Factors affecting product innovations: A literature review

George Chryssochoidis*

Abstract

Product and process innovations are prime manifestations of innovativeness by an organization. Yet surprisingly little is known regarding how to initiate and maintain the innovative momentum in organizations with the ultimate target to produce an increasing number of product innovations and improve competitiveness. Of major concern has been however, the sheer volume of contributions on the subject and the complexity of issues involved. An extensive literature review has been carried out covering 400 scientific Journals during a 10-year long period (1991-2001). Over 2500 journal articles have been identified as relevant and read. Their contribution to the subject of product innovations (i.e., process innovations are not covered) has been identified using a multitude of literature mapping techniques. The present article summarizes the contributions of individual articles depicting the current state-of-the-art in the area.

Keywords: *product, innovation, literature review.*

Introduction

Product and process innovations are prime manifestations of innovativeness by an organization. Although, process innovations are defined as new tools, devices, procedures as well as knowledge in throuput technology that mediate between inputs and outputs, product innovation is seen to do more with the outputs that are introduced for the benefit of customers (Utterback and Abernathy, 1975). Increased firm product innovativeness is of prime importance in today's highly competitive environment and of fundamental important for marketing, this applying equally for both agricultural & food and non-agrifood companies. Due to the sheer lack of knowledge on the subject of product innovations regarding agricultural & food companies, it is absolutely essential to conduct an extensive literature review of what has been written regarding the factors associated with product innovation in general, before proceeding to either identify what is known for agricultural & food product innovations in particular or develop a theoretical framework towards that end. Such distinction is of fundamental importance as there might be important differences between the character of the agricultural & food and the non-agrifood sectors and it is necessary to have a discrete and clear picture of factors affecting product innovation on each side. Moreover, investigation of important subjects in non-agrifood areas is likely to provide benefits to the agricultural & food sector, as knowledge and lessons learned

* Address for correspondence: Agricultural University of Athens, Department of Agricultural Economics and Development, Iera Odos 75, 18555, Votanikos, Athens
e-mail: chryssochoidis@aua.gr Telephone: +30-10-5294766.

elsewhere will be transferred more effectively and efficiently, in that the number and gravity of potential managerial mistakes in the agricultural & food sector will lessen. Thus, the objective of this article is to sketch current knowledge regarding the different factors associated with product innovation in general and highlight current beliefs. The character of this article is thus descriptive by default resulting in length, monotony and possible lack of excitement in places probably triggering a 'why do I read this?' wondering by the reader. To help describe the enormous and highly complex literature on the subject, while attempting to reduce the likelihood of wondering by the reader, we employ a series of questions and answers that guide the explication. These questions and their answers are grouped in three different sections. In the first section, we present the answers to questions regarding environmental, organizational and top management human nature antecedents to product innovations. In the second section we develop the answers to the questions relating to the necessary actions by top management when initiating the overall organizational processes for product innovations in less innovative organizations. In the third section we elucidate the answers to the questions relevant to the actual development of product innovations. To notice, that much of the material is drawn from evidence and experiences in non-public organizations. Public and semi-public organizations face a more rigid regulatory and syndicate environment, thus probably requiring some times and for certain aspects a more diplomatic time-consuming management approach.

Environmental, organizational and top management human nature antecedents

How the country environment affects the types of product innovation developed by organizations?

Whitley (2000) linked national-level characteristics with product innovation. He grouped national systems of economic activity (business systems) in 6 groups: state organized, highly coordinated, collaborative, compartmentalized, industry coordinated and fragmented. As a consequence, institutional differences between market economies lead to variations in innovation strategies and resulting product innovations vary in terms of technical and user novelty, differentiation of product and quality, familiarity with organizational competencies, and familiarity with current knowledge. Porter's (1986) diamond theory of national competitive advantage is also relevant here.

What business external environments are associated with incremental and radical product innovations?

Increased uncertainty of the external environment: There is agreement that rapid environmental change- and the uncertainty that this often creates for decision-makers will stimulate innovation in organizations (Zaltman et al., 1973; Slappendel, 1996). Product innovations are prevalent in uncertain environments in which competing products or customers' preferences alter significantly. They are usually far less pronounced in stable environments where customers want low prices more than novelty, and where firms rarely recoup the costs of innovation (Miller et al., 1988).

Increased heterogeneity of the external environment: No clear effect is evident. Miller and Friesen (1983) found that successful firms in increased heterogeneity sectors exhibited greater product innovation, but Robertson and Gatignon (1987)

have argued that a high degree of industry heterogeneity may hinder innovation. A common focus becomes unlikely, communication break-downs occur and innovation suffers.

Increased dynamism of the external environment: Similarly, no clear effect is evident. Miller and Friesen (1983) found that successful firms in increased dynamism sectors exhibited greater product innovation. By contrast, Subramanian (1996) found that firm innovativeness is not statistically higher in unstable external environments, but firms in such environments adopt innovations earlier than firms in more stable ones.

Technological elements of the external environment: Zahra et al.(2000) found that medium-size companies whose managers perceived that the company's external environment offers technological opportunities developed product innovations. Zyglidopoulos (1999) explained that the current technological paradigm in the organization's technological environment will influence innovations, as organizations are likely to subscribe to such paradigm.

