Radical Innovation Challenge versus Organizational Motion Reality

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Abstract — *Analyzing team members' perception of their own interdisciplinary work, particularly of the incremental / radical nature of the innovation at the center of their activity, we saw the emergence of continuous motion in the organization, directly correlated with the innovative intensity of the team's activities.*

In every observation of the human systems in the companies studied, we noted this effect of innovation on movement in the organization. We can hypothesize that, conversely, each time the organization appeared static and basically designed, the integral innovation process failed.

The paper proposes a theoretical study of the organization schedule, in the context of innovation, elaborating an interdisciplinary model based on a biological analogy, able to simulate the organization's permanent motion.

Finally, we pose the question of the relevance of the incremental/radical concept, compared with the emerging role of motion in organization.

Index Terms —*Incremental Innovation, Radical Innovation, Organizational motion, Biological analogy*

1. INTRODUCTION

Ten years work on on radical innovation, by many researchers, shows that it generates new products, services or processes whose performances are highly-improved, compared with those generated by incremental innovation. These effects influence the market, inducing major changes in customer use and sales features (Leifer, Dermott, O'Connor, (1)). Consultancies offer solutions for the replacement of the incremental approach by radical innovation. They consist of problem solving and the continuous improvement in micro structures, designed by team building inside advanced organizations, to increase financial and market performance. Some particular methods come from a Japan / U.K. mix such as "Breakthrough" (Stefik M. and Stefik B. (2)), (Shiba, S. (3)), which principally consists in learning data, coming from teams working on incremental innovation and classical product or service design, allowing a breakthrough to a radical solution to be found. This enables the designers to pass through the usual thick wall of market and product constraints.

The radical and incremental concepts come from research carried out ten years ago at Harvard Business School. They are accepted as the key point of business success, that radical innovation implies a good market share as a result. However, by what kind of team working does the organization find the best way to achieve desired business results? These working methods have not been studied often, inside the research /development or design / innovation teams, using a trans-disciplinary research approach. So we propose to share our analysis of several interdisciplinary teams working intensively on innovation, from a dual research point of view, management and organizational sociology, and taking in account the theory of complex systems.

Observing the internal collaboration in the innovation teams, we validated one of Von Hipple's (8) research works about the nature of the innovation process facilitating business success. He gave the confirmation of the importance of radical innovation in business success, but not by a process of manager decision, which would impose upon the nature of the innovation of the working teams, but rather by the ability to catalyze a facility of working in the teams, making members creative and market oriented. The validation of the research, as presented in chapters 2 and 3, is that the motion induced in the organization by teams working on intensive innovation, and which is easily measurable, is the best way to assure that innovation will be efficient.

Our research questions are:

i. Does this excellent working process systematically offer innovation success in the market?
ii. Is this kind of intensive innovation, as organizational style, predictable and manageable towards the targets of a desired business success?
iii. Are the radical or incremental criteria relevant, as the nature of innovation, to assuring business success?

As our research method was based on internal observations of the functioning of the teams, and on the team members' perceptions, in several companies having business success with new products and services, we made correlations

between collaborative approaches in teams and market results, which generated questions about what is important to business excellence: the innovation's classification, whether radical or incremental, or the movement in the working process, whatever was the nature of the innovation.

Firstly, we propose to clarify the radical concept which can be confused with the disruptive concept. They are both included in the 'Breakthrough Process' concept. In order to understand the original break process at the center of new and large innovation success in the market, we can refer back to Clayton Christensen: "The innovator's dilemma." (4). The real causes of large organizational changes in firms, adapting themselves to new markets and technologies, are based on the impact of environmental changes, and bad financial results, on the firm, producing an urgent global re-engineering of the previous organization. We can find the same perception in Goodrich § Aiman - Smith work at Harvard Business School (5). Thus, we feel that the original meaning of the radical concept has been distorted. However, is it really different from the case of incremental applications in the firms, and could not the real effects, of both the incremental and radical approaches in the organization be similar? Here is the major question at the heart of our observations of innovation teams in firms, which are presented later.

