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## **Models of Emergence in the Business Firm**

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## Abstract

One of the basic properties of complex systems is their ability to evolve in time and space in the absence of external intervention via the amplification of small internal fluctuations. This property – self-organization – and the type of change that results from it – emergent change – have caught the attention of management and organization scholars who have attempted to use these concepts to describe the processes at play in their own field. In this paper, we review in some detail four of these attempts and discuss their limits. We then present the first results of an exploratory study whose ambition is to overcome some of the difficulties inherent to the transfer of a theory from the natural sciences to the social sciences. An important result of our preliminary study is the confirmation that the processes of self-organization and emergence at play in business firms have specificities that are tied to the context in which they take place. We have also been able to identify three different models of emergence corresponding to different postures of the management vis-à-vis self-organization. We present them briefly in the last part of the paper.

**Keywords :** Strategic Management, Complexity, Self-organization, Emergent Change, Managerial Posture.

## Résumé

Une propriété fondamentale des systèmes complexes est leur capacité à évoluer dans le temps et l'espace en absence de toute intervention extérieure par amplification de fluctuations internes. Cette propriété – l'auto-organisation – et le type de changement qui en résulte – le changement émergent – ont retenu l'attention des chercheurs en stratégie et en organisation qui ont tenté d'utiliser ces concepts pour comprendre et décrire les processus de renouvellement à l'œuvre dans les entreprises. Dans ce cahier, nous passons en revue quatre tentatives effectuées en ce sens et en discutons les limites. Nous présentons également les résultats d'une étude exploratoire basée sur l'analyse de douze mini-cas qui tente de dépasser les limites identifiées. L'étude confirme que les processus d'auto-organisation et de changement émergent qui se manifestent dans les entreprises présentent des spécificités liées au contexte au sein duquel ils se déroulent. Nous avons identifié trois modèles d'émergence correspondant à trois postures de la direction face à l'auto-organisation : nous les présentons brièvement dans la dernière partie de ce cahier.

**Mots-clés :** Management stratégique, Complexité, Auto-organisation, Changement émergent, Posture managériale.

## INTRODUCTION

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One of the basic properties of complex systems is their ability to evolve in time and space in the absence of external intervention via the amplification of small internal fluctuations. This property – **self-organization** – and the type of change that results from it – **emergent** change – have caught the attention of a number of management and organization scholars who have attempted to use these concepts to describe the processes at play in their own field (Burgelman, 1983; Smith, 1986; Nonaka, 1988; Stacey, 1995; Wheatley and Kellner-Rogers, 1996; McKelvey, 1997; McIntosh and McLean, 1999). But, as Contractor observes (1999), there are some difficulties inherent to the transfer of a theory from the natural sciences to the social sciences.

In this paper, we review in some detail four of these attempts and discuss their limits. We then present the first results of an exploratory study whose ambition was to overcome some of the difficulties just mentioned. In order to avoid oversimplification, one can either develop and apply increasingly sophisticated models (e.g. agent-based computational models) to understand the processes at play in business firms or, more simply, one can start from the observation of self-organization and emergence within business firms and try and induce specific models. We have chosen the second option: we have gathered several stories of self-organization and emergence in business firms and then, tried and made sense out of them<sup>1</sup>. We present some of our findings in the second part of this paper.

The most important result of our preliminary study, we believe, is the confirmation that the processes of self-organization and emergence at play in business firms have specificities that are tied to the context in which they take place. Contrary to natural or formal complex systems, business firms are structured by routines and power relations that constrain and **resist** nascent processes. As a consequence, self-organization and emergent change find themselves **embedded** in a relatively rigid strategic and organizational milieu. They cannot freely unfold but have to create their own space around or in the interstices of this milieu, with which they establish a complex dialectical relation. We have been able to identify three different models of emergence, each of them corresponding to a different posture of the management vis-à-vis self-organization. We present them briefly in the last part of the paper. At this stage of our research, however, our claims are modest and our “models of emergence within the business firm” are intended primarily as food for thought and as an encouragement to applied complexity scientists not to neglect field observation.

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<sup>1</sup> This research was performed in the context of a book project on the management of emergent change. Ref. : « Miser sur l'imprévu : management et leadership du changement émergent. » par V. Bouchard et T. Picq, Editions Gualino, to be published.

