
The role of affect in creative projects and exploratory search

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The theory of creativity and exploratory search developed by Simon, March, and their followers in the Carnegie school relies on a coolly cognitive account of motivation. We argue that a more robust theory would give affect greater prominence. Our approach is inspired by Dewey's (2002 *Human Nature and Conduct*. Prometheus: Amherst, MA) analysis of the three components of human conduct—habit, intelligence, and impulse, where impulse is Dewey's term for affect. The Carnegie approach incorporates the first two, but has little to say about the third. We review literature on affect in psychology, psychodynamics, and neurobiology, showing how it allows us to characterize more effectively the motivational underpinnings of individual creativity and collective creative projects. This in turn enables us to sketch the key role of affect in exploratory search as compared to other domains of organizational activity.

Creativity is an important determinant of firm performance, and exploratory search (as distinct from exploitation) is thus a critical activity for many organizations. One of the more influential approaches to creativity and exploratory search is that developed by Herbert Simon and James March, and it has grown into a recognizable Carnegie school. This essay identifies some weaknesses in the Carnegie account, and goes back to the work of John Dewey to build a stronger foundation for a more complete understanding of these phenomena.

In the classic March and Simon formulation, the gap between current performance and aspiration levels prompts search, which can be modeled as random exploration conditioned by search heuristics and domain knowledge (Cyert and March, 1992: 175 ff.; March and Simon, 1993: 68, Ch. 7). The conceptual strategy underlying the Carnegie approach relies on the intuition that the complexity of our behavior does not necessarily reflect complexity in our psychological functioning: even agents governed by simple behavioral rules will generate complex behavioral patterns when functioning in complex environments (Simon, 1981, Ch. 3 on the “parable of the ant”). Simon and March together and separately have shown how such simple models can generate complex forms of behavior, including the creativity embodied in important scientific discoveries, world-class chess

performance, and organizational exploration strategies. Their successors in the Carnegie school have shown that great insights are afforded by parsimonious models that incorporate deliberate albeit bounded choice, habitual routines, and serendipity (e.g., Gavetti and Levinthal, 2000; Gavetti, 2005; Levinthal and Rerup, 2006).

We argue that notwithstanding these accomplishments, the Carnegie conceptualization of creative search is too thin. The Carnegie account recognizes the motivational potency of aspiration gaps (e.g., Lewin *et al.*, 1944), and postulates a positive correlation between aspiration gap and search effort; but it does not explicate the process by which awareness of this gap affects search effort, and as a result, it leaves unexplained some of the key features of creative search (as described in the next section). We argue that an important missing part of the story is affect—including emotion and mood—in its individual and collective forms. The Carnegie account, we argue, is limited by its commitment to explanations that rely primarily on “cool” cognition. We need an account that acknowledges the role of “warmer and more social” (Schwartz, 1998) forms of cognition.

This article proposes to remedy the excessive parsimony of the Carnegie approach by returning to the social-psychological framework advanced by John Dewey [2002 (originally published in 1922)]. Alternative approaches might turn to work on entrepreneurship in the Austrian tradition (Kirzner, 1973, 1999) and to related work based on subjective value and imagination as developed for example by Shackle (see discussion by Augier and Kreiner, 2000; Augier, 2001; Cowen, 2003). We turn to Dewey, first, because Simon and March themselves built directly on his work, but (we will argue) overlooked a key part of Dewey’s argument. And second, Dewey’s theory enables us to bring together a range of contemporary research that opens exciting new opportunities for the study of creativity and exploratory search. The goal of this article is to sketch out this terrain, identifying resources we might use to explore it, rather than to propose a specific theory.

1. Limitations of the Carnegie account of creative search

The limitations of the Carnegie conception of search are evidenced in its distance from the subjective experience of individual creativity, collective creative projects, and organization-level exploration. We address them in turn.

First, the Carnegie approach seems underspecified in its approach to individual creative activity. Creativity depends critically on intrinsic motivation and related psychological variables (Amabile, 1996); but the Carnegie account has had little to say about these factors (as noted by Csikszentmihalyi, 1989a, b; see Simon’s response, 1988). Phenomenologically sensitive accounts of creative activity—and introspective reflection on our own creative efforts as scholars—invariably reveal the large role that

is played by affect in the form of transient emotions, persistent moods, and deeply anchored emotional dynamics. This is vividly portrayed in Kidder's (1981) account of the passionate involvement of engineers designing a new Data General microcomputer: "I don't work for the money," says one, bluntly (1981: 61). The Carnegie approach needs to be supplemented by an understanding of the affective processes that lead people to *care* about performance goals and gaps.

Second, the Carnegie approach has given too little attention to the specific form taken by collective creative activity—the project. This second gap is linked to the first because of the key role in creative projects played by affect in its more collective forms. The importance of collective affect to projects is visible in many accounts. Consider the group-level emotions that are portrayed by Kidder (1981): engineers are "infected" with colleagues' "ardor" (p. 74); team members share a "rite of initiation" (p. 82); and the project leader acts as a "social director" (p. 139) who organizes rituals and games that "release tension" in the team (p. 141). Consider, too, Gemmill and Wilemon's (1994) survey of 100 project team leaders, which asked respondents to list "Major frustrations team leaders experienced in leading project teams." The most common frustrations include: team member apathy and lack of commitment (66% of respondents), lack of openness in confronting real issues (58%), and hidden agendas, low trust, rubber-stamping mentality (21%). Such data suggest that the Carnegie approach to search and creativity is not only insufficiently attentive to affect, but also too individualistic (Downes, 1990). We need a richer characterization of collective creative projects and of the role of collective affect in their conduct.

