

G U I D E
FOR MANAGING
INNOVATION
PART I : DIAGNOSIS



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Guide for Managing Innovation

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“How can managers plan, let alone trust a process which, in essence, depends so much on creativity, inspiration and luck? [...] Although some innovations are the result of a flash of genius, most of them, especially the most successful ones, are born out of a conscious and deliberate search for innovation opportunities that can only be found on rare occasions.”

*PETER DRUCKER,
The Discipline of Innovation, 1985*



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INTRODUCTION

The reasons for this guide

This guide was designed by CIDEM as a tool aimed at small and medium-sized enterprises (SMEs) to help them assess their capacity for innovation. It is intended as a first step towards setting in motion a broader reflection within the SME community. As a result, its aim is not so much to obtain the right answers as to allow companies to identify the basic issues at work in the improvement of their capacity for innovation.

Methods of managing innovation

In recent years the European Commission has promoted a series of methods in various countries directed towards introducing techniques for managing innovation.¹ However, no European standards have yet been established. Although several methods have been introduced in Catalonia, such as DT-PYMES, BUNT, EUROMANAGEMENT or EDIT, widespread take-up by the Catalan business community has been limited despite a positive reception from the recipient companies.

Unlike quality, which has seen widely used terms and methods rise to the status of international standards, such as the ISO Standards, QS or the EFQM Model, alongside a substantial awareness-raising campaign among clients and suppliers alike, in the case of innovation these factors have not yet been sufficiently established.

This guide has been written with two contradictory factors in mind. On the one hand methodological rigour has been an important consideration, which explains the length of the guide, and on the other hand we have tried to keep things as simple as possible, including only the essential parts and thereby enhancing readability. Thus, despite the fact that the innovation process cannot be analysed separately from the rest of a company's methods and processes, we have decided not to extend the questionnaire so that it becomes a business excellence model.²

The aim of this guide is not to obtain the right answers but to allow companies to identify the basic issues that will help them improve their capacity for innovation.

¹ The MINT projects (Managing the Introduction of New Technologies) were carried out previously within the framework of the European Union's SPRINT programme.

² The European Foundation for Quality Management (EFQM) has drawn up a business excellence process.

The auditing model

After studying a series of methods used for managing innovation, we selected an auditing model designed by Professors Chiesa, Coughlan and Voss at the London Business School.³ The contributions to this model from Professor David Brown of Warwick University⁴ were also taken into account. The ensuing conceptual model was then simplified as far as possible so that it can be easily used as a consultative tool.

To assess the applicability of this conceptual model, a working team was established which included large companies that already had their own methods for developing new products, and which saw the guide as a useful tool for their suppliers. A variety of small and medium-sized businesses also took part in the project as potential future users of the new tool, as did many experts and consultants involved in the innovation process.

Finally, the questionnaire included in the guide was tested during the evaluation visits made by the CIDEM experts to the 18 corporate finalists for the 1999 Technological Innovation Award of the Government of Catalonia.

A guide
aimed at small
and medium-sized
companies.

³ Vittorio Chiesa, Paul Coughlan and Chris A. Voss, Development of a Technical Innovation Audit, J. Prod. Innov. Management, 1996.

⁴ David Brown, *Innovation Management Tools*, DG-XIII, European Commission, 1997, Chapter 21.

WHAT IS INNOVATION?

Creation: PRODUCT INNOVATION

Innovation is often associated with creativity, luck or a flash of inspiration. However, these factors, even though they are crucial, are only a few elements of a much broader process. As stated by one of the world's leading experts, Professor Peter Drucker: **"Innovation is not flash of genius. It is hard work"**. Indeed, it is easy to have ideas, but developing good ideas is a much harder task. The real strategic challenge companies are faced with is to manage to continually generate good ideas and convert them into products and services that are successful in the marketplace. This is what is understood by the term "innovation".

A new way of producing: PROCESS INNOVATION

Innovation can also refer to the changes made in a company's set of processes. In actual fact, redesigning the production processes of a company can help increase the value of a final product due to lowered manufacturing costs, reduced response time and higher quality. This redesigning process, which is often applied to marketing methods, implies supplying the same service or product in a totally different way. Food supermarkets, fast-food chains, channel brands and Internet booksellers: these are all groundbreaking concepts in terms of how a company's processes are designed.

Using scientific knowledge: TECHNOLOGICAL INNOVATION

Traditionally, innovation has always been associated with R&D activities and the use of technological knowledge. This can be explained by the fact that all the examples shown in business literature use the paradigms of sectors such as the pharmaceutical industry, the chemical industry or electronics, in which fundamental research has given rise to innovations that have changed the course of history (penicillin, nylon and microprocessors).

Any innovation due to an industrial application of scientific knowledge is a technological innovation. Another misconception should be highlighted here: there are no high-tech or low-tech sectors. **All sectors can use technology to innovate.**

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EUROPASTRY-FRIPAN, a company established in Barberà del Vallès, managed to innovate in such the long-standing industry of bread-making by developing deep-frozen, ready-baked bread, and by applying the technology of liquid ferments. At the time, the possibility of having warm bread at any time of the day by means of performing a simple task that did not require any skilled staff at the point of sale appeared to most as an all but impossible task. However, the company went on to become the leader in the Spanish market, and it unleashed a revolution in what was seen as a highly traditional sector.

Breakthrough and market impact: GROUND-BREAKING INNOVATION

A groundbreaking innovation refers to a new product or service which departs from widespread consumption habits and is overwhelmingly adopted by consumers, thus giving the innovative company a significant edge over its competitors. As mentioned earlier, some of the groundbreaking innovations which have had most impact on society are closely linked to technological developments.

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Thanks to the digitalisation of information alongside the use of laser and new materials, compact discs have entirely replaced vinyl records. Similarly, other innovations such as the Walkman, whose groundbreaking concept was, "Carry your own music without disturbing anyone around you," have been based on a combination of existing technologies.

The ongoing improvement of a product: INCREMENTAL INNOVATION

The most common form of innovation in established companies is incremental innovation, whereby successive improvements are made to an existing product or service. As a result products are enhanced on an ongoing basis.

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MIKALOR, a company with a staff of 230 located in Sabadell, manufactures metal fixings for the automotive and retail industry. It has a portfolio of about 2,000 products, to which it must add value by means of incremental innovation. The average lifecycle of its products is 5 years, during which time each product undergoes approximately 15 improvements (in terms of quality, cost reductions and enhanced features, etc.), together with an average of two substantial changes following the introduction of new materials, new technologies and changes in design. As an example, the company managed to increase the performance of one of its clamps, which accounts for one third of its turnover, by 40% throughout its useful life, whilst significantly reducing the production costs at the same time. To achieve this, MIKALOR invests 1.8% of its total sales in R&D. Each year, it entrusts about 12 projects to universities, technology centres and engineering companies. In addition, it takes part in a number of R&D programmes organised by European Union.

Innovation is a subject that all companies should be focussed on,
regardless of their size and of the industry they compete in.

INNOVATION IS A PROCESS

How can a company increase its capacity for innovation? To increase their capacity for innovation, companies must allocate sufficient resources and key personnel towards managing the innovation process. In fact, innovation is related to a variety of different areas of knowledge including marketing, the creation of new ideas and concepts, design, prototypes, industrial development, R&D and company process redesign, etc.

This policy is consistent with the latest theories of business organisation, whereby the operational structure of a company should not necessarily comply with the traditional, functional scheme (production, marketing, finance, etc.), but instead be broken down into a series of business processes. A process can be defined as a logical sequence which encompasses all the activities that add value for customers, and which are carried out with the aim of achieving a specific result. In general, these activities cover a large range of operational areas.

MAIN COMPANY PROCESSES

STRATEGIC PROCESSES



KEY PROCESSES



SUPPORT PROCESSES



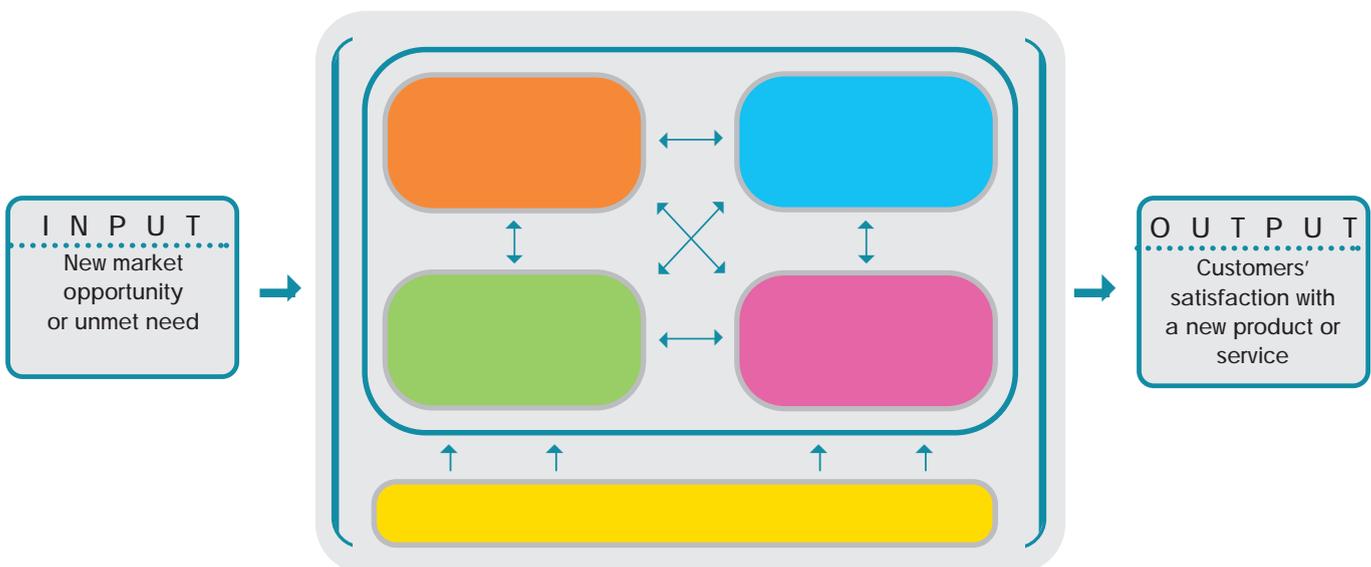
Any organisation, whatever its size, can be broken down into a series of processes. The first set of processes refers to the company's strategic activities (strategic processes), whilst the second set designates those activities that directly involve customers (key processes). The third set of processes, which supports the first two, concerns suppliers (support processes). As for the innovation process, it belongs to the strategic-process category.

