

**An Innovation Management System to Create
Growth in Mature Industrial Technology Firms**

by

Joan Badrinas, Joaquim Vilà

reprinted from

**International Journal of
Innovation Science**

Volume 7 · Number 4 · December 2015

Multi-Science Publishing

1757-2223

An Innovation Management System to Create Growth in Mature Industrial Technology Firms

Joan Badrinas¹, Joaquim Vilà²

¹Universitat Politècnica de Catalunya, Department Business Administration, Barcelona, Spain

²IESE Business School, Barcelona, Spain

joan.badrinas@blua-innova.com, jvila@iese.edu

ABSTRACT

In business terms, the ultimate purpose of innovation is to generate profitable growth. However, in mature industrial technology segments, endeavours of innovation often result merely in the maintenance of market share and rarely in net lasting growth. Expectations from the market for radical changes are unusual, and firms tend to focus on short term exploitation activities. In this environment, the creation of significant innovations with value that cannot be rapidly contested by competitors is a major challenge. Based on the analysis of innovation management systems of six European companies operating in mature technology segments, this paper presents a framework based on multi-case study research that links key components of the innovation system to growth performance. The analysis of innovation drivers is structured with constituent factors of culture, leadership, resources, and processes. The article concludes with a proposal of an innovation system construct that has shown to be effective to guide the best companies to break through the exploitation glass ceiling and create new uncontested growth streams.

1. INTRODUCTION: MATURE INDUSTRIAL ECONOMY VERSUS FAST MOVING MARKETS AND NEW ECONOMY

The subject of innovation drivers has been studied by numerous scholars, with different approaches and lenses. Predominantly new economy, high-tech segments, and fast moving markets have received more attention than mature industrial segments.

Firms in mature industrial segments operate in a market environment with quite different conditions than firms in fast moving markets or the new economy. Contrast, for instance, companies operating in manufacturing industries such as buildings and construction, elastomeric goods, or automobiles with companies operating in fast moving markets such as online retailers, consumer electronic goods, communications, or social media. The market conditions in each group force executives to have different sets of priorities in their management agendas, and therefore innovation management priorities are also different. This article sheds some light on the interrelationship of aspects related to innovation management that is key for growth and success in mature industrial businesses.

We start with a brief review of the differences between these two business environments (see Table 1). Industrial firms in mature technologies typically operate in low-growth and well-known established markets, with a value chain having strong interdependencies. The automobile industry is a typical example, where car manufacturers, together with a multi-tier supplier network, have developed progressively over about a century. A broad spectrum of alliances and agreements shape a well-known and relatively stable automotive industrial business. In Western economies, car sales are stagnant, and global market growth is moderate. Yet, for incumbents, the market to defend is big, heading to one hundred million vehicles per year. The paper industry is another typical example of a mature market, with established firms and a strong network of relationships along value chains. Here also there is no growth potential in Western economies and overall global growth is moderate, with general use and newspaper consumption in decline as a consequence of advances in tablets and new electronic information technologies.

New economy companies in fast-moving markets see higher growth potential, where the environment is more turbulent, changes in the market occur much faster, and disruptive technologies create fresh opportunities, new consumer trends, and new market needs at a rapid pace. For instance, in consumer electronics, high quality MEMS (micro-electro-mechanical system) microphones used to

cancel ambient sounds, which is critical for voice recognition and command systems, have generated in four years a new business exceeding \$1 billion^{1*}, with yearly compound growth rates up to 50 percent since 2010. This new technology has made irrelevant the manufacturing of old technology microphones. Such strong growing markets generate attractive opportunities where new players, short term strategic moves, and novel commercial schemes impose totally new mindsets – all of which creates a highly dynamic business landscape.

Table 1. Differences in business environments affecting innovation

Mature Industrial technology	Fast-moving and new economy
Established markets, known players, intertwined dependencies	New markets, rapidly changing environment, start-ups
Low growth or stagnant markets in Western economies, often declining	Big growth opportunities, fast growing, yet short cycled product markets
Technology improvements are incremental, cycles between disruptive technologies are long and transitions tend to be smooth	Technology changes rapidly and in big steps, disruption risk management is a key executive activity
Historical regional differences and regional customer relationships hinder growth opportunities	Regional barriers are small or inexistent; there is no legacy history; in many fields, like the new internet economy, markets are open, with no borders
Operational excellence and the ability to manage a balanced price-cost relationship is a must to remain competitive	Dynamic capabilities to adapt to a rapidly changing environment are key to staying in business

In mature industrial segments, technology progresses at a slow pace, with only incremental improvements over long periods of time. In the absence of disruptions with the strength to question and shake the dominant design [1,2], companies enter into long periods of complacency or stagnation, with frequent design changes until a new dominant design emerges and sets a new industrial regime. Even in that case, the transition between dominant designs is slow and smooth. For instance, nobody questions that the automobile is moving towards plug-in hybrids and electrical cars, but a dominant design around plug-in stations, recharge options, battery range versus cost, has not yet been resolved since the introduction of hybrid cars in 1997. Despite the fact that the development of electrical cars started in the 1990s, more than two decades later, the global production of plug-in hybrids and electrical cars account for less than .5 percent of total global light vehicle production. Mature established industrial technologies tend to entail equally great inertia, making the transformation of businesses progressive and lengthy, thus protecting the business from exploitation by abrupt disruptive changes.

In mature markets, regional differences tend to be significant, with roots in a long legacy predating globalization. As a result, in the automotive market, car preferences are still significantly different in America, Europe, and Japan. It is simply the consequence of cross-cultural differences. In new economy and fast moving markets, regional differences are much smaller; there is no legacy to respect. Consider smart phones, tablets, personal computers, or consumer electronics goods. Products are basically equal in all regions, with the sole exception of the electrical plug and voltage, which are, of course, tied to a mature technology. Regional differences in mature technologies are an additional burden when it comes to generating growth from new products.

In fast moving markets and the new economy, technology disruptions and frequent market changes are inherent in the business landscape. The status quo does not hold for long, and executives, attentive to the market, feel the need to be constantly open to changes. To perform and survive, firms in this context require flexible processes to continuously adapt to rapid change. Dynamic capabilities [3] become part of business-as-usual activities. The market sets the pace.

In mature industrial markets, the executive's priorities have a different focus: the defense of the competitive position and status quo in a market that will not radically change in the short term. Whilst prices are under pressure and there is a constant risk of falling into a commoditization spiral, these threats can be counteracted with strong focus on operational excellence, cost reductions, and a continuous flow of incremental innovation. That's all that markets and stakeholders require.

In summary, industrial market environments lead industrial companies to be naturally focused on defending the status quo. To deliver yearly results, strategic actions are more focused on strengthening core competences, maintaining or improving product portfolio competitiveness through incremental

* Source IHS, 2014¹⁾

innovation, and reducing costs, than on creating new competences. In other words, in most cases, operational excellence will lead, in the short term, to satisfactory financial results. If the market is stable, there are no clearly compelling reasons to undertake drastic moves. Radical changes involve high risk and commitments with uncertain pay-offs. Why then embark on major changes? Still, the achievement of profitable growth is the single most influential factor in creating value. This stands permanently as one of the highest ranked priorities of most executives. Yet it remains a challenging target in established firms operating in mature markets.

