Examining the Strategy Development Process through the Lens of Complex Adaptive Systems Theory.

Abstract

The development of strategy remains a debate for academics and a concern for practitioners. Published research has focused on producing models for strategy development and on studying how strategy is developed in organisations. The Operational Research (OR) literature has highlighted the importance of considering complexity within strategic decision making; but little has been done to link strategy development with complexity theories, despite organisations and organisational environments becoming increasingly more complex. We review the dominant streams of strategy development and complexity theories, our theoretical investigation results in the first conceptual framework which links an established Strategic Operational Research model, the Strategy Development Process (SDP) model with complexity via Complex Adaptive Systems (CAS) theory. We present preliminary findings from the use of this conceptual framework applied to a longitudinal, in-depth case study, to demonstrate the advantages of using this integrated conceptual model. Our research shows that the conceptual model proposed provides rich data and allows for a more holistic examination of the strategy development process.

Keywords: Strategy Development Process; Strategic Planning; Complexity Theory; Complex Adaptive Systems (CASs); Systems Thinking; Education.

Introduction

Contemporary strategy development is a multi-activity process, which requires input from a variety of people within the organisation who come from different backgrounds and disciplines (Hodgkinson et al. 2005; Stenfors, 2007). It is well established in the literature (Eisenhardt, 1989b; Stacey, 1995; SubbaNarasimha, 2001; Grant, 2003; Bennet and Bennet, 2004) that constant change in the external environment and evolving organisational structures make strategic development an increasingly complex process. The standpoint of this article is that, if developing strategy is a complex issue involving complex organisations in complex environments, then it would make sense to consider the integration of Complexity Theories, in order to better understand the strategy development processes, as preparation for the development of practical models and tools.

To explore this we have posed the question 'Could Complex Adaptive Systems (CAS) theory facilitate the understanding of the strategy development process?' This paper begins with a review of the strategy development and complexity theory literature, which forms the basis of our theoretical framework. The analysis and synthesis of the theories reviewed leads to the development of a conceptual framework, which is presented and discussed in a subsequent section. This includes the explanation of the CAS lens used in this research. To demonstrate the value of our conceptual framework, we present preliminary findings of a longitudinal, in-depth, interpretive case study (Chaffee, 1985; Burrell and Morgan, 1979; Yin, 2003). This is primarily a theoretical paper explaining a novel conceptual framework. The purpose of the case study is to show the potential practical utility of using CAS theory, including the CAS lens, to the OR community - both academics engaged with strategy development from an OR-Strategy perspective (Dyson, 2004) and practising organisational manager/strategists. We feel that the

OR/systems community is ideally positioned to make use of complexity and CAS theory in the investigation of facilitating models and tools to help practical organisational managers. An empirical paper is planned as a follow-up to discuss the case study more fully.

Theoretical Framework

The theoretical framework diagram (see Figure 1) outlines the next two sections of this paper: Strategy Development Process (SDP) theories (from two perspectives - SDP models and tools/ methods) and Complex Adaptive Systems (CAS) theory. We undertook a structured review of the literature, adopting a multi-discipline perspective, as it was evident from our theoretical framework development that the range of topic areas spans the strategic operational research literature, strategic management theories, strategy process research, complexity theories and the complex adaptive systems literature.

[*Figure 1. about here, please*]

Strategy Development Theories

Reviewing the Strategy Development field, we can identify two general streams of literature: the Strategy Development Process theories and the Strategy Support tools, which are shown in the left-hand side of the Theoretical Framework (Figure 1). The OR/Systems community is really interested in Strategy Development as demonstrated by the recent Special Issue in this journal on '*Supporting Strategy: Contributions from OR*' (Franco et al., 2011) in terms of tools for supporting strategy as well as strategy development frameworks.

