

RADICAL STRATEGIC CHANGE IN HIGH TECHNOLOGY NEW VENTURES: A NATURAL EVENT?

Eyal Benjamin: Swinburne University Of Technology, Melbourne, Australia

Eli Gimmon: Tel Hai Academic College, Tel Hai, Israel

Liora Katzenstein: Swinburne University Of Technology, Melbourne, Australia

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Contact: Eyal Benjamin, Swinburne University of Technology, PO Box 218, HAWTHORN, 3122 Melbourne, Australia, (T) +972-52-2266-526, (F) +972-3-6370-757, Email: eyal@keb.co.il

ABSTRACT

New venture strategy strongly affects its performance and is subject to many changes following the high levels of uncertainty as well as changes in business environment. In some cases incremental changes do not generate anticipated performance, and radical change in strategy occur. These quantum leaps, a phenomenon described in botany as punctuated equilibrium, contradict common incremental Darwinian model of new venture strategy formation. Punctuated Equilibrium was recognized in organizational behavior as well. Yet its mechanisms are still unclear. Inspired by recent explorations in botany, we explore the relationships and mechanisms initiating radical strategic change in high technology new ventures.

INTRODUCTION

Business strategy is one of the major factors affecting new venture performance (Gartner, 1998; Chrisman, Bauerschmidt and Hofer, 1998; Shepherd et al. 2000). In high technology new ventures, strategy formation process is even more complicated, due to their greater span of technological alternatives and technology markets playing a role in this context (Arora et al. 2001).

The strategy formation process in new ventures is evolutionary and incremental (Nelson and Winter 1997, Barnett and Burgelman 1996, Lovas and Ghoshal 2000). This evolutionary perspective of incremental changes in strategy and new venture formation was later paralleled with the Darwin's theory of development of species (Witt 1999, Boeker 1991) explaining the diversity of organizations, their competitive aspects and "the survival of the fittest" (Hannan and Freeman 1997). In many cases, the incremental change is not sufficient (Miller and Friesen 1984) and more radical changes in strategy take place (Ginsberg and Abrahamson 1991). Yet, these quantum leaps in organizational development and discontinues change were not easily supported by the Darwinian Theory.

The Punctuated Equilibrium perspective (Eldredge and Gould 1972,) elaborated the Darwinian view, explaining Quantum evolution and the rapid appearance of new species (Gould and Eldredge 1977). Later, Romanelli and Tushman (1994) had used the Punctuated Equilibrium model for exploring fundamental changes in patterns of organizational activity. Their findings support the inability of incremental changes to produce these fundamental transformations as well as the influence of major environmental changes

in initiating discontinued change in the organizations.

The organizational fit of a venture to its environment plays a major role in its survivability (Aldrich and Pfeffer 1976), emphasizing the dynamic internal abilities of a venture to adapt to a changing environment (Miller 1992). The interaction between strategy and the environment drive the fate of entrepreneurial efforts (Aldrich and Martinez 2001). Hence, radical changes in strategy are critical in dynamically changing and uncertain environments, such as the high tech industry (Zahara and Bogner 2000, Matthews and Scott 1995). While there has been substantial theoretical and empirical work done regarding strategy changes in mature organizations (e.g. Gioia and Chittipeddi, 1991; Stacey 1995; Rajagopalan and Spreitzer 1997); there is an uncovered area in research regarding strategy change in new ventures (Nicholls-Nixon, Cooper, and Woo, 2000; Ambos and Birkinshaw 2007)

During recent years, a few breakthroughs occurred in understanding the micro elements in deriving the evolution of new species in relation to environmental changes (Rutherford and Lindquist 1998) as well as the clarification of micro- macro of evolution (Van den Bergh and Gowdy 2003). This paper explores to what extent these findings can be useful in the context of the evolutionary perspective of strategy, studying the cases of radical changes in strategy in hi tech new ventures.

LITERATURE REVIEW

The founders of a new venture provide an initial strategic direction which puts a constraint on subsequent change in strategy (Boeker, 1989). Some researchers (Cooper 1993; Brush, Greene, and Hart, 2001) argued that although strategic decisions influence performance, they are dependent on the entrepreneur, who is the primary resource. Business strategy can be controlled by the entrepreneurial team, far more than all other factors (Shepherd, Douglas, Shanley 2000).

Planned vs. emerged strategy

The two main approaches referred to in the entrepreneurial strategy formation process are "planned strategy" and "emergent strategy" (Smith 1998; Harries, Forbes, Fletcher 2000). While Porter and subsequently Reid (1993) claimed that formal planning is more effective for achieving competitive advantage, Mintzberg (1994) criticized formal planning procedures as being too rigid and suggested that strategic decisions are reached through learning and experience, based on the intuition and creativity of key personnel. However, most entrepreneurial texts advocate planned strategies should take place prior to launching new businesses (e.g. Smith 1998; Delmar and Shane 2003; Timmons and Spinelli 2004), but that the value of planning for venture survival is context-dependent (Castrogiovanni 1996). While large firms respond to perceptions of increasing environmental turbulence with increased planning (Lindsay and Rue 1980), small firm with limited resources (in terms of managerial time as well as financial resources) make such a response less likely (Patterson 1986).

Due to the rapidity of change in emergent industries, and especially in high technology industries (Arora et. al. 2001), strategy change is required to sustain survival in new ventures, as stated by Shepherd, Douglas and Shanley (2000:399): "a business plan . . . only provides the strategic intentions behind the venture. Plans almost certainly will not turn out as predicted, and the environment faced by a venture will not be as anticipated and may change frequently. Performance will deteriorate if changes in the environment are not detected by the entrepreneur(s), if strategies are not reassessed, and if new strategies are not formulated and implemented."

Evolutionary perspective of strategic change

Since uncertainty accompanies every entrepreneurial venture, (Mathews and Scott, 1995), the need to modify and alter the business strategy is evident, resulting in the adaptation of an Emergent Strategy by many of the entrepreneurs. An Emergent Strategy indicates that the venture's strategy is being incrementally modified and altered on-the-fly, as the entrepreneurs gain more knowledge of the new-venture's real business aspects. Strategic changes are a normal part of the process by which entrepreneurs seek to position their business (Nicholls-Nixon, Cooper, and Woo 2000). These researchers proposed that the level of perceived environmental hostility affects the level of strategic changes undertaken in new ventures. This ecological/evolutionary perspective of strategy was described by Boeker (1991) who used ecological arguments to explain the role of competition and environment in influencing the expansion and decline of organizations pursuing different strategies. The evolutionary perspective of economics was reviewed by Nelson and Winter (1982, 2002) and was

later described as being a dynamic, path-dependent model that allows for possibly random variation and selection within and among organizations (Barnett and Burgelman 1996). It was only natural that the evolutionary perspective was set eye to eye with Darwinian theory of evolution (Witt 1999), since it offers a theoretical framework and ontological precepts, rather than a detailed set of theoretical explanations for all phenomena (Hodgson 2002:277). The evolutionary perspective has set the foundations for the development of strategy as guided evolution (Lovas Ghoshal 2000).