The innovation process includes activities that are related both to the creation of new products (designing and developing new products) and to the ability to do things differently with a view to increasing product value (redesigning company processes). Moreover, the innovation process must be driven by a well-defined market focus, based not only on market input, which consists of identifying opportunities and unmet needs, but also on market output, that is to say, the customers' satisfaction with the new product or service.

The innovation process
must be driven by
a clearly defined
market focus.

PROCESS DIAGRAM

The innovation process comprises 5 core activities:



MANAGING THE INNOVATION PROCESS

The innovation process comprises four core activities:

CREATING NEW CONCEPTS

- Identifying new concepts of products and services.
- Anticipating customers' needs by analysing the market trends and competitors' successes.
- Encouraging new ideas and creativity among staff.
- Identifying the mechanisms and criteria used for selecting the ideas to be developed.
- Planning the creation of new product concepts.

REDESIGNING THE PRODUCTION PROCESSES

- Redesigning the production processes to achieve greater flexibility and/or productivity, together with higher quality and/or reduced production costs.
- Changes in the production processes to allow for changes to products.
- Assessing the introduction of new technologies and management and organisational tools into the production processes to increase product value.

The fifth so-called "innovation friendly" activity is crucial as it encompasses all four previous fields of action:

MANAGING KNOWLEDGE

- Innovation through technology.
- How do companies decide on which technologies to develop in house (ongoing training, creation of an R&D department, etc.)?
- To what extent do companies procure external technology, such as by subcontracting R&D projects to engineering

DEVELOPING PRODUCTS

- How do companies go from an idea to putting a new product or service on the market? This process requires a detailed description of the functions and specifications of a product, as well as the parts and systems that it contains; all this must take into account the production process and the product's distribution and after-sales service.
- How do companies develop a new product in the shortest time possible?
- How do companies coordinate internal staff and external teams?
- What project management methods do companies implement?

REDESIGNING THE MARKETING PROCESSES

- The changes in the marketing processes contribute to an increase in the product value or the creation of new products and services.
- Using new information technology to redefine product marketing.

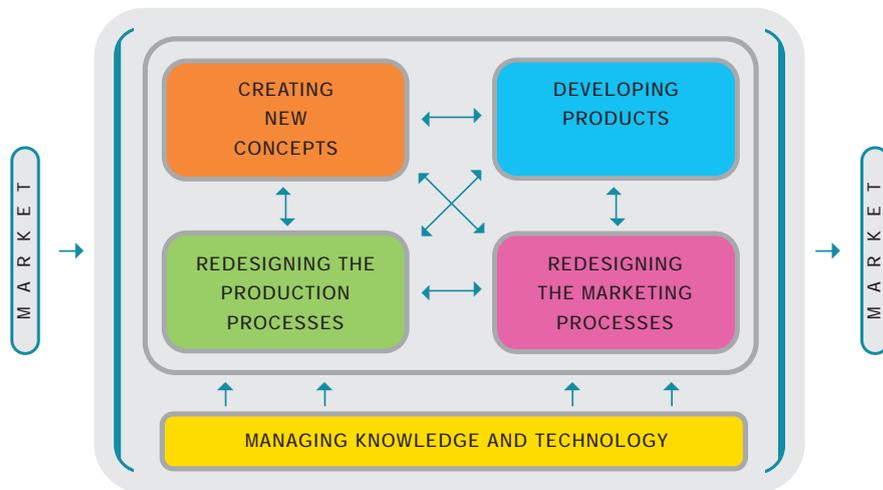
AND TECHNOLOGY

companies, technology centres and universities; by purchasing licences or patents; or by entering into technological alliances with other companies?

- Closely monitoring the technological developments that will have an impact on their products and services in the future.

The more a company's innovation process is well structured, the greater its capacity for innovation will be

The main aim of this guide is to help companies assess whether they are implementing the activities included in the innovation process and, if so, to determine the degree of excellence achieved. Another important factor to bear in mind is that innovation is not a linear but a systemic process. Thus, all activities must be considered simultaneously and within the scope of ongoing feedback from the market. This, in turn, requires companies to plan tasks and provide for a smooth organisational structure and communication flow ensuring that both the planned budget and schedule are met. The more a company's innovation process is well structured, the greater its capacity to launch new successful products will be.



The innovation process must be revised according to the planned strategy

However contradictory it may seem, having a well-structured innovation process does not necessarily guarantee sustainable success. Even if a company obtains good results in terms of innovation by doing things in a certain way, nothing guarantees that the same formula will work in the future. The positive experiences of the past often turn into pitfalls which make the learning process a lot more difficult as soon as the environment changes.⁵ This is why companies not only must learn how to manage the innovation process, but they must also know how to change their own sets of values, however successful these might have been in the past. This step is part of a strategic thinking process—a medium and long-term analysis of the elements that have repercussions on business, market trends, technological advances and competitors' strategies, etc.

To be innovative, a company must strive to implement a well-structured innovation process, and manage it in an efficient manner, while at the same time establishing a series of learning mechanisms intended to redesign the innovation process according to the planned strategy.

⁵ Chris Argyris, D.A. Schon, *Organizational Learning: a theory of Action Perspective*, Addison-Wesley, 1978; Joel Kurtzman, *An interview with Chris Argyris*, Harvard Deusto Business Review, Jan-Feb. 1999.



SELF-ASSESSMENT QUESTIONNAIRE

0 HOW TO GET STARTED

1 A CULTURE OF INNOVATION

2 CREATING NEW CONCEPTS

3 DEVELOPING PRODUCTS

4 REDESIGNING THE PRODUCTION PROCESSES

5 REDESIGNING THE MARKETING PROCESSES

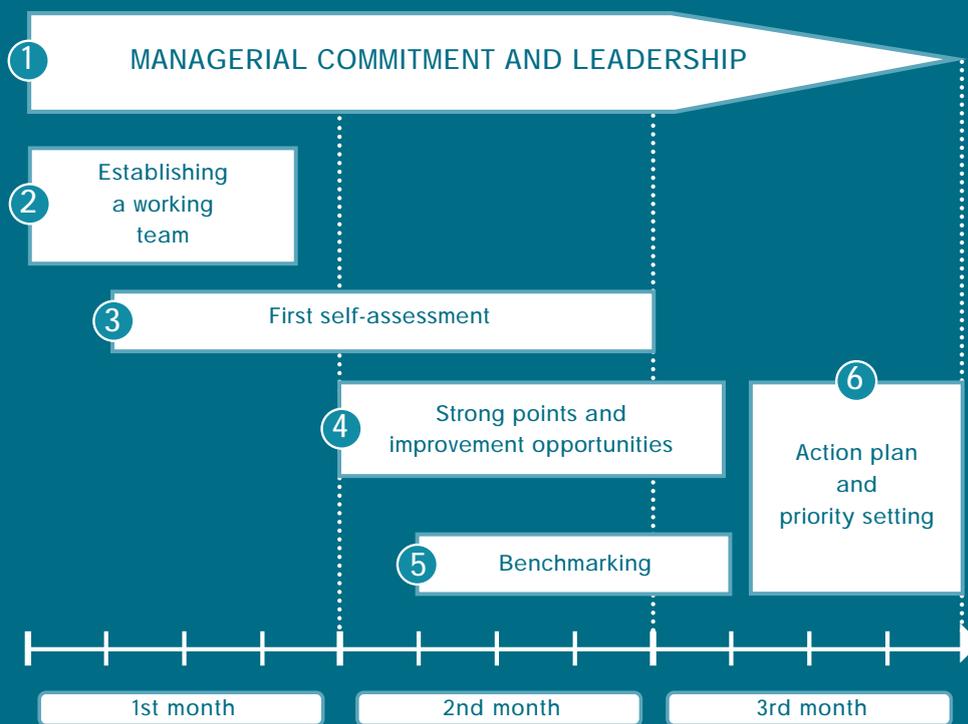
6 MANAGING KNOWLEDGE AND TECHNOLOGY



0 HOW TO GET STARTED

THE PROCESS

The self-assessment must be carried out in six main steps, as shown in the diagram below. As it might interfere with everyday work, it should not extend over more than three months, thus preventing the initial motivation from diminishing. Since it is of a circular nature, the process should be repeated on a regular basis.



1. Managerial commitment and leadership

Innovation management starts with management's belief that innovation is strategic for the company. In this sense, management should spread its message throughout the company by setting attractive objectives and by providing sufficient resources. This guide is intended to help companies initiate a joint procedure for carrying out improvement actions.