# ATTEMPTS AT TRANSFERRING COMPLEXITY THEORY TO THE FIELD OF MANAGEMENT AND ORGANIZATION

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One of the basic properties of complex systems is their ability to evolve in time and space in the absence of external intervention via the amplification of small internal fluctuations. This property – **self-organization** – and the type of change that results from it – **emergent change** – have caught the attention of a number of management and organization scholars who have attempted to use these concepts to explain the processes at play in their own field (Burgelman, 1983; Smith, 1986; Nonaka, 1988; Stacey, 1995; Wheatley and Kellner-Rogers, 1996; McKelvey, 1997; McIntosh and McLean, 1999).

In a previous publication (Bouchard, 2002), we have analyzed closely four such attempts and positioned them according to their theoretical reference and their degree of literality (see table 1).

*Table 1: Four appropriation attempts*

<b>Literality:</b> <b>Reference:</b>	<b>Literal use of the self-organization theory</b>	<b>Metaphorical use of the self-organization theory</b>
<b>“American School”: the firm as a Complex Adaptive System</b>	Stacey, 1995	Wheatley, 1996
<b>“European School»: the firm as a Dissipative Structure</b>	Nonaka, 1988	Burgelman, 1983

We concluded our review emphasizing the difficulties inherent to the transfer of a theory from the natural sciences to the social sciences. A brief summary of these attempts will allow the reader to get a better idea of some of the shortcomings of these appropriation attempts and how they can be overcome.

## Stacey’s “pure emergence” model

Stacey’s 1995 article, *“The science of complexity: an alternative perspective for strategic change processes”*, makes explicit reference to the work of S. Kaufmann<sup>2</sup>. In this purely conceptual piece, Stacey postulates that human organizations are complex systems very similar to the ones studied by

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<sup>2</sup> Stuart Kaufmann is one of most prominent exponents of the « American School » of Complexity Sciences. Biologist and member of the Sante Fe Institute, he has greatly contributed by his research and publications to the knowledge of complex adaptive systems dynamics and its diffusion beyond a circle of specialists.

Kaufmann and that, as a result, complexity sciences can help us understand and manage them better. Stacey attempts to transpose the three states of behavior characterized by Kaufmann (ordered, at the edge of chaos and chaotic) to the sphere of human organizations and suggests that human organizations will find themselves in one of them depending on a combination of formal and informal organizational features (see table 2).

*Table 2: Three alternative states of behavior of human organizations*

<b>State of behavior:</b>	<b>Ordered</b>	<b>At the edge of chaos</b>	<b>Chaotic</b>
Formal system	Stable	Stable	Unstable
Informal system	Poor	Dense	Dense

When a human organization combines a stable formal structure with a rich informal network, it finds itself at “the edge of chaos” and it is able to evolve spontaneously towards a new equilibrium that cannot be predicted or planned but that will necessarily be adapted to the challenges it faces. At the edge of chaos, strategic change will result from multiple cycles of interaction between agents and be purely emergent. As a consequence, analysis, forecast and planning will become useless activities that only serve “to reduce the anxiety of managers.” The elaboration and prescription of a common vision by the top management is not recommended since it can only contribute to reduce the firm’s range of evolutionary options. At the edge of chaos, the role of the top management should be to create a context favorable to emergence by encouraging, for example, the constitution of informal networks.

Even leaving aside their Hayekian flavor, the propositions of Stacey are hard to swallow. They are a good example of the limits of a direct and simplistic appropriation of the findings of complexity sciences. One can criticize the lack of justification of Stacey’s choice of variables, (why the formal and the informal systems? what are they exactly? what about the fourth combination of the two variables that Stacey just ignores?). One can also criticize the naiveté of his recommendations. The most important limit of this appropriation attempt, according to us, is that it entirely ignores the hierarchical nature of human organizations and, consequently, the embedded character of self-organization and emergent change. It depicts self-organization as a process that involves the whole organization and finds hardly any limits in the structure and models that have become dominant over time. As in a chemical solution or a Boolean network, all the agents indirectly or indirectly contribute to the emergence of the new order via their repeated interaction. The organizational divides that keep them in closed compartments, the differences of status that make some of them more influent than others are simply ignored.

## Nonaka's "provoked emergence" model

In his 1988 paper, "*Creating organizational order out of chaos, self-renewal in Japanese firms*", Nonaka applies Prigogine's theory of "order through fluctuation" to the study of firms' self-renewal. In this strictly conceptual piece, Nonaka explores the dialectical relation between order and disorder that is implied in Prigogine's theory and what it could mean for business firms. He postulates that the "new order cannot be constructed but has to emerge from chaos." The management consequences of this postulate are relatively straightforward: in order to foster organizational renewal, the top management should not develop and implement a vision but rather focus on the creation of appropriate conditions. More specifically, the top management should 1) introduce chaos, 2) amplify fluctuations, 3) encourage dynamic cooperation and 4) reinforce the new order.

