



The entrepreneurial journey as an emergent hierarchical system of artifact-creating processes



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ARTICLE INFO

Article history:

Received 6 February 2013

Received in revised form 6 September 2014

Accepted 11 September 2014

Available online 16 October 2014

Field Editor: Dimo Dimov

Keywords:

Entrepreneurial journey

Artifacts

Hierarchy

Complexity

Emergence

ABSTRACT

Entrepreneurial 'process' perspectives explain the events of an entrepreneurial journey in terms of mechanisms, such as 'effectual logic', 'bricolage', 'dynamic creation', 'opportunity tension' and 'enactment'. Process theorists, however, have not as yet developed an analytical framework that explains an entrepreneurial event in relation to the entrepreneurial journey as the unit of analysis. Building on Sarasvathy's (2003, 2008) and Venkataraman et al.'s (2012) conception of entrepreneurship inquiry as a 'science of the artificial' (Simon, 1996), we explain how this research gap can be addressed by conceptualizing the entrepreneurial journey as an 'emergent hierarchical system of entrepreneurial artifact-creating processes'. From this perspective, entrepreneurial events can be explained in relation to the endogenous dynamics of prior patterns of artifact emergence. We discuss some research implications of focusing on artifact emergence as a key unit of analysis in process theory development.

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Executive summary

The covering law principle that causal relationships are deducible from timeless and context-free laws is the underlying assumption of 'variance' theory – the received view in entrepreneurship inquiry (Van de Ven and Engleman, 2004). In recent years, however, there has been a growing momentum behind the 'process' view (Steyaert, 2007; Van de Ven and Engleman, 2004) that variance theory does not adequately account for what entrepreneurs actually do under conditions of genuine uncertainty (McMullen and Dimov, 2013; Sarasvathy, 2008; Venkataraman et al, 2012). The shift towards developing contextually-rich explanations of complex non-linear processes (McKelvey, 2004; Zahra and Wright, 2011) has, however, created a challenge for entrepreneurship researchers. If entrepreneurship is a historical and contextually-embedded process, how then does the researcher select and integrate the multiple contexts of that process into an explanation?

In this article, we address this challenge in relation to the specific issue of how to incorporate the entrepreneurial journey into a process explanation of an entrepreneurial event, i.e. a decision, behavioral action or outcome that structures the pathway of an entrepreneurial process. McMullen and Dimov (2013) highlight a growing 'disconnect' between variance explanations that focus on causal correlations within an entrepreneurial process and process explanations that focus on the 'unfolding' of an entrepreneurial process (p. 1481–2). This disconnect involves two distinct conceptions of the entrepreneurial journey. From a variance perspective, an entrepreneurial journey is a retrospectively identified entity within the parameters of which it is possible to isolate independent and

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inter-temporal causal relationships between conditions, properties, events and outcomes (Van de Ven and Engleman, 2004). In contrast, the entrepreneurial journey, from a process perspective, is an emergent sequence of events in which an event is both path-dependent on prior processes and contingent on contemporaneous processes (Fletcher, 2006; Sarasvathy, 2008; Venkataraman et al., 2012; Lichtenstein, 2014).

If we want to explain the unique pathway of an entrepreneurial journey, we need to adopt the process view that with every event the counterfactual possibilities of the journey change. In our words, the entire sequence of events of an entrepreneurial journey, up until the explained event, is an 'explanatory unit' that is critical to an explanation of how contingencies are interpreted and new possibilities open up (McMullen and Dimov, 2013). The process literature is rich in explanations of non-linear pathways of emergence (Lichtenstein, 2009), creativity (Dimov, 2007), path-dependency (Garud and Karnøe, 2003) and self-reflexivity (Sarason et al., 2006), as well as conceptualizations of the entrepreneurial journey as an emergent process in which abstract ideas are converted into tangible ventures (Dimov, 2007; Lichtenstein and Kurjanowicz, 2010; Venkataraman et al., 2012). As yet, however, there has been no holistic conception of the entrepreneurial journey as a unit of analysis for the explanation of entrepreneurial events. In this article, we make a contribution to process inquiry by explaining how the entrepreneurial journey can be conceptualized and operationalized as a key unit of analysis in the explanation of an entrepreneurial event.

Drawing on complexity science concepts we explain that the entrepreneurial journey is a key unit of analysis in the sense that 'emergent outcomes' of the journey (i.e. system-organizing properties, behaviors, artifacts, patterns and structures) contextualize the emergent events of the journey (Lichtenstein and Kurjanowicz, 2010). Through a 'circular' form of causality (Juarro, 2000), the contingent interactions of the journey constitute emergent outcomes and these emergent outcomes constrain and enable subsequent events. Crucially, emergent outcomes are hierarchically organized as they emerge and emergent outcomes at higher levels within the entrepreneurial journey are an 'enabling constraint' on subsequent contingent interactions at lower levels (Juarro, 2000: 39).

Building on Sarasvathy's (2003) and Venkataraman et al.'s (2012) proposal that entrepreneurial is a 'science of the artificial' (Simon, 1962, 1973/1977, 1996), we conceptualize the emergent outcomes of the entrepreneurial journey in terms of the design of entrepreneurial artifacts at different levels in an emergent hierarchical system. From this perspective, the entrepreneurial journey emerges according to the principle that abstract entrepreneurial artifacts created at lower levels are designed as contextual to the emergence of more tangible artifacts at higher levels. The entrepreneurial journey is, therefore, a unit of analysis for the explanation of an entrepreneurial event in terms of the explanatory significance of prior artifact emergence. In this article, we develop the notion of the entrepreneurial journey as an emergent hierarchical system of artifact-creating processes and explore the analytical and operational significance of this framework for process theory development.

1. Introduction

Entrepreneurial 'process' perspectives (Mohr, 1982; Steyaert, 2007; Van de Ven and Engleman, 2004) have contributed to our understanding of the emergence (Aldrich and Kenworthy, 1999; Gartner et al., 1992; Lichtenstein, 2009; McKelvey, 2004), transformation (Dew et al., 2010; Sarasvathy, 2008) and creation (Alvarez and Barney, 2007; Chiles et al., 2010; Dimov, 2007; Lachmann, 1977; Sarason et al., 2006; Shackle, 1979) of entrepreneurial processes under conditions of genuine uncertainty. Methodologically, a process explanation is usually developed by first eliciting 'sequences of events' from narrative accounts (Van de Ven and Engleman, 2004) and then operationalizing explanatory 'mechanisms', such as effectual logic and bricolage (Venkataraman et al., 2012), in order to explain the contingent pathway of an entrepreneurial journey (Garud and Karnøe, 2003; Lichtenstein et al., 2006; Sarasvathy, 2008). Less attention, however, has been given to the entrepreneurial journey itself as a unit of analysis for the explanation of entrepreneurial events (McMullen and Dimov, 2013).

From a process perspective, the events of an entrepreneurial journey are an "indelible part of the explanation of [an] outcome" (McMullen and Dimov, 2013: 1487) and "properly understood, not as an inevitable occurrence from some premises that are to be identified, but as an unfolding story that needs to be told in its entirety" (Dimov, 2011: 66). In the process literature, however, the entrepreneurial journey is only loosely conceptualized as a contingent process in which abstract ideas and intangible resources are converted into codified plans and concrete firm processes, commodities and markets (Dimov, 2007; Lichtenstein et al., 2006; Sarasvathy, 2008; Venkataraman et al., 2012). An analytical framework that establishes the elements and boundaries of the entrepreneurial journey as a 'holistic' unit of analysis, or 'unit of explanation', has not as yet been developed by process theorists (McMullen and Dimov, 2013). This research gap is important if entrepreneurship inquiry is to succeed in embracing the multi-contextual and multi-level depth and richness of entrepreneurial phenomena (Low and MacMillan, 1988; Zahra, 2007; Zahra and Wright, 2011). In this article, we, therefore, ask the question, how is an entrepreneurial event explained as a part of a whole — the entrepreneurial journey?