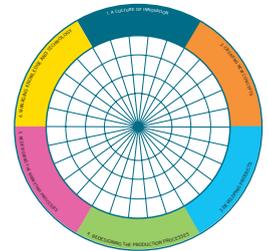
2. Establishing a working team

The team should be multidisciplinary and composed of members of staff that work in the departments related to the innovation process. A common language should be used when referring to technological innovation.

3. Initial self-assessment

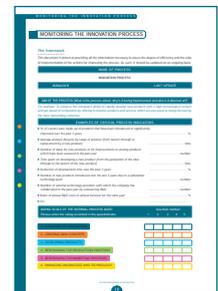


All team members must fill in a questionnaire form and discuss the differences in a group afterwards. The questionnaire is divided into six sections, each of which comprises five questions to be rated from 0 to 3. The results may be recorded on the attached graph and the questionnaire repeated later. The team can choose either to assess the process in its totality or to focus on a series of specific activities. In all cases, the questionnaire should be personalised so that it corresponds to the particular situation in which it is being applied.



4. Strong points and improvement opportunities

The team should assess the efficiency of the current process by filling out a table, using the model shown on Page 38 as an example. This document should describe the basic result indicators together with the rating obtained in the self-assessment questionnaire, as well as identifying the improvement opportunities, particularly in those key areas where the maximum rating has not been achieved.



5. Benchmarking

Before undertaking any corrective action, you should analyse what the leading companies do better and why they do it better. Companies tend to learn more from other companies, especially their competitors, than from any theoretical model.

6. Action plan

The team should reach agreement regarding the improvement areas and set its priorities. In addition, it should determine the causes of the shortcomings and attempt to identify an excellence model for each task—what actions should be carried out to achieve excellence? What indicators should be used to evaluate progress? Someone should be put in charge of each improvement action and a deadline should be set, then this information should be recorded in the table to allow for subsequent follow-up.



This guide places particular emphasis on Sections 3 and 4. However, it does not deal specifically with key aspects of the innovation process such as the strategic learning loop, nor is it concerned with other innovation-friendly activities such as leadership, human resources, tools or systems. All these elements have been summarised in the first part of the questionnaire under a single title: A culture of innovation.

1 A CULTURE OF INNOVATION

The people

Innovation is often closely connected with a company founder's vision and entrepreneurial spirit. Sometimes it is also driven by people who have a predisposition to change, the so-called "masters of change"⁶. These individuals are not always great experts, and they are not necessarily more creative than others. The truth is that they are more inclined to break free from traditional knowledge and deal with issues from a different angle. They are more persistent and defend new projects more passionately. They know how to communicate their ideas and get key players within the organisation to assist them in the process of formulating them. However, people alone cannot create a culture of innovation.

The companies which normally have a greater potential for innovation are those whose employees are open to new ideas.

The corporate culture

Successful companies know that corporate culture is an important competitive factor. Though it may be rather difficult to replace certain individuals, and relatively easy to imitate products and processes, corporate culture is unique and it persists over time - not everyone can create it. Those companies whose employees are open to new ideas and are prepared to actively take part in technological change by being creative and showing initiative usually have greater potential for innovation. However, a corporate culture does not consist of people only. It is the systems, procedures and organisational structure which lead the individuals to interact in a certain way.

The organisational structure

Those companies managing highly complex projects, in which the high content of new features requires them to take advantage of all the specialist knowledge available, have had to turn to new organisational models. One of the main differences between traditional and strategic, process-based management is how responsibility is assumed and understood. This often leads companies to abandon their horizontal structure with a fixed hierarchy, in favour of a matrix-based structure with a positional hierarchy in which the same person can be in charge of a process that extends to a number of different areas. For this reason, the innovation process manager is a key player that needs the total trust and commitment of management. In small businesses this position is held by the top director.

It is impossible to copy a culture of innovation. It must be created.

Smart Businesses

All innovative companies should grow into smart businesses, i.e. **companies which learn to learn** and know how to use their mistakes and failed projects to bounce back and keep on improving.

e x a m p l e

Soichiro HONDA, founder of the automotive company that bears his name, once said, "One can only be successful through repeated mistakes and introspection". Bill Gates, the founder of MICROSOFT, writes in his latest book⁷ that one of the cornerstones of his company's success was to learn from the array of failed projects. An example of this is the Omega database, which was withdrawn at the beginning of the 80's. In 1990 the company had to abandon the Newton project, a programme for developing a digital personal assistant, because they were unable to put together the technology required. Microsoft at Work never took off and the strategic project of creating an operating system in partnership with IBM, known as OS/2, was abandoned in 1992.

⁶ Rosabeth Moss Kanter, Chapter 5 of the book by Jane Henry and David Walker, *Managing Innovation*, Sage Publications Ltd, 1991.

⁷ Bill Gates, *Business @ the Speed of Thought*, Columna, 1999, p. 181

1. A CULTURE OF INNOVATION

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1.1 WHAT IS THE ROLE OF INNOVATION IN LONG-TERM BUSINESS PLANNING?

Management does not expect any significant changes in the industry in the coming years, and therefore it does not consider innovation to be necessary.

Management expects there to be some changes in the sector in the coming years, and is aware that these changes will have an impact on its current products and manufacturing processes. Even so, it will not take action before such changes have occurred. The resources allocated to innovation fluctuate greatly.

Management expects there to be changes in the sector and has started a strategic business-planning process in view of such changes. However, there is no direct link between this strategic vision and the resources allocated to innovation.

Management has initiated a strategic business-planning process in view of the new market trends, competitors' activities and new technologies. A series of medium and long-term objectives have arisen from this strategy, alongside resource planning of resources for innovation. A surplus is also provided for any unforeseen projects.

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1.2. DOES MANAGEMENT SHARE THE OPINION THAT INNOVATION SHOULD BE MANAGED AND NOT LEFT TO IMPROVISATION?

The company does not feel that it requires a set of methods for managing innovation. It believes that innovation arises from a flash of inspiration - it just happens.

Innovation is associated with the development of products and services designed to meet the current orders. There is a person in charge of planning, and they assign tasks according to their own criteria and the time schedule in place. Management does not allocate any specific resources to innovation.

Management is aware that innovation should be managed and not left to improvisation. Therefore it allocates resources to the technical department in charge of managing innovation with the aim of innovating both in terms of products and services, chiefly on an incremental basis. Innovation is limited to purely technological aspects.

Management has a policy of systematically managing innovation as a project-based business process, some of these projects involving drastic innovations. Innovation goes beyond the technological realm by introducing both a business and an organisational vision. Management allocates resources to funding the innovation process on an ongoing basis.

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1.3. HOW DOES MANAGEMENT INTRODUCE INNOVATION INTO THE COMPANY'S INTERNAL AND EXTERNAL COMMUNICATIONS?

The company's management does not take innovation into account or mention it in its communication with employees, customers, shareholders and suppliers. Management does not feel that it is a part of innovation. There are no signs suggestive of any propensity to innovate.

Management talks about innovation but fails to clearly communicate what it means by it. The term innovation is a buzzword that is used as yet another sales pitch. Management sees innovation as a non-critical factor.

Management is aware that innovation is a means of obtaining a competitive advantage, and it thus transmits this idea clearly to customers in the brochures and catalogues they are sent. However, internal communication does not work properly. The commitment to innovation is not expressly included in the management's statements of policy (mission, values, objectives and quality).

Management feels involved in innovation and promotes it as providing a competitive edge for the company. It communicates this vision to its employees, both through its actions and the mission and values that it sets for the company, whilst making sure that these are both understood and shared. It conveys its commitment to innovation to its customers by means of sales material, such as brochures and catalogues, etc.

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1.4 HOW DOES MANAGEMENT DEVELOP THE KNOW-HOW OF THE COMPANY ON THE BASIS OF PEOPLE'S SKILLS?

Management makes no effort to offer training to its employees, nor does it acquire external knowledge by hiring qualified staff or people with technical experience, even though there are unfulfilled needs in this area.

Management occasionally provides its employees with training actions and the possibility to participate in specific activities, including trade fairs, etc. In addition, it hires qualified staff to cover specific needs.

Management encourages in-house training but lacks a proper training plan for each job description. It values the will to learn on the part of employees and channels any initiatives in this respect. It hires qualified technical workers to further improve the knowledge base of the company.

The company has a professional development plan implemented on the basis of an internal rotation of duties. Any activity that promotes learning is encouraged, particularly team work. Qualified technical workers are hired and trained on an ongoing basis.

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1.5 HOW DOES MANAGEMENT DEAL WITH THE RISK THAT IS INHERENT TO INNOVATION?

Management gives priority to obtaining results in the short run whilst minimising risk, to the detriment of medium and long-term results. It relies on experience and doesn't accept mistakes easily.

Management accepts limited risks with medium-term results. Although mistakes are accepted, they are viewed as a highly negative event.

Management contributes to creating the required environment for medium-term innovation. Occasional creative errors are tolerated.

The company takes on high technological risks aimed at long-term results, based on a varied project portfolio. Mistakes are fully accepted as an integral part of innovation. The results of innovation are assessed and rewarded.



2 CREATING NEW CONCEPTS

Many companies still rely on the initial idea that first brought them success, the business opportunity they managed to seize before anyone else or the product that proved to be an unexpected triumph. As a rule, ideas are not produced in a conscious or systematic way; they are not seen as the result of a structured process involving all the knowledge areas of the company, such as marketing, operations, design and R&D.

The ability of a company to create new concepts and ideas depends on a set of mechanisms

Not all ideas and concepts can be introduced on the market. They must be selected according to specific criteria. As will be discussed later, this process must be linked to anticipating customers' demands or creating new demands.