For Nonaka, renowned expert of organizational learning, fluctuations are synonymous with cognitive dissonance and chaos is introduced through interventions of a cognitive nature. *Ambiguity* should characterize the strategic vision, the organization should be confronted with *contradictory sources of information* and *dissonant models*, passionate *debates* should be encouraged, *routines* should be broken and people with radically *different background and perspectives* should be put to work together... Once chaos is introduced, fluctuations should be amplified thanks to a climate of urgency, of crisis even, that will contribute to neutralize the old ways of thinking and doing. They will also be amplified thanks to the contribution of autonomous task forces that will come up with creative answers to the challenges of tomorrow. Once the dynamic has been set, it has to be guided and checked: to this end, the top management will encourage a *step by step* diffusion of the emergent model to the whole organization via cooperation, cooptation and imitation. Finally, the organization will have to formally acknowledge the emergent order and ensure that what has been learnt by the organization is properly capitalized.

In Nonaka's rather simplistic vision of the firm and its dynamics, the emergent order is generated by the organization as a whole and affects the organization as a whole. Obstacles to self-organization and emergent change are recognized, but Nonaka believes the top management can temporarily remove them. Contrary to Stacey, Nonaka does not see self-organization as natural. Self-organization and, consequently, emergent change have to be **provoked** by the introduction and amplification of "cognitive fluctuations". The role of top managers is not to imagine and create the future but to periodically shake the coconut tree, thus triggering a process of self-renewal driven by collective unlearning/learning processes.

## Wheatley's "conditional emergence" model

Wheatley and Kellner-Rogers, researchers and consultants, have written a number of management books and papers on the implications of complexity sciences for human organizations and managers. Like Stacey, they explicitly refer themselves to the work of S. Kaufmann but they adopt a more pragmatic viewpoint. In a 1996 paper, "*The irresistible future of organizing*", Wheatley and Kellner-

Rogers suggest that most management theories and practices are based on the false assumption that organizations are like machines and can be designed, built and operated accordingly. They posit that organizations are complex systems made up of intelligent individuals, able to self-organize. The property of self-organization can be observed whenever the circumstances permit, such as in crisis situations or in autonomous work cells. Self-organization has several advantages over hetero-organization: it requires less control, relies on tested, grass root principles and confers both flexibility and adaptiveness to the organization. Unfortunately, most of the time, the organizational context does not allow it.

Wheatley and Kellner-Rogers suggest that in order to encourage self-organization, managers should 1) reinforce the sense making capacity i.e., the identity of the organization, 2) provide rich information to all participants and 3) encourage the creation of dense informal networks.

While the last two conditions are mentioned by Nonaka, Stacey and others, the first one is an original contribution of these authors. Wheatley and Kellner-Rogers view the existence of a strong identity and consequently of a clear shared purpose as the basis of all organizing effort. Without a well-defined organizational identity, individuals “cannot connect their personal effort to their own personal sense of purpose and to the purposes of the whole system”. Clear strategic directions are what allow individual autonomy. Without them, the risks inherent to innovative and autonomous behaviors become too great to bear. It is when one understands well the organization and the role one can play in it, that one can be self-confident and self-directed.

For Wheatley and Kellner-Rogers, self-organization and emergent change are positive processes that become possible when certain conditions are met. One can talk of a **conditional** model of emergence. The main limit of their proposition is that it fails to recognize the highly fragmented character of most large organizations that do not (and cannot) have a single, clear identity but constitute patchworks of micro-cultures and conflicting interests. In such a context, self-organization and emergence can only remain local phenomena and have to undergo a “metamorphosis” in order to reach a larger scale.