We address this question by taking a systemic view of the entrepreneurial journey (McMullen and Dimov, 2013: 1507). Specifically, we adopt a complexity science perspective (Fuller et al., 2008; Lichtenstein, 2011; McKelvey, 2004; Sarasvathy, 2003; Venkataraman et al., 2012) and conceptualize the entrepreneurial journey as an emergent, hierarchical and self-organized system (McKelvey, 2004; Simon, 1996). Complexity science encompasses a range of methodologies and frameworks focusing on aspects of emergence (see Lichtenstein, 2011: 475–8), including cybernetics (Weiner, 1948/1961), synergetics (Haken, 1977), system dynamics (Forrester, 1961), hierarchical complexity (Simon, 1962), chaos theory (May, 1976), dissipative structures theory (Prigogine and Stengers, 1984), complex adaptive systems (Holland, 1975) and co-evolutionary theory (McKelvey, 1999). Emergence is understood here to refer to the "coming into being of a qualitatively new (level of) order that is unexpected or novel" (Lichtenstein, 2011: 475). In complexity science, new order creation "arises from the interactions of the local parts [of a system, which] cannot be traced back to the individual parts" (De Wolf and Holvoet, 2005: 2). The interactions of an emergent system create hierarchically organized emergent

outcomes, which include ‘coherent’ properties, behaviors, artifacts, patterns and structures. These emergent outcomes “maintain some sense of identity over time (i.e. a persistent pattern)” (De Wolf and Holvoet, 2005: 4) and function as ‘enabling constraints’ (Juarrero, 2000) on subsequent intra-level and inter-level interactions within the emergent system.

Complexity entrepreneurship researchers have tended to focus on multi-level mechanisms that drive the entrepreneurial journey as a process of emergence, such as ‘adaptive tension’ (McKelvey, 2004), ‘opportunity tension’ (Lichtenstein, 2009) and ‘dynamic creation’ (Chiles et al., 2010). There has also been a recognition of the hierarchical structure of the entrepreneurial system (Fuller et al., 2008; Sarasvathy, 2003) and stages in transition phases associated with new patterns of emergence (Lichtenstein, 2000). Of particular interest for our present purposes is Lichtenstein and Kurjanowicz’s (2010) conceptualization of the entrepreneurial journey in terms of ‘phases of organizing’ and ‘degrees of emergence’ associated with increasingly tangible emergent outcomes. As yet, however, there has been no complexity-based conceptualization of the entrepreneurial journey as a unit of analysis for the explanation of entrepreneurial events.

In this article, we address this research gap from the complexity perspective that entrepreneurship is a ‘science of the artificial’ (Simon, 1996). Building on Sarasvathy’s (2003, 2008) and Venkataraman et al.’s (2012) assessment of Herbert Simon’s work on complex systems (1962, 1973/1977 and 1996), we argue that the entrepreneurial journey is an emergent hierarchical system of artifact-creating processes. An artifact is an emergent outcome at the boundary interface of an inner and outer environment that is contingently and functionally designed for how things ‘might be’, rather than ‘how things are’ (Simon, 1981: ix). In other words, an artifact embodies ‘teleology’ within a process of emergence (Venkataraman et al., 2012). From an ‘artificial science’ perspective (Sarasvathy, 2008), an entrepreneurial journey, therefore, emerges according to the principle that abstract artifacts created at lower levels are designed as contextual to the emergence of more tangible artifacts at higher levels (Cf. Lichtenstein and Kurjanowicz’s, 2010, notion of ‘degrees of emergence’). Emergent artifacts then function as ‘enabling constraints’ (Juarrero, 2000) on the entrepreneurial journey in terms of extending system capabilities and constraining activity at lower levels. The entrepreneurial journey is, therefore, a key unit of analysis in terms of the contextual significance of prior artifact emergence for entrepreneurial events.

In the first part of the article, we specify the elements and boundaries of the entrepreneurial journey as an emergent hierarchical system of artifact-creating processes. To do this, we draw on Herbert Simon’s (1962, 1973/1977, 1996) notions of ‘hierarchical complexity’ and ‘sciences of the artificial’. We specify the subsystems and components at each level of the emergent hierarchy and the functional relationships between each level in terms of the creation of entrepreneurial artifacts. Although, we focus on business entrepreneurship, this does not preclude possible relevance for social forms of entrepreneurship.

In the second part of the article, we use the empirical case of *The Republic of Tea* (Ziegler et al., 1992) to illustrate how the emergent hierarchy can be operationalized to explain the critical events of a phase transition into a new pattern of artifact emergence. Finally, we discuss research implications of the emergent hierarchy in relation to the following issues in process theory development: (1) identifying units of analysis for the explanation of entrepreneurial events; (2) incorporating multiple contexts and multiple levels of analysis in the explanation of entrepreneurial events; (3) identifying critical empirical events in the entrepreneurial journey; and (4) evaluating the relative significance of diverse explanatory frameworks in the process literature.

2. The emergent hierarchical system of entrepreneurial artifact-creating processes

According to Simon (1962, 1973/1977, 1996), a science of the artificial studies the creation of human artifacts, which are those “objects and phenomena in which human purpose as well as natural law are embodied” (Simon, 1981: 6). Human artifacts are emergent outcomes of practical activities, such as engineering, medicine, business, architecture and painting, which are purposefully designed for an uncertain future in the context of uncertain contingencies. In other words, a science of the artificial studies how artifacts emerge at the ‘boundary’ between ‘inner’ and ‘outer’ environments as an embodiment of human purpose and as contextual to future activities (Simon, 1996). As Simon (1996) explains:

An artifact can be thought of as a meeting point – an “interface” in today’s terms – between an “inner” environment, the substance and organization of the artifact itself, and an “outer” environment, the surroundings in which it operates. If the inner environment is appropriate to the outer environment, or vice versa, the artifact will serve its purpose. (p. 6),

In social systems, artifacts are created at the boundary interfaces of subsystems that are organized as the ‘nearly decomposable’ (i.e. partially independent) elements of a functionally interrelated hierarchy (Sarasvathy, 2003; Venkataraman et al., 2012). The creation of artifacts at different levels in the hierarchy is functional to system reproduction or emergence. When a system is reproduced, artifacts are reproduced, and when a system is emergent, new artifacts are created.

Entrepreneurial inquiry can be viewed as a science of the artificial in the sense that entrepreneurs design artifacts that are functional to the creation of entrepreneurial markets under conditions of genuine uncertainty (Sarasvathy, 2003, 2008; Venkataraman et al., 2012). Sarasvathy (2003, 2008) and Venkataraman et al. (2012) refer to entrepreneurial artifacts as ventures, firms, commodities, opportunities and markets. How these artifacts are functionally and hierarchically interrelated, however, is not discussed. In Fig. 1 we depict the hierarchical organization of entrepreneurial subsystems and artifacts as an emergent hierarchical system. It should be noted that Fig. 1 represents simplified and generic levels of emergence, when, in practice, entrepreneurial processes involve unpredictable non-linear pathways through complex subsystem interrelationships. It should also be noted that higher levels of emergence can feedback information to any lower level (although this is not indicated in Fig. 1).

