A Review of Literature

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What Do We Know About Enhancing Creativity and Innovation?

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Introduction

The capacity of individuals and organizations to create innovations is a crucial element of public sector innovation. But do we know how to enhance creativity? The literature on this subject is very large and beyond my capacity to read and integrate. This paper is therefore a reflection of what I have been able to grasp.

Several authors have examined the relationship among individuals in the workplace. Theresa Amabile has produced the most empirical research, exploring both personal characteristics and the interaction among people in the work environment. Other researchers considered the interaction process among workers and their personal and combined characteristics. Some authors considered the way groups interact to be the most important factor. One element, personal motivation, received a good deal of attention. A new factor has been introduced from the Japanese experience - the conversion of knowledge from personal, tacit forms into explicit forms, which can be accessed by a wider group of people, including the employer. This individual-organizational interface is where knowledge is created, and is currently the key area for examination for several writers.

What Promotes Creativity?

Theresa Amabile (1988) identified the factors that promoted problem solving or personal creativity by studying a group of 120 innovators working in research and development. Although one factor, qualities of the group, assisted creativity, other group factors were not shown to do so. Personal characteristics were related to creativity, including specific personality traits, self motivation, special cognitive abilities, a risk orientation, diverse experience, expertise in the area, social skill, brilliance and naiveté (pp. 128-129). The qualities of problem solvers that inhibited creativity, on the other hand, were lack of motivation (30%), unskilled (24%), inflexible (22%), externally motivated (14%), and socially unskilled (7%) (p. 129). Individual creativity was enhanced, in other words, by domain relevant skills, creativity-relevant skills and intrinsic task motivation.

While individual factors and initiative were important to creativity, social environments also made a difference. Environments that encouraged creativity for these innovators exhibited freedom (74%), good project management (65%), and sufficient resources (52%). A half to a third of the innovators identified the need for encouragement (47%), specific organizational characteristics (42%), recognition (35%) and sufficient time (33%), whereas only 22% identified the need for challenge (22%) and pressure (12%). They felt that organizations required "a mechanism for considering new ideas, a corporate climate marked by co-operation and collaboration across levels and divisions, and an atmosphere where innovation is prized and failure is not fatal" (p. 147).

The qualities of environments that inhibited creativity, on the other hand, were (various) organizational characteristics, constraint, organizational disinterest, poor project management, evaluation, insufficient resources, a corporate climate marked by a lack of co-operation across divisions and levels and overemphasis on the status quo. Two factors sometimes described as innovation motivators were found not to be - constraint and competition. (pp. 147-148).

One notable aspect of these responses about environments was how much more important the innovators found the social factors to be than the personal characteristics. The highest portion of innovators choosing any single personal characteristic was 41%, while the top five of the group characteristics, all received a higher rating. There was therefore greater consensus about social factors than individual ones. Another striking element is how many of the group factors could be influenced by management and how few by the innovators themselves. Management usually determines the organizational characteristics, sets the tone for the corporate climate, and determines whether or not the organization is interested in innovation. It also controls whether there are competent project management, evaluation, sufficient resources, and an emphasis on the status quo, constraint and competition.

While Amabile studied the characteristics of individuals and environments contributing to and interfering with individual and organizational creativity, Brown (1989) and Harrington (1990) understood organizational creativity as a combination of the creative process, creative product, creative person, creative situation, and how these components interacted together (Woodman, Sawyer, Griffin, 1993, p. 294). "Individual creativity is a function of antecedent conditions (e.g. past reinforcement history, biographical variables), cognitive style and ability (divergent thinking, ideational fluency), personality factors (self-esteem, locus of control), relevant knowledge, motivation, social influences (social facilitation, social rewards), and contextual influences (physical environment, task and time constraints)" (Woodman et. al., 1993, pp. 294, 296). It is notable that the manager and employees trying to encourage innovation cannot affect the past, cognitive style, ability or personality of employees but can influence knowledge, motivation, and social and contextual influences. What the manager could conceivably do is choose employees with certain historical, cognitive, ability and personality profiles. A homogeneous and exclusionary work force could thereby be created, however, thus losing the potential benefits of diversity.