## **Burgelman’s “negotiated emergence” model**

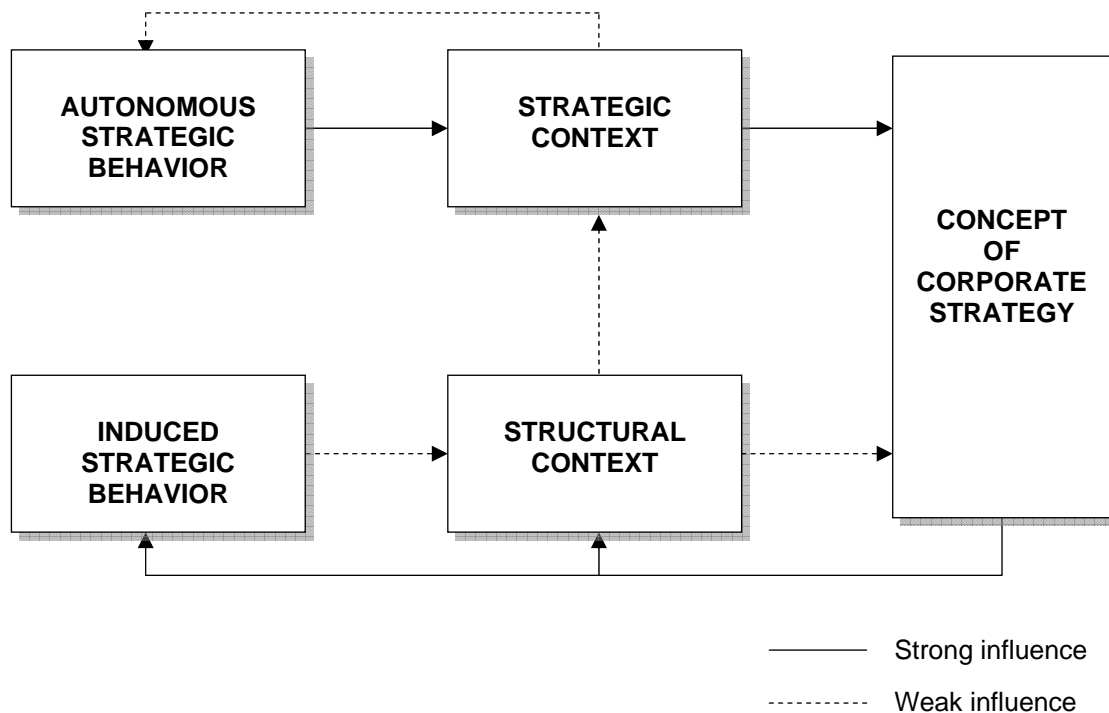
The three contributions we have reviewed are all conceptual and normative. They start from the postulate that self-organization is desirable and should be encouraged by the top management of business firms, inspired by the findings of complexity sciences. The contribution of Burgelman is different since it is not normative and relies on the meticulous observation of the spontaneous renewal processes at play in a large organization. It constitutes an inescapable starting point for those interested in the specificities of self-organization and emergence in the business firm.

In two 1983 papers, *“Corporate Entrepreneurship and strategic Management: Insights from a process study”* and *“A Process Model of Internal Corporate Venturing in the Diversified Major Firm”*, Burgelman describes the organizational processes and the conflicting forces involved in the strategic renewal of a large corporation. He proposes a model of strategic renewal that is the result of a dialectical process

between autonomous strategic initiatives on the one hand and the official strategy and decisions rules that derive from it, on the other hand.

He acknowledges the existence of five “forces” involved in the process of strategic renewal (see figure 1).

Figure 1: Model of Strategic Renewal



The *concept of corporate strategy* is the shared vision of what constitutes the domain, strengths and recipes for success of the corporation at a given time. This *concept* informs the *structural context* i.e., the administrative mechanisms (rules, procedures, systems) that ensure the correct alignment of *strategic behaviors* with the *concept of corporate strategy*. But firms are also the locus of *autonomous strategic behaviors* that are not aligned with the existing strategic categories. To become concrete realities, *autonomous strategic behaviors* have to go through a long and complicated process that involves actors at all the levels of the corporate hierarchy. The *strategic context* consists in the political (and cognitive) mechanisms through which middle managers question the current *concept of strategy* and provide top management with the opportunity to rationalize, ex post, successful *autonomous strategic behaviors*. The circle is closed when the *concept of strategy* is officially modified and starts encouraging new *induced strategic behaviors*.

Burgelman makes explicit reference to the work of Prigogine and underlines the parallel that can be drawn between his model and Prigogine’s “order through fluctuations” model. *Autonomous strategic behaviors* can be compared to fluctuations that push the system towards a more complex order, whereas the *concept of corporate strategy* and the *structural context* are the forces that contribute to

preserve the overall coherence of the system. The informal network of actors that contribute to the development of autonomous initiatives and help them acquire consistency and visibility can be seen as “fluctuation amplifiers”.