Strategy Development Process

The Strategy Development Process theories include broadly two types of models; 'descriptive' and 'prescriptive' (Tapinos et al., 2011). The descriptive models, such as the typology of Miles and Snow (1986), classify various approaches to developing strategy based on observed patterns of behaviour of organisations, and as such tend to be rather static representations. The prescriptive models are concerned more with understanding how the process of developing strategy should be undertaken in a dynamic manner by practitioners. In this paper, we are interested in exploring the activities that ought to take place when strategising (developing strategy) and therefore concentrate on the prescriptive models.

Studies from "mainstream" strategic management (Handy, 1993; Porter, 1996; Mintzberg and Lampel, 1999; Eisenhardt and Sull, 2001; Johnson et al. 2005; Bryson et al. 2009), and previous reviews of the literature (Huff and Reger, 1987; Huff et al. 1992; van de Ven, 1992; Hutzschenreuter and Kleindienst, 2006) have emphasised the importance of investigating the activities within strategy development. However, the models proposed for developing strategy, or for studying the strategy process, suggest a linear relationship between the elements and activities of the strategy process (Tapinos et al. 2005b). Similarly, the newly emerged 'Strategy-as-Practice' stream of literature, which studies the micro-strategising activities within the strategy process, has not developed any 'prescriptive' models.

The work of people involved in Systems Thinking and Operational Research, which many see as broadly occupying the same field of study (Sterman, 2000; Dyson, 2000; Richardson, 2004; Warren, 2004; Mingers, 2007), yields more significant contributions. Jackson (2009) summarises the development of both fields and explains that Systems Thinking has two main aspects: 'pure' and 'applied'. Similarly, Operational Research has a 'theoretical' side and a 'practical' side, where 'practical operational research' is broadly similar to 'applied systems thinking'. In terms

of focus and activities, both have contributed to an understanding of the strategy development process. A significant contribution to the development of 'prescriptive' models has been made by researchers from the stream of Strategic Operational Research. Within this field a number of 'prescriptive' approaches for strategy development have been proposed, emphasising the systems perspective and holistic management. For example, a model has been developed based on the work of Dyson and colleagues (Dyson and Foster, 1980; Dyson and Foster, 1983) which identifies the characteristics of effective strategy development and applies the principles of Systems Thinking (Tomlinson and Dyson, 1983). The latest evolution of this Strategy Development Process (SDP) model (Dyson et al., 2007) is shown in Figure 2.

The research described in this paper made use of the SDP model to examine strategy development, because it is a comprehensive model highlighting the processes and activities undertaken when strategising. In addition, this model has been tested in other research projects (Tapinos et al., 2011). The SDP model comprises a future view, to ensure the organisation knows where it is going; a rehearsal component to test and evaluate strategy options; and a control part to monitor progress. As can be seen from Figure 2, it has 'seven essential elements' that are numbered broadly in a sequential manner, but can form iterative loops. These elements are: direction setting, performance measurement, sense-making, creating strategic initiatives, evaluating options, rehearsing strategy, selecting and enacting strategy (implementation). The SDP model provides a systemic view on strategy development, highlighting the interdependencies and interconnections between the elements of the process.

[*Figure 2. about here, please.*]

With regard to the strategic management literature, Huff and Reger (1987) extensively reviewed the then available literature on strategy process research. The focus was on strategic planning, implementation and decision making, mainly as discrete but connected activities, where complications and complexities were considered difficulties to be overcome. One of their recommendations was to "import concepts and research from related areas", in an effort to inform understanding of the topic. Five years later, in 1992, the Strategic Management Journal published two special editions focusing on strategy process research; the 23 articles collectively showed that the field of study had expanded. However, although the scope had widened, the depth of knowledge was still restricted to high-level concepts and relatively simple, linear, sequential models, with basic (negative) feedback loops, that act as diagrammatic check lists. Hutzschenreuter and Kleindienst (2006), with their extensive literature review, have clarified the widened scope of strategy process research and expose many opportunities for deeper research into the topic. They note that "Based on numerous, in-depth, longitudinal case studies this (strategy process) research has provided a more dynamic and eclectic view of strategy process and uncovered the messy side of reality".

