

**Sustaining entrepreneurial business; a complexity perspective on processes
that produce emergent practice**

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Sustaining entrepreneurial business; a complexity perspective on processes that produce emergent practice

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Abstract

This article examines the management practices in an entrepreneurial small firm which sustain the business. Using a longitudinal qualitative case study, four general processes are identified (experimentation, reflexivity, organising and sensing), that together provide a mechanism to sustain the enterprise. The analysis draws on concepts from entrepreneurship and complexity science. We suggest that an entrepreneur's awareness of the role of these parallel processes will facilitate their approaches to sustaining and developing enterprises. We also suggest that these processes operate in parallel at multiple levels, including the self, the business and inter-firm networks. This finding contributes to a general theory of entrepreneurship. A number of areas for further research are discussed arising from this result.

Key words:

Entrepreneurship; complexity theory, emergence; sustainability

This article derives insights from complexity theory into the managerial processes that presaged the emergence of new business models and organisational structures in an established entrepreneurial small firm in the airline services industry. By means of an in-depth qualitative case study, we identify four dynamic managerial processes (experimentation, reflexivity, organising and sensing), inherent in the everyday practice of the management team, and in particular the Managing Director as he made strategic choices to remain 'fit' in a fast-moving industry. Although this study is limited to one case, we conclude that the dynamic processes we have identified provide insight into the sustainability of entrepreneurial firms over time. Better understanding of these processes may support entrepreneurs and their stakeholders manage the sustainability of the firm.

The paper commences with a discussion of the application of complexity theory to entrepreneurship. This is followed by the case study where we ground the theory in an empirical study of entrepreneurial practice: a longitudinal analysis of an entrepreneurial firm, FlightDirectors, which is sustained through the creation of a new business models and structures at critical junctures for the firm and the industry. Finally we present our conclusions as to the practical and theoretical implications of our study. In this we contribute to theory by proposing that the processes identified helps to explain the mechanism by which the agency of entrepreneurship produces (new) structures, as well as raising questions for further research.

Complexity Theory, Entrepreneurship and Emergence

This section begins with an introduction to key concepts in the linkage of complexity theory to the study of entrepreneurship. The Schumpeterian notion of creative destruction is highly resonant with complexity theory – a study of order-breaking and order creating

processes. The potential value of emergence, a central pillar of complexity theory, as an organising concept for theorising entrepreneurship is highlighted here, relating as it must to the production of novelty – new firms, new products, new processes, new business structures and new firms.

Complexity has been a focus for research into biological and physical systems since the 1950s. McKelvey (1999a) identifies the origin of complexity research in Prigogine et al (Prigogine & Stengers, 1984; Nicolis & Prigogine, 1989) work on dissipative structures, which seeks to explain the emergence of order in the physical and biological sciences. Complexity research has since become a broad church (Stacey, 2003; Burnes, 2005; Houchin & MacLean 2005) with applications in the social, management and organisational domains, not just in the sciences; Lichtenstein (2000a) has identified 13 schools of thought in complexity research that have arisen since those early days, each with its own portfolio of methodological and theoretical concerns that he suggests have all been used to generate insights by management theorists. While there is a diversity of approaches, most researchers would agree that open, dynamic, non-linear systems provide a better basis for theorising about order creation than linear mechanics (Lichtenstein & Mendenhall, 2002), based mainly on the influential work of the Santa Fe Institute (Lewin et al., 1999). The emergence of order in any system is seen as a co-evolutionary process arising from the interaction between heterogeneous agents in the system and is characterised by constant change, mutual dependence between agents (Holland, 1998; Lichtenstein, 2000b) and sensitivity to initial conditions (Gleick, 1987).

Computational modelling can illustrate this perspective for simple rule-based systems, demonstrating how order can arise in an unpredictable manner, as agents in the system interact with each other: a classic example, the flocking of birds can be observed in an holistic sense as ordered patterns that emerge from aggregate individual behaviour. More

complicated mechanisms and outcomes can be modelled in the 'complex adaptive system' (CAS) approach, where agents may adapt their behaviour by changing their rules as experience accumulates within the model (Holland, 1998).

The potential resonance of complexity theory with organisational life has been viewed by both academics and practitioners as a means of understanding organisations; this has led to the design of organisational strategies and the launch of change programmes (Lichtenstein 2000b; Stacey et al, 2002; Burnes 2005; Houchin & MacLean 2005; Lichtenstein et al 2006). As Burnes (2005) notes, while the origins of complexity theory are in mathematics, organisational complexity researchers have taken a linguistic turn, where complexity concepts are used to create a metaphorical language for change and development (Lissack, 1997), rather than computational modelling. Stacey's (2003) 'complex responsive process' (CRP) approach develops this further, recognising the significance of narrative processes, ideology and power relations in achieving organisational outcomes.

