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Imprinting by Design: The Microfoundations of Entrepreneurial Adaptation

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Entrepreneurial ventures need frequently to adapt. Yet their adaptive capacity is often limited by the legacies of imprinted founding characteristics. The question then arises whether it is possible to explain and manage the imprinting process so that the capacity to adapt is enhanced, rather than diminished. I address this question by developing a model of the microfoundations of imprinting based in collective memory. I argue that entrepreneurial founding teams naturally develop transactive autobiographical memory systems. By partially managing the design and imprinting of these memory systems, I argue that founders may improve their venture's long-term capacity to adapt.

Introduction

Important founding conditions become imprinted onto new ventures and persist over time (Levinthal, 2003). Persistent characteristics typically include the initial organizational structure, culture, identity, networks, and routines (Johnson, 2007; Milanov & Fernhaber, 2009). This process was first articulated by Stinchcombe (1965) and later described as organizational imprinting (Boeker, 1989). Subsequent studies expand on the imprinting hypothesis, arguing that founding conditions significantly define the path-dependent trajectory of an organization's future development and its subsequent capacity for change and adaptation (Hannan, Baron, Hsu, & Kocak, 2006; Tripsas & Gavetti, 2000). In some cases, the result is that a venture becomes captive to its imprinted history and finds it increasingly difficult to change and adapt.

However, much about the process of imprinting remains unexplained (Johnson, 2007). Hence, it is also unclear how better to manage the initial imprinting process and its subsequent effects on venture development. I address these questions by developing a model of the microfoundations of imprinting that integrates knowledge about collective autobiographical and transactive memory. In summary, I argue that founding teams naturally develop transactive autobiographical memory systems, and that by deliberately intervening to manage the formation and imprinting of such memory systems, founders may enhance a venture's capacity to adapt.

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Studies suggest that the psychological dimensions of the imprinting process are especially significant within entrepreneurial environments, where the personal characteristics of the founders play a major role in the development of a new venture's culture, routines, and collective identity (Johnson, 2007). For example, through iterative feedback processes, the collective mindset of a founding team becomes embedded in organizational culture (Shepherd, Patzelt, & Haynie, 2010). The founders' values and beliefs become imprinted onto the venture's culture and norms of behavior (Schein, 1983). Notably, within family firms, the founders' intimate shared history significantly influences the development of organizational identity, cultural values, and shared goals (Steier, Chrisman, & Chua, 2004). In summary, the evidence clearly suggests that imprinting is deeply related to the personal and collective memory of founding teams.

Adopting this perspective, I examine the role of collective or transactive autobiographical memory as a factor in imprinting. This is a novel perspective, given that autobiographical memory has rarely been considered in relation to organizational phenomena (cf. Ibarra & Barbulescu, 2010). In order to develop my argument, I draw on the literature regarding autobiographical memory, and combine its insights with those about the role of transactive memory in organizations. By way of definition, autobiographical memory refers to the memories people have of their own lives (Conway, Singer, & Tagini, 2004), and transactive memory refers to the collaborative storage and retrieval of memories among dyads and groups of people (Wegner, 1987).

At the core of my argument is the conception that new entrepreneurial firms typically emerge when founders collaborate in the pursuit of shared goals requiring coordinated action (Sarasvathy, 2004). I then relate this claim to studies showing that autobiographical memory has a major influence on the way people pursue shared goals requiring coordinated action. At the same time, autobiographical memory is inherently social in its origins and effects, and especially in relation to collective goal pursuit (Pasupathi, 2001; Pohl, Bender, & Lachmann, 2005). Hence, when people collaborate in organized goal pursuit, they naturally cocreate autobiographical memories, and these memories will have a significant influence on collective values, goal setting, social bonding, and identity. The puzzle is to explain how this occurs in new ventures and with what imprinting effects.

To explain this process, I draw on the closely related literature on transactive memory in organizations. Many prior studies show that persons collaborate in the storage and retrieval of memories within organizational settings in order to improve their processing capacity and efficiency in collaborative goal pursuit (Peltokorpi, 2008). That is, people divide the cognitive labor of memorization to maximize the effectiveness of cognitive resources. Transactive memory processes thus provide a well-understood mechanism for the collaborative cocreation of shared memories within organizations (Ren & Argote, 2011). Moreover, as Ren and Argote (p. 222) explain, "New entrepreneurial ventures are excellent contexts to study transactive memory systems because researchers can chart the development of those systems from the start of the firms." In this paper, therefore, I combine the literatures on autobiographical and transactive memory and argue that founders naturally develop transactive autobiographical memory systems when they collaborate in the creation of new ventures, and that these memory systems play a significant role in imprinting. I further argue that by deliberately managing the formation of these memory systems, founders may improve their venture's long-term capacity to adapt.

Among entrepreneurial teams, in particular, these transactive autobiographical memory systems build on preexisting entrepreneurial life stories and related event memories. Indeed, many entrepreneurs project an entrepreneurial life story or narrative of exploration, risk taking, and independent venturing (Johansson, 2004; Sarasvathy, 2004). These life stories are acquired through experiences in culture, education, family,

and employment. I argue that such memories interact among founding teams, are reinforced via iterative feedback loops, and result in the cocreation of transactive autobiographical memory systems. Importantly, deep autobiographical memories of this kind tend to be enduring and relatively stable over time (Pasupathi, 2001). For this reason, the cocreation of transactive autobiographical memory can be related to the process of imprinting, because both entail the embedding and endurance of collective memory. Initial characteristics of the organization are thus imprinted: cultural values, norms of social bonding, the foundation of organizational memory and identity, and collective goals and motivation.

The remainder of my paper extends this argument. I first review the literatures on imprinting in entrepreneurial ventures, autobiographical memory, and transactive memory. I then explain how core features of autobiographical memory may be the subject of transactive processing among founding teams. Next, I explain how transactive memory systems contribute toward the microfoundations of organizational imprinting. I then argue that insofar as these memorization processes are subject to deliberate design and management, it may be possible to influence imprinting and improve a new venture's capacity to adapt. In the final section of the paper, I discuss implications for future research into entrepreneurial ventures and imprinting, organizational theory including the wider role of transactive memory processes, and the dynamics of organizational learning and change.