2. GROWTH STREAMS BEYOND EXPLOITATION

The majority of industrial firms in mature markets, despite offering a continuous flow of incremental innovations to their clients, barely generate organic growth. They just defend their market share against competitive forces. In stagnant markets, growth can only be achieved through market share gain or entry into new markets. In both cases, other players will have to lose ground. Even though marginal growth is possible, if the gained competitive advantage is based on incremental innovation, it will not be long before competitors catch up, or pricing tradeoffs offset the relative advantage. Incremental innovation rarely generates sustainable growth.

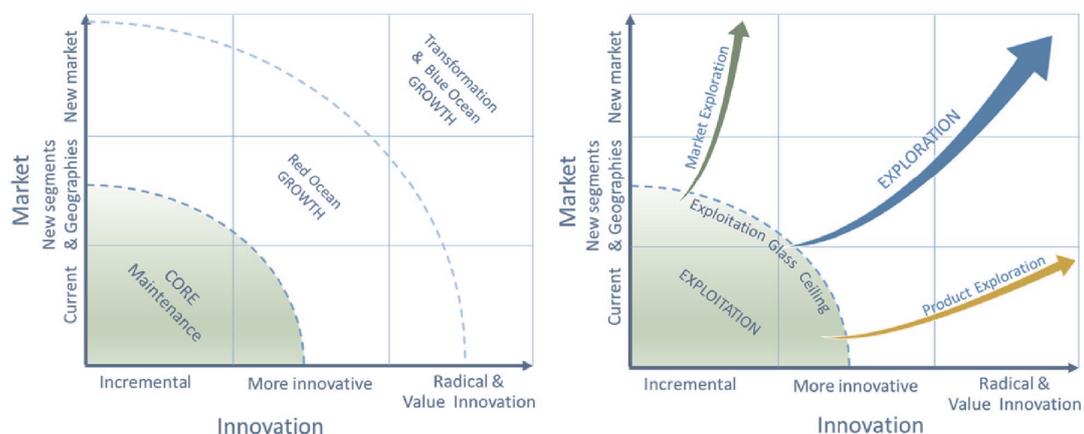


Figure 1. Innovation – Market matrix: Growth Streams

The matrix in Fig. 1, adapted from Tushman et al [2], shows the spatial targets and directional options to create growth along two dimensions: innovation and market. The innovation types on the innovation axis are the generally accepted categories used in the literature. The term “more innovative” has been taken from the PDMA CPAS study [4], which comprises architectural [5] and generational innovation [6]. “Value innovation” relates to innovation involving a drastic review of the company’s value proposition canvas, which can lead to the creation of an uncontested “blue ocean” space [7]. The measure of the innovation axis, besides the innovation type, can be seen in terms of price/performance [6]. Innovation types on the right of the scale involve higher risk and, therefore, a more favorable price/performance relationship.

Most industrial companies in mature markets are mainly focused on maintaining their core business, remaining inside the exploitation space. They are primarily concerned with launching incremental innovations in their current markets, and only occasionally do they develop more innovative products or enter in new market segments or geographies. Yet, competitors carry out very similar kinds of activities and, therefore, very often, all innovation efforts result only in maintaining market share and not generating net growth. To grow, it is necessary to undertake more innovative or radical innovations, to implement a new value proposition canvas, or enter into new markets. These movements cannot be easily replicated by competitors. The more radical the innovation, the higher the associated risk, but also the more distance from competitive “red oceans” will be generated. The upper right corner of the matrix involves a real transformation, aiming at introducing totally new products in a new market; a truly challenging task in terms of management demands and risk.

As reported by Cooper [8,9], a comparative analysis of development projects launched by industrial firms between mid-1990s and the early 2000s, shows a dramatic reduction of “new-to-world, new-to-market innovations” (20.4 percent down to 11.5 percent) in favor of “improvements and modifications

to existing company products” (20.4 percent up to 36.7 percent). The wish or ability to launch radically innovative products in mature markets seems to have slowed down over recent years. Is the trend driven by the firm’s stakeholders requiring more exploitative low-risk and short term projects, in prejudice of uncertain more long term radical innovation projects? The answer to this question is illusive.

Growth can be generated along distinctive streams: product leadership, market exploration, or a combination of both. Product leadership is primarily focused on product innovation, driving a new business model with the introduction of new architectures, technologies and/or new business concepts to generate and lead change in the currently served markets. It aims at developing and applying the potential of an internally generated technology, process, or design to well-known markets, with the objective of becoming the uncontested leader and expanding the gap with competitors. Market exploration is focused on new market development. It aims at directing core competences to adapt products to satisfy the needs of customers in adjacent and especially in new markets. While technical competences will go through relatively minor changes, new marketing approaches will be necessary. Despite mastering the technology, entering a new market poses new challenges in terms of management, commercial assets, and risk.

The combination of both will set a balanced exploration path, focused on developing product-business model innovation with the objective of serving new markets. This compounds and magnifies the difficulties, complexities, and risks of both paths in isolation.

3. RESEARCH QUESTION: BREAKING THROUGH THE EXPLOITATION GLASS CEILING

Mature technology firms appear to be hostage to their exploitation-intensive activities, trapped under an exploitation glass ceiling. To break through it and generate profitable growth is a true management challenge. This entails gaining trust and confidence in navigating unknown waters; energizing the organization to move out of the comfort zone; and driving progress to finally deliver positive growth results. As discussed in Sect. 1, in mature markets, there are few if any incentives to move away from the exploitation regime. Even in the event of a huge storm coming in, the management team’s assessment of risks and unknowns surpasses the uncertain payoffs [10]. The exploitation glass ceiling keeps firms away from growth. The thrust to free itself from the exploitation glass ceiling has to be built from inside out.

Several scholars have studied the exploitation-exploration tradeoff, following the seminal contribution of March [11]. Tushman and O’Reilly [12] argue the benefits of the ambidextrous organization. They suggest an organizational split of responsibilities between exploitation and exploration. Exploration activities are protected and free to focus on future business growth opportunities, while exploitation takes care of daily tasks, with a focus on short term business performance. This separation permits the company to foster exploratory activities isolated from the negative effects of the efficiency-oriented discipline that dominates exploitative settings [13]. This line of work sheds light on a critical phenomenon and helps practitioners set up organizational choices to overcome some of the pitfalls associated with innovation.

In the high-velocity computer industry and rapidly changing environments, where businesses and opportunities are constantly falling out of alignment, Eisenhardt [14] and Eisenhardt and Brown [15] have studied how rapid management decisions are keys to success. Based on the same industry type, Eisenhardt and Martin [16] defend the concept that patterns of dynamic capabilities vary according to market dynamism, and in stable industries tend to be detailed, analytic, with linear execution, and using existing knowledge. In rapidly changing environments dynamic capabilities tend to be simple, experiential, and reliant on quickly created new knowledge. Eisenhardt and Brown [17] introduce the “competing on the edge strategy” and propose choosing a balance between the ability to move quickly and the discipline of structured processes.