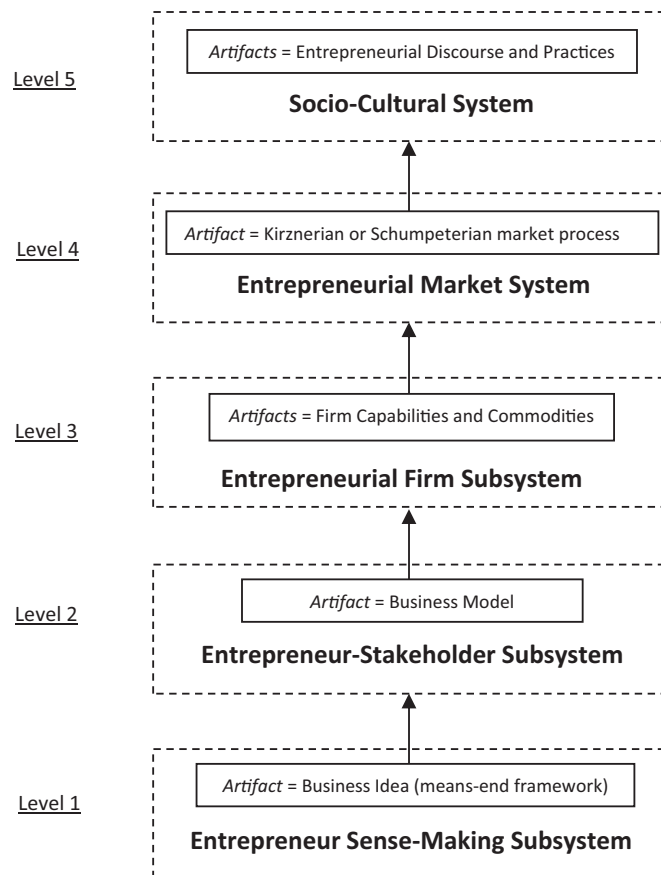


Fig. 1. Entrepreneurial emergent system hierarchy.

At Level 1, an entrepreneurial sense-making subsystem creates a business idea (artifact), which is functional to interaction in entrepreneur–stakeholder subsystems, and the emergence of an operational business model (artifact), at Level 2. At Level 3, the operational business model, created at Level 2, is functional to the emergence of firm capabilities (artifacts) and marketable commodities (artifacts) in the entrepreneurial firm subsystem. Thereafter, the marketing of a commodity is functional to the emergence of either a Kirznerian or Schumpeterian market system (artifact) at Level 4, and this market system is then functional to the formation of firm clusters and regional business relationships (artifacts) at Level 5. Levels 1–5 are functional to the wider societal emergence of entrepreneurial culture, discourse and practices (artifacts) at Level 6.

The relative independence (‘near decomposability’ or ‘loose-coupling’) of subsystem interactions and patterns of emergence in complex social systems, like entrepreneurship, is associated with distinctive causal dynamics at different system levels. The entrepreneurial system, therefore, comprises not just subsystems, but subsystems organized in coherent systems within the overarching hierarchy. In this respect, we make a distinction between Levels 1–3, which constitutes the emergence of an entrepreneurial journey (i.e. the localized organizing moves of an entrepreneurial project), and Levels 4–6 which involve patterns of emergence in higher-level populations.

In the entrepreneurial journey, or what we also refer to as the ‘venture emergence system’, a formalized, tangible and legitimized entrepreneurial venture is created by converting an initial business idea into a codified business model and usable market forms (Dew et al., 2010; Dimov, 2011; Lichtenstein and Kurjanowicz, 2010; Sarasvathy, 2008). It is important to note that we are concerned here with the entrepreneurial journey in the sense of the ‘degrees of emergence’ (Lichtenstein and Kurjanowicz, 2010) of organizational creation (Gartner, 1985), rather than the emergence of new global-level structures within an existing firm system (as in the case of ‘intrapreneurship’). A degree of emergence concerns the design and creation of an artifact in order to contextualize a more tangible pattern of emergence at a higher level.

The path of an entrepreneurial journey is neither entirely planned nor entirely circumstantial, but concerns interaction between entrepreneurial purposefulness and contingent environments within the parameters of the venture emergence system (Lichtenstein, 2001; Sarason et al., 2006; Sarasvathy, 2008). Strategies are “elaborated, refined, changed or even discarded” as the entrepreneur purposefully tests the viability of the underlying business idea and contingently addresses unforeseen problems in a

socially embedded “process of shaping, discussion and interpretation” (Dimov, 2007:714). In contrast, emergence at Levels 4–6 involves the spontaneous self-organization of interactions in market, regional and societal populations (Chiles et al., 2004). In this article, we are specifically concerned with the endogenous dynamics of the entrepreneurial journey (venture emergence system) as a unit of analysis for the explanation of entrepreneurial events. In the next section, we compare the dynamics of emergence in the venture emergence system (Levels 1–3) with emergence at higher levels in the domain of entrepreneurship (Levels 4–6).

2.1. Hierarchy, emergence and self-organization

Complexity science perspectives applied to market- and higher-level entrepreneurial phenomena emphasize spontaneous (in the sense of decentralized) effects associated with heterogeneous agents interacting locally according to individualized sets of rules (Stacey, 2001: 71–72). Chiles et al. (2004), for example, use dissipative structures theory (Prigogine and Stengers, 1984) to explain emergence in the entertainment *organizational collective* of Branson (Missouri), which comprises a population of theaters, restaurants, motels, shops, theme parks and amusements. Chiles et al. (2004) explain how regional events (fluctuations), such as the opening of a new theater or infrastructure developments, catalyzed a ‘cascade of new orders’ over the course of a century. When existing organizational relationships could not accommodate these fluctuations, a new configuration of organizations began to spontaneously self-organize driven by positive feedback loops, which amplified and reinforced the pattern that has begun to emerge. For example, Chiles et al. (2004) describe a feedback loop in which the emergence of a theater population was self-organized through a ‘bandwagon’ effect, i.e. the probability of a new organizational founding was a positive function of the number of existing organizations (p. 511). Under far-from-equilibrium conditions, positive feedback dynamics created increasing diversity in the organizational community, which generated further fluctuations and self-organized emergence.

Patterns of emergence at the level of the localized interactions of the entrepreneurial journey, however, look a little different. Unlike the decentralized self-organization of market- and higher-level populations, the ownership and control of strategic assets by entrepreneurs and stakeholders enable the purposeful contextualization of paths of emergence through artifact design and creation (Venkataraman et al., 2012). In other words, the self-organization of the entrepreneurial journey is contextualized by ‘intentional behaviors’ (Juarero, 2000). As Hazy et al. (2007) explain:

A crucial insight is that emergence is rarely spontaneous in practice, nor do complex administrative entities organize “on their own”. Instead, emergence is usually *constructed* out of materials ready-to-hand, with the help of tangible constraints – including managers – who provide the leadership necessary to encourage and support nascent bundles of organized order (Hazy et al., 2007: 8).

The pathway of an entrepreneurial journey is, therefore, explained primarily in terms of the purposeful creation of artifacts as ‘contextual constraints’ (Juarero, 2000: 39) on the process of emergence. The entrepreneur’s design of artifacts co-ordinates previously independent parts of the emergent system and constrains the possibilities of emergent self-organization. While the emergence of an entrepreneurial market is self-organized by relatively spontaneous population-wide feedback loops, the entrepreneurial journey is self-organized by feedback loops within the ‘self-causing’ order parameters (Juarero, 2000) of purposeful artifact creation. These dynamics, of course, do not preclude that problematic fluctuations can originate from Levels 4–6, which are exogenous to the venture emergence system, or from domains exogenous to the entrepreneurial system, such as the events of a financial crisis.