Background

Creating a new entrepreneurial firm calls for major psychological commitments that often encompass the founders' family, personal relationships, and sense of identity (Bhide, 2000; Kelly, Athanassiou, & Crittenden, 2000). Indeed, founding an entrepreneurial firm can be viewed as a life choice, not simply a career option (Aldrich & Cliff, 2003; Sarasvathy, 2001). It requires a deep emotional investment over long periods of time and persistence in the face of frequent setbacks and obstacles. At the same time, the founders of entrepreneurial firms must be comfortable living with high risk and uncertainty. Within numerous cultures, therefore, entrepreneurship is viewed as a distinct and challenging way of life that contributes to wealth creation and social development (Thornton, 1999). In that regard, the emergence of new entrepreneurial firms can be seen as both a socioeconomic process and the enactment of a challenging life narrative (Lounsbury & Glynn, 2001).

Founding entrepreneurs are therefore actors in an unfolding life story, as well as agents of market creation and economic growth. They often bring organizational models and assumptions from previous employment or family firms, and these inheritances influence the structure, culture, employment systems, and management processes that they adopt within their new venture (Dobrev & Barnett, 2005; Nelson, 2003). Similarly, founders may have preexisting family ties, social networks, collaborations, and commercial commitments that are transmitted to the new venture (Milanov & Fernhaber, 2009). They also bring personal values, visions, and ways of thinking and acting, and these also become part of the founding legacy. In summary, the experiences and psychology of founders have a major influence on the initial characteristics of a new venture, and many of these characteristics become imprinted and persist over time.

Imprinting is therefore explained as the progressive embedding of initial characteristics onto organizational forms. Numerous mechanisms of imprinting are identified in the literature, reflecting the social, institutional, cultural, and personal attributes of the founding process (Levinthal, 2003). Regarding the social and cultural origins of imprinting, new

ventures may inherit values, norms and networks of relationships from the social environment, the founders' families, or a parent firm (Milanov & Fernhaber, 2009; Zahra, Hayton, & Salvato, 2004). Institutional forces may also become imprinted via the transmission of culture, structures, and institutional logics from the surrounding ecology (Hannan et al., 2006), while on the personal level, entrepreneurial founders bring their individual and collective histories, values, and habits to a new venture. Then via organizational behavior, the expression of values in choices and decision making, as well as through deliberate action, the founder's personal values and characteristics may be imprinted onto the new venture's culture and routines (Johnson, 2007).

Some studies point to the negative impact of imprinting. In particular, new ventures can acquire imprinted characteristics that are resistant to adaptation and change. For example, the imprinting of work culture and employment models can become a constraint on employees' initiative and flexibility (Baron, Hannan, & Burton, 2001); the imprinting of initial network patterns can constrain future capacity to form alliances and discover new opportunities (Milanov & Fernhaber, 2009); while the imprinting of the founders' personal goals and values may restrict the evolution of mature governance (Nelson, 2003) and leadership models (Hoang & Gimeno, 2010). Specific historical narratives—including the sequence of lifetime periods that constitute collective autobiographical memory—may also become imprinted, and may subsequently limit the capacity to imagine an alternative future (Johnson, 2007).

Autobiographical Memory

Many of the social and institutional drivers of imprinting are difficult to manage, given their scale and longevity. However, in this paper, I focus on the imprinting of founders' personal characteristics, and these appear to be more tractable. In particular, I examine aspects of autobiographical memory, which is defined as the memories individuals possess of their personal lives (Conway et al., 2004). Such memories are fundamental for the psychology of human identity and the experience of personhood within culture over time. Recent years have seen significant progress in understanding the psychosocial functions of autobiographical memory, based upon research in numerous subfields of psychology, including cognitive, social, developmental, clinical, and neuropsychological research. As a consequence, we now understand that autobiographical memory is partly cocreated through social interactions and has three major areas of influence on human functioning: social, self, and directive (Bluck, Alea, Habermas, & Rubin, 2005). Regarding social effects, the sharing of autobiographical memories underpins social bonding, the forging of meaningful relationships, and the consistency of cultural norms (Conway & Pleydell-Pearce, 2000). Concerning the self, autobiographical memory underpins a concept of identity by providing a sense of personal coherence and psychodynamic continuity over time. While regarding its directive influence, autobiographical memory provides the foundation for sense making about the experience of self and others through time, thereby guiding present and future behavior, especially in relation to motivation, goal setting, and problem solving.

The most fundamental level of the knowledge base that underpins autobiographical memory is the life story schema, defined as the overall framework for a specific life narrative (Bluck & Habermas, 2000). The life story schema is not factual knowledge, but rather a mental model or narrative framework that represents the overall structure of a life path, for example, the life of being a professor and being an entrepreneur are both typical life story schemas. Life story schemas include generalizations about life periods and themes, as well as relations to cultural myths and typical narrative structures (McAdams,

2006; Singer, 1995). Such schemas enable the organization of personal experience into narratives of "lived time" (Bruner, 2004, p. 692). By thus linking events through time, life story schemas allow individuals to attribute meaning and causality to events, conceive future goals, and experience goal achievement (Bluck & Habermas, 2000). Moreover, many life story schemas are normative within culture, making them socially meaningful and valuable. For example, core features of an entrepreneurial life story schema are well embedded in American culture (McAdams), allowing individuals who adopt such life stories to make sense of experience and craft a coherent narrative across the life span (Conway et al., 2004).

The second level of the autobiographical knowledge base is the lifetime period, which consists of large units within an overall life narrative. Once again, memories of lifetime periods are not simply facts about past experience, but narrative structures that encompass a range of life experiences. Lifetime periods encompass overarching sequences of life, for example, attending graduate school or founding and growing a new business. The third level of the autobiographical knowledge base is general events, which consist of events linked across shorter time periods (e.g., a day or week) and are organized by a shared theme (e.g., regular business meetings or attending educational courses). Together, life story schema, lifetime periods, and general events complete the autobiographical knowledge base. Experience triggers retrieval from the autobiographical knowledge base, usually beginning at the level of general events, which intersect with lifetime periods and the life story schema. As a result, elements of the autobiographical knowledge base are synthesized with momentary or episodic memory, and autobiographical memories enter awareness (Conway et al., 2004).