The “Innovation Leadership Study” by the IESE and Capgemini [18], points out the influence of innovation function, strategy, governance, and culture as key factors in innovation success. This study reveals that the absence of a well-articulated innovation strategy is by far the most important constraint for companies trying to reach their innovation targets, followed by a lack of understanding of the external environment. Its findings also suggest the effect of having implemented a formalized innovation governance on innovation results.

Cooper [9] has studied the difficulties of innovating and creating growth in mature markets. He takes the position that for bold innovation, breakthrough products is the answer, and proposes to focus on developing a proper innovation strategy, building a climate, culture, and leadership style, and following a disciplined process from idea to project launch.

Table 2. Profile of the analyzed firms. Case studies

	FMatE	ICons	EComp	EMNet	EquB	PMach
Industry sector	Forest bio-materials & Energy	Industrial Construction	Elastomeric Components	Entertainment Machines & Network Systems	Building Equipment	Process Machinery & Solutions
Yearly sales & Market	~€ 10 Billion Global	~€ 30 Million Regional	~€ 800 Million Global	~€ 100 Million Global	~€ 500 Million Global	~€ 800 Million Global
Case synthesis description	Pioneering the industry transformation	Business model transformation leading to strong market share gain	Sales & Market orientation, steady organic growth	Business turnaround through innovation	From components to systems, steady organic growth	Technology leader facing a market downturn and new paradigm
Statements: Mission, Vision, Values	The statements reflect the strong transformation and drives the organization	The statements effectively give direction to the organization and encourage creativity	The statements at company and corporate level drive the organization and promotes innovation	The statements directly express the turnaround direction	The statements drive and lead the organization and provide a generic innovation direction	Statements are well shared but not linked to an innovation strategy
Firm Innovation strategy / actions	Industry transformation pioneer. Managing excellence, sustainability, while creating new growth streams	Top management anticipated the market downturn. Implemented a structured Innovation System to transform the business model	Market orientation, targeting growth in strategic selected segments. Innovation focused to serve the growth and maintain the core	Re-focus innovation to core business, to improve operational performance, and set a new basis from which to re-start exploration	Progressive transformation, from components into systems, on the basis of a new legislation	A change of industry paradigm interrupted faster than anticipated. After a right-sizing process, the innovation direction is being re-defined
Results achieved	The newly created businesses growth streams offset mature business lines' decline	Strong market share gain, up to rank #2 from rank #6. Profitable in a severe downturn	Sales increased by 30% and operating profit doubled above 2010 base line	Performance turn-around from break-even to a 20% + EBITDA	Steady organic growth of 4% per year	Dramatic reduction of sales a consequence of the market drop. Right-sizing ongoing

The above contributions help scholars and executives understand how to better manage innovation. However the process of igniting an innovation program (putting all the pieces together) in firms in mature industrial technology segments and mobilizing people to start the innovation journey and successfully cross the exploitation line have not been sufficiently studied.

4. EMPIRICAL SETTING. HIGHLIGHTS OF THE CASE STUDIES

To increase our understanding of how mature industrial technology companies break the exploitation glass ceiling to generate growth through innovation, we performed a qualitative multiple-case study based on six European companies, headquartered in three different countries. The firms operate in different mature industrial technology sectors; five address global markets and one a regional market. In this section, some highlights of the participating companies are briefly described. A short profile of each firm is included in Table 2.

4.1 FMatE: Pioneering the industry transformation

In 2006, sensitive to the global socio-economical and industrial trends of resource scarcity and climate change, board members saw some initial drift effects on their traditional business lines. They understood that the matter was not cyclical and, if the impact remained and worsened, in the long run it would pose serious risks to the company. After in-depth discussions and analyses, the identity of the company was redefined, and a vision and strategy to pioneer a profound transformation of the industry, based on responsible sustainability, was developed. A number of new growth streams into forest bio-materials and energy have ensued, which include the development of advanced technologies and innovative product lines with their own business models, to support the entry in new markets. The process has not subtracted attention to exploitation. An adequate focus on operational excellence and incremental innovation on the mature businesses has been key to maintaining sound financial performance, providing revenue stability, and financing the transformation process. The exploration journey has started to pay off. Growth of the newly created businesses not only compensates for the decline in mature businesses, but is also the main reason behind total net growth.

4.2 ICons: A Business model transformation in anticipation of a downturn

Top management felt that the firm needed to drastically change its traditional business model in spite of the prevailing excellent results in 2007, prior to, and in anticipation of, an eventual downturn. A radically new strategy was put in place, targeted to providing the best responses to a totally different environment expected in the next eight to ten years. Yet, upfront the analysis purposely deemphasized internal weaknesses. The top management team was fully committed to building a front-end innovation process, which clearly linked strategy with creativity and innovation. A large number of collaborators were invited to participate along the distinct steps of the process. Innovation was broadly defined, including new operating processes, market approaches, organizational practices, and a new business model, in addition to new products. New working methods and competences were developed. Some personnel could not tolerate the change and decided to leave the firm. While revenues of the construction supply industry have dropped 80 percent since the crisis started and ICons' dropped, too, in the first two years, in 2015 the firm has recovered the same business volume it enjoyed seven years ago and has remained profitable every single year during all this period.

4.3 EComp: Sales & Market orientation, steady organic growth

Historically, the firm has been focused on market exploration. It has enjoyed growth on the basis of adapting its elastomeric component technology to the specific needs of related industrial markets. Strategy is updated yearly, defining new growth targets in selected industries. A sophisticated customer segmentation is in place. The CEO encourages people to look for innovation and differentiation opportunities, with strong values in pursuing the delight of key customers, not only with the best product, but also with the best solution and business set-up. People are sensitive to adding new initiatives every year. Organizational changes and process improvements are implemented to satisfy relevant customers and to accomplish growth targets. Leading change management has been a business-as-usual practice. Recently, product technology development activities have been strengthened. The aim is to add more product innovation growth streams on top of already strong market exploration activities. The results have been the entry into new markets, initial successes on product technology, and steady growth, achieved over the last decade.

4.4 EMNet: Business turnaround through innovation

A period of low innovation activity led the company to lose market share and suffer operational losses in 2006. A new CEO re-stated the mission and set a new vision, both significantly more focused than in the past. Non-core businesses were eliminated or divested. An innovation strategy with well-defined goals was introduced. People, organization, and competences were adjusted accordingly. This increased intensity and focus on the organization, and created a continuous flow of incremental innovation that was key to overcoming past exploitation issues. The firm underwent a significant turnaround and subsequently recovered a leadership position in the main markets served, achieving strong profitability within one year. The newly achieved basis of solid exploitation has provided business stability and allowed the organization to initiate steps into exploration growth. With the development of more innovative and radical innovation, the firm has been able to enter into new markets. More recently, the firm is tracking possible market shifts, getting ready to compete in this new setting and expanding its vision to explore broader and more ambitious horizons.