Amabile focused on personal and social environmental characteristics, Brown and Harrington on the creative process combining the product, person and situation. Like Amabile, King and Anderson (1990) pointed to work group characteristics as being key. They described the conditions of group creativity as leadership (especially when democratic and collaborative), cohesiveness, group longevity, group composition, group structure (organic rather than mechanistic), and membership from diverse fields or functional backgrounds. Group cohesiveness and longevity seem important group characteristics, but their relationship to creativity is not totally clear. Nystrom has suggested that there may be a curvilinear relationship between group cohesiveness and creative performance (Nystrom 1979). Examining research teams, Payne (1990) came to similar conclusions, identifying the key role of "...resource availability, leadership, group size, cohesiveness, communication patterns, and group diversity as crucial factors in creative performance" (Woodman et. al., p. 302). If King and Anderson and Payne are correct, then the recruiting strategies that would seem to flow out of Amabile, Brown and Harrington's work, where managers would attempt to find "creative" staff (see below), might in fact be destructive of innovation.

Perhaps the key aspects are rather the way groups function. This consideration lead to development of creativity-enhancing group techniques such as brainstorming and mind mapping. Following development of these strategies, a review of literature by Stein (1974) found that individuals actually generate fewer ideas in such groups (p. 303). Hackman and Morris (1975) proposed that group performance is reduced because of motivational losses, but also, surprisingly, by processes and co-ordination (p. 303). Problem-solving groups could improve their effectiveness, on the other hand, by training individuals in problem solving skills (Bottger & Yetton, 1987) (p.303).

Techniques identified for enhancing organizational creativity included the separation of solution generation and evaluation of solutions (Cummings and O'Connell, 1978; Basadur et al., 1982; Basadur et. al., 1986), risk taking, free exchange of ideas, legitimization of conflict, stimulation of participation, and reliance on intrinsic as opposed to extrinsic rewards. Woodman et al. inferred, however, that there was little empirical support for these conclusions, except for that provided by Amabile (1983), although " . . . correlation evidence with ratings of overall innovation has been provided by Paolillo and Brown (1978) and Abbey and Dickson (1983) (Woodman et al., 1993, p. 306).

This conclusion continues to be challenged by those who seek to teach methods and train groups to be more creative - that is, those focusing on the process rather than the product. Their approach treats creativity as at least in part as a set of thinking skills. To Basadur, Graen and Scandura (1986), creativity is enhanced when more time is spent producing ideas, since the quality of ideas is the same throughout ideation, and when the group avoids making premature critical evaluations of ideas. These authors found that training focused on developing the thinking skills associated with creativity (active divergence, deferral of judgment, and active convergence) lead to tangible outcomes in terms of the quantity and quality of creative output. Trainers at the Manchester Business School Creativity Research Unit, using methods developed by the pioneering programs of the Creative Problem Solving Institute, Buffalo (which was also the basis for Basadur's approach), found that a one-day training program heightened awareness of personal capacity for creative action but did not have any impacts without reinforcing factors being in place in the workplace. A three-day program may achieve valuable results if the person develops a critical mass of trained people through formal or informal networking. The outputs of a ten-day program included both tangible products such as contributions to corporate innovation success and evidence of changes in behiours and problem-solving strategies of participants. (Rickards, 1993, pp. 162-5)

The heart of the matter is that group creativity is not the sum of the individuals' creativity within the group. Rather, creative behaviour is mediated through the group and is influenced by the group's composition, characteristics and processes, as well as the context of the larger organization. In short, the group mediates individual behaviour, which ultimately affects organizational creativity (p. 304).

Amabile (1988, pp. 142-3) has demonstrated that the intrinsically motivated person is more creative than someone who is extrinsically motivated. An important consequence of this conclusion is that hierarchical direction to innovate and top-down innovation would presumably not produce very creative solutions. On the assumption that more creative ideas are at least sometimes better ideas, how can the creativity of innovations be enhanced? Amabile (1988) identified domain relevant skills, creativity-relevant skills and intrinsic task motivation as the key elements. She suggests that each one of the three components of her creativity model (she calls it a "multiplicative model" - it applies to individuals and small groups, p. 141") is necessary for creativity to occur; the higher the degree of each (all must be present) of the three components, the more creativity there should be (p.137). Conceptualized as circles, individual creativity or organizational innovation will be greatest where the circles overlap; hence, the "creativity intersection"(p. 156). The implications of the "Creative Intersection", applicable to both individual creativity and organizational innovation, suggests that one should look for task skills, creative skills and intrinsic motivation, when recruiting (p. 163); environmental factors that promote creativity should be bolstered; and information should be used to remove inhibitors to creativity (that is, remove obstacles before putting new things in place) (p. 163).