2. Daily innovation practices:

The paper elaborates conclusions from project management of interdisciplinary and multidisciplinary teams working on new products, services and innovation in several firms in various areas: pharmaceuticals, mechanics, public building, insurance and banking, design equipment, and car construction. We were charged with implementing the first team building in interdisciplinary configuration, and enumerating customer's expectations and needs. Each time, the senior management's strategic target was the avoidance a poor future financial or quality result. Therefore, product and service innovation was made, at least as significant as that of competitors, in order to avoid difficulties for the firm .We therefore implemented the "Voice of the customer" approach (Griffin § Hauser (6), Shiba (3), Lepage (7)). We began with the "one to one" interviews of the customers, which were thought to be highly relevant, and carried out "by customer perception innovation making" (Von Hipple (8), Goodrich § Aiman –Smith (5), Snead, Wycoff (9)). The sound reliability of this "contextual interviewing" method has been validated by many researchers (Lepage (14) and Chritensen and Raynor (10)) and is best expressed as "The primary purpose of Contextual Interviewing is to understand the "job(s) that need to be done", or the problems that need to be solved by your business model, service or product. The unmet needs of your 'Most Important Customer' must be uncovered". The other significant part of the approach is the ability to work in multi/inter/trans–disciplinary collaborative teams. Participants are trained to be open-minded in creativity meetings, able to co-design elements, with experts from other corporation, and to be customer-needs oriented. Some authors have commented on the key success factors of these methods, (Snead § Wycoff (9)), and about the automatic behavior - change effects in the organizations (Dillon§ Lee§ Matheson (11), Kirton (12), Lepage (13)): people making personal changes in cognitive processes in order to understand their work, and teams working in an autonomous context naturally applying principles of continuous change. The implementation of these methods allows us to analyze the level of success in the teams and the effects in the running of the organization.

2.1 Innovation for new product/service success

In this case, "The voice of the customer" method, as stated by Von Hipple (8), is used for teams which have volunteered to carry out innovation. The daily experience of contextual interviewing, among customers and multidisciplinary collaborative meetings, allows the agents of the organization to discover a new, important purpose in their work. In their perception of their role, they become dependent on customer power-shift, and forget earlier internal, hierarchical rules of decision making. This creativity is not perceived as the result of individual skill and experience, but as the result of the qualities of a floating conglomerate of internal and external participants in the organization. Those involved can see that the creativity and innovation outcomes are greatly increased, but that they cannot be linked to individual efforts and qualities. The board heading the organization adapts its decisions to the natural evolution of the innovation, particularly in the case of large new product/service success. Therefore, we observed a new drive in organizations, brought about both by the customers and a self-development in the team's performance.

2.2 Innovation for an increase in employees' creativity.

Frequently, firms use an external consultant to increase creativity methods inside their teams: problem solving, brainstorming and psychodynamic aspects of the design leading (Wycoff (9), Von Hipple (8)), or mixed methods, based on adapted tools distributed to corresponding individual psychological profiles of members in the same team (for example brainstorming, TRIZ, and “One to one” sharing, by Alberti § Lepage (15)). The employees learn to become uninhibited and avoid the constrictions of formal, classical relations and static procedures, and to discover a new self-expression. New participants come from other parts of the organization, having working links with former team members, following their participation in the team. We observed, in this case, that the teams are more likely to achieve innovation success when there are incentive schemes which generate working methods free of constraint. However, when top management continues to use classical business or project performance indicators in employee evaluation, they fail because these instruments are designed to observe former, standard activities (eg.–the ordering of stock by an employee). Therefore they cannot compare the real performance of cross-collaboration in creativity between team members, nor the potential value added by a “genius solution”, which would have offered large-scale royalties or sales in five years.

2.3 Innovation for adaptation to a tough context

We had to manage several applications in the case of stake-holder change, particularly when the firms were bought by pension funds and hedge funds, inducing the re-engineering of the internal processes, with a financial target such as 24% net margin after a year's production and sales. The first means to match the strategy was to re-design all the products and services so that they became the best competitor in the major divisions of the market. All the teams were under pressure and did their best towards ensuring the firm's success. As we employed the same tools as previously described, (“The voice of the customer” with multidisciplinary collaborative approach), we observed that the highest performances, in the design results, were due to optimal practices in the teams using adapted – but different – tools for chosen individual profiles in crisis situation, as it is partly presented by some specialists in the “New-contingency Theory” (Hollenbeck (16)) (see also 'Actor’s Collaboration Under Crisis', Lepage (17)). In this crisis situation, the new product/service innovation was only oriented to be better than that of competitors. We observed, each time, that the team members launched, by their own classification, both incremental and radical innovations, in equal numbers. This surprisingly good outcome is due to the motivation of team members working on new products and elaborating new processes. First, they used new materials to produce one major new product. These new production means , particularly on new processes, allowed the teams easily to deploy many different roots of product and services as to be the first in the market, and not already conceived by current competitors. Therefore, the question here is not to have incremental or radical innovation, but to elaborate new conception and production processes able to offer whatever kind of outcomes. The second effect we observed, in the form of these disruptive innovations, was the swarming of micro self-interactions, between internal and external actors, generating new, permanently evolutionary organization(s). It appears that the board preferred to adapt itself to the movement and to take a “go” option each time new products and innovations were presented for a production decision.