4.5 EquB: From components to systems

New European legislation has created new challenges in the construction of buildings. The top management responded to it, reviewing the mission and driving a progressive transformation of the company, moving from its focus from components into more complex systems to better respond to the requirements of the new regulations. The transformation of the firm is expected to take place at a slow pace due to the relatively high level of revenues related to the renovation of old buildings, which is not affected by the new legislation that only applies to new construction. The company has a long tradition of technology leadership and benefits from strong core competences in the components field. These have been recently expanded with new built-in capabilities to develop integrated systems. A first wave of low-complexity systems have been successfully introduced and consolidated in the market; and additional progress in launching more complex and innovative systems is underway. The firm has also expanded operations into new geographies. In recent years, industry revenues showed moderate growth, and the company has been able to generate organic growth slightly above market average.

4.6 PMach: Technology leader facing a market downturn and new paradigm

In the past, the company had enjoyed a dominant position in the market, with continuous strong results thanks to excellent products and process solutions drawn from a strong competence focus on technology innovation. Given its strong reputation as a company, a risk of market shift to other products and an emerging trend towards a new industry paradigm were not considered to be relevant threats. With just minor adjustments, the company planned to refocus on the markets of emerging economies to compensate for the decline in its mature traditional markets. Yet, reality was different. The new paradigm irrupted much more strongly than anticipated, and the market turned down dramatically. The historical technology leadership lost value in the market and the competitive landscape changed. As a consequence, dramatic sales losses and a painful right-sizing process ensued. Top management is reacting strongly to this, resetting its innovation direction in line with the new industry paradigm, to start growing again in the new reality. There is a feeling in the company that they face a tough challenge in their attempt to regain competitiveness to foster growth from a high cost position and the loss of precious time.

5. RESEARCH METHODOLOGY

The research methodology is based on an in-depth analysis of the factors that drive innovation in each of the selected companies, assessed from the perspective of its contribution to the creation of innovation growth streams. Data for the analysis have been obtained through 28 semi-structured interviews carried out with managers within the six companies. Also, general information on the companies, as well as on significant processes and the results of innovation growth streams were studied. Figure 2 shows the growth streams of every case in the innovation/market matrix, where circles represent a significant innovation activity. Each matrix was discussed with corresponding company executives to confirm that it fairly captured the most significant innovation efforts and achievements of the firm. The insights and information generated in these review sessions were used to evaluate the relative success in creating growth streams. Finally, publicly available data was also utilized to complete the picture.

The evaluation of the growth streams, in Fig. 2, led to a classification of successes in generating growth through innovation at three levels: "A" represents the companies with higher performance, in

terms of achieving the most successful growth initiatives and stronger results, according to executives' self-reported assessments; "B" represents an intermediate level of performance; and "C" the lowest level, with moderate to low satisfaction by the focal managers.

The analysis of innovation systems and the design of the semi-structured interviews were made following a framework of four chapters: culture, leadership, resources and competences, and processes. Each chapter was broken down into five constituent factors, shown in Table 3, and every factor was broken down into several evaluation items, leading to a total of 45 assessed items per company. The structure for this research was based on the PDMA/TIM Innovation Standard [19] with adaptations based on the innovation guidelines of IESE [20,21,22].

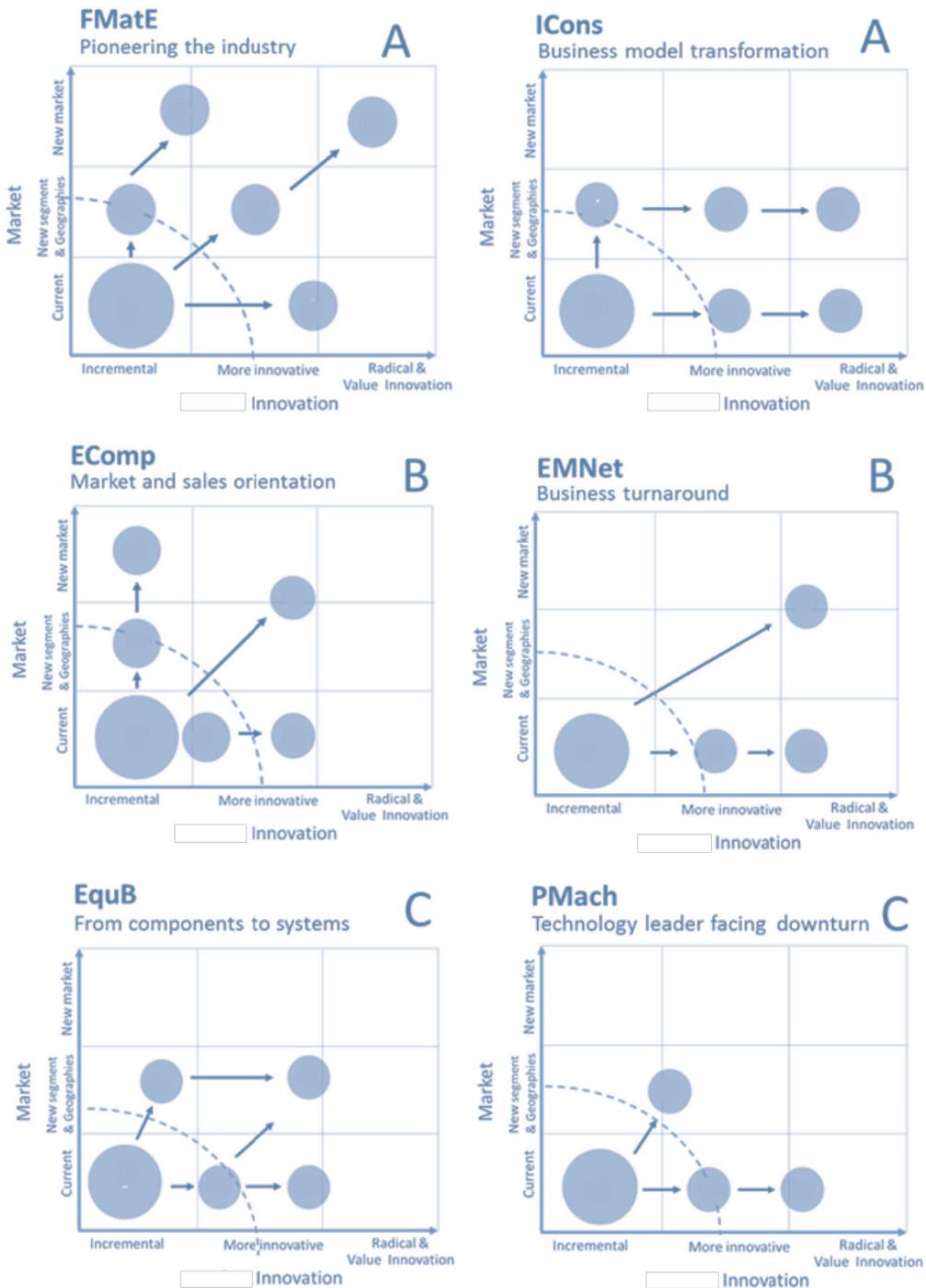


Figure 2. Innovation / Market matrices of the analyzed cases

The data obtained for every company and the cross comparison of the cases, were utilized to qualitatively identify the common themes contributing to the creation of the growth streams. In addition, a scoring system with quantitative scales was created for every evaluation item and factor. This was developed on the basis of the PDMA/TIM Innovation standard guidelines [19] and the evaluation guide proposed by IESE [23]. The score level of every evaluated item ranged from highest (equivalent to 80 points), meaning excellence in the development of the specific item and its connection with innovation-driven growth, to adequate for exploitation (rated with 40 points), meaning that practices for that particular item were in place to maintain product portfolio competitiveness, and lower than 40 if the management practice associated with the item was assessed to be insufficient to support a maintenance of the core business. The score of every factor and chapter was then calculated as the arithmetic average of the constituent evaluation items. This evaluation scheme is assessed to be very useful as a complementary analytical tool into the insights generated with the main qualitative inductive procedure.