The entrepreneurial system, as a whole (Levels 1–6), emerges through coevolutionary dynamics between ‘upward causality’ associated with the bottom-up effects of localized action, and ‘downward causality’ associated with the top-down ‘enabling constraints’ of emergence at higher levels in the system (Juarero, 2000; Lichtenstein and McKelvey, 2011). At the level of the entrepreneurial journey, however, the purposeful embodiment and embedding of entrepreneurial purpose in entrepreneurial artifacts contextualize the path of emergence, sometimes irrespective of objective constraints associated with market conditions (downward causation). This is what happens when ventures fail because an entrepreneur remains committed to a business idea irrespective of market conditions, or when entrepreneurial imagination creates new consumer demand that seems to have no connection with market conditions. A subjective artifact-creating decision can, therefore, be a critical event in explaining the route of an entrepreneurial journey, while that same entrepreneurial decision might be little more than an insignificant fluctuation in the context of wider population interactions.

The significance of subjective entrepreneurial action for the emergence of unique entrepreneurial journeys is recognized in the entrepreneurship complexity literature. Chiles et al. (2010), for example, argue that the fluctuations that drive entrepreneurial emergence can be endogenously created in the firm by entrepreneurial imagination and foresight. Similarly, Lichtenstein’s (2009) notion of ‘opportunity tension’ focuses on individual ‘motivational valence’ as a driver of emergence (p. 20). Lichtenstein (2011) also refers to ‘intrinsic emergence’, in which emergent patterns confer new functionality to the system which can be exploited by a system agent, such as an entrepreneur, that, “has the requisite information processing capability” (Crutchfield, 1994: 518). These sorts of generative mechanisms, however, do not explain specifically how upward causality is channeled through the creation of entrepreneurial artifacts. In the following section, we examine Simon’s (1962) notion of ‘hierarchical complexity’ in order to explain the creation and function of entrepreneurial artifacts in the entrepreneurial journey (venture emergence system).

2.2. Inclusion hierarchies

Entrepreneurial inquiry has tended to focus on Simon’s (1996) notion of hierarchy as a characteristic of effective artifact design, such as hierarchical modular subassemblies in production processes (Sarasvathy, 2003, 2008; Venkataraman et al., 2012). Simon

(1962, 1973/1977), however, was more generally concerned with hierarchical complexity as a “universal principle of the structure of complex things” in the physical, biological and social worlds (Agre, 2003: 416). We are concerned here with the latter conception of hierarchy.

Simon’s (1962, 1973/1977, 1996) notion of hierarchical complexity refers specifically to the structure of an ‘inclusion hierarchy’ (Lane, 2006), in which each level of the hierarchy comprises subsystems that are functional as components (or elements) of subsystems at the next level up. Simon (1973/1977) explains an inclusion hierarchy in terms of a ‘Chinese boxes’ metaphor:

In application to the architecture of complex systems, ‘hierarchy’ simply means a set of Chinese boxes of a particular kind. A set of Chinese boxes usually consists of a box enclosing a second box, which, in turn, encloses a third – the recursion continuing as long as the patience of the craftsman holds out. The Chinese boxes called ‘hierarchies’ are a variant of that pattern. Opening any given box in a hierarchy discloses not just one new box within, but a whole small set of boxes; and opening any one of these component boxes discloses a new set in turn. (pp. 4–5). By a hierarchical system, Simon (1962) is, therefore, referring to “a system that is composed of interrelated subsystems, each of the latter being, in turn, hierarchic in structure until we reach some lowest level of elementary subsystem” (p. 468).

Fig. 2 is a graphic representation of an entrepreneurial venture emergence system as an inclusion hierarchy. The firm system at Level 3 is the highest level in the venture emergence system. It should be noted that a firm is also a component of a multi-firm market system at Level 4. A component of the firm system (i.e. a firm function, such as entrepreneurship, production or marketing) is functionally related to interaction subsystems at Level 2. A component of an interaction subsystem at Level 2 (such as an entrepreneur or stakeholder) is then functionally related to an individual sense-making subsystem at Level 1. In other words, a subsystem is a component (or element) of a subsystem at the next level up in the hierarchy. Subsystems are mediated vertically through the creation of artifacts, which are indicated by an ‘A’ in Fig. 2 and can be identified by cross-referencing Fig. 2 with Fig. 1.

In physical, biological and social systems, the number of levels comprising an inclusion hierarchy, the number of components comprising a subsystem, and the number of subsystems at each level are, of course, highly variable. In biology, for example, the hierarchical levels and subsystems of a human body are, from the lowest elementary level upwards: molecules, then organic compounds, then macromolecules, then tissues and organs, then bodily subsystems (such as the nervous system or digestive system) and finally the integration of bodily systems in an organism that interacts with its environment.

2.3. Distinguishing social artifacts

Social systems do not exhibit the characteristics of complex systems in the same way as physical and biological systems (Prigogine and Stengers, 1984). Most significantly for our present purposes, physical and biological inclusion hierarchies are distinguished by spatial organization, in the sense that interaction between subsystems involves ‘relative spatial propinquity’ (Simon, 1962: 469). The subsystems that constitute the complex system of the human body, for example, are spatially organized within the body as a

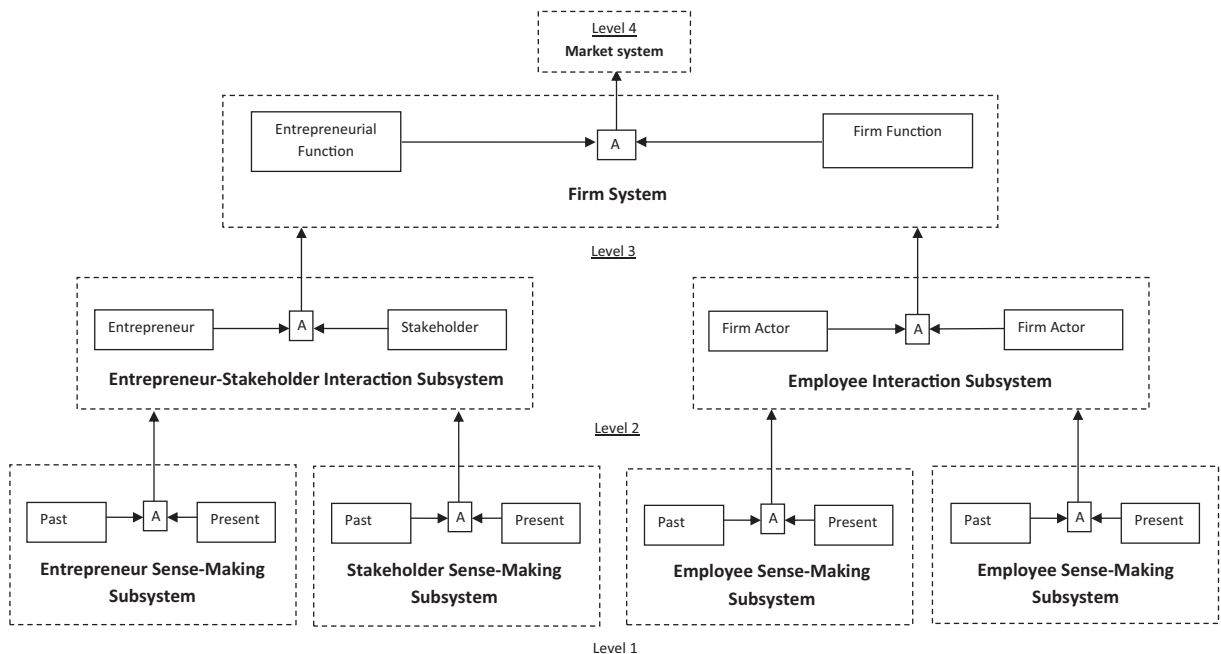


Fig. 2. Entrepreneurial venture emergence system hierarchy.

physical entity. In contrast, the interaction of subsystems and subsystem components in social systems is unconstrained by spatial proximity because interaction is mediated by 'symbolic meaning systems' (Simon, 1962: 469–470).