2.4 Innovation for a 'Best in class' target.

This is frequently the case in firms having the advantage of good financial and market results, in which the board makes the strategic decision to encourage some team members, on targeted product/service design projects, to become outstanding actors compared with current staffs. We had the opportunity to make this kind of monitoring, based on creative approaches (Snead § Wycoff (9)), and offering a panel of creative tools, adapted to the profiles of different actors constituting the teams (Alberti § Lepage (15)). We observed the same production of free innovation as in the previous case (§2.3), but with poorer results, because no vital outcome was demanded. The major difference in this case concerned the board's attitude. As the teams felt the necessity to redesign their own organization, the board ordered the team members to remain in their original places in the previously-scheduled general organization. The same attitude appears concerning the strategic “Go/No Go” decision to push further the innovation in the market, with the observation that the more frequent decision was “No Go”. In this case, the outstanding approach is to deploy the performance of high competencies, possibly interesting to use in the case of emergency, and the board remains in a research and development management position, maintaining the classical static organization.

3. HUMAN AND ORGANIZATIONAL ASPECTS OF THE MOVEMENT INDUCED BY INNOVATION.

This part displays the human and organizational aspects of the motion induced by innovation in organization. We also examine the state of existing simulation models for this movement and propose our modeling of the motion with biological analogies.

3.1 Human resistance to and acceptance of the movement induced by innovation

In the different cases that we observed, we found that innovation produces automatically a permanent movement in internal organization. The analysis of human attitudes and behaviors at the center of this motion shows the pathway by which actors contribute to the evolution of the organization. We recognized the principal parameter, in the induction of the configuration of the organization, a real human presence, as the central characteristic of a second order cybernetic system (Pangaro (18), Heylighen (19, 20)). We observed also that team members, working on innovation, generate a permanent movement of multi-combinations and links between actors, producing a 'self-design' of the organization inside the firm. We can also say that it is a true (auto) organizational learning, which is the second attribute characterizing the second order cybernetic system (Ashby (21)). This motion phenomenon is well described by John Bessant (22), who presents as “evolutive systems” those firms redesigning themselves as evolving organizations, in order to be able to produce outcomes of driving permanent and multiple innovations within themselves, particularly “discontinuous” ones (like “disruptive”).

Therefore, we apply the same definition of motion that John Bessant proposed: “motion is the evolving (“evolutive”) characteristic of the system (working team or organization in a company). For us, motion is the evolving aspect of parts of the organization between two observations, at different times. Details, like individual responsibilities, knowledge and procedures remain similar, but roles, the team's configuration and interfaces between the team and the global organization have been changed. We measure this evolutive process by the percentage of parts of the system, or the percentage of individual tasks, which have changed between two observations of the system separated by a time interval of “t”. Therefore, 100% motion means that all the parts of the system have changed between two observations. Here, the measurement is made on very simple data, roles and situations observed inside the teams. We take into account only the fact that they have changed or, conversely, that they have remained similar between two observation points. We show in figure 1, below, the good positive correlation between the % of motion in organization and business success, measured by the % of design projects which enable the company to enhance market share, due to the newly- developed product or service:

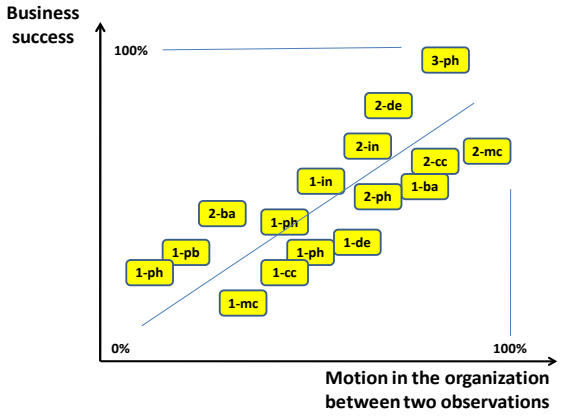

Figure 1

On the graph, the companies are classified as follows: ph (pharmaceuticals, mc (mechanics), pb (public building), in (insurance), ba (banking), de (design equipment), cc (car construction).