The Carnegie account is similarly thin in its account of the organizational process of exploration. The Carnegie approach gives us a powerful way to conceptualize the predominant form of activity in exploitation, revealing the reliance of repetitive operations on organizational routines; but this approach offers no comparably rich account of exploratory search activity. Kidder's (1981) account is useful here, too. He describes the competition between the Eclipse and FHP development groups as political in form, but intensely emotional in content. Each group thrived on the passionate involvement of its creative contributors, and the success of the corporation depended on sustaining both groups' affective engagement in the face of enormous competitive and cost pressures. Sustaining the requisite level of R&D funding also required a passionate commitment to exploration on the part of top management.

Dewey's three-part model of conduct provides a useful foundation for remedying these limitations of the Carnegie account. Dewey was clearly important to Simon's thinking (via Stene, 1940; Simon, 1976; see also March and Simon, 1993). However, the Carnegie tradition reflects only two parts of Dewey's three-part model: it incorporates *intelligence* (as boundedly rational consideration of alternatives) and *habit* (as routinized responses), but has largely ignored *impulse*, which in Dewey's usage covers the phenomena currently referred to as affect

(as discussed below).¹ The resulting Carnegie model of creative search may be easier to implement in computer simulations (e.g., Bradshaw et al., 1983; Langley et al., 1987); but this benefit comes at the cost of ignoring all but the coolest cognitions.

Several exceptions to this characterization of the Carnegie approach should be noted at the outset—but these are exceptions that prove the rule. As we have already noted, in *Organizations* and later work, March and Simon invoke the gap between aspiration levels and current performance levels as the motivator of creative search. The gap derives its motivational force from the affective responses it provokes; but the processes underlying this link remain largely unexamined. Where Simon presents emotion as an “interrupt” mechanism (1967), he reduces emotion to arousal. Simon also had a long-standing interest (inherited from Barnard) in loyalty and identification (Simon 1991, 2002); but his account highlights their coolly cognitive role in focusing attention, and he has little to say about their affective core. In Simon’s account, loyalty and identification flow from human’s natural “docility,” understood as our “tendency to depend on suggestions, recommendations, persuasion, and information obtained through social channels” (Simon 1993a: 156; see also 1993b, 2002, and Augier and Sarasvathy, 2004). Simon here echoes Dewey’s theory and his terminology (Dewey 2002: 95ff); but where Dewey’s main point about docility was the educability of our impulses, Simon focuses only on our habits and goals.

While March’s work overlaps Simon’s in many areas, it has its own profile; nevertheless, March also understates the role of affect. March has been particularly interested in the role of conflict and politics in organizational functioning (e.g., Cyert and March, 1992), but this version of politics is largely passionless, emphasizing the boundedly rational pursuit of perceived interests, where this perception itself is shaped in turn by coolly cognitive processes of appraisal and attention biases. March has also been more interested in how we choose ends (preferences, tastes) (March and Olsen, 1976; March 1978, 1994); but even here, he leaves affect over the horizon of his theorizing. As Weil (2005) points out, March’s writing on leadership as portrayed in great literature (March and Weil, 2005) and March’s own poetry are eloquent on the affective, aesthetic, and moral factors that shape both ends and means (Chytry, 2003; see also commentary by Augier, 2004). Nevertheless, for the main part, March “does not mix up different genres of text” (Weil, 2005: 108) and he has largely segregated this latter work from his “scientific” work.

¹Cohen (forthcoming) argues that Simon and subsequent Carnegie work also overlook the dynamic quality of habits highlighted in Dewey’s account.

2. Dewey's three components of human conduct

We argue that our understanding of creative search will be enhanced if we follow Dewey's lead and re-integrate affect into our theory. In Dewey's (2002) account, the three components—habit, intelligence, and impulse—are intertwined in human activity [see also Holder (1994/1995) Emirbayer and Mische (1998), and Barbalet (1998) for related tripartite perspectives.] In Dewey's words:

Life is interruptions and recoveries... [A] novel factor in the surroundings releases some impulse which tends to initiate a different and incompatible activity, to bring about a redistribution of the elements of organized activity.... In this period of redistribution impulse determines the direction of movement. It furnishes the focus about which reorganization swirls. Our attention in short is always directed forward to bring to notice something which is imminent but which as yet escapes us. Impulse defines the peering, the search, the inquiry.... During this search, old habit supplies content, filling, definite, recognizable subject-matter... As organized habits are definitely deployed and focused, the confused situation takes on form, it is "cleared up"—the essential function of intelligence.... With conflict of habits and release of impulse there is conscious search [deployment of intelligence]. (pp. 179–180)

Habit as a vital art depends on the animation of habit by impulse; only this inspiring stands between habit and stagnation. (p. 170)

Thought [the deployment of intelligence] is born as the twin of impulse in every moment of impeded habit. (p. 171)

Dewey does not define the term impulse, but uses it to refer to the range of phenomena that today are commonly designated by scholars as affect. Contemporary definitions vary considerably; however, affect is usually characterized as the arousal of positive or negative evaluations, and emotions are seen as more specific and transitory affective reactions to specific situations (Russell and Barrett, 1999; Brief and Weiss, 2002): Dewey's use of the term impulse covers this range. In particular, he was not referring only to primary processes or drives, since primitive impulses are, he argued, profoundly modified by experience (see also Alexander, 1987, Ch. 4). In real activity, impulse works hand-in-hand with habit, intelligence, and other concurrent impulses, and in this process impulse is reshaped and refined (docility).

Dewey argued that our efforts to understand human activity were ill-served by reducing the rich range of human impulse to a small set of primordial instincts or core emotions. In this, Dewey is closer to those contemporary theorists of emotion who argue that emotion involves cognitive appraisals (Lazarus, 1982) and social construction (Johnson-Laird and Oatley, 2000) than to those who postulate the

centrality of discrete, automatically triggered, core emotions bequeathed by the species' evolution [e.g., Darwin 1965 (originally 1872); Ekman, 1972; Izard, 1991]. This is because his psychology was a profoundly social one. Emotions are individual experiences, but they can only be understood as qualities of our relationship with the people and things around us. Thus, where some contemporary research on emotion treats fear, for example, as an essentially precognitive reaction to anything threatening, for Dewey (2002: 154–155) different forms of fear are qualitatively different experiences:

There is no one fear having diverse manifestations; there are as many qualitative different fears as there are objects responded to and different consequences sensed and observed. Fear of the dark is different from fear of publicity, fear of the dentist from fear of ghosts . . .