Environment influence on strategic change

Environmental Changes are commonly considered as a cause for changes in strategy (e.g. Bhide 1994; Rajagopalan and Spreitzer 1997; Kraatz and Zajac 2001). They can also be viewed as “changes in the strategic "recipes" or "formulations" that managers use to construe their environment”, which are advocated internally by new members of the top management team or, externally, by management consultants (Ginsberg and Abrahamson 1991:174). Based on differences in environmental forces and organization resources, Zajac et al. (2000) had found that the timing, direction, and magnitude of successful strategic changes can be logically predicted.

Matthews and Scott (1995) found an inverse relationship between environmental uncertainty and level of planning sophistication in entrepreneurial firms, and claim that as environmental uncertainty increases, sophistication of planning decreases. They further argue that since successful entrepreneurs are extremely sensitive to the perishable nature of the opportunities emerging in a rapidly changing environment, taking the time to plan under conditions of high uncertainty may result in the loss of the opportunity (Bhide 1994). Yet, from the evolutionary approach, strategy and environment interact in a continuous process (Aldrich & Martinez 2001), causing change to be inherent to the entrepreneurial effort. Those misalignments between the environment and the current strategy are the causes for changes in strategy. These "misalignments from the environment" are not necessarily objective ones, and are defined as perceived by the management team (Ginsberg and Abrahamson 1991). Hence, the misalignment between current strategy and the environment structure may exist or may not. Yet, it is the internal perception of misalignment that matters to the initiation of strategic change (Johnson 1998, Farjoun 2007; Parker 2006). Figure 1 below describes the change over time when a venture realigns itself to the newly perceived environment, following a strategic change that eliminated the misalignment.

Radical Strategic Change

In cases where small incremental changes may not be sufficient, the founding team may decide to conduct a Radical Strategic Change (RSC) and re-establish the new ventures' business strategic approach. Tichy (1983) defines such change as "non routine, non incremental, and discontinuous, which alters the overall orientation of the organisation and it is likely to have been imposed on the organization by change in the environment". Hopkins (1987) defined a strategic change in an organization to be "radical" rather than "ordinary" if it combines three well distinguished factors: (1) departing significantly from the organization's former way of doing business; (2) having far-reaching effects; (3) creating uncertainty and insecurity among organizational members. Changes in business orientation can be classified by magnitude as Incremental vs. Dramatic (Miller and Friesen 1984:203) or, alternatively, as Incremental vs. Radical (Ginsberg and Abrahamson 1991), where radical changes involve business state and pattern. Based on previous research, strategic change can be defined (Rajagopalan and Spreitzer 1996:49) as “a difference in the form, quality, or state over time in an organization's alignment with its external environment, (where this alignment is) the fundamental pattern of present and planned resource deployments and environmental interactions that indicates how organization will achieve its objectives.” (See figure 1 below).

Being of a revolutionary, quantum-leap nature, RSC diverges from the Darwinian evolutionary perspective of strategy (Johnson 1988, Khalil 2000). At the extreme extent of this view, Farjoun (2007) asks: "Are these [structural] established ideas, so strongly rooted in permanence and continuity, still relevant in today's unstable, hyper-competitive and turbulent environments?"

It is common view that organizations are constrained in their ability to adapt. Therefore, their general tendency is to preserve strategy rather than to perform a radical change (Quinn 1980; Miller and Friesen 1984). Porter (1980) identified mobility barriers in industries which inhibit movements of firms from one strategic position to another. In accordance with these researchers, Boeker (1989) found that semiconductor firms, who had adopted a dominant strategy at the founding stage, maintained this strategy over time. Boeker (1989:492) asserted that “the extent to which consensus

develops around a strategy at founding, may make the strategy more open to subsequent questioning or redirection by organizational participants." In addition to strategy constraints set during early stages of the company, the need for significant investments may limit the organization's ability to change its strategy (Freeman and Boeker 1984).

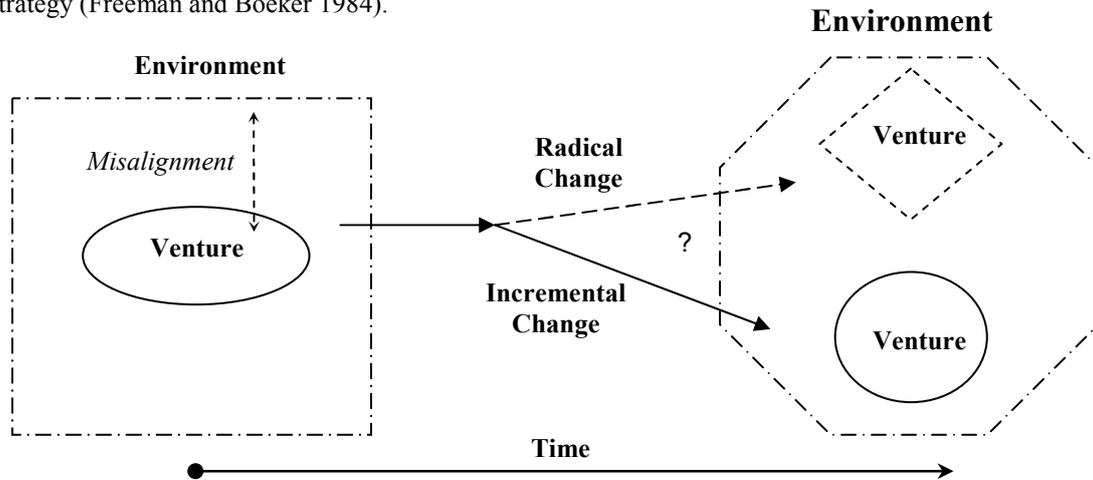


Figure 1: Radical Vs. Incremental change in business strategy.

In analyzing the process of evolution and change in high technology new ventures, where both resources levels and expertise are constrained, Ambos and Birkinshaw (2007) chose to use the concept of "Business Charter", defined as the shared understanding of the elements of business of which the venture leaders assume responsibility. Charters include three key elements: (a) products and markets targeted, (b) venture capabilities, and (c) the future state of the venture's scope as communicated to external stakeholders. Using multiple case study design in four technological new ventures, Ambos and Birkinshaw concluded that changing charters is broadly a healthy event for a venture, since whenever a venture changed its charter, the change was beneficial in terms of refocusing on a neglected aspect, or pushing the venture to think more ambitiously than it had done previously. According to Ambos and Birkinshaw, a RSC may be a common and favorable event jointly with a change in the venture's charter.

Strategic change can have a crucial impact on organizations, since the successful execution of a recommended strategic change is a rare achievement (Beaver 2003). Hence, when a RSC occurs in a venture it requires substantial thought, courage, flexibility as well as personal ability on behalf of the entrepreneur. This event represents high risk in the life of a new venture. Yet, it may be the turning point that will save the venture and place it on a growth track. While there has been substantial theoretical and empirical work done regarding strategy changes in mature organizations (e.g. Gioia and Chittipeddi, 1991; Stacey, 1995; Rajagopalan and Spreitzer 1997); there is an uncovered area of research regarding strategy change in new ventures (Nicholls-Nixon, Cooper, and Woo, 2000; Ambos and Birkinshaw 2007).

Resource-Based View and New Venture Performance

The relationship between dynamic environments, and venture strategy was suggested to be through its available resources (Kraatz and Zajac 2001). Sirmon, Hitt and Ireland (2007) linked value creation in dynamic environmental contexts to the management of firm resources, including its internal abilities (Miller 1992).