Generating ideas based on the market

An extensive study of 567 innovative products⁸ came to the conclusion that most business successes are the result of a clearly defined market pull, whereas only 21% are due to technology push. A series of studies⁹ conducted over a span of 16 years identified marketing-related variables as the main company weaknesses which lead to failure when launching new products - these failings include incomplete market studies, inappropriate market timing, insufficient marketing efforts, product defects and high costs. The recommendations laid out in these studies pointed towards more market research and a greater emphasis on product positioning, together with more effective product testing, etc.

e x a m p l e

Fifteen years ago, ANTAIX, a small manufacturer of home furniture¹⁰ based in Senia, developed a new type of product at half the price. It identified an unsatisfied market segment—young couples that could not afford to buy contemporary furniture because of the expensive materials used to make it. The company combined two concepts which until then had been considered as contradictory, by associating melamine, a cheap material, with pioneering designs that had only previously been used in combination with natural wood. Thanks to this new concept it only took the company 10 years to become leader of the Spanish market.

⁸ S. Myers and D.G. Marquis, *Successful Industrial Innovations*. National Science Foundations NSF 69-17, 1969.

⁹ D.S. Hopkins, *New Product Winners and Losers*. Conference Board Report No. 773, 1980.

¹⁰ Michael Enright, Eugeni Terré, María D. Rodríguez and Eduard Ballarín, *Antmobel*, 9-795-100, Harvard Business School, 1995.

2. CREATING NEW CONCEPTS

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2.1 WHEN CREATING NEW PRODUCTS, TO WHAT DEGREE DOES THE COMPANY IDENTIFY THE PRESENT AND FUTURE NEEDS OF ITS CUSTOMERS AND EXAMINE ITS COMPETITORS' ACTIVITIES?			
New products are created on the basis of mere intuition, without studying the customers' needs or competitors' activities.	The company relies both on its experience in the sector and its regular distributor and agent network to provide it with the market information it needs (customers' needs and competitors' actions) to launch new products.	The company gets its market ideas by studying its customers' needs, and it ensures that various areas of the company are involved in the study. The company carries out systematic monitoring of both the activities and new products developed by its direct competitors.	The company has segmented its customers and it carries out a systematic monitoring programme of the most demanding and innovative ones. It analyses the use of the current products to be in a position to anticipate the future needs of its customers. It develops market exploration programmes and performs regular analyses of market trends. It studies its competitors' activities to gather new ideas for improvement.
0	1	2	3
2.2. HOW DOES THE COMPANY PROMOTE THE CONTRIBUTION OF IDEAS, INNOVATIVE THINKING AND CREATIVITY AMONG ITS EMPLOYEES?			
There are no mechanisms in place to help employees contribute ideas and suggestions for improvements. As a result very few ideas are put forward. Both the monitoring systems in place and the lack of organisational flexibility are an obstacle to creativity. The contribution of new ideas is a painstaking process.	There are mechanisms in place to facilitate the contribution of ideas and suggestions. However, the lack of response and acknowledgement often prevents employees from using them.	The company promotes the contribution of new ideas along with innovative thinking. Team meetings are held regularly for information and feedback purposes. All contributions are expressly acknowledged.	There is a series of mechanisms for rewarding creativity, the contribution of ideas and innovative thinking. Multidisciplinary teamwork is carried out on a regular basis. Brainstorming sessions are held within the context of predetermined objectives. Management provides feedback on any suggestions made. Employees contribute good ideas, many of which are eventually put into action.
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2.3. HOW DOES THE COMPANY PLAN THE CREATION OF NEW CONCEPTS?			
There is no planning control over the generation of new ideas. Management alone decides which new concepts should be developed without involving other areas of the company.	The technical department is in charge of planning the creation of new concepts. However, there is no direct input from the market. Products are not planned in terms of ranges.	The planning of new concepts is carried out through collaboration between the technical department and the company staff that are in direct contact with customers. Product life cycles are monitored. Products are planned according to ranges.	The creation of new concepts is planned according to the product life cycle. A multidisciplinary team spearheaded by management meets regularly to study all the new ideas that have been generated. Products are planned in terms of ranges and for several generations.
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2.4. HOW DOES THE COMPANY SELECT THE IDEAS AND CONCEPTS TO BE DEVELOPED?			
There are no procedures for selecting the concepts to be developed. When in doubt, management always has the final word.	New concepts are selected based on the results of a technical viability study, without considering likely profitability, or profitability criteria are used without taking technical factors into account. Management endeavours to make decisions by consensus.	The new concepts to be developed are selected according to their technical and economic viability. However, no detailed analysis is made of the likely consequences on the current production and marketing processes. The selection process is carried out on the basis of subjective and objective criteria.	A procedure is implemented for selecting concepts depending on their level of conformity with the strategy and the internal capacity of the company, as well as on their technical viability and predicted profitability. Selection is also carried out according to parameters such as quality, price, resources and time. Market studies are conducted and the challenges posed by the new concept to both the production and marketing processes are carefully examined.
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2.5. ARE THE TOOLS FOR CREATING NEW CONCEPTS USED IN A DISCERNABLE AND SUSTAINED MANNER? (For example: value analysis, TRIZ, brainstorming, product portfolio, project mapping and project funnelling, etc.)			
Tools are not used and there is no procedure in place for introducing them.	On occasion, some advanced tools are used to create new concepts.	A number of advanced tools are used on a systematic basis to create and select new concepts.	The systematic use of this type of tool makes it possible to increase the company's ability to create new concepts, select the best ideas and involve key collaborators with the aim of reducing the risk of failure. As a rule, great value is placed on the possibility of introducing new tools whilst improving those already existing.



3 DEVELOPING PRODUCTS

The development of a new product refers to a specific sequence of actions whereby a company decides to develop an original idea or concept in order to achieve a product that can be produced and marketed according to marketing requirements. This process is critical, as 70 to 80% of all costs and most of the features of the new product are determined at the beginning of the development process. It is important to note that during this phase a whole range of non-manufacturing aspects are also defined, such as the supply of components, the method of distributing the product, the way in which it must be dismantled for transportation purposes, and packaging. During the development stage, a decision is also made as to which R&D projects the company should initiate, and which of these are to be subcontracted outside the organisation and which are to be developed internally.

A critical variable: time

The time required to complete the development process is a critical variable, as it differs greatly depending on the sector. For example, it can take a pharmaceutical company which develops molecules with a view to creating new drugs up to 10 to 15 years from the moment it decides on an R&D strategy to the moment the new drug can actually be marketed, as the product must conform to health regulations and pass through all the pre-clinical and clinical stages. In stark contrast, companies from other sectors have very short development times. Indeed, in a number of sectors related to the design and fashion industry, such as knitwear, furniture design and shoemaking, where the product life cycle is lower, it takes just a few months or weeks for a new concept to be turned into a full-blown, marketable product.

Car manufacturers are engaged in a global competition to reduce development time, which now stands at 38 months. They are struggling to reconcile product differentiation based on design with cuts in costs through the use of shared elements (platforms)¹¹. To give just a rough idea, a car is composed of nearly 30,000 components, and a host of different technologies are used in the manufacturing process, such as electronics, hydraulics, IT, pneumatics and new materials, etc. Some of the improvements to the automotive industry have included introducing a matrix-based organisation with a project manager in charge of co-ordinating a number of multidisciplinary teams, whilst involving suppliers right from the initial stages of the project by means of computer-assisted co-design and design. Since then, other sectors with a less complex sequence of activities have also taken these concepts on board.

example

METALOGENIA is a foundry based in Premiá-de-Mar that has a staff of 160 and which specialises in the manufacture of steel claws mechanical diggers and construction machinery. It develops around 200 new products each year, and these must be put on the market within the shortest time possible. The company has increased its ability to develop new products by acquiring computer-assisted design tools and by establishing multidisciplinary teams involving members of staff from management, marketing, design and production. Furthermore, it uses its own methodology to monitor the results of each project. Due to these actions, and with the aid of CAD/CAM/CAE software and other software for predicting solidification defects, which allows simulation of the properties of a material prior to starting manufacture, the company has managed to cut the development time for a new product from 8 months to just 2 months.

¹¹ Michael A. Cusumano and Kentaro Nobeoka, *Beyond Lean Manufacturing*, The Free Press, 1998.

3. DEVELOPING PRODUCTS

3.1 WHAT INFORMATION IS USED BY THE COMPANY TO INITIATE THE DEVELOPMENT OF A NEW PRODUCT?

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Development is initiated without any specifications regarding the conditions to be met by the new product and without providing sufficient information concerning customers' needs.	Development is carried out based on customers' needs. Specifications regarding the conditions to be met by the new product in terms of its functions, quality, resources and business objectives are given on a partial basis only.	Development is based on a series of needs and requirements which include well-defined specifications concerning the conditions to be met by the product, such as its functions, quality, price, and the resources and development time required. The company also sets business and financial objectives. The specifications set do not undergo any significant revision throughout the course of the project.	The development process is initially based on a set of specifications to be met by the new product, and which cover areas such as the functions of the product, quality, price, the resources and development time required, and a series of business and financial objectives specified in the marketing briefing: sales, market share, predicted profitability, etc. These objectives are continually updated.

3.2. TO WHAT EXTENT DO THE DEPARTMENTS, CUSTOMERS AND SUPPLIERS TAKE PART IN THE DEVELOPMENT PROCESS FROM THE START OF THE PROJECT?