If for the organization the key aspect of intrinsic motivation is that the individual is then willing to make personal knowledge available to the government, what can be done to support and enhance that

willingness? One approach is to value the contribution of employees, clients and the public, and to consult with staff and clients, in order to access their ideas. This is a key aspect of the quality movement and an approach used in many innovations as well. Another approach is that used in many innovative Japanese companies, where management and teams are oriented toward working with staff to access personal knowledge. Ikujiro Nonaka and Hirotaka Takeuchi have explored the process which occurs interior to creativity. According to Nonaka, appointed the first professor of knowledge at Stanford University in 1996, "Making personal knowledge available to others is the central activity of the knowledge-creating company." (Nonaka, 1991, p. 98) Of primary importance is the recognition that creating new knowledge does not simply mean processing information, but "...tapping the tacit and often highly subjective insights, intuitions, and hunches of individual employees and making those insights available for testing and use by the company as whole." To do this employees must feel a personal commitment and bond with the company and its mission. Nonaka sees this as the organizational equivalent of self-knowledge, a shared sense of "what the company stands for, where it is going, what kind of world it wants to live in, and most important, how to make that world a reality (Nonaka, 1991, p. 97).

Nonaka describes four basic patterns for creating knowledge: converting tacit knowledge to tacit knowledge (socialization), explicit to explicit (combination), tacit to explicit (externalization), and explicit to tacit (internalization). In a knowledge-creating organization all four of these interchanges occur. The Japanese are particularly good at the interchange between tacit and explicit information, the critical step in knowledge creation (Nonaka, 1991, p. 99).

The knowledge-creating process of converting tacit knowledge into explicit knowledge operates "first, by linking contradictory things and ideas through metaphor; then, by resolving these contradictions through analogy; and, finally, by crystallizing the created concepts and embodying them in a model, which makes the knowledge available to the rest of the company." (Nonaka, 1991, p.101). In attempting to design a new and different car, for example, the project leader of Honda's engineering team charged with the task developed the slogan: "Theory of Automobile Evolution." The question was asked "If the automobile were an organism, how should it evolve?" (Nonaka, p.100) The analogy required reconciling the differences and similarities of the two ideas expressed in the metaphor, "car" and "evolution." In the creative context, then, managers must take a more holistic approach which includes creating images, symbols and slogans. (p.97)

Leadership

Several writers see leadership as a key linkage between individual creativity and knowledge and organizational innovation. Amabile observed parallels between organizational innovation and individual innovation, identifying three primary components for organizational innovation. The first was motivation to innovate. Leadership influenced motivation. Leadership should come from the highest level, but middle management could also be very important. The organization should communicate value is placed on innovation in general; a willingness to risk rather than an orientation towards maintaining the status quo; a sense of pride in the organization's members and what they are capable of doing; and an offensive strategy of taking the lead toward the future, not a defensive strategy of simply wanting to protect the organization's past position. (p. 154). The second factor is resources, including people with knowledge, funds and training. The final factor is skills in innovation management, including management skills, and relevant branch, division and project level skills. Management should be professional, balance freedom and constraint, and communicate openly (pp. 153-155).

Nonaka focused on the individual-organizational interface as well. He saw middle management as the most important to innovation. The creation of new knowledge is a result of interaction among front-line staff, middle management and senior management. Most in touch with the technologies, products, or markets, front-line staff are the true experts, but turning the information they use into useful knowledge, for many reasons, can be a difficult task. The meaning of the information is continually shifting as it is transferred and diffused throughout the organization. Middle managers help to transfer information into useful knowledge by providing conceptual frameworks for employees (pp. 102-103). Senior managers "give voice to a company's future by articulating metaphors, symbols, and concepts that orient the knowledge-creating activities of employees. They do this by asking the questions: What are we trying to learn? What do we need to know? Where should we be going? Who are we? If the job of front-line employees is to know 'what is,' then the job of senior executives is to know 'what ought to be.'" (Nonaka, 1991, p. 103). It is management's task to clear away any obstacles and prepare the ground for teams and self-organizing groups. Teams are an important part of innovation as they provide for interaction, conflict, critical thinking, reflection, and constant dialogue (p. 104). Middle management is key because it translates the tacit knowledge of front-line workers and senior executives into explicit knowledge and ultimately into new products and technologies. To this end, "...they are the true 'knowledge engineers' of the knowledge-creating company" (Nonaka, p.104). The best settings for innovation are not top-down management nor bottom-up management, but middle-up-down management, where middle managers are at the very center of knowledge management. They are the conduit between top management's vision and the reality of front-line workers, and provide the conceptual model (pp. 124-129). [How could this apply in the Westminster system?]