As part of that broader movement, the salience of complexity theory to understanding entrepreneurship is becoming recognised (Fuller & Moran 2000, 2001; Lichtenstein 2000b; McKelvey, 2004), recognising the importance of both non-equilibrium systems and multiple levels of analysis in entrepreneurship research. Although different conceptual approaches are taken, it is clear that the emergence of order is a central organising principle for these authors. McKelvey (2004) argues for complexity science as the very basis for entrepreneurial research, with the emergence of order in pre-equilibrium conditions at the heart of the analysis, rather than classical Darwinian evolutionary approaches, which he argues are inadequate due to their inherent reliance on equilibrium conditions. In his analysis, McKelvey (2004) contends that this approach is consonant with the creative destruction of Schumpeterian entrepreneurship (Schumpeter, 1934), where entrepreneurship is defined as discontinuous change that destroys economic equilibria. As old orders are

destroyed, new economic ‘orders’ such as new firms, products and organisational innovations are created in contexts that are far from equilibrium.

In this context, emergence is a powerful trope for the way novel structures come into being. In general terms, conjunctions of forces can produce an outcome that is more than, or at least behaves differently from, the sum of its constituent parts (Mill, 1843). Current use of the trope is informed by systems theory and in particular by the concept of emergent structures (Nicolis & Prigogine, 1989) in the *New Science* of complexity (Maguire & McKelvey 1999), after (Gleick 1987). For Holland (1998) emergence is “above all a product of coupled, context dependent interactions” (p122). McKelvey (2004) highlights the significance of the concept of ‘adaptive tension’ as a driver in the emergence of order; adaptive tension occurs when an energy differential arises in system, generating a disequilibrium that pushes the system to re-order from a current state. In this vein, Lichtenstein (2000c) identifies ‘threshold events’, where an entrepreneurial venture is pressured, due to, say, fiscal concerns. Once a critical threshold is reached, non-linear self-organising processes will occur, initiating the spontaneous emergence of new levels of order in the system. At this point, new organisational goals, structure and strategy will result, a new ‘attractor’ in complexity terms (Lichtenstein, 2000b).

The literature on entrepreneurship includes notions of emergence, in particular the emergence of new enterprises, for example, (Katz & Gartner, 1988; Gartner, 1993; Fischer et al, 1997; Fleming & Sorenson, 2001; Garud & Karnoe, 2003; Busenitz et al, 2003). This literature tends to focus on a) new start-ups and b) what emerges and when, rather than on the dynamic processes and conditions that produce the emergent properties (Lichtenstein et al, 2006). For example, in attempting to articulate the features of an ‘emergent organisation’, Katz & Gartner (1988) after McKelvey (1982), proposed that the defining features of emerging organisation were intentions, resources, boundaries and exchange. That model, as

such, does not produce a theory but shows how consideration of different ontological domains (“intentions” being conceptual, “resources” being real, “boundaries” being linked to the firm and “exchange” being inter-firm), and the connections between them, is relevant to theorising emergence. As they acknowledged (p433), Katz & Gartner’s attempt to objectify regularities failed to identify the processes producing regularities. As Low & McMillan (1988) point out, to understand entrepreneurship, one needs to understand process, context and outcomes, or “[how] strategies are constructed, moulded and adapted in processes of interaction with environments” (Aldrich & Martinez 2001, p 520).

More recently Lichtenstein et al, (2007) have developed a more processual understanding that does emphasise dynamism and process. They note the linear perspective of much of the extant new venture creation literature, suggesting that complexity theory provides a better approach than the traditional attempts to make causal linkages between specific activities particular outcomes, such as new firm registrations. Because of the lack of consistent findings in studies on the types and sequences of events that lead to emergence, Lichtenstein et al (2007, p. 238-40) moot that organisational emergence should be examined “at a more general level by examining *patterns* of new venture creation activities, rather than focusing on specific organising activities themselves”. Organising for new venture creation, they argue, is likely to be non-linear and temporally complex, with highly interdependent sets of activities occurring together (see also Meyer et al, 2005). The outcomes of this study supports the insight from complexity theory that organisational emergence requires a ‘scaffolding’ of interlinked components that build a momentum for emergence within the system that triggers (re) organisation after a critical threshold has been reached in conditions of adaptive tension. Lichtenstein et al note the importance of entrepreneurial learning and knowledge creation during and leading up to emergence, suggesting that entrepreneurs must combine advanced thinking processes and time- and life-management skills, sustaining a

multi-dimensional focus for many months at a time – and by implication, a high degree of entrepreneurial competence.