Of central concern to the present paper's topic, Dewey (2002: 258) argued that impulse was a crucial component of human conduct in general and of creativity in particular:

The intellect is always inspired by some impulse. Even the most case-hardened scientific specialist, the most abstract philosopher, is moved by some passion.

Dewey's conceptualization uses the interplay of habit, intelligence, and impulse to portray the exploration/exploitation problem highlighted by March. This can be seen if we substitute "organization" for "individual" in Dewey's (2002) account:

[A]mong the native activities of the young are some that work towards accommodation, assimilation, reproduction [read: exploitation], and others that work toward exploration, discovery and creation. But the weight of adult custom [read: established organizational routines] has been thrown upon retaining and strengthening tendencies toward conformity, and against those which make for variation and independence, (pp. 97–98) . . .

Impulse is a source, an indispensable source, of liberation [from deadening, unintelligent routine] (p. 105) . . .

[T]he remedy [...] can be attained only as released impulses are intelligently employed to form harmonious habits adapted to one another in a new situation (p. 130).

Dewey provides a congenial platform for enriching the Carnegie account of creative search by connecting it to the burgeoning research on affect in psychology, in economics (e.g., Elster, 1998; Hanoch, 2002; Loewenstein, 2000; Thaler, 2000), and in management (e.g., Ashforth and Humphrey, 1995; Fineman, 2000; Ashkanasy *et al.*, 2002; Brief and Weiss, 2002). The following two sections discuss the ways affect

influences individual creativity and collective creative projects. We then use these insights to sketch a richer account of organization-level exploration activity.

3. Individual psychology: affect in creativity

At the individual level, affect (Dewey's impulse) is at the heart of the creative process, since affect is crucial to its motivation. Motivation theory is only slowly moving toward recognizing the importance of affect. As Porter *et al.* (2003) acknowledge, "Until very recently, the topic of affect at work has been given little attention within the area of work motivation" (p. 249). We share Meyer and Turner's (2002) sense that the coolly cognitive approaches still predominant in studies of motivation miss the main event: motivation is a relationship to an object that is valued, and to value an object is nothing more nor less than to give it affective valence. If the immediate outcome has only instrumental value, it acquires motivating force by virtue of the affectively charged ends to which it is a means.²

Seo, Barrett and Bartunek (2004) make a compelling case that all three aspects of motivation—direction, intensity, and persistence—are profoundly shaped by affect [see also Ford (1996) for similar thesis embodied in a somewhat different model]. Seo *et al.*'s model applies to the motivation needed even in very routine tasks: even under normal operating conditions, the successful implementation of a routine typically requires some degree of improvisation (Joas, 1997; Feldman and Pentland, 2003; Quinn and Dutton, 2005), and this improvisation in turn calls on affect for direction, intensity, and persistence. Affect is even more central in creative tasks: as Seo and his colleagues point out, when tasks are less familiar and more complex, generative direction and high intensity are more critical to success. Moreover, when there is greater time elapsed between goal setting and goal attainment, more numerous intermediate steps, and greater ambiguity of progress information—conditions typical of creative tasks—motivational persistence becomes more important, and so too the affectual basis of this persistence.

There are several strands of contemporary research that can help us flesh out the role of affect in motivation. First, there is a growing body of research in psychology on the various effects of affect. Here affect in the form of emotion is taken as a change in action readiness and it functions to set priorities (Frijda, 1986); moods are affective states that maintain this readiness over more extended periods (Oatley and Jenkins, 1992). Much of this work relies on the emotion circumplex—the mapping of affect on the two dimensions of valence and activation (Russell, 1980) of which one representation is shown in Figure 1. Within this strand, there is a large literature

² We may be overstating the case here. Arguably, one of the distinguishing features of modernity is the mutation of "passions" into cooler "interests": Hirschman's (1997) review opens this question for further discussion; Elias (2000) is also germane.

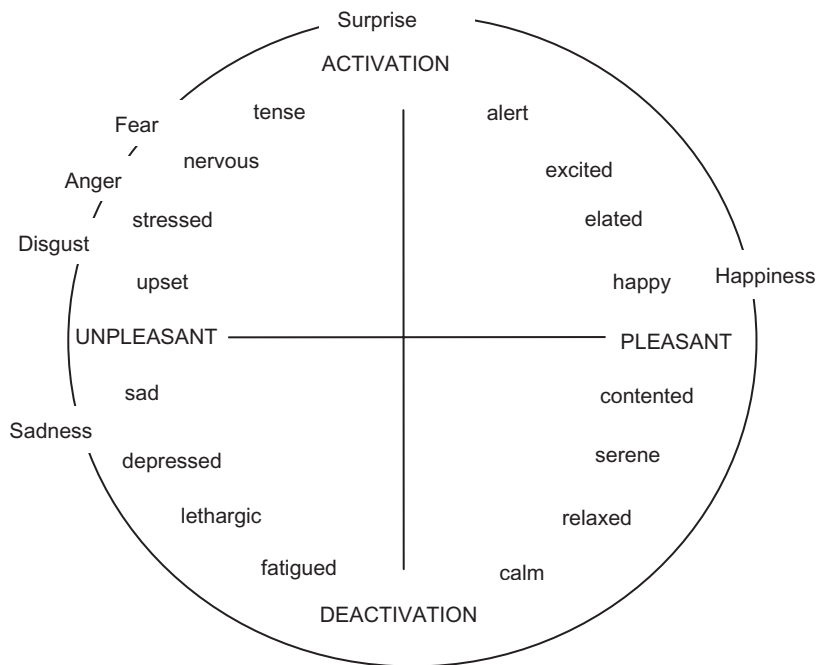


Figure 1 The emotions circumplex (Russell and Barrett, 1999).

focusing on positive versus negative affect and its effects on motivation and creativity, while other research has explored the effects of high versus low activation levels (reviewed by Eisenberg and James, 2005).