Table 3. Structure utilized to analyze the innovation systems

Culture	Leadership	Resources, Competence	Processes
Management commitment	Strategy	People & Competences	Front-end innovation drive
Stakeholders influence	Objective deployment	Information & Know-how	Product development
Values, Mission & Vision	Management review	External & Supply chain	Research & technology
Risk practice	Communication	Infrastructure	Market research
Work environment	Recognition	Financial	Deployment, commercialization

Structure based on the PDMA – TIM Innovation Standard

In the studied companies, we found that strategy and objectives were intimately related, and subsequently these factors were treated jointly. Also, management review and communications were highly interrelated and treated as a single construct.

Once the qualitative analysis was completed, it was clear that not all the factors in Table 3, the potential constituents of an innovation system, contributed the same. Some factors were clearly reported to be associated with the success to break the exploitation glass ceiling and creating growth streams, while others were not.

The most relevant factors contributing to success in breaking the exploitation glass ceiling, along with their relative scores, are shown in Fig. 3. The comparison of the factor scores with the self-reported success of firms in creating growth streams, confirmed that the companies with the highest scores were also the ones having generated more innovation revenues and superior results outside the exploitation area. This alignment sustained for the best performers, the “A” group, the second score group, “B,” and the lower performers, “C,” which supports the selection of the significant factors on which the qualitative analysis was based.

6. FINDINGS. INSIGHTS INTO THE FACTORS THAT EXPLAIN THE SUCCESS OF INNOVATION SYSTEMS

The analysis of the multiple cases shows a predominant relevance of culture elements: management commitment, stakeholders influence, and the use of statements (which includes vision, mission and values) all stand up as highly influential. This is followed by factors in the leadership category, with outstanding roles of strategy and objectives, and management review and communications. People and competences, within resources, and the implementation of a front-end innovation drive (linked to an idea generation and selection process), within processes, both came out as highly influencing factors in the firm’s ability to break the exploitation glass ceiling and generate growth streams.

6.1 Management Commitment

Top management commitment is an outmost determinant influencing the success of innovation and new product development. There is agreement on this critical role in the literature [24,25,26], and has been corroborated by this research and other previous studies on the success factors of innovation and new product development [18]. This factor seems to be the cornerstone on which any robust innovation system is founded.



Figure 3. Comparative evaluation of the factors influencing the creation of growth streams

Commitment goes beyond support. In all the studied cases, top management was supportive of innovation and considered it to be key to company success. However, for better firms (in groups A and B), with innovations delivering growth streams, the top executive (CEO) or the executive board members acted as entrepreneurs and leaders of the innovation journey, were passionate about the vision, were personally involved in building and implementing the innovation system, and were leading the organizational changes necessary to make innovation possible. Their aim was to align and energize the teams in a new direction. Top management in firms in the C group did not sustain comparable intensity in fostering innovation. All companies in the A and B groups showed some kind of ambidexterity. This last finding confirms the proposals of Tushman and O'Reilly [12].

Innovation has to be core, neither a complement nor a privilege. The findings also show that in the best companies, top executives considered the innovation system to be an integral part of the business, as regular processes of the company, not forming a parallel avenue that is sporadically reviewed by the board or an investment area that is nice to have when profits are present. In the best companies, it is impossible to differentiate innovation relevance from the rest. The cases where the innovation system was not an important protagonist for management, results were close to the exploitation core maintenance; i.e., along industry average, and significantly more modest in the creation of new growth streams.

Timing of management innovation moves is critical. Management teams that are forward looking, ahead of the game, avoiding getting caught by market changes causing exploitation performance issues – these perform better. In most of the cases studied, timing was managed proactively, yet the conviction of the need to change differed. In one case, market changes irrupted much faster than expected, causing severe exploitation pain. On the other side, the best cases have proved to be very proactive; top management had the skills to anticipate future threats as real, and acted consequently, building the foundations to create growth streams ahead of time. The avoidance of complaisance on good results, escaping the “tyranny of success” [23], and a deep belief of the need to challenge the status quo, proved to be key elements of a robust innovation management culture.

6.2 Stakeholders influence

Firms with high success in creating growth streams were proactive in monitoring the needs and expectations of the firm's key stakeholders, used to define and review the company statements and strategy. The bigger companies conducted this activity in a more thorough and formal way, while smaller ones did it less structurally and tended to be restricted to only a few critical stakeholders. The

best practices show that active and open communication with stakeholders is important in order to gain broad support for innovation. Thus, it was associated with positive effects in the employees' trust and commitment to engage in innovation activities on time. Obviously, this was done with logical reservation on sensitive matters. In a few episodes when some firm was hermetic or hid intentions or relevant actions, support for innovation suffered and new growth streams relented.

In all cases, current customers and markets served were treated as key stakeholders. All companies balanced their exploration efforts with the need to maintain high performance in exploitation. This is coherent with the lasting importance of exploitation in mature technology industries. Thus, innovation initiatives in the companies did not just focus on exploration; they pursued as well incremental innovation, to maintain the competitiveness of their core businesses as necessary to obtain the resources to support exploratory activities.

6.3 Statements: Mission, Vision and Values

Solid established firms in mature technology tend to have a set of statements that guide their people and businesses for long periods. While this is a factor that provides stability, it can also be a corset impeding the exploration of new ways of running a business and creating new growth streams. The best companies in our sample started their journey into exploration with a critical review of its mission, vision, and identity, challenging the established order and, in some cases, even the conventional wisdom in the industry, the dominant paradigms.

Changes in statements are used as pillars of change in mindsets and attitudes. Only rarely, prevailing values were directly questioned. More often, they were recalled and used to energize the company in a newly defined direction. This suggests that rather than preaching, top management placed emphasis on making people work in different ways, aligned with the pursued type of innovation, as the most effective way to build a new set of values. Also, it confirms that company statements are not modified very often, but only when a significant change in the business is pursued. In this event, a new journey has to start with questioning the statements that define identity in the firm. Some managers felt that such a review was a must if they aspired to mobilizing people outside their comfort zones where the firm had operated for a long time. Our findings concur with Trusko [24] in that revised statements set a new frame of reference and a new scope for innovation, and create a space of consistency between the intentions of the company and the innovation projects. Management teams used them to facilitate and focus change in the company.