Methodology

The Search Space for Processes and Pattern

By taking a complexity theory perspective we are driven towards a methodology that is sensitive to the creation of patterns via explicit processes, which are inherent to the environment in which the actors are situated (i.e. are self-organising and not exogenously imposed per se.). We suggest that complexity theory has the potential to provide insights into entrepreneurship, most powerfully through the notion of emergence driven by adaptive tension, with change (in patterns) occurring as critical thresholds arise. Lichtenstein et al (2007) provides convincing evidence that interdependent patterns of wide-ranging entrepreneurial activities, rather than individual acts such as creating business plans, are also significant in initiating processes of emergence. Our methodological search space for processes necessarily needs to be open to multiple activities extended over time. The space also needs to include multiple actors and the relationships between them. Consonant with Fuller & Lewis (2003) and Stacey (2003) we believe that the everyday sense-making processes of the central entrepreneur(s) are socially mediated and situated in the social context of the firm, its relationships and its networks. This is not to diminish the role of the individual; certainly the importance of the entrepreneur to the outcomes of a particular small business has been extensively delineated (Carland, et al. 1984, p356; Hornaday, 1990). However, we must take into account the management of the relationship between the small entrepreneurial firm and its immediate stakeholder environment.

Our methodology is also intended to develop recommendations for practising entrepreneurs, i.e. to have a normative dimension. While complexity theory suggests that it is not possible to predict or determine outcomes in advance, like Snowden (2002) and Stacey (2003) we believe that understanding how meaningful patterns of behaviour emerge can enhance the likelihood of desirable outcomes through increased management competence. In doing so, it is necessary to take into account the agility and foresight required by small, entrepreneurial firms to sustain their existence through flexible responses to uncertain environments. By and large, unless a firm controls the entrance of a disruptive innovation (Christensen, 1997) into the market, there is little possibility of effecting large scale structural change in the business environment. Typically then, entrepreneurial management practice in a smaller firm cannot be teleological: the firm is unlikely to have the power to achieve a particular stated goal. Entrepreneurs have to act on contingency, where strategy is what is possible in an environment where the future is unpredictable e.g. (Sarasvathy, 2001), dominated by large firms and fast-moving technological and industrial standards that co-evolve in complex non-linear ways (Garnsey & Heffernan, 2005).

The Case Study

FlightDirectors Ltd. was established by two founders in 1984 to provide brokerage services in the air travel industry. The business started in the garage of one of the co-founders. The business activities have changed significantly over its life. In September 2001 with over 100 staff in a UK airport location and in central London, it was chartering two 737 aircraft, brokering charter flights and running a multi-customer overspill ticketing call centre. The brief history is:

- 1st July 1984 Business started with three people brokering between airlines and holiday tour operators
- 1987 Consolidation in industry removes customer base, a growth relationship established with one major client, opportunity driven growth
- 1992 Four separate business units operating, none of which were brokering as in 1984, millionth passenger
- 1993 Deregulation negated brokerage role and “everything began to unravel”, downsizing to two business divisions
- 1994 Introduction of management support framework for niche brokerage activity driven by individual projects
- 1996 Introduction of operational managerial structure and strategies formed from this, based on orientation of the operational managers.
- 2000 Two divisions created and call centre established
- 2001 pre September 11: over 100 employees, ticketing call centre and a branded charter service with two 737 aircraft. Post September 11, charter service in liquidation, call centre survives only at 11th hour.
- 2001-2007 The business continues in a highly dynamic and competitive environment, with around one hundred staff providing general sales agency (a trade norm) and overspill ticketing call centre. Two founders, including Argyle, still own the company (currently registered as Flight Directors Scheduled Services Limited).

FlightDirectors was a suitable case for study because an airline brokerage business has to innovate to remain ‘fit’ within the business environment, by restructuring or the establishment of new corporate ventures. This is because it has little power or influence over supra-national events that have the potential to threaten the survival of the firm unless

decisive managerial action is taken, typically over relatively short timescales. For example, the effects of terrorist action on the demand for travel, the continued opening of trading regulations, direct internet bookings and air-crashes are all features of the landscape outside the control of the firm.