A second strand of literature focuses on the various sources of the relevant emotions, and relies on psychodynamic depth-psychology (Russ, 1993, Chs 2, 3; Hirschhorn, 1988, 1991, 1997; Gabriel, 1998; Gabriel and Carr, 2002; Glover, n.d.). The relevance to the present article’s objective is clear: “For psychoanalysis, emotion lies at the heart of human motivation—emotion drives motivation. It is not accidental that both words derive from the Latin *emovere*, to move” (Glover, n.d.: 298). Freud and Kleinian object-relations theory have proven helpful in alerting us to the forces that propel creative efforts over the longer time-frame of personal biography.

Third, recent work in neurobiology has focused on the various mechanisms of affect, and in particular its crucial role in brain function and in cognition. Damasio (1994, 1999), LeDoux (1996), and Panskepp (1998) have demonstrated the deep interconnection of cognition and affect. Damasio’s work is particularly useful in the present context, showing the role of somatic markers that attach emotional significance to memories. (See Filipic n.d. for a discussion of the considerable similarities between the ideas of Damasio and Dewey.)

Muramatsu and Hanoch (2004) summarize the neuro-biological findings concerning the role of emotion in attention, learning, and memory:

Emotions give direction to search, stopping, and decision rules that produce choice behavior [...] They alter one's goal prioritization (Simon, 1967), determine the relative salience of aspects of a task (Hanoch, 2002), shape cost-benefit assessments (Loewenstein, Weber, Hsee and Welch, 2001), often tell us when to stop processing information (Ketelaar and Todd, 2000), and rule 'out of court' or render unthinkable many options for the decision maker (Earl, 1986: 96–100).

The following paragraphs draw from these three research strands to elucidate the role of affect in the three facets of motivation (i.e., direction, intensity, and persistence), and thus help us understand the sources of individual creativity.

3.1 *Direction*

In the Carnegie account, the direction of creative search is determined by the combination of boundedly rational choice (potentially informed by deep domain knowledge), habit (in the form of high-level expert heuristics), and serendipity [potentially augmented by strategies of foolishness, per March (1979) and (1994) Ch. 6]. To this we need to add “intuitive insight” (Hatchuel, 2002), in the form of, for example, the feeling of “promisingness” that guides expert chess players (de Groot 1978). Intuition is guided by emotional markers in memory (Damasio, 1994, 1999). Arguing against a rather mechanical evolutionary theory of creativity proposed by Simonton (1999), Russ (1999) points out that affect influences (i) the variation aspect of evolution by activating associations and memory, and (ii) the selection aspect of evolution by guiding the choice among ideas. When memories are somatically marked, recall is fast and frugal—as compared to a laborious and typically infeasible search of the whole space of combinatorial possibilities (see also Hanoch, 2002; Rudrauf *et al.*, 2003; Lewis and Todd, 2005).

The impact of affect on the direction component of motivation is also found in the subject's practical engagement with an external “object” of that activity. Dewey [1988 (originally 1925): 292] writes:

Emotion in its ordinary sense is something called out by objects, physical and personal; it is a response to an objective situation Emotion is an indication of intimate participation, in a more or less excited way in some scene of nature or life.

Both Dewey and the Marxist tradition of activity theory (Leont'ev, 1978; Engestrom, 1987) give this practical engagement a central role—in contrast with much other theory that construes the object as a mere “stimulus” that provokes a

“response” in a pre-constituted subject (Dewey, 1896). The affective aspect of this object-engagement is obvious: the subject, whether as an individual or a collectivity, must care about the object.

This “caring” can have a positive or a negative valence, both of which powerfully influence the direction of creativity. Grawitch and Munz (2005) identify several ways in which the positive versus negative valence of affect will condition the direction of creative efforts. Positive affect encourages approach rather than avoidance (Carver, 2001; Erez and Isen, 2002), which encourages individuals to define the task as seizing an opportunity rather than avoiding a problem (Higgins, 1997). Where there are problems to be addressed, positive affect encourages people to approach these problems rather than shy away from them [Seo *et al.*, 2004; Amabile *et al.*, 2005; also Frederickson (2001) on the role of positive affect in “broaden-and-build” orientations].

Alongside the considerable body of research showing the role of positive affect in creativity, there is a rich literature on melancholy, neurosis, and manic-depression common among great creators (Runco, 1998; also Vosburg, 1998a, b on the mixed record of research). Bruch and Ghoshal (2003) identify important roles for both negative and positive forms of high activation in “energy zones,” forms that they call (respectively) “aggression” and “passion.” They discuss the differences in direction imparted by these different forms of energy: aggression is based on negative emotion and aims at neutralizing a threat by “slaying the dragon,” whereas passion is based on positive emotion and aims at seizing an opportunity by “winning the princess.” Goss (2005) identifies two corresponding motives in Schumpeter’s (1934) analysis of entrepreneurial projects: shame versus pride. Such nuance brings us to the psychodynamic approaches: if the object of creative effort motivates us, it is because our passions are aroused by the prospect that completing this object may allow us to complete ourselves (Hirschhorn, 2003).

3.2 *Intensity and persistence*

The affective underpinning of motivation provides intensity and persistence of effort. The latter is not a mechanical function of an aspiration gap: passion or intrinsic motivation is essential for creative work. Creative tasks are uncertain, making their monitoring and output evaluation inherently difficult. Under such conditions, purely extrinsic controls and incentives encourage shirking; moreover, facing such tasks, coercive (as distinct from autonomy-supporting) extrinsic controls provoke anxiety and undermine creativity (Amabile, 1996). Viewed psychodynamically, the intensity and persistence of effort will be a function of identification with the goals of the activity and a feeling of hope that these goals are in fact realizable (Huy, 1999).