6.4 Strategy & Objectives

Our analysis reveals that the existence of a company strategy that supports innovation is a major determinant of innovation success. In mature technology firms, changes perceived far away on the horizon do not impose urgent decisions to make. In our better performing companies, the sense of urgency to transition towards exploration was built from inside the company. Top managers saw the need to start a transformation and managed to gain the complicity and enthusiasm of the rest. Strategy was a key tool in the hands of senior management for this purpose.

Among the studied companies, the ones with stronger exploration results furthermore had a clearly defined innovation strategy, providing the teams a business framework within which innovation was expected to take place. The purpose of it was to set priorities, translate the business targets into innovation goals, and define the boundaries in terms of markets, technology, business model, alliances, and financial constraints. The innovation strategy was a key element to guide the path of moving from the abstract to the concrete.

Excellent firms had defined, in addition, innovation pivot points. These pivot points served the purpose of making sense of innovation for people in the ranks. These consisted of innovation axis and guidelines targeting specific features, markets, segments, and product lines. The definition of the pivots was open enough to allow for free creative contributions, yet focused enough to avoid dilution of innovation efforts.

The innovation strategy and pivots had been developed through a participative process that facilitated developing a shared view of what was pursued. Thus they contributed with a double objective, a well-defined innovation strategic direction and people engagement. The engaging participative approach was understood to be as important as the outcome of process, given that the innovation strategy would be evolving over time. The process was led by top management, with broad cross-functional participation, and with open communications with selected stakeholders. The end

result was a widening of the scope of innovation and aligning the organization in favor of innovation goals. The analysis therefore confirms the findings of previous studies in the sense that the existence of an innovation strategy and its alignment with the company's general strategy has a positive effect on success [4,18,29,30].

In less well performing companies, the absence of an innovation strategy framework and pivots, and a less structured participative process, ended up with resignation and some level of frustration with top management, even though they were convinced of the value of innovation. In the best companies, management felt that innovation would not have gained traction without a sound innovation strategy and process, guided to build shared understanding, trust, and commitment of the teams on the newly defined objectives.

6.5 Management Review & Communications

We have observed earlier that top management played a key function in serving as entrepreneur and architect of the innovation framework (the management commitment factor in the culture chapter). In the leadership chapter, management review looks at top management involvement in more operational innovation activities. These include its interactions and engagement with the teams [25], facilitating resources, helping to unlock decisions, and addressing any cultural conflict that might interfere in the execution of innovation projects. Also included in the construct is its ability to communicate strategic goals and objectives, and to facilitate cross and up and down communication. Top managers in the best companies delegated operative authority, yet keeping a leadership responsibility. Their role was exercised at every opportunity, making the vision and strategy tangible when needed, protecting innovation teams against opponents, giving guidance without being prescriptive, and helping people to engage in a process that was not familiar to them.

6.6 People & Competences

As companies defined a path and targets into the exploration arena, they had to assess the adequacy of their resources, people, and competences to execute the strategy. Indeed all companies did it, except one (in the "C" category), that had planned for it, but had not yet fully executed. People skills and organizational competences are at the center of this review. Radical innovation implies major changes that are not always accepted. Selective releases of managers were sometimes necessary, and people with new skills had to be recruited.

The principles of change management [31,32] apply in our context, with its level of intensity depending on the degree of transformation and speed of change pursued. However, in our sample, this journey was not disruptive. Firms preserved their historical core competences. To get into exploration, firms acquired and subsequently integrated new capabilities. Competence substitution took place only in the periphery of some technologies. This doesn't exclude rationalization processes to optimize the overall cost structure, yet the final shape looks more like new capabilities that were nested around historical core competences. This is consistent with the view that in mature industries, exploitation operational excellence cannot lose focus, since it still constitutes the main source of economic resources and financial stability. Exploration comes on top, as a new growth stream, which may eventually replace some of the historical businesses. Indeed, our study suggests that mature companies with strategies targeting new technology segments, without clear synergy with the firm's core competences, have a higher chance of failing. Along this line, one of the firms studied had to stop a substantial diversification initiative into a new technology field. Finally, to support growth streams on the upright corner of the innovation/market matrix, one focal firm used external alliances to narrow the competence gap and reduce risk, which turned out to deliver satisfactory results.

6.7 Front-end Innovation Drive

Many companies have brainstorming workshops, yet these tend to be disconnected with strategy and culture. In the best performing companies, the process of idea generation, selection, and conversion into innovation projects was very well ingrained with strategy and pivot points in place to deliver sound results on growth opportunities. This is known as the front end innovation process, and in top performers it acted as backbone, to support all the foundational factors to gain traction and deploy a successful project portfolio. The analyzed firms with high success in creating new growth streams have implemented a comprehensive front end process with supporting tools. They used it also to foster broad participation of company collaborators and some external players. This is clearly a differentiating factor

as compared to “C” companies. Less well performing companies paid significantly less attention to the front end innovation process.

In top performers, the front end process was also used to communicate the innovation strategy and pivot points. People could better understand the overall change process and, therefore, their expectations were more aligned with innovation. It also shaped the perception that management choices responded to objective judgments. The existence of an innovation strategy and pivot points focused the search for creative solutions and provided criteria to select ideas and prioritize projects. Workshops on idea generation, design thinking, open innovation, and other approaches to creatively solve problems were tried. Yet, the relevant aspect is that all those efforts were aligned with a front-end process headed by the innovation strategy and guided by pivot points.

7. THE PATH TO CREATE GROWTH STREAMS, INNOVATION SYSTEM AS CONSTRUCT

The identified drivers of innovation success would lose most of their effect if treated in isolation. Any of the key factors per se would not have delivered results. In top performing firms, they were strongly interrelated. As a whole they formed a system. *It was a gestalt, the overall framework with its contents and processes that energized and guided top management and operating teams to progress in search of new growth streams.* While the relative intensity of a factor would depend on the specific purpose of each case, there seems to be a common logic behind the task of building a solid path to breaking the exploitation glass ceiling.

The comparison and contrast of performance differences in the cases we studied led us to rethink the management innovation system as a construct. Here we include the factors identified as relevant for success, sorted according to the observed pattern. These factors are grouped in four blocks, I to IV (see Fig. 4), each with a distinct meaning, yet interdependent in their effect on results. Each block has a clear role and is logically connected to the next. As mentioned earlier, top management leads and monitors progress in the process of building the innovation system. It goes with an uncontested strong personal commitment, involvement, and support of critical ingredients. While the process can be described as putting together the pieces of the four building blocks, what we saw at the end in better performing companies was the true construction of a robust innovative culture. This confirms that innovative culture is not just a set of values and beliefs, but rather is the result of the way a firm operates its innovation system.