Competitive dynamics and hostility: Shankar (1999) showed that new product introduction strategy is influenced by entrant and incumbent characteristics, competition and market characteristics (multimarket contact, market size, growth) and competitive (re)action characteristics. Perceived hostile competitive environments place added pressure on firms to initiate changes in their effort to improve their ability to make the best use of the resources they have (Nicholls-Nixon et al., 2000).

Type of industry: Gopalakrishnan et al., (1999) suggested that the type of industry may exercise a major role in what innovations inhabitant organizations develop, and findings in one sectors may not be generalizable to other sectors.

What organizational demographic characteristics are associated with incremental and radical product innovations?

Size and stakeholder attributes: Once organizations increase in size they require more elaborate control systems and gradually lose on their ability to innovate (Miller et al., 1988), thus turning towards improvements in process than product innovations (Gopalakrishnan et al., 1999). Stakeholder attributes and expectations become pronounced in this case affecting Chief Executive Officer (CEO)'s action and the quest for product innovation in a more complex and unpredictable manner (Agle et al., 1999). On the other hand, larger firms may put increased resources behind innovation efforts (Iwamura and Jog, 1991).

Age/maturity of organization: It is difficult for older more mature organizations to generate innovations due to distorted perceptions, dulled motivation, poor creativity, political deadlocks and disconnected actions;. innovation is "unthinkable" there (Dougherty and Heller, 1994). Very young organizations may in contrast, not have sufficient resources to develop radical innovations (Nicholls-Nixon et al., 2000).

Company type and product innovation thrust: The typology by Miles and Snow was used to describe product innovation thrusts by type of business. 'Prospectors' thus, enthusiastically search for new markets with new products (Johne and Davies, 1999).

Company market orientation: Bennett and Cooper (1981) suggest that the adoption of the marketing concept philosophy stifles the development and marketing of radically new products, and rather encourages the development of incremental product innovations. This is due to customers being unable to articulate their future needs beyond current consumption experiences. Atuahene-Gima (1996) found indeed that market orientation is negatively associated with product newness to customers.

Outsiders in the board: Zahra et al.(2000) found for medium-sized firms that when the position of CEO was separated from chairman of the board, increased representation of outside directors, percentage of stock being owned by outside directors on the company's board were all positive associated with product innovation.

What power configurations impede or facilitate product innovation?

Hardy and Dougherty (1997) consider three elements that form the basis for power configurations: recourses (i.e., funds, information, expertise); processes (i.e., denial and non-decision making; agenda setting; communication and budgeting procedures); and meaning (i.e., ideology, symbols, or thinking and acting structures). Resources and decisions in an anti-innovation configuration are centralized, systematically controlled by individual groups, rely on unclear criteria, budgets are fixed by date rather than opportunity, jobs are readily defined and people with technology are excluded, or reassigned without any concern for innovation. The opposite practice characterizes the pro-innovative configuration of power. Resources are made available, the necessary information is shared, valuable rewards are consistent with innovation, collaborative structures are in place, decision-making criteria are based on collective judgment, procedures move innovations through development in visible steps. Lastly, innovation is considered legitimate for all organization members.

What is the association between organizational structures and product innovation?

Formal structural mechanisms: Complex innovation projects cannot be successfully pursued in highly politically empowered, centralized, unspecialized, and highly rigid bureaucratic structures (Zaltman et al., 1973). Such structures overburden CEOs, affording them too little time or assistance to initiate complex projects of innovation. Gersick (1991) note that a "deep structure" that inhibits innovation is in place. Zaltman et al. (1973) suggested that it is necessary to employ low formalization and low centralization during innovation initiation phases because at this stage information gathering and processing is crucial for success. During the implementation phase, greater formalization and centralization can be allowed because role conflict and ambiguity are reduced. Johne (1984) found indeed that leaders in high-tech sectors predominantly used spoken word (low formalization) during initiation and written progress monitoring tools during implementation. Similarly, CEOs delegated authority for strategy initiation, but exercised tight control during implementation.

Informal structural mechanisms: A paucity of integrative devices reduces face-to-face collaboration and consultation across functional departments, exacerbating the coordinative problems and conflicts that arise during the implementation of new products and processes (Miller et al., 1988). In older mature less innovative organizations, the influence of the controlling formal structure is so tight as to illegitimise the lateral working and information flows that are necessary to support innovation (Stopford and Baden-Fuller, 1992). The informal organizational "layer" necessary to support innovation is absent in the mature, established organization.

How CEOs and Top Management Teams (TMT) conceptualize the environment and the quest for innovation as a response to changes in this environment?

Perceptions of the external environment vary with the CEOs' (and TMT's) ability to scan and interpret the organization's external environment (Child, 1972). Yet, there is a positive association between uncertainty of the external environmental and scanning frequency and interest by CEOs (e.g., Daft *et al.*, 1988), and comprehen-

sive and sophisticated planning systems improve the use of external information by the CEO (Bluedorn *et al.*, 1994). Belief structures, culture and nature of specialization may affect top managers' quest for external information as they filtrate sings of urgency and feasibility of action (Donaldson and Lorsch, 1983).