The nature and function of social artifacts are, therefore, quite different to the nature and function of physical and biological artifacts. Artifacts in physical and biological systems are created by 'fitting' the material and biochemical properties of a subsystem with its environment. For example, in the context of the human body, glands are subsystems that produce hormones, which regulate and 'fit' a bodily system (e.g. homeostasis). Social artifacts, on the other hand, are a *medium* of social interaction. Social interaction is mediated by the intentional creation of social artifacts and the subjective interpretation of social artifacts in relation to symbolic meaning systems. Social artifacts, therefore, mediate an indeterminate number of social interactions and are manifest in a variety of artifactual forms. These forms include linguistic artifacts, such as ideas and texts, relational artifacts, such as networks and organizations, and material artifacts, such as commodities and technologies.

The embodiment and embedding of human intention in social artifacts distinguish social hierarchies from physical and biological hierarchies in the following ways. Firstly, social subsystems and subsystem components have a higher degree of independence (near decomposability), than in physical and biological systems, because interaction is mediated by the subjective interpretation of social artifacts (Simon, 1962: 469–470). For example, the emergence of a business model might be contingent on agreement in the subjective interpretations of an entrepreneur and stakeholder. Secondly, the capacity to embody and embed human intention in different artifactual forms means that the same human agent can organize 'phases of organizing' and 'degrees of emergence' at different hierarchical levels (Lichtenstein and Kurjanowicz, 2010). For example, an entrepreneur can formulate a business idea (Level 1), then negotiate a business model (Level 2) and then implement the business model (Level 3). Thirdly, the causal significance of social artifacts is mediated by authority relations and the control of resources. Consequently, entrepreneurs and stakeholders have a degree of control over the parameters of emergence in the venture emergence system. In short, the artifact-creating activities of some types of agents in a social system, such as entrepreneurs, can have a greater causal significance for the path of artifact emergence than other types of agents.

Having characterized the entrepreneurial journey as a social inclusion hierarchy, we are now in a position to characterize the emergence of the entrepreneurial journey in terms of functional relationships between subsystems at different levels in the venture emergence system.

2.4. Venture emergence system

Fig. 2 represents the subsystem structure of an entrepreneurial journey that has emerged to the point where a tangible Level 3 venture is functional to an entrepreneurial market system at Level 4. An entrepreneurial journey can involve an infinite variety of pathways through Levels 1 to 3, including unpredictable transformations into new patterns of emergence, periods of inactivity and abandonment of the venture at any point in the journey. As the journey emerges, new subsystems are incorporated into the system and subsystems can be rendered redundant. It should be noted that Fig. 2 is a simple inclusion hierarchy in the sense that it incorporates a single entrepreneur, a single stakeholder and just two employees. It should also be noted that if Fig. 2 represented an entrepreneurial market system (i.e. included Level 4), then the inclusion hierarchy would incorporate the subsystems of any competing firms. We now discuss the functions of subsystems at different levels in the venture emergence system.

2.5. Level 1 – sense-making subsystems

The principle function of an entrepreneur's sense-making subsystem (Simon, 1980; Weick, 1995), at Level 1 in the venture emergence system, is to contextualize the path of an entrepreneurial journey by creating, contingently evaluating, enacting, practicing and transforming the means–end relationships that constitute entrepreneurial artifacts. Business ideas (Level 1), business models (Level 2) and firm capabilities (Level 3) are all 'means–end' artifacts, in the sense that they concern the relationship between an intended outcome (ends) and the strategy to achieve that outcome (means). A commitment to a particular end involves both an intended outcome and ancillary expectations and criteria for evaluating short-run events and interim goals. Means are strategies that are believed to be effective in achieving interim goals and the intended outcome.

While a rudimentary business idea involves a general vision of the future and the means of how to get there, a business model involves supplementing the original business idea with a bundle of operational means–end strategies which formalize the legal, financial and practical implementation of the venture. The means–end relationships of a business idea are enacted in entrepreneur–stakeholder subsystems, and the means–end relationships of a business model are enacted in the process of venture implementation. With the emergence of a tangible venture, the means–end relationships of the business idea and business model become embedded and embodied in the routine capabilities and systems of the operational business.

Means–end relationships at all three levels of the entrepreneurial journey are contingently evaluated at the boundary interface of an entrepreneur's sense-making subsystem through interaction with the contingent environment. The mechanism that governs these interactions is the *self-reflexive capacity* of the sense-making subsystem. As Sarason et al. (2006) explain, "the creation and development of entrepreneurial ventures involves the reflexive, recursive processes of interpretation, action, consequence and reflection" (p. 295). Subjectivists and constructivists in entrepreneurship inquiry (Chiles et al., 2010; Klein, 2008; Knight, 1921; Lachmann, 1977; Sarason et al., 2006; Shackle, 1979; Wood and McKinley, 2010) have provided some insight into the components of self-reflexivity. In particular, there has been an emphasis on how entrepreneurs pursue an imagined future 'as if' it is real (Gartner et al., 1992; Weick, 1995) in order to exploit contingent experience and bridge the gap to an 'unknowable' future (Shackle, 1979). In other words, self-reflexivity is the human capacity to evaluate the significance of what is happening in the present (contingent

experience) relative to what has been envisioned and anticipated in the past. The past is embedded in an enacted means–end artifact (emergent outcome) in terms of (1) what is intended to happen in the future; (2) what should be done in the present; and (3) what is expected to happen in the present. The present, on the other hand, relates to the ongoing experience of contingent events (fluctuations), including path-dependent feedback from prior actions. The interacting components of a sense-making subsystem are, therefore, the ongoing relationship between the *past* and *present* dimensions of the entrepreneurial journey (see Fig. 2).

A principle function of entrepreneurial self-reflexivity is, therefore, to evaluate means–end relationships (emergent outcomes) against the contingent events of entrepreneurial artifact emergence as they arise. In the moment of contingent experience, an involuntary evaluation is made concerning whether or not the relationship between ‘what is’ happening in the present and ‘what should be’ happening, from the perspective of past experience, is problematic (Selden and Fletcher, 2010). If the relationship is evaluated as non-problematic, then the means–end artifact continues to contextualize the process of emergence. If the relationship is evaluated as problematic, then this evaluation signals the possible need to alter the means–end artifact and forge a new path of emergence. As Simon (1962) explains, in relation to general problem-solving activity, “indications of progress spur further search in the same direction; [while] lack of progress signals the abandonment of a line of search” (Simon, 1962: 472).

Consider a hypothetical discussion between an entrepreneur and a stakeholder about the viability of a business idea (means–end artifact). During the discussion, the stakeholder discloses market information which suggests that market demand is insufficient for the business idea to be viable. In this moment, the entrepreneur makes an involuntary self-reflexive evaluation of whether or not the new information is problematic. Self-reflexivity is, therefore, a self-organizing mechanism for the entrepreneurial journey because it signals the possible need to transform a means–end relationship. At the same time, market and higher levels of emergence are contingent on the involuntary self-reflexive responses of larger populations, which amplify fluctuations and trigger the self-organization of new patterns of emergence.

2.6. Levels 2, 3 and 4 – social interaction, firm processes and market systems

At Level 2, an entrepreneurial business idea is enacted in the context of entrepreneur–stakeholder interactions in order to contextualize the emergence of a business model (see Fig. 1). An entrepreneur–stakeholder subsystem is associated with processes of business negotiation, inter-personal problem-solving, persuasion, and business legitimization. The components of an entrepreneur–stakeholder subsystem are the individuals involved in the transaction. As a component of an entrepreneur–stakeholder subsystem, a stakeholder is any interested third party, such as a consultant, member of a development team, supplier, financially interested party, networked business actor or potential customer. A business model emerges through supplementation of the business idea with operational means–end strategies at the boundary interface of entrepreneur–stakeholder interactions and the wider market environment. The emergence of the business model constrains and enables sense-making activity at Level 1 through information feedback that can relate to either endogenous entrepreneur–stakeholder dynamics or exogenous market conditions. Entrepreneur–stakeholder subsystems become embedded into the structure of the venture emergence system when negotiations are successful and are rendered redundant when negotiations fail.