The capacity of persons to create a coherent autobiographical knowledge base is especially important within cultures where the social expression of selfhood calls for an individual life story that is sensible and acceptable to others (McAdams, 2001). In earlier or very stable cultures, life stories are typically inherited and relatively homogeneous. Within most modern cultures, however, identities are less inherited and life stories must be constructed. People must compose a self-narrative that has unity and purpose, while at the same time incorporating dynamism, diversity, and historical discontinuity (McAdams, 2006). Importantly, an entrepreneurial life story—the life story of being the founder of a new organization or business—supports such a narrative. It conceives of a life story in terms of exploratory learning, seeking new challenges, creating value, embracing risk and uncertainty, and setting independent life goals (Downing, 2005; Thornton, 1999). Modern cultures therefore tend to endorse an entrepreneurial life story schema (McAdams, 2006). By the same token, entrepreneurial life stories have increasing significance in rapidly developing societies, although these stories may entail a struggle between traditional and contemporary life narratives (Inglehart & Baker, 2000).

Transactive Memory

In a series of seminal papers, Wegner (1987, 1995) and Wegner, Giuliano, and Hertel (1985) demonstrate that transactive memory allows people to be locations of external memory storage for each other. Via transactive memory, persons can access information stored in other minds by virtue of knowing that other people store such information—that is, by storing the external address of the relevant memory. Moreover, these processes are ubiquitous, reflecting a general process of external memory storage. As Wegner (1987, p. 187) writes, "we seem to record as much outside our minds as within them." Importantly, he adds that transactive memory is a property of dyads and groups, rather than isolated individuals.

There are two major functions of transactive memory, termed differentiated and integrative. Differentiated transactive memory occurs when *different* items or structures of memory are encoded in different individual memory stores, but the individuals know the general labels and locations of the items they do not hold personally (Ren & Argotte, 2011). For example, a group of people may allocate one member of the group to remember the details of a meeting—for example, the specific decisions that were made—and the other members of the group can later refer to that person when they need to recall the relevant memory. Differentiated memories are therefore internal to the individual(s) who store these memories (Peltokorpi, 2008). In contrast, integrative transactive memory occurs when the *same* items or structures of memory are held in different individual memory stores, and the individuals' memories thus overlap because they share label and location information. For example, all members of a group remember the same general facts about a meeting—for example, when it was held and why—and can later depend on each other to organize their shared memories of this event. In this fashion, members of the group will share the same storage label and can then retrieve and integrate a range of differentiated memories about the meeting. Integrative transactive memory thereby serves to organize, connect, and recombine differentiated memories. In summary, as Wegner (1987) clearly explains, both differentiated and integrative functions are required for an effective transactive memory system. For this reason, integrative transactive memory processes are especially important in groups and organizations as sources of coordination, social bonding, and relatedness (London, Polzer, & Omoregie, 2005). Indeed, Wegner et al. (1985, p. 257) suggest that under some conditions, integrative processes can extend to whole organizations and societies, making transactive memory "into a synonym for culture." They caution, however, that such systems will become complex and only exist where groups of people effectively transact meaningful memories.

Wegner (1987, p. 197) also argues that integrative transactive memory "affirms the need to have a group in the first place, showing all members the utility of coming together to remember." Similarly, integrative transactive memory plays a critical role in group learning and knowledge creation, as new information from different locations in the transactive memory system is tied together by common labels, and thus integrated into a common memory store (Argote, 1999). In fact, within well-developed transactive systems, there is a strong trend toward such integration. As Wegner et al. (1985, p. 268) also write, "the press towards integrated structure in transactive memory is responsible for the unique, emergent properties of group mental life." When mature, the integrative functions of transactive memory exert significant control over what is to be differentially encoded, stored, and retrieved (Meyer, Bartunek, & Lacey, 2002). In summary, via integrative transactive memory, dyads, groups, and whole organizations organize and combine their separately held differentiated memories.

However, despite the importance of integrative transactive processes for the functioning of collective memory and learning, most organizational research focuses on the differentiated features of transactive memory. Surprisingly, studies consistently fail to explain the integrative functions of transactive memory, let alone relate them to organizational phenomena. Rather, they focus on differentiated processes and functions (e.g., Anand & Manz, 1998; Huber & Lewis, 2010; Lewis, Belliveau, Herndon, & Keller, 2007). This neglect appears to derive from a concern to show that transactive memory has a positive effect on group performance through the efficient processing of differentiated memories. From this perspective, transactive memory relates primarily to the shared division of cognitive labor with respect to the encoding, storage, and retrieval of different content across divergent knowledge domains. Granted, transactive memory does perform this function, but it does much more. As Wegner (1987; Wegner et al., 1985) himself

clearly explains, integrative memory is critical in those organizational contexts where every member must understand and perform the same function; for example, in most organizations, every member is expected to adopt the same core principles of behavior and follow standard procedures. In summary, prior research has not adequately considered integrative transactive memory and its important role in organizations.

Transactive Autobiographical Memory

Furthermore, no studies have so far considered how individuals' autobiographical memories might be subject to transactive memory within organizations (see Barnier, Sutton, Harris, & Wilson, 2008; Wang, 2008). Yet, there is substantial evidence to support the investigation of this topic. Studies show that people possess culturally derived self-construals as features of autobiographical memory (Markus & Kitayama, 2003), that people draw on autobiographical memory as they experiment with and adapt identities in response to social and organizational roles (Ibarra, 1999; Stryker & Burke, 2000), that autobiographical memory serves important social functions in the cocreation of identities and collective narrative (Bluck et al., 2005), that autobiographical memory is itself partly a social construction (Nelson & Fivush, 2004; Pasupathi, 2001), that transactive memory serves to reinforce and validate a person's self-concept (London et al., 2005), that shared histories deeply influence the culture and development of family firms (Zahra et al., 2004), and that transactive memory underpins narratives of identity within organizations (Meyer et al., 2002).

Therefore, the cumulative literature strongly suggests that autobiographical memory may be subject to transactive processes within organizations, and that these processes may play a significant role in relation to numerous areas of organizational life, such as culture, identity, memory, and collective goal pursuit. Previous neglect of these effects is best explained by the widespread emphasis on differentiated transactive memory. Addressing this oversight, I argue that transactive autobiographical memory systems naturally emerge within new ventures and play an important microfoundational role in organizational imprinting. Moreover, I argue that by managing the design and development of these memory systems, the founders of new ventures may influence the process of imprinting and thereby improve the capacity to adapt.