The first block (I) opens up the need to innovate, to step away from the comfort area. It informs the *why to innovate* question. Top management has to embrace the notion that significant changes are needed to sustain profitability in the mid and long term. Triggers are often external and normally seen as distant clouds on the horizon; for instance, these can be expected changes in legislation, in the competitive landscape, emerging market trends, or economic conditions. However, in mature markets, the effect of those external factors on short term firm performance is, at most, moderate. Any initial impact from an external threat can be greatly compensated for with some extra portion of operational excellence. This mutes change advocates and usually blinds management teams. External factors tend to be downplayed until they get close to the tipping point, a time at which its effect may already be catastrophic. Top management must have the willingness and skills to assess the potential impact of external factors, even in the absence of short term effect on results. It has to leverage internal factors to create awareness of the need to drive change. Undertaking changes to protect a company against external threats, in the absence of measured evidence, is a most scarce and appreciated ability. For many, the sustainability of success is at risk.

It is fundamental that top management challenges the status quo and conveys the message that operational excellence and incremental innovation, focused on exploitation alone, will not suffice for sustained growth. Dissatisfaction with the prevailing state of affairs has to come from the top. Mobilizing people in favor of an uncertain business model, when indicators of traditional operations show strong results, is a true test of high caliber leadership.

The second block of the innovation system (II) provides both content to the purpose and credibility to the intended journey. This is a fundamental piece with a pivotal role to show people that management is serious-minded in its intent to change. The first part assesses the need to revise the company statements (mission and vision) and to challenge the company identity. This will not always necessarily result in a change of the statements, but if what is pursued is a significant transformation, very likely the statements will have to be adapted accordingly. A new companywide strategy to reach the vision is to be developed, which guides the type of innovation and growth direction pursued. In the next step,

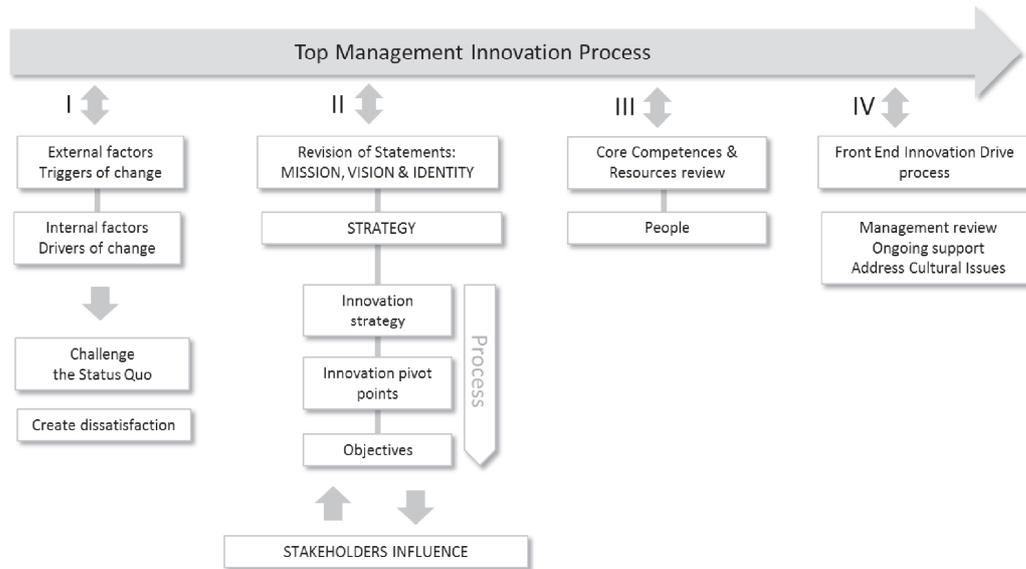


Figure 4. Innovation management system to break the exploitation glass ceiling

active participation to translate the broad strategy into an innovation strategy frame and innovation pivot points is central to building a shared understanding of the innovation path to growth streams. All the activities are to be supported by fluent bi-directional communications with the company stakeholders. The aim of this piece is to build a common view of the direction to follow to create growth streams, to guide people's efforts in the search of innovation opportunities, and reduce fears of moving away from the comfortable exploitation arena. In summary, this block gives guidance on where to go, what the priorities are, how boundaries are set, and how issues are to be addressed.

The third block of the construct (III) reviews how people and competences match the requirements and puts in place a capability building plan in selected areas of the innovation process. It clarifies who is expected to do what, and makes sure that the competences needed to deliver the objectives within the targeted time frame will be available. Specific plans will allow the company to build strength for resources, and for organizational processes to match objectives and priorities. Change management principles are to be applied to drive organization changes and accommodate new capabilities. The process identifies and builds on champions, and supporters, but also deals with skeptics and stoppers, to approach innovation as a change program to move the organization in the new growth direction. Especially here is where it becomes crystal clear that innovation is foremost about people.

The first three blocks together create the necessary conditions for innovation to flourish. In mature industrial technology firms, these initial building blocks of the innovation system are necessary to create a fertile breeding ground where novel approaches to problems, creative ideas, and innovation projects can flourish. Trying to foster innovation under an exploitation regime, that is jumping directly to ideation and innovation project management, is inevitably doomed to failure.

Once blocks I to III have set the right context for launching sound innovation, the fourth block in the innovation system (IV) walks the journey. The objective of this piece is to deploy a process that links strategic guidelines, made more concrete with pivot points, objectives, and milestones, with innovation outcomes. The front-end process of innovation moves from challenges, to idea generation, and to concept development. This is coupled with the more frequently used back-end process, covering from project development to the commercial introduction of innovation initiatives. These two operating processes (front and back end) are enhanced by the three former blocks of the innovation system. For instance, the innovation strategy is used to guide progress and select the winning opportunities, ready-to-use competences on innovation are necessary for the front and back end processes to deliver, and organizational processes and resources need to be aligned to foster progress. An innovation system is more than a great operative innovation process.

All the studied companies declared the purpose and willingness to generate innovation for growth. The ones with the best results in creating growth streams had followed an overall process conceptually matching the four proposed blocks. The companies with more modest achievements showed less

intensity and clearly deviated from this pattern. The most significant differences were found in the first and second blocks of the innovation management system, which inevitably shape the prospects of successful execution in the third and fourth blocks.

In summary, on the basis of the empirical findings of this multi-case qualitative study, we propose a systematic process that management teams in mature technology industries can follow to create innovation streams outside the established comfortable area of exploitation. The management approach outlined here seems to be highly relevant in the attempt to pursue profitable growth.

8. CONCLUSIONS

Mature industrial technology companies are strongly anchored in highly competitive exploitation areas. With satisfactory short-term results based on incremental innovation and operational excellence, new exploration activities with the potential of creating sustainable growth are often downgraded and not properly supported. Consequently, companies are progressively more locked into and trapped under the glass ceiling of their exploitation operations.

Yet, some companies are capable of breaking through the exploitation glass ceiling and generating and sustaining net growth. Successful companies have built a management innovation system as the foundation for more robust innovation. Its focus is distinct from exploitation and short-term goals. Top managers envision the impact of long-term trends in its industry. Then, through these lenses, they question the current company identity, challenge the status quo, and lead with determination the implementation of significant changes and differentiating activities. However, a willingness to innovate is necessary, but not enough.