The nature of environment in which the organization operates is also perceived to restrict or constrain the range of CEOs' and TMT's choices available as it limits managerial discretion (Hambrick and Finkelstein, 1987). This 'managerial discretion' appears to be a function of the degree to which "(1) the environment allows variety and change, (2) the organization is amenable to an array of possible actions and empowers the CEO to formulate and execute those actions, and (3) the CEO personally envisions or creates multiple copies of action", imposing thus a logic of environmental determinism regarding the extent and nature of product innovation CEOs can lead their organizations to. At the same time, important streams of research like contingency theory provide only partial answers to the question of the possible impact of environmental determinism as it postulates that organizations adapt to the conditions that exist in their environments, but not how much is that choice of action constrained (Bluedorn *et al.*, 1994). The CEO/ top management perceptions may act as a moderator in the link between the nature of the external environment and decision-making regarding product innovations as a response to environmental changes.

How CEOs' characteristics and personal attributes- including mental models of success- influence managerial product innovation related decisions?

Tenure: Top management characterized by periods of extended tenure are widely observed as impeding the innovation process (e.g., Ginsberg and Abrahamson, 1991) and their effectiveness deteriorates when embedded in crisis (Hambrick and D'Aveni, 1992). Schreuder (1993) notes that CEO and TMT turnover increases the propensity for organizational transformation and changes of greater amplitude and thus increased/renewed focus on radical product innovations. This happens because new management exhibits reduced psychological investment in the previous strategy (see Gordon et al., 2000). On the other hand, short top management tenure may have not enough time to fully elaborate and implement change (Wiersema and Bantel, 1992).

CEO's personality, cognitive and demographic characteristics: Increased attention have received the following (e.g., Tabak and Barr, 1999): (a) cognitive complexity; (b) knowledge; (c) mental models of success; (d) open-mindedness; (e) time-orientation; (f) personal values; (g) tolerance for ambiguity; (h) locus of control; (i) age; (j) risk propensity; (k) education; (l) past experience. For instance, CEOs with greater cognitive complexity can see clearer than CEOs with lesser cognitive complexity how to transform organizations and implement strategies for radical innovations. Also CEOs with an external locus of control see themselves as relatively passive agents and believe that the events in their lives are due to uncontrollable forces. Conversely those with an internal locus of control see themselves as active agents, feel that they are masters of their fates, and trust in their capacity to influence the environment (Boone et al., 2000). CEO's need for achievement influences centralization of decision making, product innovation and rationalization of the strategy making process. Things are quite different in large firms however, as complex and rigid structures can impose constraints and acquire their own momentum, restricting or canceling contacts between employees (Fredrickson, 1986) and power may be broadly distributed, resulting in CEO's drive having less impact (Miller et al., 1988).

Zyglidopoulos (1999) also explains how top management employees cognitive schemata in how they shape problems, orient information searches and restrict choice in the quest for product innovation. Such schemata is the dominant logic of the firm and it is the result of past collective experience of the organization's managers throughout the history of the organization. Furthermore, when top management have technical background (engineering, production/operations, R&D) they are more likely to commit the firm to technical innovation through increased R&D spending (Daellenbach et al., 1999) shaping their strategic perspectives, behaviors, knowledge and skills. Baden-Fuller and Stopford (1992) note that managerial skills of control have internal focus as opposed to the "feeling" and "intuitive" skills that Hurst et al., (1989) note are necessary for innovation. Lastly, Church and Waclawski (1998) identified that executives with 'inventor' and 'motivator' personality orientation are more transformational in leadership style than executives with 'manager' and 'implementor' personality orientation.

Initiating change

What is the link between overall strategy, the process of strategy formation and company product innovation?

Mintzberg and Lampel (1999) comprehensively review the different perspectives regarding initiation and development of strategic decision making in organizations and classify these perspectives along two dimensions. These are: a first dimension of understanding the external world ranging from controllable and comprehensible to unpredictable and confusing; and a second dimension of the internal process ranging from rational to non-rational. Three clear clusters of perspectives appear. The first cluster positioned on understanding the world as controllable and the internal processes as rational perceives strategy decision making taking place as 'planned' or 'strategic positioning' (that is the strategic planning school of thought). The second cluster positioned more towards the middle of the two dimensions (that is understanding the world as between control and totally unpredictable and the internal processes as between rationality and non rationality), perceives strategy decision making taking place as configuration or fit between internal and external elements. The third cluster positioned more towards the top end of the two dimensions (that is understanding the world as between totally unpredictable and the internal processes as irrational), perceives strategy decision making taking place as emergent and in accordance with power (im)balance, the outcome of interplay between management cognition or knowledge and learning through ambiguity and continuous experimentation.

Such perspectives have substantial influence on how strategy making relates to product innovation in that they affect: (a) how design for, initiation and implementation of product innovation may take place in organizations; and (b) drive for and predictability of outcome will result from a product innovation process. If we adopt perspectives in the 1st cluster, then the nature and extent of product innovations organizations need to opt for, the sustainability of the overall organizational innovativeness in the long run, as well as the initiation the process may occur through planning within the framework of an overall strategic planning exercise. If we adopt perspectives in the 3rd cluster, these will take place in a highly unpredictable manner depending upon the outcome of internal irrational processes.

What corporate conditions do CEOs need to create, business models to follow and style to adopt for product innovation? Which areas should attract CEO's attention?

How much innovation is necessary? It is assumed that innovation is universally desirable for an organization; and that certain structures and internal organizational practices can overcome inertia and increase the generation rate of innovation. Drazin and Schoonhoven (1996) suggests considering context and industry dynamics before an initiation of innovation effort takes place. Having assumed however, that organizations do need to initiate and sustain radical innovation we will now turn to the necessary corporate conditions for innovations, the nature and the process of change.