Empirical research into these phenomena can employ methods that are well established in psychology and organizational studies. Firstly, memory psychologists use a range of experimental and field techniques, including the collection and qualitative analysis of self-reported life stories and documented autobiographical narratives (Bluck et al., 2005). The same techniques could be applied to investigate the cocreation of autobiographical memory within organizations. Reliable empirical methods are also available for research into transactive memory. Studies employ self-reports, documentary records, site observations, simulations, and experiments (Lewis, 2003; Ren, Carley, & Argote, 2006). Using such methods, and assuming the accumulation of sufficiently longitudinal data, it will be possible to test whether transactive autobiographical memory systems develop within new organizations and become imprinted over time. Further research would then be possible to investigate the influence of these memory systems on social, self, and directive functions within organizations.

Development of Model

My model is summarized as follows. To begin with, I assume that new ventures emerge as founders collaborate to pursue shared goals (Aldrich & Ruef, 2006). Moreover,

by sharing goals, they naturally cocreate autobiographical memories and seek to enact life story schemas (Pasupathi, 2001). Importantly, the founders of entrepreneurial organizations also tend to possess similar life story schemas about being an entrepreneur (Dodd, 2002; Schein, 1994), where life story schemas are defined as the deepest and broadest level of the autobiographical knowledge base (Bluck & Habermas, 2000). They may also share comparable memories of lifetime period and general event memories. Such memories are derived from cultural, developmental, and employment experiences (Downing, 2005; Hytti, 2005). These memories are shared through storytelling, social interaction, and experience, allowing founders to recognize that they each possess similar autobiographical memories that form a key component of collaborative memory within new ventures (Lewis, Lange, & Gillis, 2005; Wegner, 1987). The resulting memory systems are then imprinted onto the organization's routines, artifacts, and memory stores (Peltokorpi, 2008). Once imprinted, these transactive autobiographical memories influence the future cocreation of personal and collective memories, as individuals continue to interact and experience life within the organization. In this way, transactive autobiographical memory underpins a sense of collective purpose and meaning (cf. London et al., 2005), allowing founders to be connected by shared motivations and projected narratives.

Figure 1 depicts these processes. It shows that in stage 1 of the process, founders interact in the cocreation of a shared autobiographical knowledge base, which is then integrated via transactive memory in stage 2, then imprinted onto the organization in stage 3. These imprinted memory systems then act to influence the ongoing cocreation of autobiographical memory via an iterative feedback process. When the cumulative memories and experience are highly complementary, in terms of their entrepreneurial content, this feedback process will enhance and strengthen the entrepreneurial content of the transactive memory system, ensuring that founders share a strong sense of shared purpose and collective narrative. In contrast, if their memories and experiences are more divergent, ongoing feedback will tend to diminish the coherence of the transactive memory system in terms of its entrepreneurial content, meaning that founders will share a weaker sense of shared purpose and collective narrative. The following sections of the paper discuss the three major stages of the model in greater depth.