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Projects involve all of the organisational departments, which act like sealed areas. Projects are occasionally held back in a given organisational department. The company sticks with the same suppliers as always and fails to consult them during development.	The organisational departments occasionally seek advice from experts from other areas and external suppliers by means of unofficial meetings. Although there is sometimes a project leader, their powers are rather limited. The functional structure predominates.	The company has a matrix-based structure with multidisciplinary teams that are managed by a strong project leader. The product engineering department and the production system engineering department work together on the project from the start. Efforts are made to make the assembly and manufacturing processes easier. The production system engineering is developed simultaneously with the product engineering. The company seeks regular advice from external suppliers, though these only have a limited role.	A leader with full powers and responsibility is assigned to each project, along with a team of people from various functional areas (marketing, sales, design/engineering, purchasing, production and finance) who all work on a full-time basis. Suppliers are involved from the start of the project and they collaborate in various activities. Customers are also involved throughout the course of development.

3.3. DOES THE COMPANY HAVE A TIME SCHEDULE WHICH INCLUDES THE OBJECTIVES TO BE MET, THE FORECAST COSTS AND AN ONGOING MONITORING OF THE PROJECT?

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There is no procedure in place for developing products. There are no clearly defined stages or initial forecasts with regard to costs and deadlines.	There is a simple, sequential development process. Although the company draws up a very basic provisional schedule, both deadlines and costs can be monitored. Follow-up meetings are held without any predetermined plan. Mock-ups are used for evaluating concepts.	There is a series of methods in place for developing products whilst minimising costs. The development of projects is planned and monitored on an ongoing basis (in terms of deadlines and costs). Functional mock-ups and prototypes are used for testing the new features of a product. Projects don't tend to be cancelled before completion.	The company implements a thorough product development process directed at minimising time to market costs and based on a clearly defined schedule including a series of stages, a budget and a set of objectives. There is a procedure for monitoring projects. At the end of each stage, the project is reviewed. The best options are then selected. Finally, the schedule is adjusted or the project cancelled, where necessary. Tests are performed to check the durability and reliability of the new products.

3.4. TO WHAT EXTENT ARE DESIGN AND NEW TECHNOLOGIES INTRODUCED INTO THE DEVELOPMENT OF A NEW PRODUCT?

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Industrial design is regarded as a secondary element which does not deserve any special attention. Similarly, new technologies are rarely examined with a view to introducing them into the product.	Design is regarded as a differentiating factor in terms of appeal which is only incorporated in the later stages of the development process. Occasionally, the introduction of technology is also considered to add value to the product.	Design is occasionally introduced into the various stages of development of a product from a variety of different angles thanks to the contribution of non-specialist in-house and external designers. Both the marketing and the technical departments co-ordinate their work. The possibility of introducing new technologies into the product is also normally considered.	Industrial design and/or new technologies are used from the concept stage to improve the features of a product, simplify its components, ensure manufacturability or make it more attractive. The product, packaging, point of sale and graphic communication, etc., are all based on a comprehensive use of design. Design is a key differentiating factor.

3.5. ARE PRODUCT DEVELOPMENT TOOLS USED ON A LARGE-SCALE AND ONGOING BASIS? (For example: CAD/CAM/CAE, QFD, value engineering, virtual prototype, service provision map, etc.)

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The company does not use any advanced tools for product development. And neither are there any procedures in place for introducing them.	Occasionally, some departments make use of advanced tools. Staff do not work in an integrated way.	Tools are used on a systematic basis. They are maintained and new tools are introduced. Staff work in an integrated way within the company, but this is not extended to customers or suppliers.	The use of advanced tools has allowed the company to be more proactive with customers and suppliers alike. The company has an active policy of renovating tools, developing its own tools and implementing best practices when using them.



4 REDESIGNING THE PRODUCTION PROCESSES

Within the four main activities included in the innovation process, the innovation related to the key processes has been streamlined by dividing it into two groups: the production-related processes, on the one hand, and the marketing-related processes, on the other hand.

When setting out to re-engineer or redesign a process, all of its aspects should be taken into account, starting with the results of the process, its structure, the tasks involved, the technology used, the resources invested and the initial purpose. With regard to the production processes, the final aim of the redesigned process is to increase value of products and services by reducing the production costs, by improving the response time and/or by increasing the quality of the products.

The redesigning
of production processes
can lead to the creation
of new products.

Doing things differently

The act of redesigning the production processes can have such a great impact on the final characteristics of a product (price, life time, functionality, etc.) that it can effectively result in the creation of an altogether new product.

When redesigning the operational processes of a company, several steps must be followed. A team must be established which is specifically responsible for analysing the process from the angle of customer and business requirements. All the characteristics of the current process should be well understood before embarking on a brainstorming session. Similarly, prior to entering the final stage of process redesign, the applicability of the new process should be evaluated together with the results expected from such change.

e x a m p l e

In 1986 the company INDO of Hospitalet de Llobregat, which specialises in the manufacturing of corrective ophthalmic lenses, identified a market demand for higher quality products. The only way of achieving this was to replace the traditional spherical design with an aspherical type of lens which caused less image defects, such as lateral distortion or oblique astigmatism. The main difficulty lay in that the traditional manufacturing process did not allow for the development of a new design. Consequently, INDO decided to redesign the process used for cutting optical surfaces by introducing numerical control, which at the time was still new and innovative as far as the ophthalmic industry was concerned. The company thus set about creating a new concept for introducing a numerically controlled cutting machine with a mechanical precision greater than that of conventional machines, whilst readjusting the process used for polishing the new lenses. Subsequently, the company was able to launch aspherical lenses on the market. Compared to the previous type of lens, this new product had the advantage of offering improved optical properties, together with a smoother and more appealing design.

4. REDESIGNING PRODUCTION PROCESSES

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4.1 HOW DOES THE COMPANY MONITOR THE MANUFACTURING TECHNOLOGIES AND THE MODELS USED FOR MANAGING THE PRODUCTION PROCESSES?

There are no mechanisms in place for monitoring the manufacturing technologies and the organisational models implemented in the industry.

Employees are provided with specialist magazines and attend courses, conferences and trade fairs, etc., to keep up to date with the development of production technologies and organisational and management models.

Employees are provided with specialist magazines and attend courses, conferences and trade fairs, etc., on a regular basis. Periodic internal meetings are held with multidisciplinary teams to review any comments and conclusions with a view to investigating the introduction of new technologies into the production processes and looking at alternative organisational and management models.

There are benchmarking mechanisms in place to gain knowledge about the production technologies and the organisational models implemented by leading companies across the world. Periodic meetings are held to study alternative technologies and new organisational models in order to redesign the existing production processes. New processes are tested with the aim of building up experience.

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4.2. DOES THE COMPANY HAVE PLANS TO DEVOTE RESOURCES TO THE DEVELOPMENT OF NEW PRODUCTION PROCESSES?

Company planning doesn't allocate resources for the development of new production processes.

There is no strategy for developing new production processes, though the company does purchase the appropriate technologies whenever necessary, thus fomenting incremental innovation.

The production manager is responsible for improving the production processes. The company has made provisions for any unforeseen costs, which may be used occasionally to launch specific projects in this area, some of which involve drastic innovations.

There is a manager who is allocated an annual budget by the company, and is in charge of a team of both in-house and external collaborators whose mission consists of redesigning and improving the production processes; this is done in accordance with the company's strategy and a series of objectives related to the reduction of costs, the enhancement of product quality and the achievement of greater flexibility.

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4.3. DOES THE COMPANY HAVE AN OUTSOURCING STRATEGY?

The company is not sure what it should outsource and what it should not. Outsourcing is decided on the basis of insufficient capacity. There are no stable relations with suppliers.

Outsourcing is used to cut costs and transfer responsibilities. However, no assessment is made as to whether any core responsibilities are being transferred. The suppliers' potential for innovation is not valued at all.

Outsourcing is carried out in such a way as to allow the company to keep all its core responsibilities. All suppliers are selected according to an evaluation procedure which takes account of their capacity for innovation.

There is a strategy both for outsourcing and for the integration of responsibilities depending on the costs arising from each option. Core responsibilities are not outsourced. All suppliers are selected according to their skills, flexibility and capacity for innovation. The company has stable and trusting relations with its suppliers, and it actively encourages their development.

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4.4. DOES THE COMPANY PLAN TO INNOVATE BY INTEGRATING LOGISTIC ACTIVITIES?

All the activities related to the acquisition, transfer and storage of materials and products are the responsibility of each operational department and, as such, they are not co-ordinated as a whole.

The logistics of supply, production and distribution include both the material and the information flow. They are managed in a co-ordinated manner. However, they still have not been acknowledged as creating potential value.

Logistics are integrated internally, right through from supply to distribution. This brings value to customers in terms of costs and delivery times.

Logistics are based on the integration of customers and suppliers according to customers' needs. The requirements arising from the launch of innovative products are taken into consideration, such as flexibility, availability and the handling of small orders.

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4.5. ARE THE MOST APPROPRIATE TOOLS FOR DEFINING AND CONTROLLING THE PRODUCTION PROCESSES USED TO A SIGNIFICANT DEGREE AND ON AN ONGOING BASIS? (For example: FMEA, process simulation, TPM, controlled pilot experiments)

The company does not make use of any advanced tools for the purposes of production process innovation, and neither are there any mechanisms in place for introducing such tools.

On occasion, the company has implemented tools for redesigning and controlling the production processes. However, no substantial improvement has yet been registered.

The company systematically implements advanced tools for redesigning and controlling the production processes, and it has obtained good results in terms of efficiency increases.