The Use of Analytical Narrative

Qualitative data has been collected over a 5-year period from a number of sources. The primary data source was a reflective account produced by Paul Argyle, one of the original founders of FlightDirectors and currently owner and Managing Director of the company. Argyle's self written historical account and analysis of entrepreneurial management in FlightDirectors, which included interviews with others in the managerial team, was presented as a Master's dissertation in 2000 (Argyle 2000). After this publication, extended collaboration has continued between the subject and the researchers, through interviews, further notes, Weblogs and informal discussions up to the present day; this included visits to the company premises and meetings with members of the senior management team and other staff. The narrative produced in the dissertation and further notes were re-analysed by the researchers from the perspective of the 'foresight' inherent in accounts of change in the organisation, in relation to strategic decision making. By foresight we mean the ways in which changes were anticipated, planned and/or brought about.

A very significant driver in this project was that practically relevant knowledge should be generated as well as a contribution to the entrepreneurship and complexity literature. Thus a 'mode 2' ethos was prevalent throughout (Starkey & Madan, 2001).

The approach to grounding our theoretical analysis in empirical data was an iterative process between deductive theory and a gradual understanding of process through mainly inductive means. Throughout the study period, both inductive and deductive approaches

have been used: inductive analysis, explicitly informed by extant theory. Thus, in Argyle's original dissertation, he used a set of extant concepts as an analytical framework. These were drawn from literature on entrepreneurship and small business integrated with concepts drawn from complexity theory. Specifically these were

I) A conception of hierarchical ontological or systemic levels drawn from Fuller & Moran (2000, 2001) which Argyle operationalised analytically as: 1) Individual cognitions/mental models/constructs/values, 2) Individual capabilities/motivations, 3) Internal 'functional' activities/relationships, 4) Business Model (concept/strategy/vision), 5) Business to Business relationships, 6) Networks/clusters/micro-economies, 7) Industry/Macro economic factors.

II) Metaphors from complexity science, namely bifurcation (in this case synonymous with critical points of change) adaptive tension (in this case synonymous with motivations / incentives / imperatives to change), attractors (in this case synonymous with a dominant logic or organising principle) and rules (in this case normative ways of doing things or expectations that people had).

These concepts were used by Argyle in his historical analysis of the firm, to analyse, from the point of view of understanding strategic foresight, in what ways changes in company strategy emerged: were they anticipated or endogenously initiated, or were they imposed by exogenous forces; further, where, within or between the multiple layers, did such foresight reside? Was it possible to detect general dynamics of emergence operating across or between the ontologies?

Having described events at critical points in the firm's history (critical events and changes in path i.e. bifurcations) through this conceptual framework, Argyle reflected on the rules that appeared to pertain to behaviour linking one level or ontology with another. For

example, linking functional activities with vision or strategies, or linking the business with its stakeholders. His evidence showed that different ‘rules’ or heuristics or ways of doing things, applied in different divisions of the business, i.e. the nature of the dynamics related to context and to the people involved.

This extensive self-analysis was then re-analysed by the co-authors, along with further discussion with Argyle and further observations of his business in practice. This re-analysis, shaped by Argyles narrative analysis, by extant theory and by longitudinal observations of Argyle and the firm, identified a small number of different processes that appeared to produce the reformulated business that emerged over time. These processes, under the acronym EROS (experiments, reflexivity, organising, sensitivity) are discussed below in relation to the case study and to extant theory.

Findings and Analysis

Enforced agility

The path of FlightDirectors appeared to be entirely composed of the disruptive effects of environmental changes to their contemporary way of doing business, a phenomenon Argyle later called “enforced agility”. These included technology-mediated structural changes in the industry, such as the shift to direct booking over the Internet, or quick-response to wider events, such as changes in flight cargo transport requirements to new areas following the tsunami disaster in 2004. This did not conform to established models for strategic planning in the literature. The directors did not appear to have the cognitive prescience that Schumpeter (1934) or Whitehead (1929) ascribe to successful organisations. It cannot be said that the business exemplified Pathfinding (Turner & Crawford, 1994) competences in its everyday approach to business. It did not routinely or explicitly undertake

formal foresight activities, such as scenario planning, it was not able to assess the “total impact of any particular change” that strategic awareness assumes (Gibb & Scott, 1985). Nor was there evidence of the “highly visible vision of the future” that Hamel & Prahalad (1994) associate with Strategic Intent.

What the firm did was to repeatedly create new initiatives or projects, some of which survived to become distinct businesses and some of which did not. In time, some of FlightDirector’s experiments have become the “future” business, though it was not clear at the time that they were established. However, such instances do not fully explain the sustainability of the firm. That sustainability is, we suggest, more bound up in the commitment of the founders, in an existential way, to an ongoing interwoven life story of the firm. The motivation to survive and maintain this identity has been resilient to the huge environmental or systemic changes that the firm has experienced. Sustainability has not been achieved through pure opportunism however. While particular business units have been created on the basis of opportunities, the meaning of these opportunities has been interpreted within the overall coherent direction of the founders, which is to be independent and part of the airline industry.