Corporate conditions for innovation: Rothwell (1992) identified the following as necessary corporate conditions for innovations: (a) top management commitment to, and visible support for, innovation; (b) having a long-term corporate strategy where innovation plays a major role; (c) an associated long-tern commitment to major projects based upon consideration of future growth; (d) corporate flexibility and responsiveness to change; (e) top management acceptance of risk; (f) the organization being of an entrepreneurship-accommodating culture. From the above, we can conclude that initial steps focus upon overall change rather than innovation activity per se.

The two alternative, yet parallel, paths of action for the CEOs: The first path is to initiate and implement an overall corporate transformation process that will later enable innovation. Effects may not be immediate as the corporation will need time to adjust to changes, but the ultimate output may be a corporation that nurtures product innovations in a sustained manner. The second path should take place in parallel. Leading innovators create teams for radical product innovations that carry on their work outside the established organization structure. Such teams are created with mandates, resources and support for radical product innovation during a wider overall corporate level transformation process (Johne and Snelson, 1988).

The phases of change: Current models for change show that a relatively complex series of configurational changes are required to develop the capacity for innovation initiation. The underlying rationale across models is that an initial instability is created, the actual changes take place, followed by stabilization to a new configuration. Stopford and Baden-Fuller (1994) observed a four-phased process: (a) Individual entrepreneurship – the CEO realizing and championing the need for large-scale change; (b) Initiating – focusing the top management team's attention upon the need for change; (c) Unfreezing the organization and its values; and (d) Breaking the frame – experimentation. De Vries et al.,' model (1998) suggested 3 phases. Phase 1: Creation of a shared mind set (a sense of urgency is created; focus moves from the internal to the external environment; collective ambition is developed; commitment and motivation becomes explicit). Phase 2: Behavior changes (Leaders are empowered; information is shared; cross-functional cooperation increases; internal and external benchmarking is introduced; architecture of organizational structure and systems changes). Phase 3: Capabilities are built in the necessary areas. Within this model individuals also go through a series of individual change process (5 stages). Armenakis and Bedeian's model (1999) synthesizing the efforts by several other researchers suggest three phases: Phase 1: Unfreezing the organization. Phase 2: Moving. Phase 3: Freezing. These include the occurrence of several actions that are presented in sequence: A sense of urgency is created by relating external environmental realities to real and potential crises and opportunities facing an organization;

A powerful coalition of individuals who embrace the need for change and who can rally others to support the effort is formed; A vision for the end-result is crafted; This vision is communicated through multiple communication channels; Several people are empowered to act on the vision by changing structures, systems, policies, and procedures in ways that will facilitate implementation; Short-term wins are publicized in order to build the momentum for continuous change; improvements and the new structures, systems etc are consolidated; and the new approach is institutionalized by publicizing the connection between the change effort and organizational success. Certainly, public or semi-public organizations face rigid regulatory and syndicate environments, thus requiring greater maneuvering by the CEO.

The position of individuals in the above process: An interactive process between individuals and structural elements is appropriate for change. The actions of individuals who lead for change either because they possess certain personal qualities or because they behave with adequate leadership attitudes are constrained by external factors (Slappendel, 1996). This framework is also in line with Pettigrew's (1987) theoretical argument that change should be analyzed in terms of the interplay between the context (both outer and inner), the content, and the process of change.

The style and pervasiveness of change: CEO's necessary leadership style can be examined in terms of evolution and way of transformation. Evolution can be 'participative' (used to execute minor adjustments to the configuration when key interest groups favor change) or 'forced' (used to execute relatively minor changes but when interest groups oppose change). Transformation can be 'charismatic' (used for more radical change, but where there is internal support for change- the "inspirational" leader focuses upon the development of new shared values) and 'dictatorial' (large-scale change is needed but there is little internal support-change is ruthlessly driven from the top). Dunphy and Stace's (1988) schema indicates that there is only one viable course – "Dictatorial transformation" – led personally by the CEO for quick and radical change. "Shared values" or culturally led approaches appear to be ineffective within the context that we are studying. Pettigrew observes the role of the CEO as instigator and leader of the change process – to such a degree that any alteration in the position of CEO before the process of change has been completed will in all probability lead to failure. In contrast to the above, Waldman and Yammarino (1999) suggest that charismatic instead of dictatorial transformation is associated with greater organizational member effort and TMT intra and intergroup cohesion especially in the case of a turbulent environment, such positive feelings being also cascading to lower hierarchical echelons and it is also expected to positively affect performance.

The areas that need to attract CEOs' attention first: This is similar to the question: "where does the CEO aim the gun when first pulling the change trigger?" The literature points to three clear target areas:

(a) The dominant TMT that controls accepted behaviors and perceptions. As Grinyer and McKiernan (1990) observe, clear changes to the "high level learning rules" in the organization must be a primary priority. It is important to notice that even in a non-change situation few TMT are problem-free (Hambrick, 1995). CEOs need to make sure that they face no problems with their TMT altogether. The problems that CEOs usually experience regarding TMT are clustered around the following: (a) inadequate capabilities of an individual executive; (b) common team-wide shortcoming (executives develop their skills and mindsets under different competitive conditions and may be unable to cope with radical changes); (c) harmful rival-

ries; groupthink (team members always subscribe to the same logic); and (d) fragmentation (everyone pursues own objectives causing breakdown in communications and inefficiencies). Furthermore, as not all top managers share the same personality orientation, it is necessary to employ TMT people whose personalities can sustain and strengthen the transformation effort.