Advanced tools for redesigning and controlling the production processes are applied right across the company, which has a proactive policy of implementing them on a regular basis. The company is active in the renovation of tools, the development of its own tools as well as the introduction of best practices when using them.



5 REDESIGNING MARKETING PROCESSES

Very often, the redesigning action extends to the processes related to marketing, thus causing a product or service to be provided in a completely different way. This turns out to be a differentiating factor for many large manufacturing companies. In some cases, the fact of taking marketing into consideration from the very start of the redesigning process has given rise to what is known as “extended products”. This term refers to products that are designed in an integrated manner, which takes in packaging, point of sale and communication strategy. In other cases, the redesigning of marketing processes has resulted in new products and businesses, such as food supermarkets, take-away chains, channel brands and the sale of books through the Internet.

Any redesigning activity that extends to marketing-related processes may create so much value for customers that a new product or service arises in the process.

examples

In order to compete with emerging nations, MANGO, a group specialised in the design of women's wear collections, decided to create its own distribution channel as a means of differentiating products instead of redesigning the production processes. In 1984 it opened its first store in Barcelona. At present, the company has 420 establishments, whether owned or franchised, in 44 countries around the world, each of which is a real vantage point from which to gauge customers' reactions day in and day out. This has not only allowed the company to gain information straight from the market, without having to turn to intermediaries, but also to design and renew its collections on a fortnightly basis. The group's investments in technology have been mainly focused on the warehouse automation and information technologies applied to logistics and order management systems, the aim being to provide a speedy response to the customer at the point of sale.

PROUS SCIENCE is a publishing house employing 65 people. In 1958 it began publishing a series of specialist magazines in Barcelona covering research and the development of new drugs. Following a study led in 1994, the marketing department identified a number of business opportunities offered by the Internet for creating new information products and services aimed at the international biomedical community. Among these new products is a daily Internet-based information service visited by 150,000 people every month, which includes access to databases with over 110,000 biological products and Internet transmission of live international congresses and surgical operations. Prous has increased its sales by 66% over the past 5 years.

5. REDESIGNING MARKETING PROCESSES

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5.1. DOES THE COMPANY IMPLEMENT OTHER COMMERCIAL PRACTICES TO CREATE NEW IDEAS FOR IMPROVING OR MODIFYING MARKETING PROCESSES?

The marketing practices of the company's competitors are not well known (distribution channels, sales logistics, handling of orders and invoicing, after-sales service), and neither is there any systematic monitoring in this area.

There is some unofficial monitoring through attendance of trade fairs and conferences, etc. Although some reports are drawn up, there are no regular in-company meetings to discuss the observations made.

The marketing practices of competitors and companies in related sectors are well known, and there is a well-documented, systematic follow-up procedure which allows for the introduction of improvements into existing practices.

The company has mechanisms in place both for gaining information and for assessing the best marketing process management practices of both its competitors and leading global sectors alike. This information enables the company to frequently review the validity of its processes.

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5.2. HOW DOES THE COMPANY MARKET A NEW PRODUCT?

The method of distributing and selling a new product is not taken into account during the stage of conceptualisation, development and manufacturing processes. The usual distribution and communication channels are not reassessed.

From the inception of the conceptualisation stage, it is assumed that the current distribution and sales processes will also be applicable to the new product. Only on rare occasions does the company envisage other possibilities.

Any possible modifications and changes to the usual marketing and communication processes are usually proposed from the initial stages of the development of a new product.

The creation of new concepts does not stem from any predetermined marketing process. The future distribution channel, sales method and after-sales service are outlined in detail during the development of the product, and the possibility of rethinking the whole system is always an option.

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5.3. HOW DOES THE COMPANY REDESIGN THE MARKETING PROCESSES? TO WHAT EXTENT DOES THIS HELP THE COMPANY INCREASE PRODUCT VALUE?

The company has a clear-cut product focus, and it thinks that fixed elements such as price, communication, distribution and sales cannot increase the value of products.

Although the company has a product focus, it has identified distribution and after-sales as a major area that can help differentiate its products.

The company is fully aware of the potential for innovation not only in terms of products, but also of price, communication, distribution and sales. In fact, it has already carried out a series of innovations in this area which have increased the value of its products.

The company has a broad vision of what is required for a product, including service, price, communication, distribution and sales. The changes introduced have brought about a sea change in the market, which has helped the company set itself apart. The company is constantly introducing new marketing methods and strategies to increase the value of its products.

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5.4. DOES THE COMPANY MAINTAIN CONTACT WITH ITS CUSTOMERS AFTER THE SALE?

The company does not maintain contact with its customers after the sale. Customers are not included in the development of new products, and complaints are not handled.

The company has good relations with the distribution channels, and it even has some contact with end customers. Management does everything in its power to prevent complaints from arising. If there are any complaints, it handles them on a case-by-case basis.

The marketing processes have been fully introduced into the company's quality system. As a rule, the company listens to customers' ideas. In addition, customers are encouraged to contribute proposals for creating new products and services. Even though all complaints are handled, the system is still not set up in such a way as to allow for the identification of possible improvements to the existing products.

The marketing processes have been designed to provide useful information about the market throughout the development of a new product, such as new uses and applications, customer suggestions, etc. Both the stores and the end customers are involved in the process of approving products in terms of specific objectives. The company provides a customer service hotline and it has a system in place for handling complaints that helps identify the improvements to be made to existing products.

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5.5. IS THE COMPANY AWARE OF THE MARKETING POTENTIAL OFFERED BY THE NEW INFORMATION TECHNOLOGIES?

The company is not aware of the new information and communication technologies applied to business.

The company is aware of the new information and communication technologies, but it does not carry out any extensive research since it believes that it will not give rise to any significant short-term changes with respect to the industry's marketing practices. In any case, the company just does the same as its competitors.

The company pays close attention to the development of information and communication technologies. A number of new tools are used on a systematic basis, which has helped the company increase its efficiency. As a result, management is thinking of adopting new technologies as a standard practice for all marketing processes (handling of orders and invoicing, customer complaint management and customer loyalty system, technical assistance and after-sales service).

The company has been able to set itself apart by applying information and communication technologies to marketing processes. Due to the introduction of information systems, the company is in direct contact with its stores and customers, whilst being fully responsible for logistics. This has contributed to a change in business model. The company is active in the renovation of tools and the development of its own tools, as well as in the introduction of best practices when using these.



6 MANAGING KNOWLEDGE AND TECHNOLOGY

The management of knowledge and technology is a critical area on which all four previous activities depend. Indeed, technological change is one of the key deciding factors of competitiveness, as it determines the restructuring of many sectors along with the creation of new business opportunities. It is not intended to be an objective in itself, but rather a tool for developing the company's strategy, whether in terms of costs or differentiation. From a business point of view, technology relates to the introduction of external knowledge into the central activities of the company, from logistics to manufacturing or after-sales service. We will now set out to describe the technology required to manage the innovation process.

All companies should
define their own
technology strategy.

In-company R&D and outsourcing

All companies should define their own technology strategy¹² by analysing the development of technologies that will affect new products. In the process, they should decide on the following questions:

- What type of knowledge does the company wish to develop internally? And what technology can it outsource?
- How should this knowledge be introduced? By hiring highly qualified staff; by training or retraining the existing workforce; by entering into technological joint ventures with other companies; by developing an in-company R&D department, or by outsourcing specific projects to universities, technology centres and engineering companies?

example

UT-MAI, an automotive company based in Valls which has been taken over by the multinational group LEAR CORPORATION, has an R&D centre that provides for all the European subsidiaries. MAI has developed its own technology strategy, in which more than 200 engineers are involved, with an annual R&D budget of around 11.42 million euro. Each year, it launches between 70 and 80 projects, some of which set the ground for real technological breakthroughs. MAI has decided to develop its own technology by taking advantage of the sectorial knowledge available, also known as "pockets of knowledge". The company maintains stable relations with over 40 university lecturers and 7 technology centres located across Catalonia, as well as with 15 collaborators from the rest of Spain and Europe. In 1998 the company designed 48 electrical and electronic systems for a number of customers throughout the world, and it registered 26 new patents.

¹² Michael E. Porter, *Competitive Advantage*, The Free Press, 1985, page 181.

6. MANAGING KNOWLEDGE AND TECHNOLOGY

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6.1. HOW DOES THE COMPANY IDENTIFY THE KEY TECHNOLOGIES FOR ITS BUSINESS? HOW DOES IT ASSESS THE IMPACT OF THESE TECHNOLOGIES ON FUTURE PRODUCTS?

The company believes that it does not need to have any particular form of technology monitoring system. It has not identified its key knowledge areas and competences.

Research into emerging technologies is carried out by analysing the competitors' products, together with the new products presented by industry leaders at international trade fairs. The company has identified some of its key competences.

As a standard policy, the company investigates the products and technologies of competitors and leading global companies by attending trade fairs, conferences, etc. There are some exchanges with a number of local knowledge providers (engineering companies, technology centres, universities and experts), and internal meetings are held to discuss conclusions and study the way in which they could be introduced into the organisation. Both the key knowledge areas and competences have been identified.

The company analyses its competitors' products from a technological perspective. It is up to date with the legislation in force and recent patents, and has identified the external knowledge providers. Any information obtained is used to introduce new technologies into products. Standard management policies include carrying out a technology watch and search activities. Both the key knowledge areas and competences have been identified, and they are frequently revised in order to be improved.