Processes of Re-Creating the Business; Processes of Emergence

The sustainability of the Flight Directors arises from the episodic production of new patterns; such as new identities, new services, new forms of organisation, new stakeholders. The emergent forms of order had precedent. The prescience of these changes was in the form of experimental behaviour and the sensing of a changing environment – often through relationships with key informants, sometimes within their normal sphere of business and sometimes from an external source. The ordering of new patterns into day to day practice

came through an emergent realigned sense of identity and plausible working practices around an organising principle.

These four inter-related processes (**experiments, sensing, identity and ordering practice**) and the empirical and theoretical bases for the framework are discussed below.

Experimental behaviour

Baum (2003) notes the lack of empirical studies of experimentation among entrepreneurs, where rapid change is needed and information is poor. This is an area that might benefit from more empirical research, as we observed experimentation to be highly significant in the sustainability and development of the firm. Experiments were observed as a range of diverse exploratory behaviours at any one time in the firm. Throughout Argyle's narrative of the firm's history (Argyle, 2000) is the sense in which new things were being tried out, often in very informal ways. There is a sense in which social interactions were used to search for and examine possibilities for new activities which might be formalised as experimental projects if judged to hold promise. If these worked, they were built upon. If they didn't work they were changed or dropped.

The projects or reorganising of activities were relatively small scale and were talked about in terms of seeing what would work. Each experiment had at its core an actor – either a particular member of the management team or a particular customer or supplier. Thus there is a sense of a shared experiential learning going on between these actors and the other people involved; assembling and legitimising practices. Two examples of 'experimentation' are (i) the approaches to responsibilities of the management team and (ii) the introduction of call centre division based on technologies well in advance of the industry.

With regards to management, from at least 1993, and certainly from 1996 is evidence that Argyle and his co-director saw themselves as providing the conditions for operational management to create business. By 2000 this had become more formal. Argyle's description

of this is *“New ideas for businesses are conceived and allowed to be developed by teams which form around the new advocates of those ideas”* The process also engaged external stakeholders: *“the idea is developed, in theory or on a small scale, and then appropriate partners are found”*. The outcome of one particular example of this, said Argyle, was that, *“This division focuses [...] on a new relationship with a large Spanish airline”*.

The second example, the introduction of call centre technology, is brought about by opening new dialogues with technology suppliers keen to support ‘experiments’ in the industry. The act of collaborating, in itself, was a further ‘experiment’. The attitude towards the testing of the process is articulated by Argyle, when he said:

“The business relationship with [supplier] is very special with this business partner investing effort and resources... This ‘open-ness’ to participation and help from external sources is a new characteristic of [the division] and the success or failure of the experience ... may well determine whether it [collaboration] becomes a permanent trait.”

All new projects described by Argyle shared two qualities, one was the ‘lets see if it works’ approach and the other was that they were created because of an anticipated need from the close stakeholders. Some experiments worked and some did not.

Reflexive construction of identity

The significance of identity was observed from Argyle’s narrative as ever changing descriptions of self, the firm and the industry, in which were constituted motivations, roles, daily practice and behavioural imperatives. Reflexivity describes the process by which the

individual constantly assesses the relationship between ‘knowledge’ and the “ways of doing knowledge” (Calás & Smircich 1992, p240). Reflexivity links the cognitive domain of the individual to their experienced environment which for the entrepreneur, includes the everyday practices of doing business with others. Argyle, as shaper and decision maker influences the emergent structures of the firm and the context (Fuller & Lewis, 2003).

A continuous reflection on the identity of the firm and the self-identity of its owner(s) through the discourses within the business and with stakeholders was central to the direction and identity of the firm, as well as the entrepreneur. Lounsbury & Glynn note (2001, p554) that a key challenge for an entrepreneurial firm is “to establish a unique identity that is neither ambiguous nor unfamiliar, but legitimate”. Downing (2005) goes further, suggesting that individual, collective and organisational identities are co-produced over time through narrative and dramatic processes. For Stacey (2003, p. 319), strategy is the evolving patterns of an organisation’s identity. Thus, an inability to reshape organisational identity puts the future at risk for the firm. This does *not* mean that the FlightDirectors was chameleon-like, able or willing to change their more fundamental values. Paradoxically, it was the underlying strength and continuity of the basic values and self-identity of the founders that sustained FlightDirectors Limited through the various manifestations of the firm. For a small firm, the entrepreneur is more central and hence we have found that their sense of self-identity is more directional and indeed more significant than for a manager in a larger organisation. The close identity of Argyle and his fellow founder to the airline industry has maintained the business when it might otherwise have ceased to exist.