Affect intensity and the associated arousal appear to have a curvilinear effect on creativity, facilitating it when they are at a moderate level but impeding it when too high or too low, independent of the valence of the affect

(Weiss and Cropanzano, 1996). Grawitch and Munz (2005) point out that positive affect has been shown to increase the number and quality of brainstorming ideas as well as cognitive flexibility (see also Isen, 2000; Grawitch *et al.*, 2003; Amabile *et al.*, 2005). Positive affect helps people avoid evaluation apprehension and its creativity-suppressing effects. On the other hand, positive affect can lead people to evaluate the current situation positively and thus weaken the motivation needed to undertake creative efforts to improve the situation. Negative affect will help identify and respond to risks that threaten the success of the creative endeavor (George and Zhou, 2002).

We should note that much of the research discussed earlier focuses on the affective conditions for effective creativity, but little of it addresses the role of affect in undermining creativity. Some of the research samples only people whose creative efforts were successful. Much of it aims to be practical in helping foster creativity. Most of the discussions of creative failure focus on how failure can be the seedbed of future success (exceptions include Flam, 1993; Frost, 2003; Henrickson, 2003; Maitlis and Ozcelik, 2004; more generally on destructive emotions see Goleman, 2003). Our “success oriented” culture makes us uncomfortable with a sustained research focus on true and abject failure and on the role of emotion in such failure.

4. From individual psychology to forms of collective activity: affect in creative projects

Creativity in organizational settings is not only a dimension of individual activity: it is organized as a discrete form of activity—as projects. A project is a “temporary endeavor undertaken to create a unique product or service” (Duncan, 1996: 4; see also Obstfeld, 2006a). While individual creative activity sometimes takes the form of a project, and while some projects are temporary endeavors that do not aim at particularly unique results and therefore require relatively little creativity, our concern here is with collective creative projects. Dewey’s theory provides a platform for understanding both the nature of such projects and the key role of affect in them.

Dewey’s approach is particularly appropriate to the study of phenomena such as collective creative projects where individual- and group-level mechanisms interact. This is because Dewey’s psychology was truly social—what goes on in the individual’s head is merely one aspect of an interactive whole. It is not just that behavior reflects the interaction of pre-constituted person and situation, but also that both the person and the situation are constituted in and through the history of such interactions: Dewey thus prefers the term *transaction* over *interaction* [Dewey and Bentley, 1989 (originally 1949): 96–130]. In particular, individual habits are largely shaped by collective “customs” through the process of internalization. Simon (1976), following Stene (1940), recognizes this, and building on Dewey, he takes the generic concept of social custom into the organizational setting, where it appears as

collective “routines.” Simon and March arguably do something similar with Dewey’s second mechanism: “intelligence” in the individual psyche corresponds to collective deliberation in organizational decision-making. But what about impulse? Considering the Carnegie school’s neglect of the role of impulse at the individual level, it is not surprising that we find here little discussion of any collective counterpart to impulse—which, we argue subsequently, is the creative project. Whereas routines are ongoing and rely primarily on habit, and whereas deliberation is recurrent and relies primarily on intelligence, projects are distinctive in being bounded in time and in relying crucially on impulse.

Numerous studies have addressed the role of impulse/affect in organization change processes and in individual creative efforts; but to date, impulse/affect has rarely been brought into the study of creative projects. In the organizational literature, relatively little research has gone beyond discussion of the intrinsic motivation requirement. We submit that the link between impulse/affect and project is far deeper. The word *project* comes from the Latin *projectus*, the past participle of *proicere*, to throw forward: if projecting is the result, impulse is the motor force. (See Schutz, 1962, 1967 on projects as the fundamental unit of action, and the discussion in Emirbayer and Mische, 1998.) The intimacy of this connection was apparent to Dewey (2002: 93)³:

Impulses are the pivots on which the re-organization of activities turn, they are agencies of deviation, for giving new directions to old habits and changing their quality. Consequently, whenever we are concerned with understanding social transition and flux or with *projects* for reform, personal and collective, our study must go to analysis of native tendencies [i.e., impulses]. (emphasis added)

The subsequent paragraphs will suggest various ways in which collective creative projects rely crucially on impulse/affect, especially in its collective forms. We do not mean to imply that intelligence and habit have no role to play: all three components are intertwined in projects as they are in routines and deliberation. The close empirical analysis by Feldman and Pentland (2003) and Howard-Grenville (2005) shows that in the performance of routines, habit is typically buttressed by intelligence and impulse. Similarly, collective deliberation is not well understood if our analysis

³ We should also note that Dewey is often associated with the project as a form of pedagogy (see e.g., Katz and Chard, 1989); but we should keep in mind that Dewey saw projects as such good pedagogical instruments because projects were central to the form of life for which education should, in his view, prepare us, namely a form in which every citizen was engaged in creative (re-)construction projects. Knoll (1997) discusses the history of the project method of instruction, tracing it back to the 16th century architecture schools; but he forgets to mention that if architecture and engineering were so receptive to the project as a pedagogical method it was because these occupations themselves have always been largely project-based.

excludes the habitual and impulse components that typically mark its course. In a parallel manner, we propose that there is a particularly strong connection between projects and impulse, even if projects also rely on intelligence and habit. In this spirit, we can map the relation between Dewey's components of individual behavior and their collective-level counterparts as shown in Table 1. In action, all three components are always intertwined; but in each type of activity, one of the three components dominates, as indicated by the relative number of + signs in each of the three columns.

We should note in passing that these three forms of collective conduct are only ideal-types: in reality, they often appear as hybrids. Hybrids of projects and routines include custom and semi-custom manufacturing as well as relatively repetitive projects whose results are not notably novel (e.g., many auditing or total quality projects). Hybrids of projects and deliberation include activities such as “strategy retreats” and project status review meetings. Hybrids of deliberation and routine are found in activities such as operations status review meetings and the “mindful” operations described by Weick and Roberts (1993).