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6.2. DOES THE COMPANY HAVE A STRATEGIC PLAN TO INTRODUCE NEW TECHNOLOGIES INTO THE DEVELOPMENT OF NEW PRODUCTS? IS THIS BASED ON A BUDGET ALLOCATION AND AN ESTIMATE OF EXPECTED PROFITABILITY?

There is no strategic plan to introduce new technologies, nor is any fund allocation provided to that end.

There is no technology plan. Attempts are made to identify the necessary technology and raise the funds required for achieving it on a project-by-project basis.

There is a technology plan but it is not implemented due to the burden of everyday tasks. However, efforts are made so that all new products are provided with the latest technology. In all cases, an estimate is made of the resources necessary to finance the R&D included in the project.

There is a medium or long-term technology plan in line with future market demands and with the company's strategy. The company allocates a budget to the R&D and/or technology development manager. The progress of the plan is measured on a regular basis and any necessary changes are carried out accordingly.

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6.3. IS THERE A PROCEDURE IN PLACE FOR DECIDING WHAT SHOULD BE DEALT WITH INTERNALLY AND WHAT SHOULD BE OUTSOURCED?

As yet, the company has not carried out any R&D, whether in house or externally. There is no knowledge of the government schemes to support R&D.

Although the company is a member of technology associations in the sector, all its R&D is dealt with internally. It only outsources specific projects with little added value. Management is aware of the government schemes to support R&D, but the red tape involved is seen as a hindrance.

For any significant R&D project, an assessment is made as to whether it should be carried out internally or outsourced according to economic and strategic suitability. The company has established contacts with technology centres, universities and engineering companies, and it actively participates in government schemes to support R&D. It also takes advantage of R&D tax incentives in relation to corporation tax.

The company has clearly defined the strategic knowledge areas and technology that should be developed internally. It has a well-structured R&D department, based on highly qualified personnel and on the appropriate facilities for the execution of projects and the administration of R&D outsourcing. The company takes maximum advantage of all government schemes to support R&D along with tax incentives, as it has allocated resources for the systematic monitoring of any developments in this respect.

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6.4. DOES THE COMPANY MANAGE KNOWLEDGE APPROPRIATELY?

There is a widespread belief that knowledge is a non-transferable asset which belongs to the individual holding it. The advantages that could be gained by sharing knowledge are not perceived.

The only corporate knowledge available consists of documents about the quality system and a number of different projects. There is no standardised activity oriented towards identifying and introducing new knowledge.

The company conducts a number of activities geared towards the capture, structuring and dissemination of knowledge within the organisation. The company endeavours to keep the knowledge updated, but there are problems in terms of staff participation.

The company has the mechanisms and tools necessary to identify, structure and absorb new knowledge. A corporate knowledge base has been created which can be easily accessed by all members of staff, and which is regularly updated and supplemented. Differential knowledge is acknowledged as a competitive advantage.

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6.5. DOES THE COMPANY MANAGE ITS INTELLECTUAL PROPERTY ASSETS (PATENTS, COPYRIGHT, TRADEMARKS, INDUSTRIAL SECRETS AND KNOW-HOW)?

The company has no policy regarding this type of asset, and it is unaware of the mechanisms that exist to protect it.

The company is aware of certain protection mechanisms, but it still has not listed or valued its intellectual property assets. As a result, only in a few cases has it undertaken protective actions.

The company has a good knowledge of its intellectual property assets and of the mechanisms that exist to protect them. However, there is no procedure for deciding whether to protect assets or not. Intellectual assets are only protected when there is a clear case for it.

All intellectual property assets have been listed and valued. There is a procedure for deciding on the need for legal protection, and there is a system for allocating the necessary resources to achieve this.



MEASURING INNOVATION

The final aim of innovation management is to enhance the company's competitive edge. Increased competitiveness not only means achieving profitability levels that are higher than average in the segment in which the company operates, but also maintaining them over time. This is usually preceded by an increase in sales and the company's market share in consumer segments associated with demanding customers. Likewise, the company's image as a leader in the sector is enhanced. Of course, such results are only made possible when all basic management areas are given full attention, such as strategic planning, quality/productivity, financing and globalisation.

The following information must be provided within the FINAL INDICATORS of the innovation process:

- ▶ Current rate of sales of products that have been introduced in the previous 3 years (or 5 years).
- ▶ Gross profit on sales of new products compared to gross profit on mature products.

INNOVATION AND COMPETITIVENESS

The correlation between innovation and competitive edge has been revealed in a study led by the Department of Industry, Trade and Tourism of the Generalitat de Catalunya¹³ on gazelle companies (the most rapidly expanding companies in Catalonia). The study set out to analyse the competitive strengths of 254 Catalan companies with similar characteristics, namely, with a turnover of more than 400 million pesetas and a very high growth rate (turnover increase of at least 50% over the past three years), coupled with good profitability levels (the relation of net profits to own funds was greater than 8%, 7% and 6% over the course of the last three years, respectively). A critical indicator for assessing the capacity for innovation of gazelle companies is the amount of new products that have been introduced on the market over the last 5 years, compared to the total sales figure.

CATALAN GAZELLE COMPANIES: NEW PRODUCTS IN 1998 (IN %)

SECTOR	% OF SALES
Food products	20
Textile, leather and clothing	40
Paper, publishing and graphic arts	41
Chemicals	41
Rubber and plastics	37
Metallurgical industry and metal products	17
Machinery and equipment	39
Electrical, electronic and IT equipment	46
Transport equipment	39
Other	40
TOTAL	35

¹³ Joan Miquel Hernández, Oriol Amat, Jordi Fontrodona and Isabel Fontana, *Les empreses gasela a Catalunya*, Papers d'economia industrial, Departament de Indústria, Comerç i Turisme, Generalitat de Catalunya, 1999.

The following elements are used as INTERMEDIATE INDICATORS for assessing the efficiency of the innovation process:

CREATING NEW CONCEPTS

- ▶ Number of ideas for new products and for the improvement of existing products which have been evaluated in the past year (compared with the previous year).
- ▶ Number of concepts that were not part of any plan and were contributed by employees, by the R&D department and by suppliers or customers.
- ▶ The time frame used in the strategic planning of new products (number of years).
- ▶ The average lifecycle of the different ranges of products available.
- ▶ Number of project managers trained in creativity techniques.

DEVELOPING PRODUCTS

- ▶ Development time: reduction of the time required from conception of the idea through to the launch of the product over the past 3 years (in percentage terms).
- ▶ Development time according to the different stages: conceptualisation, design, prototype, etc.
- ▶ Budget changes due to project achievements.
- ▶ Number of redesigned projects.
- ▶ Number of designers/engineers who have access to CAD units (either in-company or externally).
- ▶ Number of products listed in the CAD database.
- ▶ Number of employees who have worked in other departments, such as marketing, finance, etc.

REDESIGNING THE PRODUCTION AND MARKETING PROCESSES

- ▶ Number of new products and improvements made to products that have been introduced in the past year following the redesign of key processes (compared with the previous year).
- ▶ Number of new processes and improvements implemented in the past year.
- ▶ Time required for implementing the improvement from the identification of the intervention required through to the resumption of the modified process.
- ▶ Changes to the budget in order to allocate funds to the redesigning of processes.
- ▶ Number of suggestions for improvements made by employees, suppliers and/or customers.
- ▶ Number of technicians trained in computer-integrated manufacturing systems (CIM).

MANAGING KNOWLEDGE AND TECHNOLOGY

- ▶ Number of new products introduced in the past year due to a substantial technology push (compared to the figures for previous years).
- ▶ Number of external knowledge and technology providers that have been identified and registered, ranging from engineering companies to technology centres or university lecturers.
- ▶ Number of external technology providers with which the company has collaborated in the course of the last year.
- ▶ Number of R&D projects that have been partly outsourced.
- ▶ Ratio of R&D costs to annual turnover (separating internal costs from external costs).
- ▶ Number of people employed in the R&D department compared to the total workforce.
- ▶ Cost-benefit analysis of the R&D budget: sales derived from R&D expenditure.
- ▶ Number of patents and utility models developed over the past 3 years.

OUTSOURCING R&D

An important finding of the study is that, on average, Catalan gazelle companies outsource one fourth of their R&D activities. Even so, great variations can be found depending on the sector. Whereas food product manufacturers outsource almost no R&D at all, companies in the electrical, electronic and IT equipment industry outsource more than 60% of their R&D.

R&D EXPENDITURE OF CATALAN GAZELLE COMPANIES IN 1998

SECTOR	IN-HOUSE % OF SALES	EXTERNAL % OF SALES	TOTAL % OF SALES
Food products	1.96	0.06	2.02
Textile, leather and clothing	1.71	0.28	1.99
Paper, publishing and graphic arts	0.30	0.35	0.65
Chemicals	3.56	1.16	4.72
Rubber and plastics	1.31	0.20	1.51
Metallurgical industry and metal products	0.76	0.15	0.91
Machinery and equipment	2.30	0.87	3.17
Electrical, electronic and IT equipment	1.49	2.71	4.20
Transport equipment	2.24	0.74	2.98
Other	2.95	0.40	3.35
TOTAL	1.80	0.64	2.44

This finding is also highlighted in a report commissioned by the Federation of German Industry¹⁴, in which 1,900 companies were surveyed in 17 countries. The study revealed that the most innovative companies outsourced more of their R&D to technology centres and universities than the least innovative ones did. According to the study, 25% of the most innovative companies outsource their R&D, but this figure drops to 11% in the case of less innovative companies. In addition, successful organisations co-operate more with their suppliers in the development of new products than other less successful companies.

¹⁴ Bunderverband der Deutschen Industrie, e.V., *Worldwide Study on Innovation Management*, Droegge & Comp. AG.