Promoting the Resource Based View (RBV), Barney argued that "sustained competitive advantage derives from the resources and capabilities a firm controls that are valuable, rare, imperfectly imitable, and not substitutable" (Barney et al., 2001:625). He suggests that resources and capabilities can be heterogeneously distributed across competing firms, in a way that explains why some firms consistently outperform others. Based on this perspective, Barney (1991, 2001) regards the resource-based view as consisting of a rich body of related, yet distinct, theoretical tools for analyzing firm level sources of sustained competitive advantage. Porter (1991) argues that RBV cannot be an alternative theory of strategy, since it cannot be separated from the cross-sectional determinants of competitive advantage which derives from more than just resources. The conditions which make a resource valuable bear a strong resemblance to industry structure. Porter also considers the RBV to have the greatest significance in environments where change is incremental and the number of strategic

variables and combinations is limited. Building on RBV, Noda and Bower (1996) demonstrated the important role of resources at different corporate contexts which function as an internal selection environment to generate a varied resource allocation pattern and to shape different evolutionary dynamics among multiple competing businesses. They found that the escalation or de-escalation of a firm's strategic commitment to new businesses is a consequence of iterations of resource allocation.

The importance of resources in new ventures

The recognition of the firm as a heterogeneous bundle of resources, as follows from resource-based theory, yielded the need for a systematic categorization of resources in order to better understand, evaluate, and select the resources necessary for the start-up process. Alvarez and Busenitz (2001) used the resource-based view to show that entrepreneurship involves the founder's unique awareness of opportunities along with his/her ability to acquire the resources needed to exploit the opportunity and the organizational ability to recombine homogeneous inputs into heterogeneous outputs. Resource-based theory provides a basis for explaining resource identification, acquisition, and deployment in new ventures, where the discerning appropriate inputs are a matter of entrepreneurial vision and intuition. The initial combination of resources is necessary to support the increasingly complex layers necessary for the company to achieve a competitive advantage (Greene, Brush, and Hart 1999).

Stevenson and Gumpert (1985) stated that resources in entrepreneurship were central to the implementation of the opportunity. Brush et al. (1997) suggested examining various types of resources and their role in small firms since, despite the critical nature of resources in entrepreneurial endeavors, there are comparatively few studies in this field. Greene, Brush and Hart (1999) considered the foundation of resources and means by which they enter a new organization to be critical to its success. They argued that though current applications of resource-based theory in the strategic management literature assume the initial establishment of a resource-base commitment to an opportunity has already taken place, the process of assembling the initial resources for a new venture is a theoretical gap.

Radical Change and Punctuated Equilibrium in Botany

Similar questioning, regarding the limitations of Darwinian perspective to explain quantum leaps (Simpson 1953) in evolution, appeared in the biological world, making room for the Punctuated Equilibrium theoretical framework by Eldredge and Gould (1972). As a matter of fact, Punctuated Equilibrium was claimed to be a "natural manifestation of the wrightian evolutionary theory" (Newman et al 1985:400). The idea of Punctuated Equilibrium proved to be useful and appropriate in various social science fields as stated by Gersick (1991:11): "This new way of thinking has far-reaching implications for organizational practice and theory about when and how change occurs, and how it can be managed. More important, it offers some promising conceptual tools for understanding the issues facing organizations in an environment where incremental adaptation increasingly appears to be unequal to the economic, social, and ecological dislocations taking place."

The application of the Punctuated equilibrium theory in the business world was suggested by Tushman and Romanelli (1985) and later empirically validated in the semiconductor industry by Romanelli and Tushman (1994) stating: "Results of this study demonstrate that revolutionary transformation, as predicted by the punctuated equilibrium model, is a principal means by which organizations fundamentally alter their systems, strategies, and structures" (Romanelli and Tushman 1994:1158).

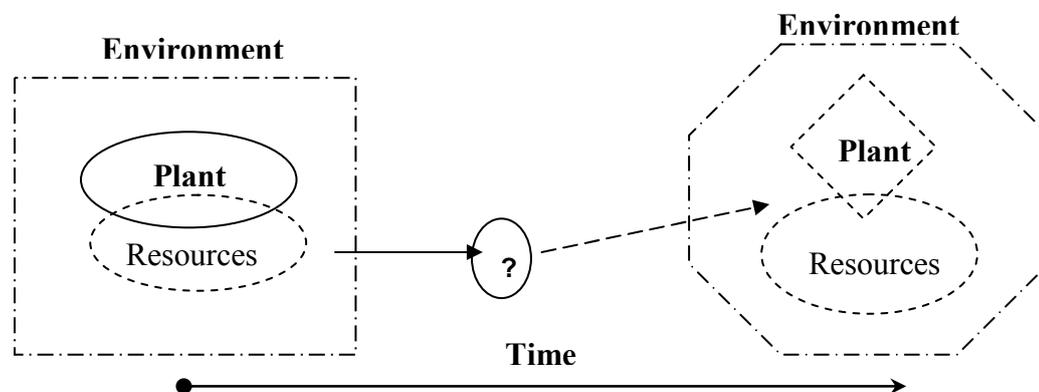


Figure 2: Quantum leap in plant evolution

Although the punctuated equilibrium theory was widely accepted in the botanic world, and implemented in many other disciplines, the causes for the "punctuated leap" i.e. for moving from one equilibrium phase to another, were yet to be discovered: An important problem for evolutionists is understanding the forces that cause the adaptive shift (Kirkpatrick 1982) as described in Figure 2. Another challenge is tracing the cause and effect flow from the micro (genetic) characteristics to the macro (strategy) behavior (Van Den Bergh and Gowdy 2003). In the botanic world demonstration of such mechanism was shown when widespread variation of morphogenic pathways in a population occurred when a specific protein was buffered by extreme heat (Rutherford and Lindquist 1998). Other examples explored the genomics response to environmental stress (Gasch and Washburn 2002).

THE SUGGESTED ANALOGY

The analogy between biology and economics has its roots back in the early days of economic thinking and has grown broadly into use as described in the work of Dosi and Nelson (1994) and Levit et al. (2008). This paper builds on these principles in order to explore the trigger for the occurrence of RSC in hi-technology new ventures.

We first outline the analogy model described in Table 1. In this model, business strategy and the organs' DNA hold the "pattern in stream of decisions" (Mintzberg 1987:935), operating under a given context of resources and conditions. It is noted here that using the term "decision" regarding plants does not imply intelligence or "plant thinking", rather it refers to conditioned actions such as - flourish at a certain temperature or sprout at certain moisture levels etc. The "pattern" implantation process is via translation to various actions performed in all parts of the organization, similar to various RNA transcriptions from the DNA impact parts of the plant (Stern 2006).

Section II presents the Darwinian part of the analogy, in which incremental evolution is achieved by incremental steps. According to this process those who do not fit the environment perish, except for those plants having an "error" in their DNA enabling them to survive, or those adjusting their RNA, generating a new Phenotype. This type of change is not far lasting as it survives only the current life cycle of the venture or plant (Burt 2003).