The process described by Burgelman is not a purely emergent process but rather a process of integration (elimination) of local initiatives in which the prevailing *concept of strategy* and *structural context* play a key role. The new order is the result of a dialectical process and reflects the balance of power of the forces at play. This new order is not totally predictable since it results from spontaneous initiatives, but neither totally unpredictable, since it also reflects the prevailing concept of strategy and balance of power. Burgelman describes a **negotiated** emergence process in which autonomous initiatives must conquer their space and legitimacy. Finally, Burgelman believes that autonomous initiatives continuously arise and should not be explicitly encouraged by the top management “in order to avoid creating games or encouraging some misguided opportunism”. However, managers can contribute to the creation of favorable selection conditions acting on the structural context.

## In synthesis...

Table 3: In synthesis...

For	Self-organization...	Implications are that...
R. Stacey	Is natural and desirable ( <b>pure</b> emergence model)	Top managers should not impose their strategic vision but encourage self-organization (e.g. by reinforcing informal networks).
I. Nonaka	Is desirable but must be triggered ( <b>provoked</b> emergence model)	In order to trigger self-renewal, top managers must introduce and amplify “chaos generating” factors and let the organization secrete the “new order”.
M. Wheatley et M. Kellner- Rogers	Is desirable but requires several conditions ( <b>conditional</b> emergence model)	Top managers should create conditions favorable to self-organization by acting on three levers: collective sense of purpose (identity), information and connections.
R. Burgelman	Is spontaneous but strongly constrained ( <b>negotiated</b> emergence)	Even in large corporations, some autonomous strategic initiatives manage to survive in spite of the constraints imposed by the structural context, thus contributing to strategic renewal.

It is apparent from the heterogeneity of the reviewed models and their sometimes-contradictory implications, that the transposition of the concepts of self-organization and emergence to the field of human organizations is not straightforward. As Contractor (1999) observes, “research on the self-organizing processes runs the risk of being overwhelmingly metaphorical (some would argue ‘hand waving’), or an unenlightened and inappropriate attempt at importing models and theories from the physical and life sciences to the study of social phenomena.” We believe that part of the problem is methodological and related to the use of non-trivial models to describe the complex reality of social systems. In recent years, thanks to the increasing accessibility of sophisticated simulation tools and techniques, this challenge is being better met (Cartier, 2003). Part of the problem, however, is epistemological and therefore not amenable to technical solutions. In effect, social systems differ from

complex physical, biological or formal systems in some fundamental ways. Table 4 synthesizes some of these differences.

*Table 4: Differences between complex natural systems and complex social systems*

	<b>Complex physical, biological or formal systems</b>	<b>Complex social systems (Business firms)</b>
Agents behavior	Simple and stable generative rules Rules are imposed to agents	Complex and evolving generative rules Rules are imposed but also chosen by agents
Network topology	Flat, contiguous "space"  All agents are directly or indirectly connected  Agents have equivalent "weight" Agents interact directly with their immediate neighbors	Hierarchical and compartmentalized "space"  There are voids or barriers in the network that isolate or separate some agents  Agents do not have equivalent "weight" Agents interact directly with their immediate neighbors but also with distant ones via broadcasting
Nature of self-organization	Natural phenomenon  Unconstrained	Quasi-natural phenomenon resulting from both human intentionality and "natural causes" (McKelvey, 1997) Self-organization is embedded and constrained by the existing organization

We believe that these epistemological differences complicate the transfer of models developed in the field of natural sciences into the sphere of human organizations, ripe with contradictory interests and constrained by power structures, be they formal or informal. In this political context, bottom-up change processes cannot freely unfold: they are embedded in the existing organization and at all moment constrained by the prevailing rules and power structure with whom they have to "negotiate".

## SELF-ORGANIZATION AND EMERGENCE IN THE BUSINESS FIRM: SOME PRELIMINARY FINDINGS

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The appreciation of these differences has encouraged us to consider self-organization and emergence in business firms as specific processes that should be studied as such. To this end, we have tried and gathered relevant self-organization or emergence cases from various sources.

We found and analyzed twelve mini-cases, covering a wide panel of companies and business processes (see table 5).