Here, the team cognition, the interpersonal collaborative approach and the impact of context in the team's functioning are not considered. Otherwise, we would have had to modify the measurement, taking into account the variations, due to the complexity of human behaviors, making the system a second order cybernetic one (Heylighen (19,20),Pangaro (18)). In this research, we observed and measured the system as a first order cybernetic one.

Our involvement, in the actual projects within companies, allowed us to analyze the internal links between teams and the global organization. We were able to put aside an introverted view of the system, and spend much more time in our laboratory, and thus reflect on the psychological, social and organizational aspects of these episodes of entrepreneurial life. These internal/external analyses, in a dozen firms, respect the principles of the “quali-metric” reliability of research approach, which we continuously apply (Lepage, (23)). These observations enabled us to validate that top management is mostly opposed to the movement. Obviously, if the board is made up of members accustomed to the practice of market-driven creativity, the firm can drive innovation in a motion sense. However, in most of cases, firms with varying order books and unpredictable financial resources are unable to apply the system. Of course, conversely, more often we

saw board members panicking each time that innovation was generated by a team. Therefore, they preferred to hedge in the innovation projects with many constraints and limitations, proportionally to the importance of the innovation's potential. They frequently made a "No Go" decision, in meetings with team members, in which everybody gave their opinion of the project's efficiency. It is not necessary to comment further on the effects of this kind of meeting on the motivation of team members. We acknowledge, however, that it must be really very difficult for most of the managers to understand actually what is the permanent movement in organization (organizational motion, Lampel § Shamsie (24)). In each case studied in the firms, we observed that project management criteria, which are well known to be a rigid control style of management, squashed the breath out of the natural innovation and reduced its creativity level almost to zero. In all cases, we validated the necessity to reduce the project table and to leave the innovation team to run, by itself, towards success.

The other aspect of firm global management is performance evaluation. In classical business, in stable and easily-understood organizations, managers are accustomed to using global indicators to analyze business success. These are employed at all levels of the organization, from the top down to the last member in a team. In organizational motion, we have many difficulties in linking individual creative efforts with team success in product design, and it is impossible to balance added value, produced by a team, with the global business expectations of the firm, particularly about order levels. This effect is described by Dave Ulrich (25) who explains that some top firms fired the lowest 10% of creative team members to obtain 20% more in global net margin. However, he demonstrates first that classical, individual indicators, used in employee surveys, tend to destroy people's motivation and generate more than a 30% loss in net margin. We are able to state that classical top management practices, in business reporting and employee evaluation, generate resistance against the free development of organizational motion driven by innovation.

3.2 Simulation of motion in organization.

Some simulations have been carried out to describe human organizations, mostly using animal and human body analogies, in first order cybernetics approaches often named "simply systemic". However, in the case of organizational motion driven by innovation, we found two types of analogy recently proposed to represent this movement.

The first model proposed is the genetic one, based on natural genetic diversity. Making algorithmic simulations to preview all kind of situations, it offers a panel of choices to be decided, with less than twenty internal parameters to be changed in less than ten modes. It performs large equations with the use of a reasonable parameter number. (Miura § Maini (26)). However, our problem in organizational motion is, conversely, based on simple equations of the system, with a great number of parameters, making the system unstable and unpredictable.

The second model is based on human metabolism, simulating the self development and the organizational learning movement. Researchers observed this phenomenon in the case of high level innovation practice in project teams in charge of new products (see Hatchuel and Weill (27)). This is a useful simulation model, from our point of view, because it seems to mirror the free, "anarchistic" increase of living interactions between elements, in the phase of innovation generation, compared with the change in metabolism with the rise in body temperature. Particularly, the analogy with a bunch of grapes (Hatchuel) seems to be relevant in simulating the acquisition and learning of competencies and skills in innovation teams. However, it seems to be only truly analogous in the first phase of metabolism. Indeed, we are not completely satisfied with this solution, at the end of the cycle, because the metabolism cycle dictates an automatic return to the initial point of equilibrium. This is the case with innovation under constraint, or under strict project management control, evaluated by "Go/No Go" meetings in non-motional organization in which the top management remains committed to a research and development culture and constantly returns to an identical business configuration in order to be reassured. This attitude could be defined as "zero risk management", diametrically opposed to innovation.