There are two constant themes in the historical analysis of the case. The first is the Argyle’s sense of being something in the Airline industry – an enduring sense of self-identity which is also manifest in the internal discourses of the management team. Second, a constant re-appraisal both of Argyle’s role and also just what the business was, in relation to the

industry. Argyle mentions working in his garage when the business first started, and how he symbolically separated leisure-time and work-time “*by putting on a suit each morning and removing in at the end of the working day*” and at the time “*The Founder [Argyle] was the salesman*”. Much later in the life of the business Argyle sees himself as “*chairman*”, stepping back to let other “*grab contracts*”. The business itself is described as a broker, then an agency, then a service company, then two different kinds of business, then one kind of business again... and continues to change. These descriptions fitting a broad idea of what it actually does as its business opportunities unfold into daily practice.

Organising Domains

An organising domain is a space where activities are organised around a dominant logic. Lichtenstein links activity domains, which “guide organizational activity and also prescribe limits to the system's capacity to get the work done” with “organizing domains,” which in his studies of successful young businesses emerged rapidly in a self-organizing process, e.g. “*Once agreement for a new mission had been reached, a new set of organizing domains rapidly emerged to implement that goal*” (Lichtenstein 2000c, p 128). The idea of what constitutes an organising domain is not developed further by Lichtenstein. It seems to us that organising domains produce observable everyday practices and that this production is a process of social construction. That is to say, as people unite their activities around a dominant logic, a pattern is established by virtue of negotiated activities between those involved.

Lichtenstein (2000b) shows how in each of four high technology business start-ups the business model had to be changed several times before becoming stable, not because a particular pattern was unstable per se, but because it was designed relative to an unstable and unpredictable environment. The reshaped behaviour pattern of the enterprise is, according to

Lichtenstein, an “emergence from a process of self-organizing” that created repeating and amplified behaviours around the “dominant logic”. Stacey too argues for the importance of self-organising (Stacey, 2003, p 332-333): complex understandings of organisational life requires that managers are viewed (and view themselves) as participants in self-organising processes where conditions enable and constrain the interactions between agents in the system. Stacey also notes that the organising that leads to the emergence of novelty is not the province of separate individuals on their own, but an overall pattern of relationships that is organising, the system and its agents emerging together in a reflexive manner, simultaneously constraining and being constrained by each other in contexts where narratives and power relations form the ‘dominant logic’, that is, the analogues of attractors in Complex Adaptive Systems (CAS) terms.

Within the narrative history of FlightDirectors are several examples of reorganising the firm. In each case, there is first a sense of interpretation of a changed situation followed immediately by a conclusion about the necessary form of the business. For example, in the early days of the business is the phrase “*we only had one customer left, so we decided to concentrate on him*”. Later in the history, after another downturn, Argyle records: “*the difference between the current state and more desirable state was a vastly slimmed down business, fewer people, fewer transactions, less office space, less management...*”. And later still (in a more successful period) “*Returning to profitability owed more to the internal mood rather than any external event or trend*”.

After Fuller (1999), Argyle learnt during the period of the study, to use the idea of an ‘attractor’ to understand and establish new scenarios in response to environmental threat and opportunity. After a crisis, the business would reform around sets of personal commitments and new practices, which would become entrenched and amplified through relationships with stakeholders and formalisation of internal social processes such as business plans, titles and

physical locations. Patterns tended to emerge around leaders in the organisation, as the need arose to build a new 'attractor', that is a match between new internal projects and external expectations (of customers, suppliers, and at the industry level, new trends and standards).

Efficiency is often attained through regularity of practice. In volatile or high velocity landscapes in particular, the speed at which new regularised practices can be put into place contributes to the sustainability of the enterprise. The tension between innovative (pattern breaking) practices and recurrent practices (maintaining patterns) requires managerial judgement. The space of an organising domain involves discourses between individuals in order to constitute efficient practices, and is shaped by the effectiveness of those practices in relation to the competitive landscape and in particular by its resonance with stakeholders. It is thus formed across the levels of the model in but is constituted through the inter-connections of identity, skills and motivations, task efficiency and meaning or value in relationships both internally and externally. The wider industry environment too, acts as a source of both opportunity and constraint.