The third section (section III) describes the analogy in light of the Punctuated Equilibrium model in which quantum leaps in evolution occur in reaction to environmental stress (misalignment). It is noted here that in plants resource surplus is considered a stress condition as well e.g. over watering or intense sun light. Stress conditions were shown to ignite changes in DNA (Rutherford and Lindquist 1998, Gasch and Washburn 2002, Gasch and Washburn 2002). When changes made fit the new stressed environment, the plant survives, but not all survive the change.

Limitations of analogies are well noted and we note the limitations of these analogies in particular. DNA changes in plants will happen in many cases only in the next generation, unlike businesses that can modify their strategic DNA within their own life cycle. Furthermore, plants do not have the ability to move to a different habitat, they have no regulations and their limitations on resource accumulation are much bigger than of businesses.

The Analogical Model		
Business	Principle	Botanic
<i>Section I: Terms Compatibility</i>		
Business Environment	Context	Environment
Business strategy	Content	Plant Genetic code (DNA)
Strategy Implementation	Process	Transcription (RNA)
Performance	Growth	Biomass
<i>Section II: Evolutionary perspective</i>		
Incremental changes in strategy	Evolutionary Evolution	Darwinian Theory of evolution
Between Venture and Environment	Environmental Misalignment	Between Plant and Environment
Business failure	Mortality	Plant termination for most, "Survival of the fittest."
Venture performed an incremental	Survival	Phenotype:

change		A new variation of plant.
<i>Section III: Revolutionary perspective</i>		
Between Venture and Environment	Environmental Misalignment	Between Plant and Environment
Strategy reformed by Radical Strategic Change	Quantum leap Evolvment	Gould's theory of Punctuated Equilibrium
<i>Relation between venture resources? Focus of this study.</i>	Cause igniting the change	Lack/Surpluses of resources ignite genetic change in DNA.
Venture departing significantly of its old business manners.	Modified Content	Genotype: A new type of plant.
RSC failure	Mortality	Mismatched Genotype: Plant perishes.
RSC Success	Survival	Genotype: A new type of plant.

Table 1: The suggested analogy

This research focuses on this particular gap: Can we expect a correlation between resources to the initiation of RSC in new ventures as applied in plants? We explore the major causes which prompt RSC in high technology new ventures, based on the level of resources, and based on an analogy to similar mechanisms discovered in Botany.

METHODS: DATA COLLECTION AND ANALYSIS

Aiming to provide an internal view for the empirical phenomenon of Radical Strategic Changes (RSC) in new ventures, we applied a qualitative study in order "to understand and represent the experiences and actions of people as they encounter, engage, and live through situations" (Elliott, Fischer and Rennie 1999:216). In order to explore the factors and effects of RSC, we opted for an inductive research design of a multiple case method (Eisenhardt 1989; Fried and Hisrich 1995; Yin 2003). Following Ambos and Birkinshaw (2007), we believe that the case study method fits well with this research in order "to explain the presumed causal links in real-life interventions that are too complex for the survey or experimental strategies" (Yin 2003:15). Following Porter (1991:116), the methodology of this study controls for major external effects when studying the effect of internal resources on performance. The external factors monitored were: competitors and markets for the products of the venture.

This paper includes the findings of four cases. We chose to adopt a multiple case study design, which is preferred over a single-case study design for more robust generalization, due to "the substantial analytic benefits from having two or more cases" (Yin 2003:53). Replications should alter one or two experimental conditions to see whether the findings could still be duplicated. The initial case selection criteria were: hi-technology venture, which had undergone at least two RSCs', one considered by management as a successful one, and another, regarded as a non-successful one. In order to reduce biases resulting from specific unexpected items, the selected company had to have minimal variations in terms of decision leaders in the two RSC events.

The selected cases were expected to have two radical changes in strategy in sequence, while the same management remains in place. One of the RSC's had to be considered by the company as "unsuccessful", and the other as "successful". This ensures that many variables would resemble in both RSCs'. By comparing two RSC's in the same venture, we reduce the number of uncontrolled variables. Secondly, we aim at variation in filed of action of the cases. These criteria allow "to obtain information about the significance of various circumstances for case process and outcome (e.g. three to four cases that are very different on one dimension)" (Flyvbjerg 2006:230).

We selected diverse characteristics of four Israeli high-tech companies as follows: (i) an internet software company established in the year 2000, which survived one failed RSC and had a second successful RSC. (ii) an energy management company, established at 1997, which had lately gone through a promising second RSC, (iii) a network software company established at 2005, and went through 2 RSCs, (iv) a supportive case of a medical device company which had undergone 3 RSCs,

based on the Visionsense (Marram and Hedberg 2005), a case study of Babson College which we followed and updated.

Data was collected through a methodology of semi-structured interviews: we interviewed the major figures involved in the ventures from initial idea to commercialization, including the managers and owners of the venture, venture capitalists, and alliance partners. The interviews were taped and subsequently transcribed, and notes were taken throughout the interview. We then sought for patterns in the data, by looking for consistencies and inconsistencies in the explanations given by the interviewees. By tabulating data and comparing responses across all respondents, as recommended by Myles and Huberman for cross-case displays (1994).

Interviews lasted between 60 and 120 minutes, including questions concerning the history and emergence of the venture, the decision making process, the people involved, as well as the environmental challenges and the teams' responses to them. The interviews were analyzed using the Nvivo software (Richards 1999).

FINDINGS

The interviews aimed at presenting a coherent view of the company's evolution process, described below. Names of companies and people were changed in order not to reveal their identity

Datamate

Datamate is a software design company operating from Israel, providing software maintenance tools to Information Technology (IT) administrators in the business workspace. The product is not industry specific. Yet, it is internet-technology related, without any specific country/culture orientation. Datamate was established in 2000 when one of the founders, was nominated CEO, and is still holding this position. The founders believed in a "Grow as we go" strategy, which meant, avoiding extreme risks and Selling directly to end users. The large availability of financial resources enabled the founding team to raise US\$ 3 Million within just a few weeks.

The first RSC was moving to sales through channels. The decision aimed to gain rapid market share. During the first two years of operation, the company has signed agreements with most of the significant relevant manufacturers at that time, as well as with a few resellers. A few direct sales to end-users who accessed Datamate directly, were signed as well, but revenues did not grow. Datamate's funds were draining out, representing about ten months of survival for the company. The investors were reluctant to invest additional funds into the company, while crushing financial markets prevented the company from raising new funds from new investors. Datamate's second RSC took place at mid 2002: moving back to direct sales. The team adopted a 'survival' mentality, utilizing the advantages offered by the internet and targeted advertising, the company became profitable by the end of 2004. Datamate never stopped growing since then. Datamate's market and technology environments were unchanged during the 2 RSCs.

Gellergy

Gellergy was established in 1997 following 3 years of R&D, aiming to revolutionize energy supply for low consumption electronic devices. Gellergy raised about US\$1.5 million. The core strategy was to be an Intellectual Property company aiming to sell know-how and licenses for using Gellergy's technology. Once a first customer has shown interest in late 1999, Gellergy managed to raise additional US\$ 13 Million from venture capital firms.

At this point, Gellergy actually underwent its first RSC: design products based on their core technology. Having sufficient cash at hand, manufacturing facilities were built in order to prove the ability for "Quality, Quantity and Price". The company had signed agreements with leading players in each of the targeted markets, which assisted in raising about US\$ 12 Million for the company.