Nonaka and Hirotaka posit a "hypertext organization" in which three totally different contexts are coexisting within the same organization. The business layer is the middle layer, used for routine operations and is shaped like a pyramid with its tip at the middle management level. The project team layer is the top layer, where numerous teams engage in knowledge creation. Team members come from various units, and are assigned to a specific project team only until the project is complete. The knowledge-base layer is at the bottom, where organizational knowledge created in the other layers is re-categorized and re-contextualized. This layer does not exist organizationally, but is embedded in corporate vision, organizational culture or technology. (pp.166-167)

Dennis Grady (1992) also explored the role of managers in innovation, studying 190 supervisors and 160 innovators, who identified the crucial roles of managers in innovation. In strengthening readiness, they created a supportive climate of risk-taking and lateral thinking within their organizations. Innovative managers supported "fast failures" rather than the classic public manager model of deliberative decision making, efficient use of public resources and adherence to standard operating procedures. In support of approval, managers viewed the organization as an open system connected to its political environment, built connections to external forces to foster support for the innovation as it emerged, and shared a view of the organizational environment with the innovative employee. Finally, managers rewarded innovation. Based on behaviourial theory, rewards are controversial, because they create a competitive environment. Like Grady, Wilson (1966) also saw executives as being crucial to innovation.

Organizational Knowledge Creation and Continuous Innovation

To Nonaka continuous innovation is possible, and is dependent on knowledge creation. Innovation is seen as organizational knowledge creation, in which the conversion of tacit, personal knowledge to explicit, organizational knowledge is crucial. This sounds like creativity, as described by other authors.

The first step in managing the knowledge-creating company, and a key principle of organization design in Japanese companies is redundancy. Transfer of tacit knowledge is increased as a result of frequent communication and dialogue; strategic rotation, especially between different functions and technologies; and free access to information (Nonaka, p.102). It is in the midst of redundancy and ambiguity that new knowledge is created (Nonaka and Hirotaka, 1995, p. 12). Redundancy sounds synonymous to waste and duplication for Westerners, but it promotes dialogue and communication. When members of the organization share overlapping information (share a "common cognitive ground") people can get a sense of what others in the organization are trying to articulate. While redundancy primarily involves information sharing, this explicit knowledge can then be internalized by employees (Nonaka and Hirotaka, 1995, p. 14). Redundancy is promoted by the management of "...product development as an overarching process in which different functional teams work together on a shared division of labour (Takeuchi and Nonaka, 1986). Another aspect of redundancy is revealed in many Japanese companies which take this process even further and divide product development teams into competing subgroups, which develop different approaches to the same product, the advantages/disadvantages of each are then argued out, and a best approach is decided upon (Nonaka and Takeuchi, 1995, p.14).

Japanese companies have been successful because they are experts at creating organizational knowledge: they create new knowledge, disseminate it, embody it in products, systems and services, and so innovate. They do this on a continual, incremental basis. It should be noted that this goes against the common view in the West that Japanese are only good at imitation and adaptation, that they are not very innovative (Nonaka and Takeuchi, 1995, p. 3).

According to Nonaka and Takeuchi, however, neither the Japanese nor Western models of knowledge creation are best case scenarios; they both exhibit shortcomings. In Japan the conversion of tacit to explicit knowledge takes place primarily at the group level, but the Japanese tend to focus too much on the figurative and symbolic rather than on more documented, analytical approaches. The West, on the other hand, utilizes clear cut decisions and conversion from tacit to explicit knowledge occurs primarily at the individual level, focusing only on a few key people (p. 209, 210, 226). A comparison of the European and Japanese approaches to developing high-end automobiles illustrates the point. Western knowledge is explicit - it can often be processed by a computer, whereas Japanese knowledge is more tacit - difficult to process or transmit by computer. What is needed is an approach that integrates the merits of both methodologies (p. 226).