At Level 3, the business model contextualizes the emergence of concrete firm capabilities and commodity production (see Fig. 1). These artifacts are created at the boundary interface between interacting firm components and the firm environment. The components of a firm system are firm functions, such as the entrepreneurial function, managerial function, marketing function, production function and sales function. The emergence of firm artifacts is tested against either endogenous information feedback, such as production line problems, or exogenous information feedback, such as regulatory requirements or issues with the supply of factor products. With the implementation of the business model, subsystems associated with firm functions (e.g. employee interactions), and new contractual relationships with external parties (e.g. firm-supplier interactions), are incorporated into the emerging order. It should be noted that problematic fluctuations can originate in non-entrepreneurial subsystems. For example, a change in the stakeholder ownership of a company could trigger restructuring and a new pattern of entrepreneurial artifact emergence.

Market processes at Level 4 are external to the venture emergence system. However, information feedback from market processes is a contextual constraint on the function of means–end artifacts in the venture emergence system. The function of entrepreneurial commodity artifacts created at Level 3 is to facilitate new supply for existing demand (Kirznerian equilibration) or new supply for a new demand (Schumpeterian disequilibrium) at Level 4 (Foss and Klein, 2010). If the entrepreneurial firm can protect a competitive advantage by creating barriers to entry, then a monopolized position can be maintained and extant means–end artifacts do not necessarily need to be transformed. However, if competing firms enter the market (new market subsystems), spontaneous fluctuations, such as an increase in the cost of factor products, reduced level of demand or competing products, can then catalyze the transformation of means–end artifacts and a new pattern of artifact emergence, such as product diversification.

3. Explaining critical events in the entrepreneurial journey

In this section, we operationalize the venture emergence system in order to explain critical events in the emergent path of an entrepreneurial journey. In particular, we focus on the events of phase transitions into new patterns of artifact emergence associated with the transformation of means–end relationships. We understand transformation here to refer to either (1) *redefining* means–end relationships in the sense of initiating a new pattern of emergence by altering the business idea, or (2) *recontextualizing* means–end relationships in the sense of initiating a new pattern of emergence by *re-testing* the business idea in a new subsystem context. The key to identifying and explaining the critical events of phase transitions is to focus on how means–end artifacts are *redefined* or *recontextualized* at the boundary interface of the entrepreneur’s sense-making system.

As we have already discussed, the entrepreneur's sense-making system tests the viability of means–end relationships in relation to contingent experience. In and of itself, however, a problematic experience does not trigger transformation of a means–end relationship and a new pattern of emergence. For transformation to take place, problematic contingent experience must be interpreted by the entrepreneur's sense-making system as a problem that can be solved by transformation. 'Problem identification' is, therefore, the 'transformational event' that initiates a new pattern of emergence.

If, for example, an entrepreneur experiences the contingent failure of a product to sell in accordance with a business model, this problematic experience is not a transformational event that initiates a new pattern of emergence. The contingent experience is a fluctuation in the system that has not yet been assimilated into the extant pattern of systemic relationships. It is only when the entrepreneur decides that the problematic experience should be solved by transforming the business idea that problem identification – the transformational event – initiates a new pattern of emergence.

Problem identification is not random or blind because the entrepreneurial journey is a path-dependent process that organizes resources through the creation, enactment and testing of artifacts. Information feedback from enacting artifacts in social and business relationships creates an 'order parameter', or context, for entrepreneurial attention, selection and evaluation (Juarrero, 2000). For example, the problematic experience that catalyzes a transformational event might be a critical threshold event contextualized by prior fluctuations in a process of artifact emergence. Whether the entrepreneur decides to transform a means–end artifact or not depends on knowledge and experience, which includes "patterns of learning" relating to prior patterns of emergence (Cheng and Van de Ven, 1996: 609). In the following discussion, we use *The Republic of Tea* (Ziegler et al., 1992) as an empirical case study to illustrate how the endogenous dynamics of a venture emergence system can explain the critical events of a phase transition into a new pattern of artifact emergence.

3.1. *The Republic of Tea*

The text of '*The Republic of Tea*' (Ziegler et al., 1992) tells the story of the creation of an innovative tea company (*The Republic of Tea*) through a narrative reconstruction of a fax dialogue between the founder members, Mel Ziegler and Bill Rosenzweig (see Gartner, 2010). The text combines the empirical data of the original fax dialogue with a retrospective analysis by Mel and Bill. Bill is a nascent entrepreneur and Mel is a mentor and stakeholder. Although the text runs to over three hundred pages, the focus is a single pattern of emergence in the development of the business model and a phase transition into a new pattern of emergence. In other words, the narrative tells us about a period of discussion and disagreement between Mel and Bill about practical strategic issues, rather than how the original idea emerged or how the business model was implemented. In the context of the emergent hierarchy of entrepreneurial artifact-creating processes, the focus of the text is the endogenous dynamics of a Level 2 entrepreneur–stakeholder subsystem.

The story of *The Republic of Tea* begins with a chance meeting. At this meeting Mel tells Bill about his idea for a tea company marketed on the basis of the *meditative* attributes of tea drinking. The story, therefore, begins with the decision by Mel to socially enact a rudimentary business idea (means–end artifact) in order to catalyze the emergence of a concrete business venture (p. 7–12). In retrospect, Mel describes this event as the moment that "the Idea existed but had not manifested" (p. 7). Bill interprets this unexpected contingent experience as a life-changing transformational event and starts a new pattern of living as an entrepreneur.

Initially, Mel and Bill discuss seemingly endless visions of an imagined market, including various 'merchandizing possibilities', such as packaging designs, flavor combinations, product names, product line ideas and catalogue design (p.21–28). The problem with this 'dream stage' (Bill's commentary, p. 104) is that it is not productive in terms of supplementing the original business idea with the operational business strategies of a business model. While Mel and Bill find it easy to imagine what they want to create in terms of goals and visions, they find it much harder to decide the practical means of doing so. Mel and Bill struggle to make practical decisions because they have different intentions. Mel is only interested in the business idea from an intellectual point of view, and doesn't want to be involved in the running of the business, even though he has practical experience as an entrepreneur. Bill on the other hand, wants to run the business, but has no practical experience.

Bill realizes that success depends on being "able to move between the practical world and the world of bigger perspective" [i.e. the ideational world] (Bill's fax, p. 155). He researches the tea market and is aware of the sorts of practical questions that need to be answered in order to develop a business model. Should the company enter the market as a joint venture with an existing company (p. 56), or as wholesalers, and/or retailers, and/or as a mail order company (p. 273)? How extensive should the product line be (p. 71–78)? How will the business be financed (p. 75)? Should the business acquire an existing tea company or set up new distribution channels (p. 88–90)? Should the company sell to a niche market or the wider black tea market?

Bill researches the issues but the information he gathers does not give him the experience or confidence he needs to make practical decisions. Bill tries to resolve the situation by getting Mel to make decisions for him, but Mel is reluctant to give easy answers (p. 85–86). Each unsatisfactory response from Mel is experienced by Bill as a contingent event (fluctuation) that signals that the emergence of the business model is problematic. However, Bill is unwilling or unable to interpret these events as a cue to transform the original business idea. Instead of identifying a new solvable problem that will facilitate a new pattern of emergence (i.e. a transformational event), Bill simply posits alternative goals and possible courses of action without being able to evaluate their practical viability (p. 95–97).