In 2001, it was clear that the contracts failed to deliver, as the technology did not mature. During the years 2002-2007, more contracts were signed, the technology was improved, and more funds were raised. Yet, the company was unable to generate cash via sales. The strategy was not altered during the 2.5 years Shane was acting as CEO, and even continued when he was replaced by Jeremy Cereme. The second RSC took place at the end of 2007, when Gellergy had its RFID division spun-off to be a

separate company raising \$8 million from new investors. At this point Gellergy returned to being an IP-based venture, as initially planned. In terms of market environment, there was a stable and moderate evolution of the market. No major or critical events were noticed during the researched time span.

Netaction

Netaction was established in 2003, as a 'Garage'-based software house, aiming to simplify PC network maintenance and control. During the first 2 years the team operated in its local market (Israel), building up the technology and accumulating a customer-base. In early 2005, Netaction raised a major investment from a UK-based investment group. Yet, the former management stayed in place. Having funds available along with strategic connections in the UK, the first RSC took place: The Company focused its sales efforts to resellers in the UK alone, abandoning the web-based sales strategy.

As the new strategy failed to deliver an increase in sales additional funds had to be injected in early 2006. The efforts invested during 2006 and 2007 still did not produce sufficient sales and targets were continuously unmet. Direct competition was mostly unchanged during the lifespan of the company, and no major product has managed to overtake dominance in the market. The demand for PC network management tools was generally unchanged. No major changes were identified in the technological environment. In early 2008 Netaction shifted to a global internet sales strategy, utilizing the remaining cash to establish web-based sales and marketing infrastructure. The results came soon in the form of sale leads from around the world. However, sales were not enough to support the company. At the same time, the company enjoyed growing interest from potential strategic investors.

Visionsense

Visionsense was established in early 2000, aiming to bring three dimensional visions into the field of minimal invasion surgery based on software-driven platform. The founder, managed to raise US\$ 6 million at the end of 2000, with a vision to grow sales and profits quickly through mergers and acquisitions.

Visionsense had stumbled upon many hurdles with cash running low due to its high monthly burn rate. The crash of financial markets during 2001 prevented raising additional funds. The first RSC came in late 2001 when Visionsense revealed its first system that could be integrated into most modern operation environment. This represents a product-based company, rather than an IP-based company, as planned upon inception. Soon Visionsense noticed that the change was not enough in order to either bring the company to financial independence, or to raise the additional funds required to bring it there. The second RSC took place by perusing several leading medical manufacturers in the global market for embedding the technology. The market environment might be somewhat deceiving, since the RSCs actually changed the marketing target of the company. Yet, during the researched period, no alternative technology was introduced to create a significant threat or turbulence in the market.

Data Analysis:

In all cases above, the companies held a variety of resources including: human capital, technological abilities, and financial resources, access to market and ability to raise funds. We identified five basic resources the companies had to manage: (i) Managerial resources (ii) Technological abilities (iii) Cash reserve (iv) Cash generation through investments (v) Cash generation through sales. Out of these, the first three are internal resources, and the last two represent access to external resources.

Internal resources:

The management resource was unchanged in Datamate, and moderately changed in Netaction. Gellergy went through 3 CEOs, some of them came from within the team, and other were brought from outside. Furthermore, in most cases, we see a shift in position rather than abandoning of the company. We did not notice significant evidence of a unique change in managerial support by external consultants or advisory boards. The technology, as well as R&D function, were also stable during the researched lifespan of the companies, and there was no evidence of external technologies entering the company by means of intellectual property purchase, technological alliances, patent rights etc. Initially cash reserves were high. Prior to the first RSC the cash was virtually zero, and they soared to about 1-3 Million dollars US. In Datamate's case, cash balance gradually drained during the researched period, until the second RSC took place. In Netaction and Gellergy, cash balance was fluctuating due to investors support. Once the investors stopped supporting the companies, cash reserves diminished until the second RSC took place.

To summarize, we found that managerial and technology abilities were unchanged in both RSC cases, while the cash reserve was fluctuating along a declining curve.

Access to external resources:

Ability to raise cash from sales: although Datamate had proven its competence in direct sales, it had no experience in generating sales by channels. Yet, this did not stop the team from pursuing the 'channel distribution' strategy. We identified two hidden assumptions (a) the 'channel distribution' ability could be developed using the cash resource, and (b) the newly developed 'channel distribution' ability was expected to generate cash from sales faster than the existing 'direct sales' ability already existing in the firm. These two hidden assumptions eventually did not materialize, resulting in cash resource drainage, while the new "channel distribution" resource failed to generate cash. Netaction moved to channel-based marketing and later to direct marketing, based on the managers' previous experience. Yet, they failed to generating cash from sales.

Ability to raise funds is indicated by growth in company valuation. Company valuation can grow thanks to rise in financial markets, or due to the management's actions or thanks to interest indicated by a potential buyer. Each of the above options enables the company to raise money from existing or new investors.

All Datamates' stakeholders estimated the ability to raise funds as a strong resource. The slumping financial markets during that period and NASDAQ crash, along poor sales performance, blocked this ability. We find the question: "which of the two factors (markets or sales) had a greater influence on the company's inability to access external funding?" impossible to answer with the data available to us and irrelevant for our discussion at this point. Hence: funding as well as sales abilities were declining from the first RSC until the Second RSC and changed after the second RSC proved successful.

Gellergys ability to raise funds was high yet, stable through the life-span of the company. It was only during the last year of the company, when an investment with a lower valuation was made during the second RSC. Netaction never had an increase in its valuation. Its entire fund raising was conducted from existing investors, as a convertible loan, until its last days; indicating expectation for future rise in company value – yet an effective decrease in value.