(b) The shared vales or culture (Dougherty and Heller, 1994). Change in shared vales can only be achieved through alterations in the TMT and the formal structure to encourage external learning (Ascari et al., 1995).

(c) Macro and micro changes. Here, Dougherty and Heller (1994) point for top level change and simultaneously the instigation of experimental learning activity at the business or micro level in the organization. Johne and Davies (1999) found that successful CEOs had two initial focal points: the formal structure and the composition of the top management team (macro changes) and "micro changes" in the form of encouraging learning about the true state of the organization at the business level.

The areas that need to attract CEOs' attention second- subsequent actions: During the time the overall transformation process takes place, a widespread turbulence is expected. Such turbulence is anticipated to cause alterations and inefficiencies in the formal structural aspects of the organization as personnel changes, and new roles are learned. CEOs can facilitate the transition to greater and sustained product innovation by focusing upon: (a) informal system-type structural aspects: the increased use of informal systems and appropriate teamworking are the means of escalating transfer of information, accelerate learning and break down communication barriers. (b) creation of a creativity-prone environment. (c) creation of systems that allow early recognition of opportunity and breakthrough innovation when this happens. Action in these areas is explained in the third section.

Development of product innovations

Calantone et al., (1995) explicated that the following are necessary for development of product innovations: (a) A vision of excellence broken down by tasks and communicated to the proper groups. CEOs who are too bottom line conscious do not focus upon human and technical resources, and on the right activities needed to build the new and better products. The performance of intermediate steps must be emphasized. Then, only by making these priorities visible to all, especially to those groups responsible for each step, will the activity be performed well. The CEOs must set the stage and the spotlight. (b) Flexibility in configuration, coordination and leadership responsibility is necessary over the development cycle. This may conflict with a soft-handling 'team approach', but top performers put the responsibility where the appropriate expertise resides, even if it means disrupting the natural workings of teams. (c) Leadership from the CEO and TMT geared towards 'great performance' on very specific activities.

Systems and stimulation of creative climate. How CEOs can relate individual and organizational creativity and intelligence for product innovation?

Informal structural mechanisms: Product innovations require increased use of such mechanisms including: (a) lateral or cross-departmental relations; direct managerial contact, temporary or permanent teams, task forces, committees, integrators, and integrative departments (organization of lateral relations) and (b) informal per-

sonal contacts among managers, management trips, meetings, conferences, transfer of managers etc. (informal communication) (Zaltman et al., 1973).

Teams**:** The creation of teams is seen as action of fundamental importance in the implementation transformation strategies (Taylor, 1995) as teams circumvent inefficiencies of the formal structural elements. Leading innovator firms ensure that all important developments are headed by a team or project leader who are given specific commission from top management allowing to appeal right to the top in case of difficulties; these teams usually carry on their work outside the established organization structure. The transformational CEO needs to provide a supportive empowering context for such teams to operate in a as smooth as possible manner, maintain a strong focus on individuals, provide resources, coaching and mentoring and provide a flow of new ideas to stimulate thinking for better solutions. Best practice includes: (a) the clarification of responsibilities among teams; (b) an assessment of the effectiveness of team-to-team coordination; (c) the facilitation of conflict resolution between teams; (d) the organization of the information flow between teams; and (e) ensuring that teams have access to the right people at the right time (Harris and Lambert, 1998). We should add the need for a clear mission, autonomy and rewards for increased team performance (Denison et al., 1996). The emergence of multiple leaders who employ a common enabling, participative and highly communicative style may also facilitate product innovation (Johne and Harborne, 2001) and delivery of key business tasks. Yet adopting team-working without equipping members and non-members in skills and systems (such as Return Maps) will negate team effectiveness (Donnellon, 1993).

Creation of a creativity-prone climate: A creative climate subsequently nurtures product innovations and allows a higher probability of success of the innovation implementation effort (Klein and Sorra, 1996). Amabile et al. (1996) see creativity to consist of dimensions that include: encouragement at organizational level (supervisors encourage, work group supports); autonomy of freedom; sufficient resources; decreased workload and provision of challenging work; decrease in the formal aspects of structure and increase in the informal-systems' aspects of structure. Within the above frameworks there is a need for appropriate human resource management, identification of the nature of individual intelligence and handling of the expression and outputs of the individuals. Mumford (2000) provides sufficient guidance on human resource management practices for creative people. Individual intelligence relates to a person's capability to solve problems in a particular domain or context (Glynn, 1996). Like individuals, organizations possess multiple types of intelligence and creativity too. Freedom, motivation and immediate rewards are also fundamental precursors for the individuals to employ and deploy their creative abilities. In turbulent markets, such creativity may be substantially assisted by the adoption of what Sawhney and Prandelli (2000) call market-based governance model that allows for full exchange and distribution of information with outside agents. This is best exemplified in the high-technology world by the Linux paradigm. Chaos and lack of controls characterizes this model.