Let us now flesh out the argument of Table 1 and discuss the role of impulse/affect in collective creative projects. We argued in the previous section that at the individual level impulse/affect influences creativity via its effects on motivation. Here we make a parallel argument at the collective level: we first establish the importance of collective forms of both impulse/affect and motivation, and then show how collective impulse/affect influences creative projects via the mediation of collective motivation.

First, we need to recognize the collective forms of impulse. Durkheim (1982: 59) provides the strong case:

An outburst of collective emotion in a gathering does not merely express the sum total of what individual feelings share in common, but is something of a very different order [...]. It is a product of shared existence, of actions and reactions called into play between the consciousnesses of individuals. If it is echoed in each one of them it is

Table 1 Components of individual conduct and forms of collective activity

Forms of collective activity ⇒ Components of individual conduct ↓	Project	Deliberation	Routine
Impulse	+++	+	+
Intelligence	+	+++	+
Habit	+	+	+++

precisely by virtue of the special energy derived from its collective origins. If all hearts beat in unison, this is not as a consequence of a spontaneous, preestablished harmony; it is because one and the same force is propelling them in the same direction. Each one is borne along by the rest.

Weick and Roberts' (1993) work on "group mind" get us at least half way towards such a recognition. They show that cognition can be a collective phenomenon anchored in individuals' heedful interrelating; but they depict cognition without emotion. Heed, however, has an affective dimension: on our understanding, to heed is also to care. Hutchins' (1995) work on distributed cognition affords us a similar critical appropriation: insofar as cognition is distributed both among actors and between actors and artifacts, so too is emotion (Glazer, 2003).

Several strands of research including psychology, psychodynamics, and neurobiology can help us understand the collective dimension of affect as distinct from the simple aggregation of individual affect. We discuss in turn research in psychology, psychodynamics, and neurobiology.⁴

Psychological research on emotional contagion in groups documents the power of the group in shaping individual emotions (Barsade and Gibson, 1998; Kelly and Barsade, 2001; Barsade, 2002; Kelly and Spoor, 2005). Groups often maintain a specific "affective tone," a shared emotional state, through attraction-selection-attrition, socialization, and social-influence (George and Brief, 1992). This is of particular importance to creativity in the form of "innovation climate," which is a collective affective tone that supports the kind of motivated effort required for innovation (Ekvall, 1997; Anderson and West, 1998; Maitlis and Ozcelik, 2004). Within organizations, organizational identification leads individuals to internalize group values and goals, and their emotional, motivational states come thereby to reflect collective emotions.

In psychodynamic research, collective emotion was addressed by Freud (1921), who saw the emotional life of groups as driven by mechanisms of identification, group bonding, and the formation of the ego-ideal. Freud's ideas, as further

⁴ There is also a growing body of research in the sociology of emotion, devoted to studying the social and cultural determinants of emotion, how emotions are defined, appraised, and managed. This field opens onto a host of research opportunities (see overviews in Kemper, 1990; Turner and Stets, 2005). Collins (2004), for example, proposes a comprehensive social theory based on shared "emotional energy." Of considerable interest to the study of creative projects is the emerging area of research on the role of emotions in social movements: creative projects often resemble social movements of contestation, especially when these projects originate lower down in the organizational hierarchy (Emirbayer and Goldberg, 2005; Obstfeld, 2006b). Even when they are mandated from above, creative projects in organizational contexts are typically fraught with political challenge, and this stream of work in sociology has shone a powerful light on the role of emotions in providing the motive force for political struggle. Summers-Effler (2002), for example, is eloquent on the role of shame, fear, anger, and hope in driving the feminist movement.

developed by Klein's object-relations theory, were developed into a fuller model of group functioning by Bion (1961), of which more below.

Recent neurobiological research on mirror neurons (Thompson, 2001; Rizzolatti and Craighero, 2004; Gallese, n.d.) suggests that at least some emotions are intersubjective and can sometimes be automatically shared. More generally, Thompson (2001) reviews a range of cognitive and neurobiological research on empathy in primates and humans to argue that individual human consciousness, including its emotional register, is formed in dynamic interaction between self and others, and that it is therefore essentially intersubjective.

The second step in our argument is to recognize the collective dimension of motivation. The concept of collective motivation sits uneasily with more conventional theories depicting motivation as an individual, intra-psychic phenomenon. With Dewey, however, we argue that motivation is essentially a relation between an individual and an object of activity in a social setting (Prawat, 1998; Dewey, 2002: 95). This motivation-as-relation has an ontogenic dimension (i.e., in the history of the individual, sedimented in dispositions) and a situational dimension. As concerns the ontogenic dimension, Dewey argues in a manner very close to Vygotsky (1978) that higher-order cognitive and affective functions are formed through interaction with significant others in the socialization process (Ratner, 2000). As concerns the situational factors shaping the individual's affective response, research in the activity theory tradition shows the motivating effects of a shared object of collective activity (Leont'ev, 1978; Engestrom, 1987; Miettinen, 2005) as does related work by Knorr Cetina on the motivating role of "epistemic objects" in scientific communities (Knorr Cetina, 1999; Knorr Cetina and Karin, 2001). Csikszentmihalyi's (1996, 1999) "systems perspective" on creativity highlights the interdependence of individual, community, and domain of research in constituting creativity. Work in cognitive anthropology shows the power of shared cultural schemas in structuring individual goals and providing motivational force (D'Andrade and Strauss, 1992).

The third and final step in our argument is to show how collective impulse/affect influences collective creative projects via the mediation of collective motivation. The following paragraphs summarize the effects of affect on motivation in creative projects under the same three headings we used above, augmenting the earlier discussion which was focused at the individual level with a summary of mechanisms operative at the collective level.