Tacit knowledge is personal, difficult to formalize, subjective, intuitive, and rooted in one's actions and experiences, ideals, values and emotions. More specifically, tacit knowledge can be broken down into two components: informal skills captured in the term "know-how" (this is the technical dimension), and a cognitive dimension consisting of "...schemata, mental models, beliefs, and perceptions so ingrained that we take them for granted. The cognitive dimension of tacit knowledge reflects our image of reality (what is) and our vision for the future (what ought to be)." (Nonaka and Takeuchi, p. 8).

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Figure 1 Comparison European & Japanese high-end Auto development

	European-Style	*Japanese Style*
Objective	Pursuit of superior performance	Adaptation to changing needs
Product Appeal	Function e.g. high-speed performance	Image and quality
Product concept creation	Clear-cut decision at the initial stage, adhered to throughout the ensuing stages	Vague at the initial stage, modified and altered in ensuing stages according to changing needs
Flow of activities	Sequential approach	Overlapping approach
Ensuing process	Specific design targets fixed at initial stage pursued under a strict division of labour	Close cooperation among all departments concerned during the development
Organization	Organization according to function and often under a project leader with limited authority	Matrix mgmt/ project teams under a project leader with authority over entire process - planning, production, sales
Strengths	Conducive to relentless pursuit of superior performance, function, high quality	Shorter lead time -3-4 years, high quality, attuned to needs in the market
Weaknesses	Longer lead time (7-8 years), high development costs	Risk of compromise on a low level; not conducive to an all-out pursuit of superior performance

Source: Nonaka and Hirotaka, 1991, p. 211

Of course knowledge has to be shared to be useful; therefore, tacit knowledge must be transformed into explicit knowledge, and eventually back into tacit knowledge - this is how organizational knowledge is created (p. 9). The West believes that innovation is about putting together diverse data or information, but in Japan the employees' commitment to the company and its mission is what is important: "In this respect, the creation of new knowledge is as much about ideals as it is about ideas. The essence of innovation is to recreate the world, including the company and everyone in it, according to a particular ideal or vision." (p. 10)

Nonaka and Hirotaka describe five conditions required at the organizational level to create the knowledge spiral: intention/ aspiration to create knowledge; autonomy of workers; fluctuation and creative chaos; redundancy; and requisite variety - an organization's internal diversity must match the variety and complexity of the environment (1995, pp. 74-83). They conceive a five-phase model of the

organizational knowledge-creation process: sharing tacit knowledge, creating concepts, justifying concepts, building an archetype, and cross-leveling of knowledge, where the new knowledge moves on to a new cycle of knowledge creation at both an intra-and inter-organizational level (p. 90). This process is similar to the one I have identified for innovation (Glor, 1997a,b; 1998).

In summary, the key factors that seemed to support continuous innovation in Japanese companies were effective conversion of tacit to explicit knowledge, redundancy in information sharing and task assignment, and continuous creation of the knowledge spiral.

Conclusion

Based on the literature reviewed in this paper, one would conclude that it is possible to support creativity and innovation. Individual creativity was found by Amabile to be mediated by the group and can be supported by the social environment and management. Woodman et. al. also found that the elements impacting on creativity which employees and management could influence were knowledge, motivation, social and (to some extent) contextual influences. Studies reported contradictory findings on whether managers should create teams of creative people (a kind of homogeneity) or teams with a diversity of backgrounds and skills. Likewise, there was no consensus on whether the way in which groups function and the processes used with groups affected creativity, but it was clear that the group mediates individual creativity. Recent Japanese work on knowledge creation has described creativity in terms of making tacit knowledge explicit and has suggested this process can be enhanced. Other key factors in creating continuous innovation are information sharing and ongoing creation of the "knowledge spiral". Likewise the social environment can facilitate the intrinsically motivated individual making her/his knowledge explicit. The empirical underpinnings of these ideas are still limited, however, and some authors continue to conclude that we do not know how to facilitate personal creativity (e.g. Dror, 1997). Dror does agree, however, that "(i)t is possible to design organizational structures and processes which encourage innovativeness and creativity." (Dror, 1997, p. 15) The newest and most interesting area of theory development is the individual-organizational interface and how tacit knowledge can be converted into explicit knowledge.

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