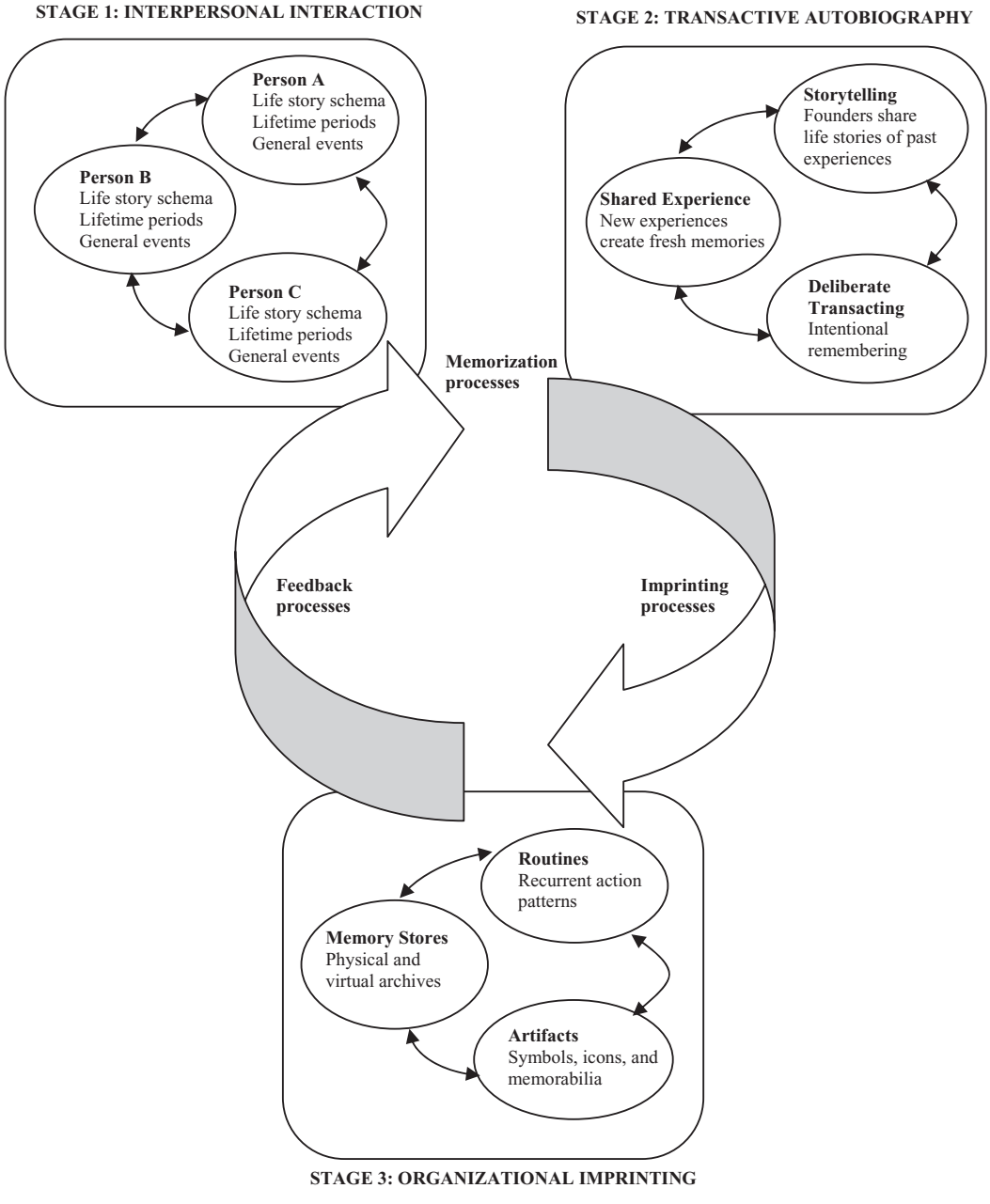
Stage 1: Organizational Interaction

In the first stage of the process depicted in Figure 1, like any interconnected social group that shares experience, organizational founders cocreate autobiographical memory, and in particular autobiographical knowledge bases (Pasupathi, 2001). Each person's knowledge base will be composed of three major components. First, at the deepest and most general level, it will include culturally derived or constructed life story schemas, such as being an entrepreneur or innovator (Bluck & Habermas, 2000). At the next level of specificity, the knowledge base will include lifetime period memories, such as memories of prior career phases. Even more specifically, the knowledge base will include general event memories, such as memories of team meetings. Each level of the autobiographical knowledge base therefore entails social interactions and shared experience related to the pursuit of shared goals (Hirst & Manier, 2008).

Memories are selected for encoding by virtue of their coherence and significance in relation to the founders' collective values, goals, and shared sense of identity. For example, memory of the venture's first successful fund-raising campaign will be likely to generate many significant memories, and these will be encoded into organizational memory. Such memories may be stored within an individual's memories and/or in shared symbols, artifacts, or archives (Moorman & Miner, 1998) as cocreated autobiographical

Figure 1

Microfoundations of Organizational Imprinting



memories, that is, as memories of shared life experience. Moreover, many of these memories will be coherent with the life story schema of being an entrepreneur. In this fashion, memories acquire meaning by virtue of their coherence (or lack of it) with a preexisting autobiographical memory system.

Stage 2: Transactive Autobiography

In the second stage of the process depicted in Figure 1, founders will transact their cocreated autobiographical knowledge bases. Integrative transactive memories will develop, as they share common features of life story schemas, lifetime periods, and general events, and each person comes to store integrative memory labels referencing these common structures. For example, among an entrepreneurial founding team, each may possess and recognize in the others an entrepreneurial life story schema and common memories of the venture's founding period (McAdams, 2006). At the same time, members of the founding group will also develop differentiated transactive autobiographical memories, whereby they distribute the storage of specific event memories about their individual and shared organizational experience. These differentiated memories will then be organized in relation to the shared integrative memory labels. Memories of specific founding events will cohere by virtue of an integrative memory of the founding period.

Studies suggest three major mechanisms of transactive processing: (1) the sharing of experiences that generate new memories, (2) storytelling about the past, and (3) processes of deliberate transactive remembering. To begin with, in the course of their organizational interactions, founders will share experiences that generate new autobiographical memories, that is, new personal memories of their collaborative actions and experiences as a founding team. Naturally, as in other group contexts, the founders will develop integrative transactive memories that serve to organize and connect their shared experiences, while also developing differentiated memories of specific event details (Pasupathi, 2001). As Wegner (1987) first explained, this process is a natural consequence among groups that work together to achieve shared goals and objectives. At the same time, members of the founding group will share personal stories of their past lives (Hollingshead, 1998; McAdams, 2001). This is a common feature of social life, both within and beyond organizations (Ibarra & Barbalescu, 2010; McAdams). By sharing such stories, founders will acquire common integrative transactive memories that connect their life story schemas, memories of lifetime periods, general events, and significant developmental experiences. As integrative structures within the emerging memory system, these structures serve to organize, connect, and combine differentiated memories (Wegner).

Stage 3: Organizational Imprinting

Studies suggest at least three main mechanisms for imprinting memory: (1) the development of organizational routines, (2) the creation of symbol and artifacts, and (3) archival storage (Johnson, 2007; Moorman & Miner, 1997). Regarding the development of routines—defined as recurrent action patterns (Becker, 2005)—if a founding group shares a strong entrepreneurial life story schema, then specific features of such a life story, such as narratives of risk-taking behavior, may become part of the organization's management routines (Hannan et al., 2006). This will occur as relevant features of the transacted autobiographical knowledge base, for example, patterns of risk-taking behavior, are stored within procedural memory (Cohen & Bacdayan, 1994). The resulting system of transactive autobiographical and procedural memory would then constitute a risk-taking decision routine (cf. Lazaric & Denis, 2005).

Typical artifacts are iconic images of historic events, important products, and portraits of the founders, such as those typically deposited in corporate lobbies and museums (Nissley & Casey, 2002). Imprinting will occur as features of shared memory are systematically stored into archival form as information that is relevant for future action and decision making (Tripsas & Gavetti, 2000). For example, the founding group may transact memories of past or recent failures, and then select important information or images about

these experiences to be placed into formal memory storage, such as electronic databases or operating procedures. This will entail integrative memory labels about failures as a class of general events, as well as differentiated memories of specific event details. In these multiple ways, transactive autobiographical memories become imprinted onto the organization's routines, artifacts, and archival memory. Moreover, having been imprinted, these memories then influence the subsequent cocreation of new autobiographical memories.

The founding group will also engage in deliberate transactive memorization of new and preexisting autobiographical memory into the shared memory system (Barnier et al., 2008). That is, the founders may intentionally select specific memories of individual and shared experience to be systematically transacted into collective memory (Brandon & Hollingshead, 2004). Different members of the founding group will be assigned the task of storing one of other differentiated memory, and all members of the group will simultaneously encode the memory and store its address. Simultaneously, the group as a whole will develop integrative transactive memory structures that serve to organize and connect their dispersed differentiated memories.