The interaction between Bill and Mel gets stuck in a repeated cycle of failing to assimilate problematic fluctuations within the existing pattern of interaction (p. 179–180). In other words, the disequilibrium conditions of their interaction are amplified by contingent feedback. What explains the difficulty in resolving these problems is not exogenous events, such as market developments, but a dysfunction in the endogenous dynamics of the Mel–Bill interaction subsystem. Eventually the unresolved fluctuations

culminate in a 'bifurcation point' (Prigogine and Stengers, 1984) and an abrupt shift from one form of disequilibrium order to another. Bill reaches his threshold of toleration and decides to break communication with Mel (p. 214–220).

Although this decision marks a critical threshold event, it is not a transformational event. The decision is a precursor to a period of reflection. After reflecting, Bill asks himself, "How do I get the necessary practical experience of the tea market in order to gain the knowledge and confidence to make practical decisions?" This identification of a solvable problem is the transformational event. Bill's answer to the question is that he can get practical hands-on experience working as a tea merchant. So he becomes a tea merchant and initiates a new pattern of emergence, in which the Mel–Bill interaction subsystem is superseded by his social enactment of the original business idea in a new context. In other words, Bill recontextualizes, rather than redefines, the means–end relationships of the business idea in the hope that the new context will be more productive for testing viability. His hopes are rewarded. The decision to become a tea merchant catalyzes the successful emergence of a business model and, in due course, the successful launch of the company.

4. Research implications

The notion of the entrepreneurial journey as an emergent hierarchical system of artifact-creating processes has important research implications for future directions in process research. Our primary concern in this article is the significance of the emergent hierarchy for our understanding of the entrepreneurial journey as a unit of analysis. In variance theory a unit of analysis is an entity, such as an entrepreneur, network, firm or market, and the causal properties of entities are the focus of theory development (Van de Ven and Engleman, 2004). Process theory, however, involves a "shift from a language of things to a language of relationships" (Venkataraman et al., 2012: 25), in which a unit of analysis concerns the 'relational' interdependence of actions and contexts (Fletcher, 2006; Sarasvathy and Venkataraman, 2011). Sarasvathy and Venkataraman (2011), for example, argue that 'intersubjective interactions' between entrepreneurs and stakeholders should be a key unit of analysis (p. 126). From the perspective of entrepreneurship as a science of the artificial, intersubjective interactions can be studied at the boundary interface of entrepreneur and stakeholder interactions (Venkataraman et al., 2012). However, if we want to explain the causal significance of the entrepreneurial journey for the explanation of an event, then we must consider how prior sequences of events can be conceptualized as a unit of analysis.

4.1. Artifact emergence as a unit of analysis

In order to consider the entrepreneurial journey as a unit of analysis, it is first necessary to specify the boundaries of the journey in terms of beginnings and endings (McMullen and Dimov, 2013). In social processes, however, there are no *absolute* beginnings and endings because social events are *indeterminately* related to the past in an infinite regression of contexts (Bauman and Briggs, 1990) and to the future in an ongoing process of contextualization (Nardi, 1996). An entrepreneurial opportunity idea, for example, might appear to be the starting point for an entrepreneurial journey, but it is causally related to the prior contexts of life histories and wider social phenomena. Similarly, if an entrepreneurial market is being maintained by routine managerial activity, then this does not mean that the entrepreneurial journey has come to an end. Under competitive market conditions, 'far-from-equilibrium' (Lichtenstein, 2009), an entrepreneurial journey is only ever in abeyance pending market developments that can only be solved by the creation of new entrepreneurial artifacts. Moreover, the entrepreneurial journey as a venture emergence system is not contingent on individual agents. If a founder member leaves the business for whatever reason, this may signal the end of a personal entrepreneurial journey but does not signal the end of the venture emergence system. A change in ownership, for example, may result in a change in managerial personnel and the end of an entrepreneurial journey for a founder member, but not the end of the business venture. Even if a venture is dissolved, this may represent a phase transition into a new pattern of entrepreneurial emergence, rather than the end of the journey. There is usually some element of continuity in entrepreneurial activity, whether this relates to individuals, organizational structure or business strategy.

In social inquiry, it is useful, therefore, to identify the end of a process in terms of the beginning of a subsequent process. From this perspective, the units of analysis for theory development are sub-processes, such as the social transactions of an *intersubjective interaction process* (Sarasvathy and Venkataraman, 2011), that have an explanatory significance when conjoined as part of a larger process. In the case of the emergent hierarchical system of entrepreneurial artifact-creating processes, artifact emergence is a sub-process that begins and ends with a phase transition into a new pattern of artifact emergence or a new hierarchical level/degree of emergence. We, therefore, propose that an entrepreneurial event can be explained in relation to the entrepreneurial journey by taking artifact emergence sub-processes as the unit of analysis, rather than the entrepreneurial journey as a whole. From this perspective, *relative* beginnings and endings of particular entrepreneurial journeys, for individuals or venture emergence systems, can be identified in terms of phase transitions into, and out of, entrepreneurial activity. The *relative* beginning for a nascent entrepreneur like Bill, for example, could be regarded as the onset of the transition phase from a non-entrepreneurial life to an entrepreneurial life, i.e. the fluctuations of his chance meeting with Mel.

A sub-process of artifact emergence develops through problem-solving activities until either the emergent pattern is superseded by a new pattern or until the artifact is created and there is a phase transition into a new level/degree of emergence. A sub-process will, therefore, begin with either a phase transition into a new pattern or new level/degree of emergence, and end with either a phase transition into a new pattern or new level/degree of emergence. In the case of a phase transition into a new pattern of artifact emergence, an entrepreneurial artifact is transformed when a threshold is reached in the entrepreneurial capacity to assimilate problematic experiences (fluctuations). For example, Bill's journey shifts into a new pattern of emergence when he reaches his threshold of toleration in his communications with Mel. In the case of a phase transition into the next hierarchical level/degree of emergence, there is a decision to test the viability of an emerged artifact in relation to a larger aggregation of entities. For example, Mel's initial decision

to tell Bill about his business idea represents a phase transition from ‘first-degree’ emergence at Level 1 to ‘second-degree’ emergence at Level 2 (Lichtenstein and Kurjanowicz, 2010: 78–81).

An entrepreneurial journey is punctuated by a unique sequence of artifact-creating sub-processes. The elements of a sub-process operationalized in the explanation of an event are the components and subsystems of that sub-process. For example, in the case of the Republic of Tea, Bill’s decision to end negotiations with Mel can be explained in relation to the emergence of the business model, as the unit of analysis, and Mel and Bill as the interacting elements. Prior patterns of emergence also have an explanatory significance as part of the entrepreneurial journey, but involve different units of analysis. For example, Mel’s creation of the initial business idea is a prior unit of analysis and an explanatory context for subsequent interaction between Mel and Bill. How far back the researcher goes in relation to prior processes of artifact emergence depends on the research question. If, for example, the researcher wants to explain the *reluctance* of Bill to break with Mel, it might be necessary to recognize patterns of behavior associated with artifact emergence in areas of life prior to his entrepreneurial journey.

4.2. Multi-contextual and multi-level explanations

The proposal that artifact emergence should be a key unit of analysis for entrepreneurship inquiry opens up new possibilities for process theory development. One of these possibilities relates to how multiple contexts and multiple levels of analysis are incorporated into the explanation of entrepreneurial events (Welter, 2011; Zahra and Wright, 2011). The issue of how to integrate the “heterogeneous aspects of contexts” and “delineat[e] the microfoundations of entrepreneurship” (Zahra and Wright, 2011: 67) in multi-level explanations remains an important issue for entrepreneurship inquiry (Davidsson and Wiklund, 2001; Low and MacMillan, 1988; Shepherd, 2011; Welter, 2011; Zahra, 2007; Zahra and Wright, 2011). The principle challenge for multi-contextual and multi-level explanations concerns which contexts are selected and how those contexts are integrated into the explanation of an event.