Sensitivity to conditions

An observable outcome of a firm's or individual's sensitivity to conditions is a propensity to reshape their relationship with the salient actors. We see this as inherent to a process of emergence, in that the interpretation and perception of differences in the landscape provides both meaning and imperatives to organising activities. From this particular case study we note two significant aspects of sensitivity: (i) the threshold of unplanned change (internal or external to the firm) that triggers a reorganisation of activities (change in regularities) (ii) the timing of the instigation of breaks to regularities. The first of these implies that the capability to detect difference is a significant competence. The second aspect concerns the relative imperative (motivation or incentive) to change, which we

suggest may account for the threshold at which change is triggered and the rate at which it takes place. These two aspects elaborate the ‘critical value’ metaphor drawn by McKelvey (1999b) from the natural sciences (Bénard cell), and Lichtenstein’s description of threshold events.

In this particular case, the evidence of ‘sensitivity to conditions’ came from Argyle’s accounts of the periods of transition or bifurcation. In particular, the management team’s awareness of changes in the environment and in the business itself, and their own translation of this awareness into acting, i.e. what it was that made them change. The evidence suggests that the management were highly aware of changes in the external environment and also of the cash-flow and profitability produced by the business model. The main issue for this business seemed to be mainly one of enacting new patterns, and more particularly breaking existing ones. As the business became more established it seemed to take longer for such decisions to be enacted. For example with hindsight in 2000 the Financial Director said of a period in 1993 “*Everything was beginning to unravel, there were so many things we should have done...*” while Argyle reports of the same period, “*The consensus at a number of Board meetings, and as discussed openly within the company, was that sooner or later the organisation needed to radically review its future strategy if it was going to survive. The decision to do this was not reached for six months.*” The way in which changes were interpreted and the clarity of a desired future (vision) made a difference to the emergence of new regularities of practice.

Inter-connectedness of processes of emergence – an entrepreneurial mechanism

Four processes (EROS) are identified above that interact to produce new emergent structures, such as a new organisational structure (changes in the responsibilities of the management team) or a new corporate venture (the new call centre). In this case the

influence of the individual entrepreneur (Argyle) on the shape of the business through its life is significant. This shaping takes place in a social context of relationships with colleagues, customers and other stakeholders, all within the landscape of the airline industry. The centrality of the relationship between an individual and their environment in these processes leads us to argue that this explanation is synonymous with accepted notions of entrepreneurship. That is, where a particular individual is seen as central to the explanation of the organisational practices that are formed.

Although the above four processes of emergence (experiments, reflexivity, organising and sensitivity) are described distinctively from one another, it is evident that they are inter-related. For example, the formation of experiments can have strong aspects of identity and vision attached to their inception, (and vice versa). Similarly the motivation to change and the interpretation of environmental signals are informed by the power of existing organising domains and self-identity. There are also inherent tensions between the processes, for example between the ordering of practice and the flexibility of experimentation. Such tensions are not polarised, and can be understood as part of a dialectical production of outcomes. Taken in totality, these four areas of process provide an entrepreneurial mechanism, i.e. a set of processes that together produce novel and emergent structures.

Discussion: Complexity and Entrepreneurship, Theory and Practice

EROS as an Entrepreneurial Mechanism; Emergence in Multiple Ontologies

The EROS model reveals processes of the emergence of novelty, which is at the heart of entrepreneurship: evolving entrepreneurial and organisational identities, new management structures and organisational forms, and a new corporate venture. Like Lichtenstein et al (2007), we emphasise the importance of interdependent patterns of behaviour resulting in

(re)organisations and novel structures at critical junctures in the firm's trajectory, rather than linear sequences of individual acts.

What emerges from the (EROS) processes can be identified at more than one ontological level. A simple example of empirical ontologies in entrepreneurship might be the individual, the firm and the network. Analytical ontologies include psychological, social, behavioural and economic. For example, experimentation takes place at the cognitive level (thought experiments), behavioural (trial and error), relational (joint ventures); identities can be formed at the personal, organisational or inter-organisational level (e.g. communities of practice); organising domains and sensitivity to change are also processes that transcend particular disciplinary and empirical ontologies. Each process inter-relates with others through multiple ontologies. For example, a thought experiment, might be discussed with colleagues, and then with someone in the network, resulting in the construction of an idea upon which some action is taken – i.e. experimentation and identity creation transcending disciplinary domains in the process of the emergence of a new venture. Overall, the emergent pattern forms what, in complexity parlance, is called an “attractor”.

