁴ Our colleagues Michel Callon and Bruno Latour at the Ecole des Mines Centre for the Sociology of Innovation developed an actor-network theory, which criticizes classic diffusionist views of innovation in sociology. However, such criticism is not valid for management research, which has always focused on the development phases of new products and innovations.

Hatchuel and Weil 2003, 2009) and not on the traditional methods used in the management or social sciences. The use of non-intuitive, formal models that require an effort of abstraction was justified in this case because they are highly interpretative and explicative. They confirmed our assumption: *innovation capability is based on reasoning that is not easy to understand with ordinary approaches.*

This is not all that surprising, considering that everyday life does not provide us with many opportunities to try our hand at designing new objects. Any thought given to creative activities is more or less limited to the arts and usually tends to be in the form of a judgement or comment on the work rather than on the design process itself.

- c) **Intervention enrichment: validatory experience.** The emerging models of innovative design then served as a reference framework for intervention research projects⁵ in several companies (Renault, RATP, Schlumberger, Rhodia, Air Liquide, etc.) that had expressed an interest in studying and enhancing their capability to innovate. The results of this work validated *the principles of a transition from R&D to RID*, i.e. confirmed that the methods of innovative design make a decisive contribution, distinct from research and development, whilst strengthening the overall innovation capability.

Management research as an actor in business history

By putting a focus on discovery rather than on confirmation, the traditional objectives of management research are set in a different context and change on several levels.

- a) It is generally accepted that discovery and observation in the 'field' cannot be separated from *theoretical and conceptual invention*. We can only 'see' what can be 'thought'; this is the condition of scientific research. Nonetheless, this 'law of nature' seems less rigorous in management or in the social sciences, where rigorous and well-documented empirical observations appear to suffice for the production of knowledge. However, this 'natural' approach is no longer sufficient when the

⁵ Most of this research was carried out by the authors, but we should also point out the contributions made by our students of the Design Engineering Option at the Ecole des Mines de Paris, under our direction. Work by students from the Ecole Polytechnique for the Master's Degree in Project, Innovation, Design (under the direction of C. Midler) and students from the INA-PG, option Innovation and Management, Life Sciences (under the direction of M. Nakhla), also made precious contributions to the research on these questions.