*Table 5: Mini-cases of self-organization and emergence in the business firm*

Company	Emergent ...	Source
Juridiscal, Legal and fiscal counseling	Reorganization	Primary
Barilla, Pasta and bakery products	Diversification (strategic renewal)	Primary
IBM, Computers and IT services	Diversification (strategic renewal)	Secondary <sup>3</sup>
WorldPack, Packaging (cardboard)	Solution to new product development problem	Secondary <sup>4</sup>
Mecanix, Fine mechanical parts	Solution to outsourcing problem	Primary
Sino Groupe, Automotive stamps	Plant location decision	Primary
Groupe Tau, Electrical equipment	New Business development	Primary
Lucent New Ventures Group, Telecom	New Business development	Secondary <sup>5</sup>
Groupe Zeta, Fine chemicals	Horizontal cooperation	Primary
Spora, Special textiles	Business strategy	Primary
Carrefour, Retailing	Store format	Secondary <sup>6</sup>

Our preliminary study confirms that self-organization in the firm shares many characteristics with “natural self-organization” and that its appearance conditions – dense non-linear relations between agents, slack resources and “fluctuations” – are in fact homothetic to those observed in nature. There remain important differences, however, that are a direct consequence of the **embedded** nature of self-organization in the business firm.

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<sup>3</sup> Ref. « Waking Up IBM : How a Gang of Unlikely Rebels Transformed Big Blue » by G. Hamel., Harvard Business Review, July-August 2000.

<sup>4</sup> Ref. “The Anatomy of Transnational New Product Development Projects”, Cahiers de Recherche N° 2003/5, E.M. LYON, 2003 by T. Atamer, D. Schweiger,, and R. Calori.

<sup>5</sup> Ref. « Lucent Technologies : The Future of the New Ventures Group » by A. Massaro and H. Chesbrough, Harvard Business School, N9-601-102, 2001.

<sup>6</sup> Ref. « Carrefour in Asia (A) Taiwan : a bridgehead to Asia » by P. Courbon and P. Lasserre, Insead Euro-Asia Centre, 195-001-1BW, 1994.

Burgelman (1983) has shown that emergent change unfolded in the interstices of the “structural context” (the existing organization) and that it was molded by it. Our study shows that the influence exercised by the “structural context” is variable in degree and nature. We have identified three models of emergent change, each one corresponding to a specific management posture vis-à-vis self-organization (see table 6).

*Table 6 – Emergence in the business firm: a preliminary typology*

<b>Emergence model</b>	<b>Management posture vis-à-vis self-organization</b>
Sporadic	Opportunistic
“Controlled”	Supportive but cautious
Dominant	Stop and Go

## **Sporadic emergence model**

We all know instances in which chance and luck played a significant role in the development of a business firm. This can happen even in the most bureaucratic organization. The penrosian model of the firm as a structure of opportunity explains why autonomous behaviors continuously arise and Burgelman’s model of strategic renewal shows how some of them manage to acquire significant weight. We should expect the wise manager to know of and take advantage of these spontaneous forces of change, using them to advance her agenda or because of their intrinsic potential. We found several examples of this **sporadic** use of emergence in both large and small structures.

The top managers of “Worldpack”, a large cardboard manufacturing and packaging company, saw in a simple local product manager the right leader for a complex new product development process, in which competences and resources were spread on three different continents. The motivation and drive of this product manager, directly in touch with the needs of lead clients, his insistence on the necessity of quickly developing the new product, as well as his networking and communication skills, convinced the top management of the firm to support him wholeheartedly. He was able to lead the project to completion and allowed Worldpack to reach a leading position in a new product segment. Similarly, the owner of “Mecanix”, a small mechanical parts company who wanted to outsource part of his production but could not find an acceptable sub-contractor, jumped on the occasion when the foreman of one of his workshops told him he was ready to become an entrepreneur and his supplier. The owner of Mecanix helped him shape his project and appraise the concrete difficulties tied to it. The foreman eventually managed to create his own company and became Mecanix’s trustworthy supplier.

The posture of these managers can be described as **opportunistic**. They chose to support individual initiatives because they see potential benefits in them but also because they have faith in the

person(s) involved. An alliance is established between the project initiator, personally and strongly involved in the project, and the sponsor, who stays in the back but is able, from there, to provide guidance and support. Most of the times, this alliance remains informal and discrete, which helps reduce friction and conflict with the rest of the organization. It also allows the project initiator and the sponsor to eventually disengage from the project without losing face in case of failure.

This opportunistic posture is very advantageous for top managers who can select only the most interesting initiatives and reduce the cost and risk of exploration by betting on highly motivated employees. This posture, furthermore, is not incompatible with an autocratic management style and does not require changes in the structure and procedures in place. There are some caveats, however. A record of unsteady support, disloyalty or a predilection for foolish pet projects will dampen the intrapreneurial flame within the firm. Furthermore, project initiators are sometimes very exposed and should be aware of it. There can be significant human costs in case of failure or unsteady sponsor support.