Creation of systems that allow early recognition of opportunity and breakthrough innovation when this happens: Opportunity recognition for radical innovation is highly dependent upon individual initiative and capacity rather than routine practices and procedures of the firm (O' Connor and Rice, 2001). Nonetheless among the methods to improve organizational capacity for opportunity recognition are: (a) periodic conferences that bring together people from various organizational units; (b)

a project oversight board with outsiders; (c) promoting and nurturing participation in industrial networks; (d) mandate specific people for 'hunting' promising projects within the organization and creation of radical innovation hubs.

What is the most appropriate team composition, format and structure for product innovation?

The most appropriate team composition, format and structure for product innovation: McDonough (1993) found that the best team-member characteristics - for speed of product development - varied depending on whether the development was radical or routine. Routine developments were faster when the team style was participative and when team members were better educated and been with the businesses some time, thereby understanding business processes and practices. Conversely faster radical developments required a directive style from the project leader, with team members relatively new to the business.

Need to identify individual team member characteristics. Senior (1997) identifies that not all team roles can be performed by the same individuals during a project's development. For instance long-term planners and specialists have an increased role in the formulation of plans' project development stage. Kloppenborg and Petrick (1999) also explain that while imagination and foresight are necessary team virtues and traits at the initial project development phase, cooperation, trust, expressiveness and commitment are necessary at a later stage. Kichuk and Wiesner (1997) also described how the Big Five personality factors (conscientiousness, extraversion, neuroticism, agreeableness and openness to experience) have implications for team performance.

What is the best leadership style for team effectiveness?

In contrast to dictatorial leadership style apparently necessary for corporate transformation, an opposite character style will be successful at team level management. Avery (1999) explains that building relationships and using "integrative power" is most effective in a cross-functional team based working environment. Shell are reported (Brenneman *et al.*, 1998) to have changed to the concept of "servant leadership" where the leader's role is to walk ahead, support and enable others to deliver the business objectives. Yet, such leadership may be contingent upon the task to be performed. McDonough (1993) considered that faster radical developments required a directive style from the project leader, with team members relatively new to the business.

What communication patterns between team members and problem-solving practices for product innovation should be adopted?

Extensive communication between both team members, between teams and between actors inside and outside the company is necessary. Yet, we know little on problem-solving practices- Ayers *et al.*, (1997) explained that disputes resolved directly between parties involved brought greater effectiveness.

What alternative methods of communication can managers use to effectively convey messages to management audiences?

Managers in 3M employ context-rich explanatory methods like story-telling as a way to effectively convey messages. Shaw *et al.*, (1998) explain that stories are central to human intelligence and memory and that they play an important role in learning. A good story defines relationships, the sequence of events, cause and effect, and priorities among items, those being understood and remembered as a complex whole.

Which software for product innovations?

Rangaswamy and Lilien (1997) cite that Mindlink, IdeaFisher, Inspiration and NamePro are products assisting idea generation; GroupSystems electronic brainstorming; BUNDOPT, Bretton Clark and Sawtooth ACA product design; NewProd and AHP project evaluation and portfolio analysis; and GroupWorks and Lotus Notes project management.

References

Agle, B.R., Mitchell, R.K., and Sonnenfeld, J.A. (1999) 'Who Matters to Ceos? An Investigation of Stakeholder Attributes and Salience, Corporate Performance, and CEO Values', Academy of Management Journal, 42 (5): 507-526

Amabile,T.M., Conti,R., Coon,H., Lazenby,J., Herron, M. (1996) 'Assessing the Work Environment For Creativity', Academy of Management Journal, 39 (5): 1154-1184

Armenakis , A.A. and Bedeian, A.G. (1999) 'Organizational Change: A Review of Theory and Research In the 1990s', Journal of Management, 25 (3): 293-315

Ascari, A., Rock, M. and Dutta, S. (1995) 'Reengineering and Organizational Change: Lessons From A Comparative Analysis of Company Experiences', European Management Journal, 13 (1): 1-30

Atuahene-Gima, K. (1996) 'Market Orientation and Innovation', Journal of Business Research, 35 (2): 93-103

Avery, C.M. (1999) 'All Power to You: Collaborative Leadership Works', The Journal For Quality and Participation, 22 (2): 36-40

Ayers, D., Dahlstrom, R., and Skinner, S.J. (1997) 'An Exploratory Investigation of Organizational Antecedents to New Product Success', Journal of Marketing Research, February: 107-116

Baden-Fuller, C. and Stopford, J.M. (1992) Rejuvenating the Mature Business: The Competitive Challenge, London: Routledge

Bennett, R.C. and Cooper, R.C. (1981) 'The Misuse of Marketing: An American Tragedy', Business Horizons, 25 (November-December): 51-61

Bluedorn, A.C., Johnson, R.A., Cartwright D.K., Barringer, B.R. (1994) 'The Interface and Convergence of the Strategic Management and Organizational Environment Domains', Journal of Management, 20 (2): 201-262

Boone, C., De Brabander, B., Hellemans, J. (2000) 'CEO Locus of Control and Small Firm Performance' Journal of Management Studies, 21 (3): 641-646

Brenneman, W.B., Keys, J.B and Fulmer, R.M. (1998) 'Learning Across A Living Company: The Shell Companies Experience' Organisational Dynamics 27 (2): 61-69

Child, J. (1972) 'Organizational Structure, Environment and Performance: The Role of Strategic Choice' Sociology, 6: 1-22

Church, A.H. and Waclawski, J. (1998) 'The Relationship Between Individual Personality Orientation and Executive Leadership Behaviour' Journal of Occupational and Organizational Psychology, 71: 99-125

Daellenbach, U.S., Mccarthy, A.M. and Schoenecker, T.S. (1999) 'Commitment to Innovation: The Impact of Top Management Team Characteristics' R & D Management, 29 (3): 199-209

Daft, R.L., Sormunen, J. and Parks, D. (1988) 'Chief Executive Scanning, Environmental Characteristics, and Company Performance: An Empirical Study', Strategic Management Journal, 9: 123-139.