In parallel, Dyson et al. (2007) perceive complexity as a perturbation, or disturbance, to a system; the complexity issues of the organisation and of the environment in which it operates, are seen as negative aspects that must be overcome. The SDP model relates to the real world, to some extent, in that it takes account of operational issues (managing the business, implementing change, uncontrollable inputs and the trial of new ideas) but it does not embrace complexity theories, nor does it consider organisations as complex adaptive systems. The SDP model deals with complexity by suggesting the use of Strategy Support tools, which make "explicit

representations, or models of the experienced world-to-be-managed that can be used to develop and rehearse strategy" (Dyson et al. 2007).

Strategy Support

The second element of the Strategy Development Theories concerns Strategy Support. Existing contributions in this field can be divided into two streams: Strategy tools and Operational Research (OR) tools. Recent studies (Kettinger et al., 1997; Pidd, 2003; Hodgkinson et al., 2005; Stenfors, 2007; Knott, 2008) have established that strategy tools are regularly used by managers to support their strategic decision making. OR has also played its part and made significant contributions to strategy-supporting tools and models. Most of the work from the OR field of study has been at the functional level of the organisation to solve specific operational problems, and many useful capabilities, models and concepts have been developed over the years. From the Systems Thinking (ST) area, Checkland (1999) has contributed with his Soft Systems Methodology (SSM), which is an approach for managing problematic issues that links theoretical systems thinking to people's understanding of the real world. SSM has been applied in practical situations in many organisations; for example ICI, ICL and the NHS (Checkland and Scholes, 1990; Checkland and Poulter, 2006), but mainly in re-structuring operational and support areas for greater effectiveness. The Shell Oil Company has made use of SSM as a means to contribute to emergent strategy development via a technical support service function (Checkland and Poulter, 2006). Other notable support tools from the field of OR include Problem Structuring Methods (Rosenhead and Mingers, 2001; Franco, 2007); Systems Modelling (Pidd, 2004); Simulation Models (Kotiadis and Mingers, 2006); and the Eden and Ackermann (1998) JOURNEY Making (JOintly Understanding, Reflecting and NEgotiating strategY) framework, which helps explain to top managers their "basic value system" so that a clear, continuous, cyclical process can be started. The System Dynamics community has also considered

complexity. For example, the work of Senge (1990) considers organisations as holistic, dynamic systems, and he makes the distinction between "detail complexity" and "dynamic complexity", where the latter is becoming more appropriate for contemporary organisations. However, he does not explore complexity theories in any great depth. In contrast, Sterman (1989, 2000) offers some explanations of complexity in his work on modelling dynamic complex environments, such as markets and economies; and Morecroft and Robinson (2005) explain that System Dynamics is of use for strategic and holistic organisational problems where the emphasis is on *dynamic* complexity.

The common thread of all these tools is that they offer the potential to study strategic issues in an organised and systemic manner, in order to cope with complexity as a negative perturbation to a system. This view that complexity is a negative disturbance that needs to be overcome is problematic because complex adaptive systems theory argues that complexity is in a large part irreducible. Therefore, the practical value of this theory for understanding how organisations can *live with* (rather than reduce) complexity has not been sufficiently appreciated. We see the above devices, methods and models as useful potential strategy support to top management teams in their practical development (planned or emergent) of organisational strategies, but not as comprehensive solutions in themselves.

Complex Adaptive Systems (CAS) Theory

As yet complexity theories have been embraced by only a few 'strategists' as being potentially useful and only relatively recently (Caldart and Ricart, 2004; Pettigrew et al. 2006; Camillus, 2008).