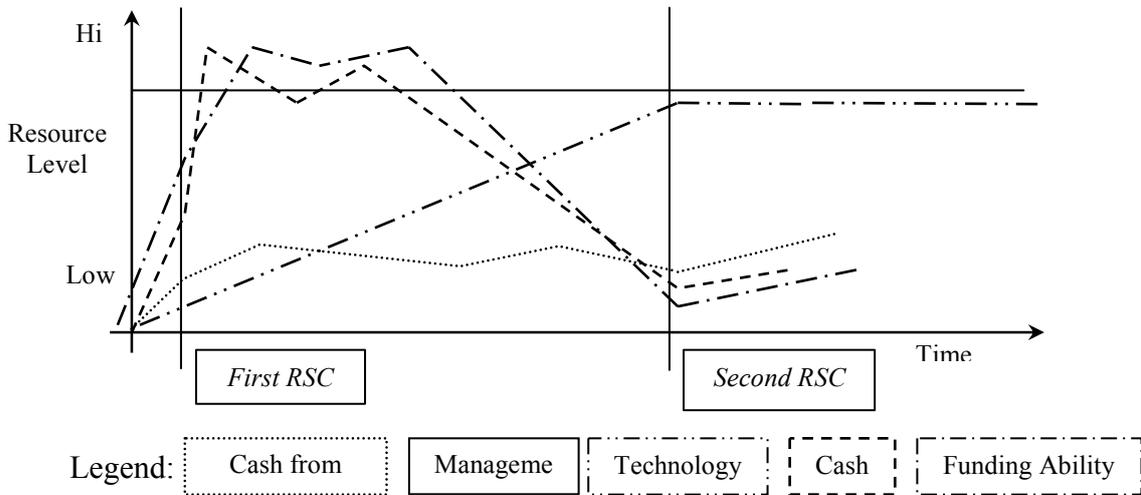
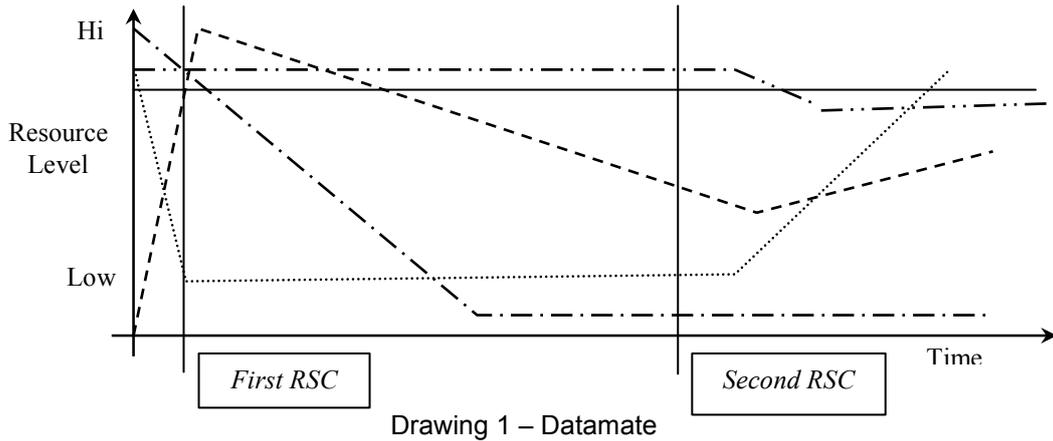
The resource availability is presented in graphic manner. Example for the cases of Gellergy and Datamate are described in drawing 1 and 2 respectively, which are similar to the other 2 cases.

Success of RSC:

Datamate: According to the view of the venture directors, "Success" was viewed as gaining market-value to provide them with high returns on their investment. On this basis, the first RSC was a failure. The second RSC was viewed to be a successful one, resulting in growing revenues and profit. Another indicator for a successful RSC was that the investors agreed on converting the loan to about 50% in equity; representing a company value of about US\$ 6 Million.

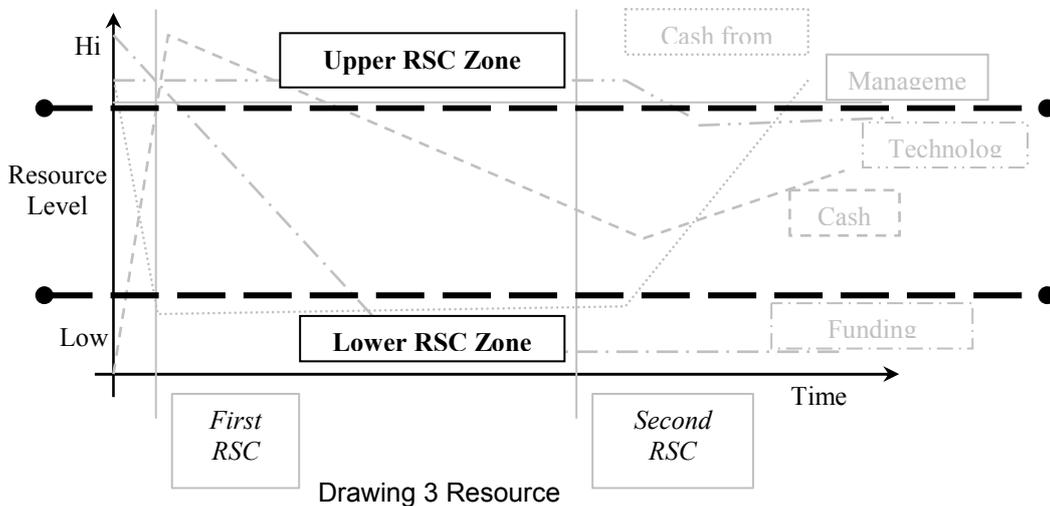
Gellergy: The first RSC was a success on the short term: the company was able to raise more money for its expansion plan. Yet, it did not last long enough to ensure sustainability. Hence, according to first round of investors, the RSC was a failure. The second RSC enabled an increase in value of the daughter company, and although it might be temporary, it is considered a success.

Netaction: According to stakeholders, the first RSC failed to deliver in terms of venture value as well as in terms of cash generation. The second RSC did provide new hope and the indicators seem promising.



DISCUSSION

During the analysis of case study data, we observed two important dimensions – thresholds of resource-levels and the match of resources to the environment in which the venture operates. This observation led us to configure a chart regarding the factors and affects in RSC, related to the venture's resources (see Drawing 3).



An interesting observation relates to the impact of resource-levels on management's decision making. While the first RSC took place when resources were at 'higher levels', the second occurred when resource levels went 'below' a certain level. The definition of 'high' and 'low' in this perspective is not by objective metering of the resources. It is rather the resource levels as they are perceived by the decision-makers in terms of "time to live". We suspect that when resource levels are beyond a 'high' level, as perceived by management, RSC is more likely to take place. Management feels more secure to perform a RSC, having the sometimes wrong assumption, that the venture has enough slack to bare a wrong RSC move. On the other end, when resource level is perceived to be 'low', the management is encouraged to act "before it's too late" in a radical measure in the form of RSC.

Therefore, we can outlay 3 working zones based on the resource-based view, as described in drawing 3. The middle zone is the one a new venture will work within most of the time. Yet when critical resources move into the *Upper RSC zone* or to the *Lower RSC zone*, the venture is more likely to perform a RSC.

Another observation concerns the relation between the level of resources and success of the RSC. We do not measure whether the selected strategy was "right" or "wrong". Rather, we focus on the question of the RSCs success as perceived by venture leaders. At all four case studies a low level of resources led to a successful RSC, while a high level of resources led to an unsuccessful RSC. This finding requires further research.

This behavior resembles findings in botany showing that at stress conditions, i.e. extremely low/high resource levels, plants have a higher tendency for DNA modifications. This explained by the malfunctioning of the DNA correction mechanism under stress, enabling "hidden" DNA patterns to appear. Metaphorically speaking, we suggest that under "stress" the openness of management is higher, enabling "hidden" strategic alternative to be considered and in some cases implemented. We hence conclude that a successful RSC depends on the dynamic alignment (Ambos and Birkinshaw 2007) of resource levels to the environmental conditions. Changing the variety or levels of a venture's resources is not necessarily sufficient for performing a successful RSC. Furthermore, we suggest that if the appearance of new genotypes is mainly achieved via Punctuated Equilibrium, it might be that RSC should be deliberately created in order to increase the ventures abilities in relation to the environment and competition.

Contribution of this study comes in a numerous levels. First we have learned that plants naturally undergo resource-level related actions, which are likely to occur within new ventures. Managers should be aware of this mechanism and use relevant decision making in order to promote or decline these RSC actions. These findings are applicable for investors as well as new venture managers in terms of awareness to radical changes in strategy in the good as well as bad times of the venture. Apparently, it is likely to encounter one or both ends of venture resource level.