De Vries, K. & Manfred F.R., Balazs, K. (1998) 'Beyond the Quick Fix: The Psychodynamics of Organizational Transformation and Change', European Management Journal, 16 (5): 611-622

Denison, D.R., Hart, S.L., Kahn, J.A. (1996) 'From Chimneys to Cross-Functional Teams: Developing and Validating A Diagnostic Model', Academy of Management Journal, 39 (4): 1005-1023

Donaldson, G. and Lorsch, J (1983) Decision Making At the Top: The Shaping of Strategic Direction, New York: Basic Books

Donnellon, A. (1993) 'Cross-Functional Teams In Product Development -Accommodating the Structure to the Process', Journal of Product Innovation Management, 10: 377-392

Dougherty, D. and Heller, T. (1994) 'The Illegitimacy of Successful Product Innovation In Established Firms' Organization Science, 5 (2): 200-218

Drazin, R. and Schoonhoven, C.B. (1996) 'Community, Population, and Organization Effects On Innovation: A Multilevel Perspective', Academy of Management Journal 39 (5): 1065-1083

Dunphy, D.C. and Stace, D.A. (1988) Transformational and Coercive Strategies For Planned Organisational Change: Beyond the O.D. Model', Organization Studies 9 (3): 317-334

Fredrickson, J.W. (1986) 'The Strategic Decision Process and Organization Structure', Academy of Management Review, 11: 280-297

Gersick, C.J.G. (1991) 'Revutionary Change Theories: A Multilevel Exploration of the Punctuated Equilibrium Paradigm', Academy of Management Review, 16 (1): 10-36

Ginsberg, A. and Abrahamson, E. (1991) 'Champions of Change and Strategic Shifts: The Role of Internal and External Change Advocates', Journal of Management Studies, 28 (2): 173-190

Glynn, M.A. (1996) 'Innovative Genius: A Framework For Relating Individual & Organisational Intelligence', Academy of Management Review, 21 (4): 1081-1111

Gopalakrishnan, S., Bierly, P., and Kessler, E.H., (1999) 'A Reexamination of Product and Process Innovations Using A Knowledge-Based View', The Journal of High Technology Management Research, 10, (1): 147-166

Gordon, S.S, Stewart, W.H., Sweo, R and Luker, W.A. (2000) 'Convergence Versus Strategic Reorientation: The Antecedents of Fast-Paced Organizational Change', Journal of Management, 26 (5): 911-930

Grinyer, P.H. and Mckiernan, P. (1990) 'Generating Major Change In Stagnating Companies', Strategic Management Journal, 11: 131-146

Hambrick, D.C. and D'Aveni, R.A. (1992) 'Top Team Deterioration As Part of the Downward Spiral of Large Corporate Bankruptcies', Management Science, 38 (10): 1445-1466

Hambrick, D..C and Finkelstein, S. (1987) 'Managerial Discretion: A Bridge Between Polar Views of Organizational Outcomes' In L.L. Cummings and B. Staw (Eds) Research In Organizational Behavior 9, Grennwich, CT: JAI Press, pp: 396-406

Hambrick, D.C. (1995) 'Fragmentation and the Other Problems Ceos Have With Their Top Management Teams', California Management Review, 37 (3): 110-127

Hardy, C. and Dougherty, D. (1997) 'Powering Product Innovation', European Management Journal, 15 (1): 16-27

Harris, R. C. and Lambert, J.T. (1998) 'Building Effective Teams' Research Technology Management, (September-October): 28-35

Hurst, D.K., Rush, J.C. and White, R.E. (1989) 'Top Management Teams and Organizational Renewal', Strategic Management Journal, 10: 87-105

Iwamura, A. and Vivay M.J. (1991) 'Innovators, Organizational Structure and Management of the Innovation Process In the Securities Industry', Journal of Product Innovation Management, 8: 104-116.

Johne, A (1984) 'High-Technology Product Innovation' European Journal of Marketing, 18 (6/7): 55-71

Johne, F.A. and Davies, R.W. (1999) 'Approaches to Stimulating Change In Mature Insurance Companies', British Journal of Management, 10: 101-121

Johne, F.A. and Harborne, P. (2001) 'One Leader Is Not Enough For Major New Service Development: Results of A Consumer Baking Study', The Services Industries Journal (In-Press)

Johne, A. and Snelson, P (1988) 'Auditing Product Innovation Activities In Manufacturing Firms', R&D Management, 18 (3): 227-233

Kichuk, S.L. and Wiesner, W.H. (1997) 'The Big Five Personality Factors and Team Performance', Journal of Engineering and Technology Management, 14: 195-221

Klein, K. J. and Sorra, J. S. (1996) 'The Challenge of Innovation Implementation', Academy of Management Review, 21 (4): 1055-1080