From the 'strategy support' area (OR and ST), complexity, as a phenomenon, was considered

much earlier. Weaver (1948) was one of the first authors to consider 'complexity' academically as an influence on the development of science. Boulding (1956), in his explanation of General Systems Theory, devised his 9 level 'Hierarchy of Complexity', where level 8 ('the Social Organisation', which is the appropriate level for this paper) is the penultimate, most complex one (the most complex being 'transcendental systems'). Buckley (1968) extended systems thinking into the social entrepreneurship arena, and may have been the first to coin the phrase 'complex adaptive systems' (CASs) in the context of this paper. Beer (1984), a cybernetician, developed his Viable Systems Model, which explains how some systems are capable of an independent existence and can form self-organising social groups (organisations). Self-organisation is considered by some as a core characteristic of Complex Adaptive Systems (Griffin et al. 1999; Stacey, 2001; Mitleton-Kelly, 2003a).

Snowden's work on the Cynefin Framework may help with sense making and analysis of organisational environments. He considers the unordered environment, where it may be 'chaotic' or 'complex' and where patterns can emerge, and compares this to an ordered environment where patterns are more structured and may be 'simple' or 'complicated'. The framework (see Figure 3) includes an area between the four types of environment, which is 'disordered' and may be occupied or vacated by any of the other four types of environment as they dynamically interact. It helps explain that 'complicated' environments and situations can potentially be modelled, and are therefore relatively definable and predictable; whereas 'complex' environments and situations are difficult to define, can only be partially modelled, and are largely unpredictable. The framework is a static representation of a dynamic process in which the 'shape' of the environment is continually changing (Kurtz and Snowden, 2003).

[*Figure 3. about here, please.*]

Based on this model of organisational environments, Snowden and Boone (2007) recognise the inherent uncertainties and unpredictability of environmental changes and organisational adaptation, suggesting a potential contribution from complexity theories. They also consider organisations as complex adaptive systems.

Midgley and Richardson (2007) have written about the co-evolution of systems and complexity thinking and argue that there are several interacting research communities working in this area "that have the potential to learn from each other" (p.167). Nevertheless, despite the many years of consideration of complexity theories by the OR and ST community as support for strategy development, the practical application of complexity theories at top management level is relatively new. Because of this there are problems in studying these theories and their application. For example, some are concerned about the need for 'hard' empirical evidence and others about the theoretical uncertainties of complexity theories applied to social systems (Rosenhead, 1998; Jackson, 2009). The terminology has also not yet reached general consensus and some describe complex adaptive systems, for example, as 'complex systems' (Cilliers, 1998), 'complex responsive processes' (Stacey, 2001), 'complex evolving systems' (Mitleton-Kelly, 2003a), or 'intelligent complex adaptive systems – ICAS' (Bennet and Bennet, 2004). The most common term mentioned in the literature appears to be 'complex adaptive systems' (CAS), so this term is used in this article. We consider any human social system, such as an organisation, as a complex adaptive system, which has the characteristics mentioned below in the CAS lens, because human social systems are capable of independent spontaneous, self-organisation, offering opportunities and threats to organisation managers (Kauffman, 1995; Eoyang, 2001; Caldart and Ricart, 2004).

Complex Adaptive Systems (CAS) 'Lens'

The authors mentioned above (Cilliers, Stacey and Mitleton-Kelly), selected for their empirical and theoretical work in applying CAS theory to organisations, have each devised lists of characteristics and behaviours for complex adaptive systems as applied to organisations. They are very similar lists, which support rather than contradict each other. These lists have been analysed, synthesised and distilled here as fifteen characteristics, in three groups plus one underlying characteristic (= 16 characteristics) and the result is the CAS lens, with four facets, summarised diagrammatically in Figure 4. Each is explained briefly here below.

[*Figure 4. about here, please*.]

The CAS lens comprises four facets, which group the 16 characteristics. These are – continuous varying interactions (CVI), patterns development (PD), people factors (PF) and self-organisation (SO). There is some overlap between the facet composition of the characteristics, as explained. The first group of characteristics is:

1. Local and remote – the richest interactions between people usually occur locally within the relationship network of the organisation, but influences can be far reaching, and remote connections may be important due to non-linearity [see below] (Cilliers, 1998; Stacey, 2001; Barabasi et al. 2002; Mitleton-Kelly, 2003a).