4.1 Direction

As with individual creativity, the direction component of collective motivation is a function of the collective subject's practical engagement with the object of that activity. The collective actor, just as much as the individual actor, must care about this object. Circumplex-based models have been used to map the nature of this

collective caring and trace the effects on creativity. Bruch and Ghoshal's (2003) four energy zones are group-level as much as individual-level phenomena.

Grawitch and Munz (2005) identify several ways in which the positive versus negative valence of collective affect will condition the direction of collective creative efforts towards promotion or prevention. They discriminate among the collective motivational/affective challenges facing the project team at the various phases of its work—problem identification, brainstorming, solution development, and implementation. The first two phases benefit, they argue, from positive affect because it encourages approach rather than avoidance. The second and third phases benefit from positive affect because it facilitates cognitive flexibility. Cognitive flexibility in turn facilitates idea integration, which is particularly valuable in the third phase, solution development. The fourth phase, implementation, benefits from negative affect, since in this phase identifying and avoiding risks is a key challenge.

Bion (1961) argued psychodynamically that groups often succumb to the anxiety provoked by uncertain (read: creative) tasks. This takes the form of shared “basic assumptions” that shield the group from the threatening environment and allow emotion, fantasy, and delusion to take over. Using this approach, he thus distinguished sophisticated, effective groups from groups in the grip of basic assumptions such as dependency (blind faith in and submissiveness towards the leader), flight-or-fight (the paranoid-schizoid position with its associated hate, anger, and fear), and pairing (fantasies of self-assurance). Huy (1999, 2002, 2005) shows that the collective fear provoked by radical strategic change efforts can be transformed into active support if leaders' actions express authenticity, which enhances employees' trust in leadership and increases knowledge sharing. Expressions of sympathy increase employees' receptivity to the radical changes.

4.2 *Intensity*

John-Steiner (2000) analyzes how creative collaboration among artists and scientists intensifies their efforts to master a common object such as an aesthetic or scientific breakthrough. She quotes Monet on the influence of his ongoing dialogue with painters Renoir, Sisley, Bazille, Cezanne, and Degas in their common pursuit of the Impressionist project:

Nothing could be more interesting than these causeries with their perpetual clash of opinions. They kept our wits sharpened, they encouraged sincere and disinterested research, they provided us with stores of enthusiasm that for weeks and weeks kept us up, until the final shaping of an idea was accomplished. (cited in Stuckey, 1985: 27)

Grawitch and Munz (2005) argue that group-level positive affect helps avoid evaluation apprehension and its creativity-suppressing effects. Quinn and Dutton (2005) argue that “energetic arousal”—which they define as positively valenced

activation—is contagious. So too are other emotions, including apathy and cynicism that fall in Bruch and Ghoshal's (2003) low energy zones.

4.3 Persistence

Persistence in the highly uncertain tasks that confront creative project teams depends on the affective dimension of the team's work; in routine operations affect and emotion are far less significant in determining persistence. Project champions are key as leaders whose impulses and charismatic—i.e., emotion-based—legitimacy in the eyes of others “drive” the project to overcome the psychological frustrations and anxieties provoked by the project's uncertainty (on charisma as emotion-based legitimacy, see Spencer, 1970). The psychodynamic approaches sketched by Huy and Bion seem particularly probative in this context.

Huy (2002) provides case study evidence showing the importance of collective emotion in explaining motivational persistence in radical strategic and organizational change projects. His work suggests that effective project managers facilitate persistence by ensuring “emotional balancing”—acknowledging team members' anxiety but simultaneously fostering enthusiasm about the goal. Kidder (1981) offers journalistic corroboration (e.g., pp. 139–145). Huy presents this as a form of organization-level emotional capability. Reus and Liu (2004) argue similarly that emotional capability is a collective counterpart of individual emotional intelligence, composed of an ability to recognize and regulate emotions in groups. Zhou and George (2003) argue that the emotional intelligence of leaders is critical to supporting creativity efforts by mobilizing emotions to support the appropriate collective motivational direction, intensity, and persistence. John-Steiner (2000) extends Vygotsky's (1978) concept of “zone of proximal development” to argue that partners in creative collaborations offer each other “emotional scaffolding” in the form of the “gift of confidence” that fosters persistence.

5. Towards a richer account of exploratory search

The two preceding sections showed the centrality of affect in individual and collective creativity; this argument gives us a platform on which to begin building a richer account of exploratory search as a distinct institutionalized domain of organization-level activity. The Carnegie approach affords considerable insight into two other domains of activity: *exploitation* as embodied in repetitive operations relies on individual habit and collective routine, and *strategy* as a practical activity relies on individual intelligence and collective deliberation (what Winter, 2003, calls “ad hoc decision making”). However, the absence of impulse/affect and projects from the Carnegie account makes it difficult to characterize *exploration*, which we understand to consist of the orchestrated stream of more or less creative projects that yield new products and processes.

March and Simon (1993, Ch. 6) identify some key features of the “institutionalization of innovation”; but they overlook the affective dimension so salient to practitioners. Accounts such as Kidder’s reveal that mobilizing an organization for sustained exploration is at its core a matter of sustaining creative contributors’ passionate investments. Balancing competing product development teams is not just a cost-benefit exercise: it also requires nurturing emotional investments through the ups and downs of inevitable budget swings. Given the radical, Knightian uncertainty at the core of exploration, affect is bound to play a key role at this organizational level just as much as at the individual and team levels. Deliberation and routine alone cannot set and sustain adequate exploration budget levels or fix promising technology directions.

Using Dewey, we can conceptually differentiate exploration, exploitation, and strategy as three domains of organization-level activity, showing how each relies predominantly on one or other of the three forms of collective activity (i.e., projects, routines, and deliberation)—as presented in Table 2. By linking Tables 1 and 2, we can see the corresponding elements of individual conduct. The off-diagonal terms in Tables 1 and 2 are crucial in the real world, since the elements of each row are invariably intertwined in real activity. Table 3, therefore, elaborates on Table 2 so as to show some of the ways in which this intertwining is manifested.