IN-COMPANY R&D

Almost 50% of all Catalan gazelle companies have a formal R&D department. The personnel assigned to full-time R&D activities averages 3.1 employees per company, which represents 3.2% of the total workforce; this indicates that most gazelle companies are SMEs. 80% of the staff assigned to R&D have higher education qualifications.

R&D DEPARTMENTS IN CATALAN GAZELLE COMPANIES

SECTOR	DOES THE COMPANY HAVE AN R&D DEPARTMENT? % YES	NUMBER OF R&D PERSONNEL % OF WORKFORCE
Food products	43	1.2
Textile, leather and clothing	53	3.0
Paper, publishing and graphic arts	10	0.2
Chemicals	75	8.5
Rubber and plastics	39	2.4
Metallurgical industry and metal products	33	1.3
Machinery and equipment	63	5.2
Electrical, electronic and IT equipment	60	4.3
Transport equipment	60	1.9
Other	50	1.6
TOTAL	49	3.2

This guide does not provide any quantitative or qualitative criteria for establishing the optimal values for the indicators. As mentioned above, these values may vary greatly depending on the company's strategy (costs v. differentiation), the sector in which it operates, the position it occupies in the chain of production (supplier of raw materials, supplier of components and systems, manufacturer, distributor, etc.) and in the environment in which it competes (number of competitors and centres of excellence, level of qualification of the workforce, venture capital availability, etc.).

This complexity is made apparent in the following table, which attempts to list a number of activities according to a series of determinants of innovation. Even though all companies should allocate resources towards maintaining a well-balanced innovation process, it is clear that some areas are given more priority than others depending on the type of innovation project involved in each case.

DETERMINANTS OF INNOVATION ACCORDING TO THE TYPE OF PROJECT

TYPE OF ACTIVITY

TYPE OF PRODUCT

TYPE OF COMPONENT

- ▶ AUDIOVISUAL
- ▶ PUBLISHING
- ▶ DESIGNER GOODS
- ▶ ...

- ▶ CD-ROM
- ▶ Novels
- ▶ Furniture, shoe wear
- ▶ ...

- ▶ Ideas and configuration
- ▶ Content creators
- ▶ Providers of format and style

- ▶ CAR MANUFACTURERS
- ▶ FIRST-TIER SUPPLIERS
- ▶ CONSUMER ELECTRONICS
- ▶ MACHINERY MANUFACTURERS
- ▶ ...

- ▶ Cars
- ▶ Car doors
- ▶ Large format printer
- ▶ Welding machine

- ▶ Integration of numerous components combined in different systems and technologies

- ▶ FOOD INDUSTRY
- ▶ INDUSTRIAL GOODS
- ▶ SECOND-TIER SUPPLIERS
- ▶ ...

- ▶ Cold meat
- ▶ Metal fastening devices
- ▶ Safety tape
- ▶ ...

- ▶ Live raw materials
- ▶ Very few components of poor quality
- ▶ Commodities

- ▶ FOOD OUTLETS AND SERVICES
- ▶ FASHION DESIGN
- ▶ E-BUSINESS
- ▶ ...

- ▶ Fast food delivered to door
- ▶ Women's wear
- ▶ Sale of books through the Internet
- ▶ ...

- ▶ Numerous components and services from other companies

- ▶ MEDICINES
- ▶ PRIMARY PRODUCTS
- ▶ STANDARD COMPONENTS
- ▶ UNIVERSITY SPIN-OFFS
- ▶ ...

- ▶ Penicillin
- ▶ Nylon
- ▶ Micro-processors
- ▶ Fractal antennas
- ▶ ...

- ▶ Very few standard components
- ▶ Commodities

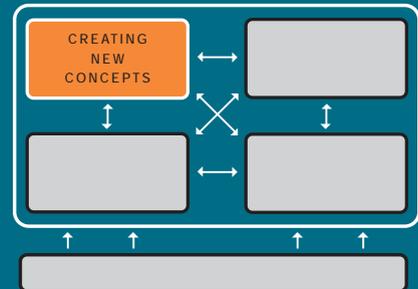
DEVELOPMENT TIME

LIFE CYCLE OF THE PRODUCT

DETERMINANTS OF INNOVATION

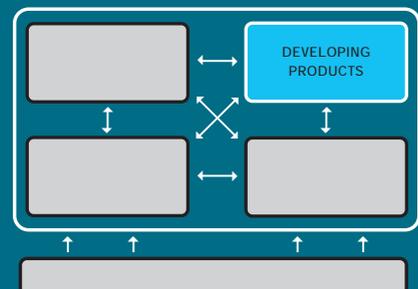
- ▶ 6 months
- ▶ 2 years

- ▶ 6 months - 1 year



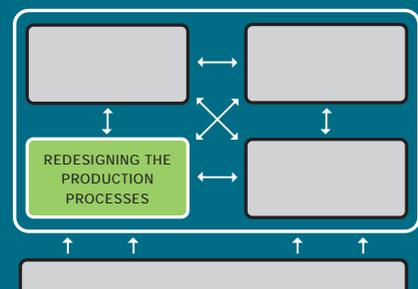
- ▶ 2 - 4 years

- ▶ 2 - 5 years



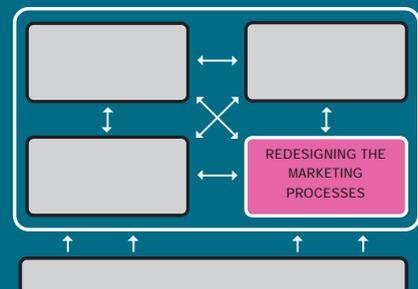
- ▶ 1 year

- ▶ 5 - 7 years



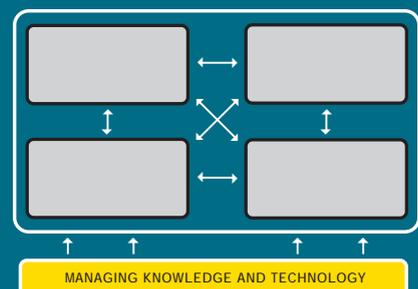
- ▶ 3 - 6 months

- ▶ 3 - 6 months



- ▶ 5 - 15 years

- ▶ 15 - 30 years
- ▶ According to the term of the patent



MONITORING THE INNOVATION PROCESS

The framework

This document is aimed at providing all the information necessary to assess the degree of efficiency and the state of implementation of the actions for improving the process. As such, it should be updated on an ongoing basis.

NAME OF PROCESS

INNOVATION PROCESS

MANAGER **LAST UPDATE**

AIM OF THE PROCESS (What is the process about, why is it being implemented and who is it directed at?)

For example: To enhance the company's ability to rapidly develop new products with a high technological content and get ahead of competitors by offering innovative products and services which are perceived as being the best by the most demanding customers.

EXAMPLES OF CRITICAL PROCESS INDICATORS

- ▶ % of current sales made up of products that have been introduced or significantly improved over the past 3 years %
- ▶ Average product lifecycle by range of product (from launch through to replacement by a new product) time
- ▶ Number of ideas for new products or for improvements to existing products which have been assessed in the past year number
- ▶ Time spent on developing a new product (from the generation of the idea through to the launch of the new product) time
- ▶ Reduction of development time over the past 3 years %
- ▶ Number of new products introduced over the last 3 years due to a substantial technology push number
- ▶ Number of external technology providers with which the company has collaborated in the past year by outsourcing R&D number
- ▶ Ratio of annual R&D costs to annual turnover for the same year %
- ▶ Etc.

RATING SCALE OF THE INTERNAL PROCESS AUDIT Question number:

Please enter the rating recorded in the questionnaire 1 2 3 4 5

1. A CULTURE OF INNOVATION	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
2. CREATING NEW CONCEPTS	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
3. DEVELOPING PRODUCTS	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
4. REDESIGNING THE PRODUCTION PROCESSES	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
5. REDESIGNING THE MARKETING PROCESSES	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
6. MANAGING KNOWLEDGE AND TECHNOLOGY	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

EXTERNAL FACTORS THAT IMPACT ON THE PROCESS (circumstances that are unrelated to the innovation process and which either help or prevent the aim of the process from being achieved)

INCENTIVES (factors that are beyond the scope of the process, but are nonetheless helpful)	OBSTACLES (factors that are beyond the scope of the process and are detrimental to it)
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Tax deductions on R&D costs.

There are no local R&D technology centres which can handle subcontracted differential projects in the field of ...

There are a number of local high-tech suppliers which can collaborate on large projects in the field of ...

INTERNAL FACTORS THAT IMPACT ON THE PROCESS (any internal circumstances which either help or prevent the aim of the process from being achieved, and which can be altered by the company)

STRONG POINTS (any strong points that have developed through the innovation process)	IMPROVEMENT OPPORTUNITIES (the internal weaknesses that the process must overcome and the opportunities to be fostered)
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Well-structured information systems which make it possible to work as a team and carry out various other tasks throughout the development of a new product...

More information is needed about future customer needs when initiating the conceptualisation stage of a new product...

The R&D department should be sufficiently consolidated to launch advanced technology projects...

ACTIONS V. OBSTACLES AND OPPORTUNITIES	Manager	Completion date	State*
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Identifying R&D centres and engineering companies so as to outsource projects with a high value in... for ...

Increasing the internal R&D capacity by means of for.....

Carrying out a marketing action to identify the market segment with the most innovative customers and subsequently introduce them into the initial stages of development of a new product... with the aim of....

* State: Pending / Scheduled / In progress / Cancelled / Completed