## **“Controlled” emergence model**

Large organizations tend to stifle employees' creativity and proactiveness. In order to counter this negative influence, a number of business firms have set up organizational devices whose aim is to encourage and support employees' initiatives. Thanks to these devices, managers want to stimulate new behaviors, generate new streams of revenues, improve business processes, reduce costs and enhance the morale of employees.

When the head of the French division of “Tau” – a large electrical equipment company – took on his job, staff's morale was very low. A series of acquisitions had put a lot of pressure on employees and internal growth had practically come to a halt. In order to pep up his staff and encourage internal growth, he asked the director of strategy to imagine an organizational device that would encourage and support the development of new business ideas. “A Myriad Ideas” saw the light a few months later. A very effective communication campaign, carried from the top level and relayed to all the operational units of the division, created a lot of excitement among the employees who, in less than a couple of months, came up with more than 200 business propositions. Selection and support procedures were put in place and a manager was dedicated 100% to the monitoring of the process and support of would-be entrepreneurs. He helped them formulate their business concept and ascribed them an official internal sponsor. Projects were assessed periodically by a committee. If they passed successfully, their initiator was granted resources and free time. In less than three years, Myriad Ideas treated over 400 business ideas and twelve of them became realities.

“Zeta” is a key player of the fine chemical industry. Its R&D budget was high, but according to its top management, not well spent. Too little research efforts ended in new products or processes for their client, while innovation was clearly becoming a key success factor. Clients in the textile or the automotive industry expected Zeta to come up with new compounds and applications that could translate into value at the end of the line. Top managers wanted to encourage their scientists and

managers to work together and focus more on clients needs. Several practice communities, each dedicated to a specific industry, were created. The communities included, on a voluntary basis, people from different functions (R&D, Marketing, Sales, production) and different sites and divisions within the company. The communities did not have specific mandates: their only obligation was to present a quarterly activity report to the executive committee. In a matter of months, several practice communities became very active. They identified and aggregated the most valuable contributors worldwide, pursued various initiatives such as global client management, commercial opportunity signaling, best practices diffusion, cost sharing, innovation workshops led by researchers and marketers, etc. The automotive community, particularly active, grew from 5 to 50 participants and launched 17 projects in one year.

In the cases corresponding to this model, the managers aim at generating emergence on a continuous basis and want to involve as many employees as possible. They also want to exercise some **control** on what comes up. To this end, they rely on formal and “objective” mechanisms whose function it to foster, select and support new initiatives.

In this “controlled” emergence model, as in the previous one, an alliance is established between the top managers and the individuals that pursue innovative projects, albeit a more formal and impersonal one. Individuals provide their creativity, energy and personal networks, while top managers, via the device and sometimes personally, support them. The organization as a whole provides a safety net that protects the project initiator in case of failure. Initiatives are regularly assessed and the top management’s level of commitment will depend on the results of this assessment.

This “**supportive but cautious**” management posture can be very effective as the three cases considered demonstrate. In effect, it seems that top managers can always count on the enthusiasm and resourcefulness of a significant number of employees who need nothing but the slightest encouragement to deploy their wings. Their enthusiasm contaminates more prudent individuals who, thanks to the safety net and the support provided, feel they too can pursue an initiative. The processes put in place clearly encourage networking and collaboration across functions, hierarchical level, sites, etc. They contribute to the identification and development of new talents and to a good climate inside, and image outside, the business firm. Just like the previous model, the “controlled” emergence model does not require major changes in the existing organization since the “emergence-inducing device” is superposed to it or positioned sideways.

The “controlled” model has also important limitations which tend to make the success of “emergence inducing devices” short-lived. In effect, the flow of initiatives they contribute to generate is rarely welcome by the “mainstream”. Conflicts over respective turfs, jealousy, misunderstandings can be observed in all the cases surveyed. Furthermore, the procedures and systems that are supposed to provide guidance and support the project initiators are often deficient, leaving them isolated and exposed. Not surprisingly, some in the organization see the single initiatives and the framework that encourage them as a waste of time and money and will do whatever is in their power to channel the “wasted resources” back into the “mainstream”. It is not rare therefore to see “emergence inducing devices” dismantled after a few years: this has been the case for both Tau’s Myriad Ideas and Zeta’s

communities of practice. It is worth underlining that, in the two cases, this resulted in a backlash. The project initiators felt let down – some of them even left the company – and the rest of the employees ended up even less motivated and trustful in its management.