Feedback Processes

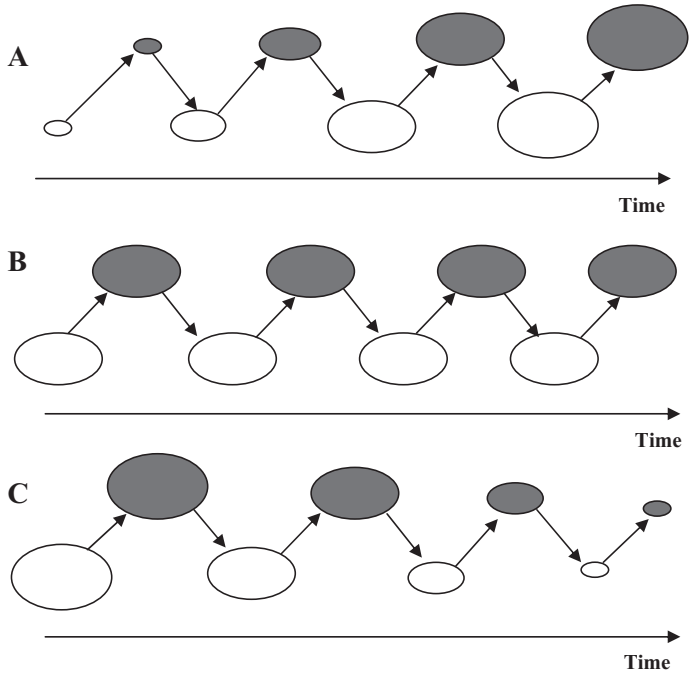
All transactive memory systems exhibit consistent feedback mechanisms, as stored memories become the foundation for the future memory selection, encoding, and retrieval (London et al., 2005). Within my model, feedback of this kind unfolds as a spiraling effect, similar to the process described by Shepherd et al. (2010). That is, feedback between the founders and their shared transactive memory system iterates in spirals of memorization and imprinting, which may enhance, stabilize, or diminish the coherence of the memory system's entrepreneurial content. As these spirals unfold, they imprint the transactive autobiographical memory system onto new ventures' routines, artifacts, and formalized memory stores: transactive memory is imprinted onto routines defined as recurrent action patterns; artifacts are progressively adopted to symbolize aspects of transactive autobiographical memory; and some memories are systematically entered into formal archival storage. Subsequent feedback loops spiral over time, meaning that imprinted transactive memories feed back into the lived experience of employees, thereby stimulating new behaviors and memories.

This iterative spiraling process of memorization and imprinting is depicted in Figure 2. Each of the iterations depicted in Figure 2 can be viewed as full cycles of the process depicted in Figure 1. There are three broad scenarios of spiraling, which I adapt from the model developed by Shepherd et al. (2010). In the first scenario (labeled A), the feedback process results in an enhancing spiral of the imprinted transactive memory system, resulting in an accumulation of more entrepreneurial content and meaning. In the second scenario (labeled B), the autobiographical content and imprinting effects are stable, or effectively a nonspiral pattern. While in the third scenario (labeled C), the feedback process results in a diminishing spiral of the imprinted transactive memory system, as entrepreneurial content and meaning are dissipated and diminished within collective memory. These different scenarios of memorization and imprinting, and their resulting degrees of integration and differentiation, will determine the degree to which the group has a strong sense of shared entrepreneurial identity, cultural norms, similar patterns of social bonding and belonging, and shared entrepreneurial goals and motivations.

Indeed, when groups form for the purpose of enacting a collective life narrative grounded in transactive autobiographical memory, a variety of initial conditions are possible. To begin with, not all members of the group will share identical life story

Figure 2

Spirals of Transactive Memorization and Imprinting



(A) Enhancing Spiral, (B) Steady-State Nonspiral, (C) Diminishing Spiral
⬭ Development of transactive memory system (stage 2 in Figure 1).
⬬ Imprinting of transactive memory system (stage 3 in Figure 1).
(Adapted from Shepherd et al., 2010, p. 63)

schemas, nor share the same structure of lifetime periods and general event memories. Some founders may have alternative or contradictory life story schema. One may have a dominant life story schema of being a risk-taking entrepreneur, another of being an innovative engineer. Indeed, evidence suggests that founding teams adopt range of life story schemas and employment cultures with enduring consequences for future development (Baron et al., 2001). In fact, some new ventures are relatively hierarchical and production oriented, rather than exploratory and risk taking. When these schemas dominate, the third scenario in Figure 2 is most likely, resulting in diminishing entrepreneurial content.

Furthermore, founding members of the organization may not possess equally strong components of autobiographical memory. For example, some may have weaker versions of a particular life story schema. Various types of power and status may also give some members' memories greater significance within the group (Baron, Hannan, & Burton, 1999; Nelson, 2003). Additional variations can occur after initial founding. Most critically, key members of the founding team may depart and new recruits may join, thus altering the blend of autobiographical memory within the organization (Hannan et al., 2006). Such changes will be especially impactful if the new members do not possess compatible features of autobiographical memory, resulting in less group coherence

overall. At the same time, departing founders may take with them important differentiated memories, thus depleting the transactive memory store and potentially fragmenting the organization's collective narrative (Lewis et al., 2007).

Areas of Imprinting

Based on the models developed in the preceding section, the imprinting of transactive autobiographical memory affects three major areas of social and organizational functioning: cultural norms and social bonding, organizational memory and identity, and collective goals and motivations (Bluck et al., 2005). The fundamental mechanism underlying the formation of such memory systems is the recursive interaction of the founding members of the venture in the spiraling process of memorization and imprinting (depicted in Figures 1 and 2). That is, recurrent action patterns imprint features of transactive autobiographical memory onto routines (Cohen & Bacdayan, 1994); artifacts are progressively created or adopted to symbolize aspects of collective memory; and some features of transactive autobiographical memory are systematically entered into formal archival storage. These processes are natural and typical in new organizations. In the following section, I discuss these effects in detail and propose methods for deliberately managing them. In summary, I will argue that by deliberately choosing which autobiographical memories to transact, founders can aid the development of a strongly entrepreneurial transactive memory system and thereby enhance the imprinting of characteristics that support adaptation.