This characteristic of the same general processes at different but related ontologies, leads us to consider that the processes have a global significance, i.e. that they might also help to understand emergent properties at other levels in which the owner and firm are situated. Taken in totality, these four areas of process provide an entrepreneurial mechanism, i.e. a set of processes that together produce novel and emergent structures. The mechanism conceived thus transcends theories bound in disciplinary ontologies. Thus while managerial practices instantiate these processes in any particular context, awareness of the power and necessity of the general set of processes provides guidance for strategic action at multiple levels and in coherently inter-connected processes.

EROS and Management Competence

Over the period of study, we have found that for FlightDirectors, EROS is linked to managerial competence in relation to the sustainability of the firm, and as such can provide the basis for recommendations for management practice, that is, guidance on practices that generate and exploit novelty in organisations. In our analysis the ability to maintain systemic fitness is a function of entrepreneurship expressed as:

- (a) the number and quality of **experiments** that deal with “weak signals” of opportunities
- (b) the quality of **reflexivity** (the way that the conceptualisations of identity (entrepreneur and firm) are able to transcend external structural changes in the business environment)
- (c) the capacity to restructure patterns of behaviour around the dominant logic of the **organising domains**.
- (d) the **sensitivity** of the entrepreneur to changes in business conditions and their willingness to act on their interpretations

Each of these processes is discernible to the actor, is manageable and is an areas in which competence can be developed.

It is necessary then to not only understand and use EROS as a set of processes where managerial competence can be increased, but also to organise EROS around the concept of attractors. The role of leadership embraces the building of consistency and value around emerging attractors. While in general the concept of attractor might be considered weak in its normative sense, being descriptively morphological, it is much stronger when considered as a performative organising principle for the EROS processes at multiple levels. The construction of identity, narratives, structures and patterns of behaviour formed on market-

resonant principles is the construction of regularised performances, and hence an attractor pattern.

We suggest that our study contributes to managerial competence in three ways. The first is conceptual competence, derived from giving meaningful dimensions to abstract metaphors of complexity. The use of metaphor is both unavoidable and necessary for management practice, and part of the “linguistic turn” (Burnes 2005) that accompanies complexity theory into managerial practice (Fuller and Moran 2000; Lissack 1997; Stacey 2003). The second is strategic competence, as the theory enables purposeful practice with the goal of organisational sustainability to be designed and evaluated. The third is reflexive competence, i.e. agility or foresight, through practices that turn external signals into internal structures manifest as everyday activities.

5. Further research and summary

The authors are tentative in putting forward this challenging set of ideas based on what appears to be one case study, which itself is highly reflexive in that the data is imbued with the language of complexity theory. However, the work has been through a number of iterations and further work is in progress that appears to support the general direction. There are a number of areas for further research; we suggest six major themes below.

One strong test of the normative value of the work will be the extent to which entrepreneurs find the model and the ideas behind it of value in their everyday management of sustainability. To this end, action research in entrepreneurial reflexivity, engaging with a variety of entrepreneurs is necessary. Secondly, the case reported is based on an established SME. Given the generic claim for the model with regards to the emergence of new ventures, the processes need to be investigated in other entrepreneurial contexts, i.e. the effect of variety. For example, what meaning or resonance do they have in relation to start-ups or to

corporate venturing? Thirdly, the concept of emergence itself, and the underlying ideas of less teleological causes, as inherent in theories of becoming or effectuation needs further conceptual and theoretical development. Fourthly is the idea which emerged in reviews of this article of the fractal relationship of similar processes at different ontological levels. This requires greater attention to the inter-relationships between ontologies encompassed by the entrepreneurship literature. Fifthly our data indicates that part of the story of the emergence of novelty is the role of external sources play in developing 'new combinations' i.e. the use of cross-over from existing structures to new structures, or to new stakeholders or to assimilate knowledge which is non standard to the industry. As a source of experimentation and sensitivity to conditions, resources used from outside the everyday experience or relationships of the firm to produce emergence needs further investigation. . Finally, inherent in analyses of reflexivity, variety, emergence, effectuation, cross-over, co-evolution, etc. are the creative powers of tensions and sensing, which could be further researched in entrepreneurial contexts.

In this article we have explained entrepreneurship as producing the emergence of novelty through processes acting across multiple levels of analysis. Drawing on complexity theory, we have provided explanatory theory of an entrepreneurial mechanism. We have also offered suggestions to improve management competence in entrepreneurial small firms that is centred on the entrepreneur, considers the relationships of the stakeholder environment and considers how strategy emerges in uncertain and unpredictable environments. In doing so, we have bridged the literatures on foresight and strategy in the entrepreneurship domain and provided knowledge of the way that entrepreneurs can translate their relationship with the environment into a sustainable organisational performance.

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