## Dominant emergence model

In some instances, emergence is not limited to sporadic initiatives (first model) or to a well-circumscribed space (second model) but, on the contrary, finds itself at the very heart of the business firm's management, molding its strategic orientations.

The Spora case is a good illustration of the **dominant** emergence model. Spora is a small high tech textile company that was created in 1993 by Max Patissier. Since its creation, the company has developed steadily in terms of sales and profits. Its success seems to be based on the ability of M. Patissier not only to seize but also to generate new opportunities. Patissier's first stroke of genius resulted from a talk he had with a doctor during a medical appointment. He discovered that hospital blankets were a headache for the persons in charge of cleanliness and safety. They were heavy and very costly to wash, which meant they often were not clean enough. Together with his technicians, M. Patissier came up with a very light and warm product that could be cleaned chemically. He then went in search of clients and managed to convince surgery unit's heads. But this was only a starting point for M. Patissier. Roaming in hospital corridors, he realized that emergency units were also good potential clients. He managed to sell his blankets to a number of them, which triggered a chain reaction. The mobile medical teams and firemen who took people to hospitals saw the blankets and liked them. Very quickly M. Patissier was selling to them. A European bylaw was passed that obliged ambulances to use "clean" blankets and soon all of them were equipped with Spora's products. At some point, the nurses working in the cool atmosphere of surgery blocks asked M. Patissier if he could design vests for them. He then started selling his vests to the people handling frozen food in large refrigeration units of hospital kitchens. In the meanwhile M. Patissier had a small car accident. While he was getting his data, he discovered that the other driver involved was a computer specialist and asked him to come and help for him. The computer specialist created an ad-hoc ERP software that worked so well that, soon, it was sold to other companies...

In the various dominant emergence cases surveyed, the safeguards provided by strategic planning (studying environmental trends, generating options, evaluating them, selecting the best according to external and internal factors) are lacking. As a result, this model appears risky. It is also demanding organizationally speaking: as products and clients evolve, the value chain and the internal processes, the behavior and competence of the company have to adapt continuously and quickly. However, the cases indicate that the posture of top managers vis-à-vis self-organization and emergence is not steady: periods of dominant emergence are followed by periods of – relative – calm in which the organization seems to be gathering strength for the next bifurcation. The posture they adopt is a **stop and go** one.

What are the advantages of this model? By accepting to follow trajectories that lead outside the firm's strategic domain, by branching out, the top management enlarges the company's strategic domain and competence repertoire. The responsiveness and innovation capability of the organization and the individuals that constitute it are continuously solicited and consequently reinforced. They learn to learn and adaptation becomes increasingly painless. It should be noted that *informal networks* and *proximity* play a significant role in the trajectory and success of Spora, and this is true also in the other cases surveyed. A richly connected firm and top management are quick to detect and seize opportunities and are also good at turning clients and suppliers into benevolent partners.

The limits of this model are obvious. First, it is risky and demanding. We can imagine it is not comfortable for the employees to unlearn old skills, learn new ones and continuously adapt to new challenges. Second, we suspect that the style of management, the skills and competencies required to successfully apply this model cannot be easily taught but are very much tied to personal qualities such as intuition, power of observation, relational abilities, self-confidence, optimism...

## CONCLUSION

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Complexity sciences have shown that the performance of complex systems is not directly tied to the degree of control that is exercised over them. Transposed to the world of business firms, this finding allows to envision entirely different organizational processes, management practices and working relations. However, when one analyzes concrete instances of self-organization and emergence within human organizations, one observes that these processes are embedded in a relatively constraining strategic and organizational milieu with which they maintain a complex dialectical relation. At any point of time, the top management has the power to choose a posture vis-à-vis self-organization and emergence and how much space will be granted to them. Among top managers, the desire to control emergence, in a way or another, is usually as strong as the desire to foster it. Even when emergence apparently plays a dominant role, the top management continues to exercise its control by alternating phases of activity with phases of rest and by taking a direct part in the emergent process (cf. Spora).

Emergence in the business firm takes place in a political context and the power and influence of the various actors involved definitely affect its outcome. At this stage, we have identified three models of emergence which correspond to three different postures adopted by the top management. We obviously have no pretence at exhaustiveness and believe other cases emphasizing the influence and posture of other groups of actors could enrich substantially these preliminary and partial findings.

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