In the cases studied there was a pattern of RSC failure in the event of resource surplus. Although the sample is too small for definitive conclusions, we are carefully tempted to assume that when RSC is performed during surplus of resources, it is likely to fail. We did not find evidence for this claim in Botany.

The venture-plant analogy holds numerous limitations as described above; addition limitation is noted that this research was limited to high technology start-up companies originating in Israel. Further research is required in international firms, as well as in a larger sample. From a research perspective, it seems as biologically inspired research can be fruitful, and opens new aspects for further study of the Punctuated Equilibrium mechanism in business organizations.

REFERENCES

- AMBOS, T. C. & BIRKINSHAW, J. (2007) How Do New Ventures Evolve? An Inductive Study of the Process of Charter Change in Technology Ventures. *Paper submitted to Academy of Management, August 2007*
- ALDRICH, H. E. & PFEFFER, J. (1976) Environments of Organizations. *Annual Review of Sociology*, 2, 79-105.

- ALDRICH, H. E. & MARTINEZ, M. A. (2001) Many Are Called, but Few Are Chosen: An Evolutionary Perspective for the Study of Entrepreneurship. *Entrepreneurship: Theory and Practice*, 25, 41-57.
- ALVAREZ, S. A. & BUSENITZ, L. W. (2001) The entrepreneurship of resource-based theory. *Journal of Management*, 27, 755.
- ARORA, A., FOSFURI, A. & GAMBARDELLA, A. (2001) Markets for Technology and their Implications for Corporate Strategy. *Industrial and Corporate Change*, 10, 419-451.
- BARNETT, W. P. & BURGELMAN, R. A. (1996) Evolutionary Perspectives on Strategy. *Strategic Management Journal*, 17, 5-19.
- BARNEY, J. (1991) Firm Resources and Sustained Competitive Advantage. *Journal of Management*, 17, 99.
- BARNEY, J., WRIGHT, M. & KETCHEN JR, D. J. (2001) The resource-based view of the firm: Ten years after 1991. *Journal of Management*, 27, 625.
- BEAVER, G. (2003) Small business: success and failure. *Strategic change*, 12, 115-122.
- BHIDE, A. (1994) How Entrepreneurs Craft Strategies that Work. *HARVARD BUSINESS REVIEW*, 72, 150-161.
- BOEKER, W. (1989) Strategic Change: The Effects of Founding and History. *The Academy of Management Journal*, 32, 489-515.
- BOEKER, W. (1991) Organizational Strategy: An Ecological Perspective. *The Academy of Management Journal*, 34, 613-635.
- BRUSH, C. G., GREENE PATRICIA G. & HART MYRA M. (2001) From initial idea to unique advantage: The entrepreneurial challenge of constructing a resource base. *The Academy of Management Executive*, 15, pp.64-78.
- BRUSH, Candida G., and Pieter A. VanderWerf. (1992) "A comparison of methods and sources for obtaining estimates of new venture performance". *Journal of Business Venturing*, 7: 157-170.
- BRUSH, C. G. & VANDERWERF, P. A. (1992) A comparison of methods and sources for obtaining estimates of new venture performance. *Journal of Business Venturing*, 7, 157-170.
- BRUSH, C. G., GREENE, P. G., HART, M. M. & EDELMAN, L. F. (1997) Resource configurations over the life cycle of ventures. *Frontiers of Entrepreneurship Research*, 315-329.
- CASTROGIOVANNI, G. J. (1996) Pre-Startup Planning and the Survival of New Small Businesses: Theoretical Linkages. *Journal of Management*, 22, 801-822.
- COOPER, A. (1993) Challenges in Predicting New Firm Performance. *Journal of Business Venturing*, 8, 241-253.
- CHRISMAN, J. J., BAUERSCHMIDT, A. & HOFER, C. W. (1998) The Determinants of New Venture Performance: An Extended Model. *Entrepreneurship: Theory and Practice*, 23, 5-7
- DELMAR, F. & SHANE, S. (2003) Does business planning facilitate the development of new ventures? *Strategic Management Journal*, 24, 1165-1185.
- EISENHARDT, K., 1989, Building theories from case study research. *Academy of Management Review*, 14, pp.532-550.
- ELDREDGE, N. & GOULD, S. J. (1972) Punctuated equilibria: an alternative to phyletic gradualism in models in paleobiology. *Models of Paleobiology*.
- ELLIOTT, R., FISCHER, C. T. & RENNIE, D. L. (1999) Evolving guidelines for publication of qualitative research studies in psychology and related fields. *British Journal of Clinical Psychology*, 38, 215-229.
- FARJOUN, M. (2007) The end of strategy? *Strategic Organization*, 5, 197.
- FLYVBJERG B., (2006). "Five misunderstandings about case study research". *Qualitative Inquiry*, 12, 2, pp.219-245.
- FREEMAN, J. & BOEKER, W. (1984) The ecological analysis of business strategy. *California Management Review*, 26, 73-86.
- GASCH, A. P. & WERNER-WASHBURNE, M. (2002) The genomics of yeast responses to environmental stress and starvation. *Functional & Integrative Genomics*, 2, 181-192.
- Gartner, William B., Jennifer A. Starr, and Subodh Bhat. (1998) "Predicting New Ventures Survival: An Analysis of 'Anatomy of a Start-Up.', Cases from *INC. Magazine*." *Journal of Business Venturing*, 14, 2, pp.215-232.
- GERSICK, C. J. G. (1991) Revolutionary change theories: A multilevel exploration of the punctuated equilibrium paradigm. *Academy of Management Review*, 16, 10-36.
- GINSBERG, A. & ABRAHAMSON, E. (1991) Champions of Change and Strategic Shifts: The Role of Internal and External Change Advocated. *Journal of Management Studies*, 28, 173-190.
- GIOIA, D. A. & CHITTIPEDDI, K. (1991) Sensemaking and sensegiving in strategic change initiation. *Strategic Management Journal*, 12, 433-448.