Adopting artifact emergence as the unit of analysis can help address this issue by explaining how an entrepreneurial event is contextualized by the entrepreneurial journey. Multiple and multi-level contexts associated with artifact emergence in an entrepreneurial journey are combined by the mechanism of self-reflexivity in the moment of the problematized event. These contexts can be identified at the boundary interface of the entrepreneur sense-making subsystem as follows. Firstly, in the moment of the event, the entrepreneur will have an awareness of the history of endogenous dynamics, such as problematic fluctuations, associated with prior processes of artifact emergence. Secondly, in the moment of the event, the entrepreneur experiences contingent events (contexts) as information feedback from the current process of artifact emergence. Thirdly, in the moment of the event, the entrepreneur interprets contingent experience by instantiating motivational states and cognitive capabilities, which are, in part, a learning outcome of the process of artifact emergence. Fourthly, in the moment of the event, the entrepreneur evaluates contingent contexts against artifacts (means–end relationships) that have already been created in the process of artifact emergence.

If we again consider Bill’s decision to end negotiations with Bill, this event is a multi-level and multi-contextual phenomenon at the boundary interface of Bill’s sense-making subsystem. The event is a multi-level phenomenon because it involves contingent information feedback from a Level 2 social interaction network to a Level 1 sense-making level. The event is also multi-contextual because Bill self-reflexively evaluates the contingent environment (context) against the rules of Bill’s sense-making system (context) and prior events in the entrepreneurial journey (context). When an entrepreneurial event is explained at the boundary interface of the entrepreneur’s sense-making subsystem it is, therefore, possible to develop multi-contextual and multi-level explanations that reflect the dynamics in the entrepreneurial journey up until the event that is being explained.

4.3. Critical empirical events

Another implication of adopting artifact emergence as a key unit of analysis is that critical empirical events in the entrepreneurial journey are brought to the attention of process researchers. These critical events are: (1) problematic experiences (fluctuations) associated with phase transitions; (2) problem identifications (transformational events) that initiate a new pattern or new level/degree of emergence; and (3) problem-solving actions, which solve an identified problem by transforming means–end relationships and subsequently test a transformed artifact in a new pattern of emergence (or test a created artifact at a new level/degree of emergence). It is important to note here that problem-identifying and problem-solving actions are either involved in transforming a means–end artifact, as part of a transition into a new pattern/level of emergence, or in making practical changes during the process of creating an artifact. The former requires a re-evaluation and re-testing of a means–end artifact, while the latter involves incrementally developing an artifact. For example, in relation to incremental development, when Bill and Mel discuss different packaging ideas or flavor combinations, this is a refinement of the business idea and a part of the development of a practical business model, rather than a transformation of the original business idea.

The empirical operationalization of the following aspects of the emergent hierarchy, therefore, has important implications for process theory development: (1) explaining entrepreneurial events in the context of artifact emergence as the unit of analysis; (2) explaining entrepreneurial events in terms of multi-contextual and inter-level interactions at the boundary interface of the entrepreneur’s sense-making subsystem; and (3) focusing on the empirical events of problematic experiences, problem identification and problem-solving activities.

4.4. Integrating process perspectives

The explanation of entrepreneurial events at the boundary interface of sense-making subsystems not only has implications for process theory development, but also has implications for our understanding of explanatory mechanisms in the process literature. There are a range of perspectives that can be included under the umbrella of process-oriented research (Steyaert, 2007). These include effectuation theory (Sarasvathy, 2008), bricolage (Baker and Nelson, 2005), enactment theory (Gartner et al., 1992), radical subjectivism (Chiles et al., 2010), complexity theory (McKelvey, 2004), entrepreneurial creativity (Dimov, 2007), evolutionary realism (Alvarez and Barney, 2007), structuration theory (Sarason et al., 2006), social constructionism (Fletcher, 2006), constructivism (Wood and McKinley, 2010) and phenomenology (Berglund, 2007). These perspectives identify various explanatory 'mechanisms' of entrepreneurial emergence, creation and transformation, including 'effectual logic' (Sarasvathy, 2008), 'dynamic creation' (Chiles et al., 2010), 'reflexive interpretation' (Sarason et al., 2006), 'interpretive asymmetry' (Garud and Karnøe, 2003), 'opportunity tension' (Lichtenstein, 2009) and 'adaptive tension' (McKelvey, 2004). It remains, however, unclear whether or not this diverse research output can be understood as producing complementary insights into the dynamics of entrepreneurial processes.

From the viewpoint that entrepreneurship inquiry should move forward as a science of the artificial (Venkataraman et al., 2012), perspectives like effectuation and bricolage concern the explanation of entrepreneurial events by identifying "mechanisms in the making of entrepreneurial artifacts" (Venkataraman et al., 2012: 23). The emergent hierarchy of artifact-creating processes contributes to this viewpoint by offering the possibility of conceptualizing process mechanisms as complementary artifact-creating inter-level and intra-level subsystem relationships.

Effectual logic (Sarasvathy, 2008), for example, can be understood in terms of the relationship between Level 1 'ideas' and Level 2 'actions'. Sarasvathy (2008) explains that effectual logic involves the entrepreneur's experience of asymmetries between entrepreneur and stakeholder commitments to means–end relationships. This experience redraws the problem space, and cues the entrepreneur to take 'non-predictive' control of the entrepreneurial journey by altering means–end relationships in the light of contingent experience (Sarasvathy, 2008). In the context of the emergent hierarchy, the mechanism of effectual logic concerns the self-reflexive evaluation of a means–end artifact at Level 1 against the experience of contingent social interaction at Level 2. At the boundary interface of Level 1, a new pattern of artifact creation emerges when entrepreneurial decision-making evaluates the experience of problematic stakeholder interaction against decision criteria, such as affordable loss (Sarasvathy, 2008: 90).

Bricolage, on the other hand, focuses on the path-dependence of artifact emergence. Garud and Karnøe's (2003) application of bricolage theory to technological entrepreneurship, for example, concerns a collective process in which multiple actors embody and embed 'agency' in the artifacts, tools, practices, rules, knowledge and learning of a 'technological path' (Garud and Karnøe, 2003: 280). In the context of the emergent hierarchy, this technological path is a process of artifact emergence at Levels 2 or 3 that constrains and enables problem-solving and learning processes at Level 1 through endogenous information feedback. While effectual logic focuses on decision-making at Level 1, bricolage focuses on the explanatory significance of artifact emergence at Levels 2 and 3. Both perspectives are distinct, but complementary, when viewed through the lens of artifact emergence. The emergent hierarchy of artifact-creating processes, therefore, has implications for evaluating the relative explanatory significance of a range of process perspectives.

5. Conclusion

In this article, we have taken up Venkataraman et al.'s (2012) proposal that entrepreneurship inquiry should move forward as a science of the artificial by considering the significance of hierarchically organized artifact-creating processes for process theory development. We have argued that the ability to conceptualize the entrepreneurial journey in terms of hierarchically organized patterns of artifact emergence contributes to our understanding of the endogenous, self-causing, context-creating, self-organizing and path-dependent dynamics of venture creation. In particular, we have explained how the emergent hierarchy of entrepreneurial artifact-creating processes has implications for units of analysis in the development of multi-contextual and multi-level explanations of phase transitions in the entrepreneurial journey. Although the notion of an emergent hierarchy of entrepreneurial artifact-creating processes is in its infancy, we hope we have made some thought-provoking suggestions concerning how the work of Herbert Simon (1996) and complexity science concepts more generally might impact on the future direction of entrepreneurship process research.

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