Exploitation is the world of repetitive operations such as we find in mass production. It relies primarily on routines/habit. Deliberation/intelligence and projects/impulse are also important buttressing elements: without these, exploitation becomes rigid and unresponsive. Strategy is the world of priority- and direction-setting such as preoccupies management decision-making forums. It relies primarily on collective deliberation and individual intelligence. Routines/habit and projects/impulse are important buttressing elements: without the former, the strategy process lacks discipline and stability, and without the latter, it lacks creativity. Exploration is the world of creative research such as predominates in for example (some) design, R&D, and engineering organizations. It relies primarily on projects and their underlying impulse/affect. Deliberation/intelligence and routines/habit are important

Table 2 Forms of collective activity and domains of organizational activity

Domains of organizational activity ⇒ Forms of collective activity ↓	Exploration	Strategy	Exploitation
Projects	+++	+	+
Deliberation	+	+++	+
Routines	+	+	+++

Table 3 The individual and collective psychological mechanisms in three domains of organizational activity

Domains of organizational activity . . . ⇒ ... both rely on and drive individual psychology and collective activity (the primary one for each column is in bold) ↓	Exploration (the world of creative search)	Strategy (the world of priority- and direction-setting)	Exploitation (the world of repetitive operations)
* Impulse * Projects	* Creative intuition * The innovation champion's drive * The psycho-social maintenance of a project team's motivation under the stress of uncertain ends and means	Intuition and drive and team psychology are all needed as complements to reasoned deliberation in the strategy process	* Domesticated impulses of self-control and discipline * Mindfulness in routine operations as affectively valenced caring
* Intelligence * Deliberation	* Moments of intendedly rational deliberation (e.g., to establish strategic priorities or make trade-offs) that punctuate ongoing project activity. * Experimentation in projects requires rational design and interpretation	Intended but bounded rationality in: * strategy setting meetings * management review meetings for projects (phase reviews) * operations review meetings	* Moments of rational decision needed in routine operations to decide (i) which routine to invoke, and (ii) how to adapt it to the specific situation * Mindfulness in routine operations as cognitive awareness of others in the situation

(continued)

Table 3 Continued

<ul style="list-style-type: none"> * Habit * Routine 	<ul style="list-style-type: none"> * Creative search relies on individual habits and collective routines to accomplish individual and team tasks: problem-solving heuristics, templates to guide project activities (higher-level routines) * Cultivating habits of creativity * Strategic decision-makers rely on routines for setting priorities and funding for project efforts 	<ul style="list-style-type: none"> * The strategy process also leverages routines: data presentation templates, analysis routines, templates for deliberation process * Cultivating habits of rational deliberation 	<ul style="list-style-type: none"> * Reliance on explicit procedures, templates, etc. plus internalized collective routines and individual habits * Cultivating habits of mindfulness in routine operations
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buttressing elements: without these, exploration lacks strategic direction and discipline.

As Table 3 shows, affect/impulse is the heart of exploration, but—as Dewey argued—it is profoundly modified by the intertwining with intelligence and habit. Most notably, alongside the ongoing need for emotion-based charismatic leadership of creative organizations and for affectively charged innovation climates, the “routinization of innovation” discussed by Schumpeter (1976) requires the domestication of unruly creative impulses. Creativity becomes a habit. Collective creativity acquires its own routines as project management becomes an established discipline. Impulse is also enriched by intelligence: its direction can become more forward-looking, and strategic planning can ensure that the creative impulse is afforded the resources it needs to do its work in the form of an aggregate project plan (Wheelwright and Clark, 1992). In Dewey’s terms, impulsive, spontaneous “valuing” evolves into a more deliberative “evaluating” (Anderson, 2005) as firms develop more sophisticated ways to steer the exploration effort and to balance exploration and exploitation. However, if we forget the impulsive/affective basis of creativity and creative projects, we will find it difficult to account for the passion that is needed to support high levels of investment in exploration.⁵

6. Conclusion

The goal of this article was to highlight the role of affect in exploratory search, and thereby to remedy a significant gap in the Carnegie account. We identified various ways in which affect is crucial to individual creativity and to collective creative projects, which then enabled us to sketch a richer account of exploration in organizations.

We should note in conclusion that our analysis can be extended to show the role of affect in exploitation and strategy. Table 4 suggests several ways in which exploration, exploitation, and strategy are themselves intertwined. Tables 3 and 4 together lead to the conclusion that if affect is key to exploration, it also has considerable effects on strategy and exploitation. Not only are impulse and affect directly implicated as secondary influences (as shown in Tables 2 and 3), but this influence is magnified insofar as exploration, strategy, and exploitation mutually condition each other.

Notwithstanding its scope, the goal of this article was modest: to understand creative search in organizations, we have sought to show how we might enrich the Carnegie model using Dewey’s account of human conduct. This will, we hope open

⁵ Affect has also become a focus for the study of governance in political science: see Nussbaum (2001); Marcus (2002); Markell (2000); and Aldrich and Transue (2002).

Table 4 The intertwining of exploration, strategy, and exploitation

These ⇒ drive these ↓	Exploration	Strategy	Exploitation
Exploration	One exploratory project sparks another	Strategy sets the direction of exploration	Experience in exploitation activities throws up problems and opportunities for exploration
Strategy	Exploration opens up new strategy options	Strategic action creates strategic options	Operational improvements through refined exploitation create new capabilities and open up new strategy options
Exploitation	Exploratory projects can create new processes and routines for exploitation operations	Strategy shapes the priorities of exploitation-oriented operations	Accumulation of exploitation experience drives habit formation and learning curve

research on creativity, projects, and exploratory search to the rapidly growing fields of research on affect at the individual and collective levels.

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