The generation of relevant sustainable growth demands the execution of specific tasks and the discipline of following a systematic process. It starts from more abstract forward-looking activities, questioning the status quo, and profiling the future industry paradigm, to more concrete activities, such as defining an innovation strategy and innovation pivots that will guide the search for creative solutions to problems and to translate opportunities into concrete projects and initiatives. Putting together such an innovation management system has to be a top management priority. Yet the construct, its constituencies, and process are unfamiliar, and demand bold undertakings.

The innovation system, to generate new exploration pathways, has to be led by top management. It is to be constructed of interrelated activities and responsibilities, clustered around the four constituent building blocks described in this paper. Firms applying such an innovation system will be able to translate the high-level aspirations of top management into concrete realities, break through the exploitation glass ceiling, and generate profitable new growth streams.

REFERENCES

- [1] Tushman M. L. and Anderson P., "Technological Discontinuities and Dominant designs: A Cyclical Model of Technological Change," *Administrative Science Quarterly*, no. 35, pp. 604-633, 1990.
- [2] Tushman M. L., Anderson P. C. and O'Reilly C., "Technology Cycles, Innovation Streams, and Anbidextrous Organizations: Organizational Renewal Through Innovation Streams and Strategic Change," in *Managing Strategic Innovation and Change. A Collection of Readings*, New York, Oxford University Press, 1997, pp. Chap.1 3-23.
- [3] Teece D. and Pisano G., "The Dynamic Capabilities of Firms: an Introduction," *Industrial and Corporate Change*. Oxford University Press, vol. 3, no. 3, pp. 537-556, 1994.
- [4] Markham S. K. and Lee H., "Product Development and Management Association's 2012 Comparative Performance Assessment Study," *Journal of Product Innovation Management*, vol. 30, no. 3, pp. 408-429, 2013.
- [5] Henderson R. M. and Clark K. B., "Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms," *Administrative Science Quarterly*, <http://www.sp.uconn.edu/~langlois/ARCHITECTURAL.htm>, 1990.
- [6] Gatignon H., Tushman M. L., Smith W. and Anderson P., "A Structural Approach to Assessing Innovation: Construct Development of Innovation Locus, Type and Characteristics," *Management Science*, vol. 9, no. 48, pp. 1103-1122, 2002.
- [7] Chan K. W. and Mauborgne R., *Blue Ocean Strategy: How to Create Uncontested Market Space*, Harvard Business School Publishing, 2005.

- [8] Cooper R. G., "Your NPD Portfolio may be harmful to your Business's health," *Visions*, vol. 29, no. 2, pp. 22-26, 2005.
- [9] Cooper R. G., "Perspective: The Innovation Dilemma: How to Innovate When the Market is Mature," *Journal of Product Innovation Management*, vol. S1, no. 28, pp. 2-27, 2011.
- [10] Christensen C. M., *The Innovator's Dilemma*, Boston: Harvard Business School Publishing, 1997.
- [11] March J. G., "Exploration and Exploitation in Organizational Learning," *Organization Science*, vol. 2, no. 1, pp. 71 - 87, 1991.
- [12] Tushman M. L. and O'Reilly C. A., "Ambidextrous Organizations: Managing Evolutionary and Revolutionary Change," *California Management Review*, vol. 38, no. 4, pp. 8-30, 1996.
- [13] Benner M. J. and Tushman L. M., "Exploitation, Exploration, and process Management: The Productivity dilemma Revisited," *Academy of Management Review*, vol. 28, no. 2, pp. 238-256, 2003.
- [14] Eisenhardt K. M., "Making fast Strategic Decisions in High Velocity Environments," *Academy of Management Journal*, vol. 32, no. 3, pp. 543-576, 1989.
- [15] Eisenhardt K. M. and Brown S. L., "Patching: Restitching Business Portfolios in Dynamic Markets," *Harvard Business Review*, <https://hbr.org/1999/05/patching-restitching-business-portfolios-in-dynamic-markets>, 1999.
- [16] Eisenhardt K. M. and Martin J. A., "Dynamic Capabilities: What are they?" *Strategic Management Journal*, vol. 21, pp. 1105-1121, 2000.
- [17] Brown S. L. and Eisenhardt K. M., *Competing on the Edge. Strategy as Structured Chaos*, USA: Harvard Business School Press, 1998.
- [18] Miller P., Klokgieters K., Brankovic A. and Duppen F., "Innovation Leadership Study. Managing Innovation: an Insider Perspective," Capgemini Consulting and IESE, 2012.
- [19] PDMA & TIM (Product Development and Management Asociation & Total Innovation Management) , "Product Innovation Management Standard," PDMA, 2013.
- [20] Vilà J., "Innovative Culture: Values, Principles and Practices of Senior Executives in Highly Innovative Companies," IESE Business School SMN-681-E, Barcelona, 2011.
- [21] Vilà J. and. Muñoz-Nájar J.A., "Systematizing the Innovation Process," *IESE Alumni Magazine*, no. September, 2004.
- [22] Vilà J. and Muñoz-Nájar J. A., "The Innovation System: Organizational and Managerial Competencies to Innovate," *IESE Alumni Magazine*, no. March, 2002.
- [23] Vilà J. and Muñoz-Nájar J.A., "Guia de Autoevaluación de las Capacidades para Innovar. Una Herramienta de Diagnostico," *IESE Business School*, Barcelona, 2003.
- [24] Cooper R. G. and Kleinschmidt E. J., "Benchmarking the Firm's Critical Succes Factors in New Product Development," *Journal of Product Innovation Management*, no. 12, pp. 374-391, 1995.
- [25] Felekoglu B. and Moultrie J., "Top Management Involvement in New Product Development: A Review and Synthesis," *Journal of Product Innovation Management*, vol. 1, no. 31, pp. 159-175, 2013.
- [26] Stanley Kam Sing Wong, "The Role of Management Involvement in Innovation," *Management Decision*, vol. 51, no. 4, pp. 709-729, 2013.
- [27] Tushman M. L. and O'Reilly C. A., *Winning Through Innovation*, Massachusetts: Harvard Business School Publishing, 2002.
- [28] Trusko B., "The Innovation Iteration Grid," *International Journal of Innovation Science*, vol. 1, no. 3, pp. 121-129, 2009.
- [29] Kahn K. B., Barczak G., Nicholas J., Ledwith A. and H. Perks, "An Examination of New Product Development Best Practice," *Journal of Product Innovation Management*, vol. 2, no. 29, pp. 180-192, 2012.
- [30] Acur N., Kandemir D. and Boer H., "Strategic Alignment and New Product Development: Drivers and Performance Effects," *Journal of Product Innovation Management*, vol. 2, no. 29, pp. 304-318, 2012.
- [31] Kotter J. P., "Leading Change," *Harvard Business Review*, www.hbrreprints.org, pp. 1-10, 2006.

- [32] Gupta P., “Leading Innovation Change - The Kotter Way,” *International Journal of Innovation Science*, vol. 3, no. 3, pp. 141- 149, 2011.