Organizational Culture and Social Bonding

Organizational cultures develop early and their impact runs deep. Within entrepreneurial organizations, in particular, culture plays a significant role (Schein, 1994). Culture underpins the creation of a shared strategic vision and unites the founders around a common purpose (Downing, 2005). Culture also helps to define the boundaries of a new organization and its ecological identity, which are critical factors in building social capital networks and alliances. Founders appear to play a critical role in these processes by defining the initial goals, values, and meanings of the organization, often drawing from prior personal experience (Sorensen, 2007).

I argue that these effects are partly the result of the natural imprinting of transactive autobiographical memory in routines, artifacts, and archival storage. This occurs as the imprinted features of the transactive memory system provide a shared framework for interpreting and assigning value and meaning to experiences and events. The imprinting of transactive autobiographical memory supports cultural continuity over time. It allows members of the organization to integrate past, present, and future into a continuous narrative of interdependent relationships and events (Bluck et al., 2005). Moreover, as Wegner et al. (1985, p. 257) suggest, these processes can extend to whole organizations and societies, making transactive memory "into a synonym for culture." This is especially pertinent with respect to autobiographical memory, for the deepest structures of the autobiographical knowledge base—namely life story schemas—are typically representative of the wider culture (Bluck & Habermas, 2000).

By influencing the development of transactive autobiographical memory, therefore, founders can create a shared, cultural conception of a new venture's purpose, values, and narrative. Employees come to share deep memories of collaborative goal pursuit in terms

of exploratory risk taking and innovation, and these memories help to define organizational roles and principles of relatedness. This can be accomplished using a number of techniques. First, founding stories, values, and principles can be deliberately recalled and celebrated. For example, Hewlett-Packard preserves its founders' garage in Silicon Valley as a physical symbol of the company's culture and values (Hewlett-Packard, 2011). Second, the values of exploratory risk taking can be encouraged and linked to the company's early achievements. At Google, for example, employees are given free time to explore any development project they choose, reflecting the founders' historic commitment to innovation (Amabile & Khaire, 2008).

Organizational Memory and Identity

As noted earlier, autobiographical memory is inherently social, as people simultaneously cocreate autobiographical memory and social identity (Polya, Laszlo, & Forgas, 2005). Comparable effects occur at the organizational level, as the imprinted components of the integrative transactive autobiographical memory system help to select, prioritize, and organize the storage of new content within organizational memory. For example, early experiences of shared risk taking and persistence in the face of obstacles will tend to be viewed as important features of collective memory, partly because they cohere with the imprinted norms of an entrepreneurial life story (Baron, 1998). Such experiences are naturally selected and stored into collective memory, and organized in terms of the integrative structure of the transactive memory system. These effects can be enhanced by deliberately reinforcing memorization. At the same time, the specific content of shared life stories, life periods, and general event memories forms the initial repository of organizational memory. Indeed, transactive autobiographical memory will partly form the foundation for organizational memory.

Regarding organizational identity, the imprinting of a transactive autobiographical memory system will establish the foundations of the temporal continuity of a distinctive organizational identity (Albert & Whetten, 1985). As a result, features of a distinctive, enduring identity will become imprinted onto routines of agency or leadership. Additionally, the imprinted transactive memory system will support the creation of enduring symbols of identity, such as iconic images of action and leadership. Finally, specific transactive memories will be systematically encoded in archival memory owing to their relevance for a collective sense of identity (Nissley & Casey, 2002; Rowlinson, Booth, Clark, Delahaye, & Procter, 2010).

Once again, it may be possible deliberately to influence the unfolding of these imprinting effects. For example, new ventures can adopt recruitment and reward schemes that encourage entrepreneurial behavior among employees, and explicitly relate these policies to personal career paths within a collective entrepreneurial narrative. Evidence suggests that such policies create a normative entrepreneurial identity within the company, underpinning ongoing loyalty and innovative behavior (Downing, 2005). In their study of Silicon Valley start-ups, for example, Baron, Burton, and Hannon (1996) find that those with a dominant entrepreneurial employee identity are better able to adapt and grow.

Collective Motivation and Goals

By supporting the organization of past, present, and future events, the imprinting of transactive autobiographical memory also helps members of the organization to locate

events within an unfolding entrepreneurial purpose and logic, allowing collective motivations and goals to be derived and understood (Bluck & Habermas, 2000). That is, by sensing the temporal continuity of prior events, members can value past achievements, project future goals, and seek to cause future events. New problems, opportunities, and challenges can be understood in relation to the organization's entrepreneurial narrative. For example, periodic failures may be identified as expected outcomes of entrepreneurial risk taking and as opportunities to learn (Sarasvathy, 2002). Therefore, risk-taking goals and motivations will be viewed as consistent with the imprinted nature of the transactive autobiographical memory system. As a result, members of the organization can rely on each other to share risk-taking motivations and goals, and to encode, store, and retrieve significant memories of risk taking into the transactive memory system.

To influence these imprinting effects, founders can deliberately explain and symbolize strategic decisions in terms of the company's long-term vision, thus linking goals and decisions to an ongoing collective narrative (Downing, 2005). Employees will then be more likely to conceive of their goals and motives within an enduring history that transcends short-term episodes. In this fashion, actions are accorded meaning and status if they support the enactment of the collective organizational narrative. In fact, these principles underpin the very process of organizing itself, when defined as the development of a network of continuous social relationships among people sharing common goals and purpose (Mohammed & Dumville, 2001).

Discussion

My paper contributes to the literatures on imprinting within entrepreneurial firms, organizational learning, and transactive memory. To begin with, regarding the literature on imprinting, I argue that organizational narratives take their initial form and coherence from naturally developing transactive autobiographical memory, which subsequently becomes imprinted onto organizational routines, artifacts, and memory stores. Assuming this explanation of the microfoundations of imprinting, a number of novel research questions then arise. For example, how do the functions of transactive autobiographical memory vary at different stages of new venture development, especially at times of change and transition? And if imprinting effects are initiated during the early period of an organization's life, what impact will transactive autobiographical memory have during later stages of growth and maturity? Next, and importantly, what is the scope for deliberate intervention to influence processes of memorization and imprinting? Research into these questions may help to explain some of the challenges entrepreneurial firms encounter during periods of transition and change. At such times, both organizational culture and identities must adapt, requiring that encoded transactive autobiographical memories adapt as well. By illuminating the microfoundations of imprinting with respect to culture and identity, my model may help better to explain and ultimately manage such transformations.