- GOULD, S. J. & ELDREDGE, N. (1977) Punctuated equilibria; the tempo and mode of evolution reconsidered. *Paleobiology*, 3, 115-151.
- GREENE, P. G., BRUSH, C. & HART, M. M. (1999) The Corporate Venture Champion: A Resource-Based Approach to Role and Process. *Entrepreneurship: Theory and Practice*, 23, 103-123.
- HANNAN, M. T. & FREEMAN, J. (1977) The Population Ecology of Organizations. *The American Journal of Sociology*, 82, 929-964.
- HANNAN, M. T. & JOHN, H. (1984) Structural Inertia and Organizational Change. *American Sociological Review*, 49, 149-164.
- HARRIS, S., FORBES, T. & FLETCHER, M. (2000) Taught and enacted strategic approaches in young enterprises. *International Journal of Entrepreneurial Behaviour & Research*, 6, 125-144.
- HODGSON, G. M. (2002) Darwinism in economics: from analogy to ontology. *Journal of Evolutionary Economics*, 12, 259-281.
- HOPKINS (1987) Impacts of radical strategic change and radical strategic events on corporate culture. *American Business Review*, 5, 42-48.
- JOHNSON, G. (1988) Rethinking Instrumentalism. *Strategic Management Journal*, 9, 75-91.
- KHALIL, E. L. (2000) Survival of the Most Foolish of Fools: The Limits of Evolutionary Selection Theory. *Journal of Bioeconomics*, 2, 203-220.
- KIRKPATRICK, M. (1982) Quantum Evolution and Punctuated Equilibria in Continuous Genetic Characters. *American Naturalist*, 119, 833.
- KRAATZ, M. S. & ZAJAC, E. J. (2001) How Organizational Resources Affect Strategic Change and Performance in Turbulent Environments: Theory and Evidence. *Organization Science*, 12, 632-657.
- LINDSAY, W. M. & RUE, L. W. (1980) Impact of the organization environment on the long-range planning process: a contingency view. *Academy of Management Journal*, 23, 385-404.
- LOVAS, B. & GHOSHAL, S. (2000) Strategy as Guided Evolution. *Strategic Management Journal*, 21, 875-891.
- MARRAM, E., Hedberg C., (2005). "Visionsense." *Babson college case studies*, case rev. 050605, pp.1-18.
- MATTHEWS, C. H. & SCOTT, S. G. (1995) Uncertainty and Planning in Small and Entrepreneurial Firms: An Empirical Assessment. *Journal of Small Business Management*, 33.
- MINTZBERG, H. (1994) The Fall and Rise of Strategic Planning. *Harvard Business Review* 72, 107-114.
- MILLER, D., FRIESEN, P. H. & MINTZBERG, H. (1984) *Organizations: a quantum view*, Prentice-Hall.
- MILLER, D. (1992) Environmental Fit versus Internal Fit. *Organization Science*, 3, 159-178.
- Myles, M.B., Huberman, A.M., (1994). *Qualitative Data Analysis: An expanded sourcebook*. Thousand Oaks, CA: Sage.
- NELSON, R. R. & WINTER, S. G. (2002) Evolutionary Theorizing in Economics. *Journal of Economic Perspectives*, 16, 23-46.
- NEWMAN, C. M., COHEN, J. E. & KIPNIS, C. (1985) Neo-darwinian evolution implies punctuated equilibria. *Nature*, 315, 400-401.
- NODA, T. & BOWER, J. L. (1996) Strategy making as iterated processes of resource allocation. *Strategic Management Journal*, 17, 159-192.
- NICHOLLS-NIXON, C. L., COOPER, A. C. & WOO, C. Y. (2000) Strategic experimentation Understanding change and performance in new ventures. *Journal of Business Venturing*, 15, 493-521.
- PARKER, S. C. (2006) Learning about the unknown: How fast do entrepreneurs adjust their beliefs? *Journal of Business Venturing*, 21, 1-26.
- PATTERSON, R. (1986) Strategic planning for small business. IN GARDNER, J. R., RACHLIN, R., SWEENEY, H. A. W. & RICHARDS, A. (Eds.) *Handbook of Strategic Planning*. New York, NY, John Wiley, pp.242-251.
- PORTER, M. E. (1980) *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. Original from the University of Michigan.
- PORTER, M. E. (1991) Towards Dynamic Theory of Strategy. *Strategic Management Journal*, 12, 95-117.
- QUINN, J. B. (1980) *Strategies for Change: Logical Incrementalism*, RDIrwin.
- RAJAGOPALAN, N. & SPREITZER, G. M. (1997) Toward a Theory of Strategic Change: A Multi-lens Perspective and Integrative Framework. *The Academy of Management Review*, 22, 48-79.
- REID, G. C. (1993) *Small Business Enterprise: An Economic Analysis*, London, Routledge.

- RICHARDS L., (1999). Data Alive! Thinking behind Nvivo. *Qualitative Health Research*, 9, 3 May 1999 : 412-428.
- RUTHERFORD, S. L. & LINDQUIST, S. (1998) Hsp90 as a capacitor for morphological evolution. *Nature*, 396, 336-342.
- ROMANELLI, E. & TUSHMAN, M. L. (1994) Organizational Transformation as Punctuated Equilibrium: An Empirical Test. *ACADEMY OF MANAGEMENT JOURNAL*, 37, 1141-1141.
- SIRMON, D. G., HITT, M. A. & IRELAND, R. D. (2007) Managing Firm Resources in Dynamic Environments to Create Value: Looking Inside the black Box. *The Academy of Management Review (AMR)*, 32, 273-292.
- SHEPHERD, D. A., DOUGLAS, E. J. & SHANLEY, M. (2000) New venture survival Ignorance, external shocks, and risk reduction strategies. *Journal of Business Venturing*, 15, 393-410.
- SHEPHERD, D. A., DOUGLAS, E. J. & SHANLEY, M. (2000) New venture survival Ignorance, external shocks, and risk reduction strategies. *Journal of Business Venturing*, 15, 393-410.
- SHEPHERD, D. A., ETTENSON, R. & CROUCH, A. (2000) New venture strategy and profitability A venture capitalist's assessment. *Journal of Business Venturing*, 15, 449-467.
- SIMPSON, G. G. (1953) *The major features of evolution*, Columbia University Press, New York.
- SLEVIN, D. P. & COVIN, J. G. (1997) Strategy Formation Patterns, Performance, and the Significance of Context. *Journal of Management*, 23, 189-209.
- SMITH, J. A. (1998) Strategies for start-ups. *Long Range Planning*, 31, 857-872.
- STACEY, R. D. (1995) The science of complexity: an alternative perspective for strategic change processes. *Strategic management journal*, 16, 477-495. TICHY, N. M. (1983) *Managing Strategic Change: Technical, Political, and Cultural Dynamics*, Wiley.
- STERN, K. R. (2006) *Introductory plant biology*, Boston, Mc Graw Hill.
- STEVENSON, H. & GUMPERT, D. E. (1985) The Heart of Entrepreneurship. *Harvard Business Review*, March-April, 85-94.
- TIMMONS, J. & SPINELLI, S. (2004) *New Venture Strategies: Entrepreneurship For The 21st Century*. Burr Ridge, IL: Irwin-McGraw-Hill Publishers.
- TUSHMAN, M. L. & ROMANELLI, E. (1985) Organizational evolution: A metamorphosis model of convergence and reorientation. *Research in Organizational Behavior*, 7.
- VAN DEN BERGH, J. & GOWDY, J. M. (2003) The microfoundations of macroeconomics: an evolutionary perspective. *Cambridge Journal of Economics*, 27, 65-84.
- WITT, U. (1999) Bioeconomics as economics from a Darwinian perspective. *Journal of Bioeconomics*, 1, 19-34.
- YIN, R.K., (2003). *Case Study Research – Design and Methods*. Third Edition. (London, New Delhi: Sage Publications).
- ZAHRA, S. A. & BOGNER, W. C. (2000) Technology strategy and software new ventures' performance Exploring the moderating effect of the competitive environment. *Journal of Business Venturing*, 15, 135-173.
- ZAJAC, E. J., KRAATZ, M. S. & BRESSER, R. K. F. (2000) Modeling the dynamics of strategic fit: a normative approach to strategic change. *Strategic Management Journal*, 21, 429-453.