Kloppenborg, T.J. and Petrick, J.A. (1999) 'Leadership In Project Life Cycle and Team Character Development', Project Management Journal, June: 8-13

Mcdonough, III E.F.(1993) 'Faster NPD: Investigating the Effects of Technology and the Characteristics of the Project Leader and Team', Journal of Product Innovation Management', 10 (2): 241-250

Miller, D. and Friesen, P.H. (1983) 'Strategy Making and Environment: The Third Link', Strategic Management Journal, 4: 221-235

Miller, D., Droge, C. and Toulouse, J-M. (1988) 'Strategic Process and Content As Mediators Between Organizational Context and Structure', Academy of Management Journal, 31 (3): 544-569

Mintzberg, H. and Lampel, J. (1999) 'Reflecting On the Strategy Process', Sloan Management Review, 40 (3): 21-30

Mumford, M. D. (2000) 'Managing Creative People: Strategies and Tactics For Innovation', Human Resource Management Review 10 (3): 313-351

Nicholls-Nixon, C. L., Cooper, A.C., and Woo, C. (2000) 'Strategic Experimentation Understanding Change and Performance In New Ventures', Journal of Business Venturing, 15: 493-521

O' Connor, Gina Colarelli and Rice, M.P. (2001) 'Opportunity Recognition and Breakthrough Innovation In Large Established Firms', California Management Review, 43 (2): 95-116

Pettigrew, A.M. (1987) 'Introduction: Researching Strategic Change In the Management of Strategic Change', Pettigrrew, A.M. (Ed) Oxford: Basil Blackwell, pp: 1-13

Porter, Michael E., Ed. (1986), Competition In Global Industries Boston: Harvard Business School Press

Rangaswamy, A. and Lilien, G.L. (1997) 'Software Tools For New Product Development', Journal of Marketing Research, February: 177-184

Robertson, T.S. and Gatignon, H. (1987) 'The Diffusion of High Technology Innovations: A Marketing Perspective' In 'New Technology As Organizational Innovation' Pennings, J.M. and Buitendam, A. (Eds), Cambridge, MA: Ballinger, pp. 179-196,

Rothwell, R. (1992) 'Successful Industrial Innovation: Critical Factors For the 1990s' R&D Management, 22 (3): 221-239

Sawhney, M. and Prandelli, E. (2000) 'Communities of Creation: Managing Distributed Innovation In Turbulent Markets', California Management Review, 42 (4): 24-54

Schreuder, H. (1993) Timely Management Changes As An Element of Organizational Strategy', Journal of Management Studies, 30 (5): 723-738

Senior, B. (1997) 'Team Roles and Team Performance: Is There 'Really' A Link?' Journal of Occupational and Organizational Psychology, 70 (3): 241-259

Shankar, V. (1999) 'New Product Introduction and Incumbent Response Strategies: Their Interrelationship and the Role of Multimarket Contact', Journal of Marketing Research, 36 (3): 327-345

Shaw, G., Brown R. and Bromiley, P. (1998) 'Strategic Stories: How 3M Is Rewriting Business Planning', Harvard Business Review, May –June: 41-50

Slappendel, C. (1996) 'Perspectives On Innovation In Organizations', Organization Studies, 17 (1): 107-130

Stopford, J.M. and Baden-Fuller, C. (1990) 'Corporate Rejuvenation', Journal of Management, 27 (4): 399-415

Stopford, J.M. and Baden-Fuller, C. (1994) 'Creating Corporate Entrepreneurship', Strategic Management Journal, 15: 521-536

Subramanian, A. and Nilakanta, S. (1996) 'Organizational Innovativeness: Exploring the Relationship Between Organizational Determinants of Innovation,

Types of Innovations, and Measurements of Organizational Preformance ' Omega, 24 (6): 631-647

Tabak, F. and Barr, S.H. (1999) 'Propensity to Adopt Technological Innovations: The Impact of Personal Characteristics and Organizational Context' Journal of Engineering and Technology Management, 16 (3/4): 247

Taylor, B. (1995) 'The New Strategic Leadership: Driving Change, Getting Results', Long Range Planning, 28 (5): 71-81

Utterback, J. and Abernathy, W. (1975) 'A Dynamic Model of Process and Product Innovation', Omega, 3: 639-656

Waldman, D. A. and Yammarino, F.J. (1999) 'CEO Charismatic Leadership: Levels-of-Management and Levels-of-Analysis Effects' Academy of Management Review, Academy of Management Review, 24 (2): 266-286

Wiersema, M.F. and Bantel, K.A. (1992) 'Top Management Team Demography and Corporate Strategic Change', Academy of Management Journal, 35: 91-121

Whitley, R. (2000) 'The Institutional Structuring of Innovation Strategies: Business Systems, Firm Types and Patterns of Technical Change In Different Market Economies' Organization Studies, 21 (5): 855-887

Zahra, S.A., Neubaum, D.O. and Huse, M. (2000) 'Entrepreneurship In Medium-Size Companies: Exploring the Effects of Ownership and Governance Systems', Journal of Management, 26 (5): 947-976

Zaltman,G., Duncan R. and Holbeck, J. (1973) Innovations and Organizations, New York: Wiley

Zyglidopoulos, S. (1999) 'Initial Environmental Conditions and Technological Change' Journal of Management Studies, 36 (2): 241-260