In true motional organization, driven by innovation, we need a model simulating an open, natural evolution with a stable, but unpredictable first phase, following the necessary period of transformation. Therefore we propose the analogy with fermentation. The process begins with the crushing and pressing of fruit, and sometimes with the addition of a little sugar. The juice is held in tanks and maintained at controlled temperatures in two phases, and then filtered, before being transferred to another tank and the 'must' left for sedimentation to occur. At this stage we leave the fermentation phase, which is triggered naturally in vinification, and can enter the "seeding" process in acetification, with the introduction of Acetobacter. The two processes are similar in the final phase of fermentation, because they are both based on the twinned

development of two chemical reactions: alcoholic fermentation and acetic fermentation, (the former mycological and the latter bacteriological). This last part is very important and very difficult to achieve, with the precise control of temperature and addition of powdered yeast. Of course, oenology is deeply involved at this stage, with human intervention, based on skills coming from knowledge and experience. These skills are at the center of the quality of the products obtained. Interviewing oenologists, we learned how, annually, they assure a continuum of taste and high quality of wine, or vinegar, as the case may be, whatever the quality of grapes, the weather, the natural sugar concentration, external temperatures and the quality of the oak used in the barrels. These are some simple examples of the real multitude of variable parameters which apply in wine production. Oenologists say that they are not able to master the process from their knowledge alone. The system is simple at heart, but becomes very complex due to environmental impact, the natural variability of ingredients, and many unknown factors which arise during the progress of central process: parameters, environment and human intervention. It is impossible to simulate the system in equations, but oenology has been able to cope with problematical factors, a second order cybernetics system, and, by experience, sensing how to assure the quality, whatever the actual conditions are, sometimes making a fine, delicate adjustment in a small part of the freely developing system. We propose this biological analogy with the natural evolution of the innovation process, as a prescriptive frame, with the parameters of the analogy as under:

-cells and materials involved in the fermentation process are similar to members' profiles, and technological knowledge available to the team;

-oenologist's interventions on temperature, and experience of the fermentation process, are similar to skills, collaborative tools and methods in interdisciplinary team management.

Now, this frame was tested on the sixteen teams, mentioned in figure 1, that we observed in companies. At present, we have not received all the data, and, therefore, can neither analyze nor validate the model. Obviously, it will be the subject of a further research paper.

4. Conclusion

Based on our Beta–Binomial validation research method (Griffin § Hauser (6), Lepage (7, 23)) our observations in firms involved in intensive innovation show that, whatever was the desire of the top management to keep radical or incremental innovation as an outcome of their strategic decision, the actual daily innovation practice produces a permanent movement in organization. We observed also that, each time design teams volunteered to acquire good methods, like the contextual interviewing of customers, and collaboration management, to induce a continuous movement of the organization towards market and environment, the innovation was successful, even if the staff's strategic decision was against the launching of the innovation process. In every case, in which working teams became professionals in customer-need oriented innovation, and inter/ multi/trans-disciplinary team collaboration, the firm had the advantage of producing permanent innovation outcomes, even if it was not desired by the strategic board. However, it has the problem of being unable to drive the self-developmental movement inside its internal organization. As validated by Stefik, M., and Stefik, B., (2) innovation is a breakthrough which takes people by surprise. Therefore our research shows that, when firms work with outstanding innovative teams, using advanced methods to produce "best in class" business results, it is not opportune to focus on the attribute of the classification of incremental or radical innovation. It is more relevant to use the concept of motion, applied to the heart of the new permanent development of the organization which has been created by the new radical best practices with their "disruptive" properties. This motion, centered on human activation, allows the firms to function in a second order cybernetics system (Heylighen(20), Ashby (21)). The most pertinent question to ask is not what kind of innovation – radical or incremental – is crossing the organization, but whether the organization of the working life of the firm is in permanent motion, or not.

As top managers in charge of their organization need tools to drive this permanent evolution, we propose a prescriptive frame of a possible model, coming from the biological analogy with fermentation. We focus on measuring several robust parameters to extract a systemic part of the organization, which is able to model the motion inside the complex global system in the firm. This analogy is derived from the approach, used in oenology, to obtain an annual continuum of best product quality, giving best customer satisfaction, whatever is the high level of complexity in the fermentation process or external conditions.

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