Furthermore, given the fundamental role of imprinting as a feature of the emergence and evolution of entrepreneurial firms, my paper contributes to the literature on the mechanisms of organizing as such (Davis & Marquis, 2005; Scott & Davis, 2007). Scholars seek to explain the origins of culture, institutional logics, and behavioral routines, among other features of organizing. My model explicitly addresses the microfoundations of such organizational characteristics. I argue that the imprinting of transactive autobiographical memory systems—and especially of integrative transactive memory structures—is one of the fundamental mechanisms by which organizational culture,

identity, roles, and routines first emerge. Future research should therefore investigate these mechanisms in relation to other processes of organizing, such as the development of status, networks, and power within communities (Milanov & Fernhaber, 2009).

My argument suggests additional contributions to research into learning within entrepreneurial firms. To begin with, the imprinting of transactive autobiographical memory might significantly influence the trajectory and scope of exploratory search behavior and opportunity recognition. It may do so by determining which content is accorded meaning and significance, by virtue of its consistency and coherence with the underlying memory system, and thus which content the venture is more mindful of (Levinthal & Rerup, 2006). Similarly, as entrepreneurial firms transition to later stages of development, the imprinted features of transactive autobiographical memory may either enable or impede future search and adaptive learning. On the one hand, if the content and form of the transactive autobiographical memory system are weakly entrepreneurial and resistant to change (the result of a diminishing spiral), then the memory system will tend to impose constraints and learning will become increasingly myopic and risk averse. On the other hand, if the transactive autobiographical memory system supports a more coherent entrepreneurial narrative (the result of an enhancing spiral), then future learning can be more exploratory and innovative (March, 2006). Thus, the imprinting of transactive autobiographical memory will either constrain or enable future learning and may help to explain why some firms are more adaptive than others in these respects (Gavetti, Levinthal, & Ocasio, 2007).

Similar effects may help to explain the strong path dependence of culture and identity within entrepreneurial firms (Sarason, Dean, & Dillard, 2006). On the other hand, if the transactive autobiographical memory system implies a relatively entrepreneurial, exploratory, and open future, the organization will be better equipped to manage cultural transitions. By the same token, new employees will tend to enliven the transactive memory system with fresh content and renewed coherence (Slevin & Covin, 1997). In contrast, if the transactive autobiographical memory system implies a narrowly conceived closed future, it may result in an incapacity to adapt (Burgelman & Grove, 2007). The organization will have fewer options for strategic and structural variation. Relatedly, a deeper understanding of the role of founders in these processes may help to explain the organizational stress that is often associated with the exiting or removal of founder entrepreneurs (Wasserman, 2003).

My paper also contributes to the wider literature on transactive memory itself. As noted earlier, most prior research on this topic focuses primarily on differentiated transactive memory in relation to team coordination and task efficiency (Peltokorpi, 2008). In fact, few studies explicitly mention the integrative functions of transactive memory. My paper aims partly to correct this oversight, given that integrative memory structures are central to my analysis. Specifically, I consider how organizational culture, memory, identity, motivations, and goals are deeply influenced by the integrative functions of transactive autobiographical memory. Future research should test these proposals, and give far greater attention to the integrative structures and functions of transactive memory, not only its differentiated features (Ren & Argote, 2011). By expanding the analysis of transactive memory in this fashion, organizational scholars will be better able to explore its deep relevance for many of the integrative features of organizational life, such as culture, identity, and group learning.

My model may also help to resolve some of the persistent dilemmas concerning the observed impermanence of organizational memory and the relative stability of organizational identity (Meyer et al., 2002), as well as the interaction of culture and cognition in organizational change (Smith & Tushman, 2005). A partial resolution of these dilemmas

is provided by recognizing that the deeper, integrative structures of the transactive autobiographical memory system—namely life story schemas and lifetime periods—are longer in duration and relatively stable. These deeper features of both transactive memory and organizational culture underpin a more mutable system of differentiated, episodic memories (cf. Wang, 2008). That is, the organization's imprinted, integrative life story schemas and lifetime periods will provide a relatively stable foundation for collective identity and meaning, while the more differentiated and variable elements of the autobiographical memory continue to change and evolve, allowing for more adaptive, provisional identities and systems of meaning (see Ibarra et al., 2010). Similar effects may influence socialization in mature organizations as well, as psychic attachment may depend upon a person's capacity and willingness to adopt the deeper structures of the organization's imprinted autobiographical memory system (Stryker & Burke, 2000).

Furthermore, if future research confirms the existence and functions of transactive autobiographical memory systems, it will have significant practical implications. Most importantly, it should then be possible to design specific techniques for influencing the development of transactive autobiographical memory systems within entrepreneurial firms, and thereby influence the process of imprinting. As a consequence, it may be possible to improve an organization's capacity to learn and adapt, by deliberately creating shared memories of entrepreneurial life stories, lifetime periods, and general events, and infusing these transactive memories into organizational culture, identity, relational norms, and goals. For as noted earlier, entrepreneurial autobiographical memories are grounded in the enduring values, norms, and principles of exploration risk taking, innovation, and independent action. Additional organizational benefits could be the ability to enhance absorptive capacity and exploratory search, by creating a memory system that supports a more adaptive collective narrative and distal search (Todorova & Durisin, 2007).

Conclusion

Reflecting their founders' passions, goals, and personal histories, new ventures develop collective identities, cultural values, and behavioral norms, which are imprinted and persist over time. At the same time, founding teams naturally develop transactive autobiographical memory systems that integrate both individual and collective narratives. Significant features of the resulting memory system then become part of the organization's routines, artifacts, and memory stores via spirals of iterative memorization and imprinting. These effects are especially deep and significant if the founders share coherent entrepreneurial life story schemas and lifetime period memories. Via the process of imprinting, these memory systems underpin the emergence of organizational culture, norms of social bonding, the foundations of collective memory and identity, and shared goals and motivations. Whether these effects help or hinder future adaptation and growth will depend on the coherence and content of collective memory and its imprinting. By understanding the origins and dynamics of these processes, it may be possible for founders to actively influence the imprinting process—to imprint by design—and thereby enhance a venture's capacity to adapt.

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