2. Non-linear interactions – unpredictable cause/effect relationships. Small actions can have big effects, big actions can have minimal effects, and the scale of effects cannot be predicted. In some contexts this phenomenon is known as the 'butterfly effect' (Cilliers, 1998; Stacey, 2001; Mitleton-Kelly, 2003a).

3. Positive and negative feedbacks – both can exist within the system, being developmental [positive feedbacks] and restraining [negative feedbacks] (Cilliers, 1998; Mitleton-Kelly, 2003a).

4. Large numbers of elements – some authors refer to the number of people and some to the relationships between people (the latter number being far greater), and others are not specific as to either or both (Cilliers, 1998; Stacey, 2001).

5. Continuous interaction – endless, repeating and dynamic interaction between people [communication within, and external to, the organisation] (Cilliers, 1998; Stacey, 2001).

6. Connected open systems – CASs are open systems, and they can be passive or active in their interactions with other CASs, which can be at various levels of integration within and external to the organisation (Cilliers, 1998; Mitleton-Kelly, 2003a).

7. Rich interactions – high to low quality, changing, developing, iterative and self-referential [concerning the quality of interaction] (Cilliers, 1998; Stacey, 2001; Mitleton-Kelly, 2003a).

8. Relationships co-evolve – the above produce on-going variety in the relationship 'rules' [includes traditions, customs and organisational 'culture' influences] as people and the CAS develop and co-evolve (Stacey, 2001; Mitleton-Kelly, 2003a).

The above eight characteristics form the first facet of the CAS lens and are classified here as elements of 'Continuous Varying Interactions' (CVI), because they are to do with the type of relationships within and around the organisation. This group of characteristics has some connection to the structure of the organisation, which is not static but dynamic and constantly evolving.

The second group of characteristics is:

1. Patterns emerge – coherent patterns of order emerge spontaneously [and become 'attractors', which may develop the pattern further, expanding their influence on the CAS] (Stacey, 2001; Mitleton-Kelly, 2003a).

2. Stable and far-from-equilibrium - CASs can cope, adapt, survive and prosper in periods of (relative) turbulence [sometimes known as 'far-from-equilibrium'], where the instability may be in either or both their operational environments or their structures and processes as they change. Stability is not a requirement for progress and could lead to atrophy (Cilliers, 1998; Mitleton-Kelly, 2003a).

3. Origins of patterns – these are unpredictable [in time and place] (Stacey, 2001).

4. Patterns [and, 'attractors'] - can be stabilising [orderly], de-stabilising [chaotic] or both simultaneously ['chaordic' (Hock, 2005)] (Stacey, 2001).

The above four characteristics form the second facet classified as 'Patterns Development' (PD) elements.

The third group of characteristics is:

1. Whole system ignorance – no one person within the CAS can have complete knowledge of the CAS, because it is too complex and dynamic, which contributes to risks and uncertainties that affect people and organisations (Cilliers, 1998).

2. Histories – origins and histories of development are very important, of both people and the CAS, because development options can be preferred [and possibly locked-in or out] influencing option choices available for future actions [in some contexts known as Path Dependency (Greener, 2002)] (Cilliers, 1998; Mitleton-Kelly, 2003a).

3. Space Possibilities – CASs can explore the 'space' (and time) possibilities into which it can develop by adapting existing conditions, because people can think, learn, imagine and make decisions (Mitleton-Kelly, 2003a).

The above three characteristics, plus 'relationships co-evolve', the eighth characteristic from Continuous Varying Interactions (CVI), and 'patterns emerge', the first characteristic from Patterns Development (PD), form the third facet classified here as 'people factors' (PF) because they are more specific to human social systems (organisations) then biophysical ones. This third facet (PF), also has connections to the intuition process element of strategy development considered important by Miller and Ireland (2005).

Because of the above characteristics, CASs or parts of them can and do self-organise spontaneously (Boulding, 1956; Buckley, 1968; Beer, 1984; Griffin et al. 1999; Stacey, 2001; Mitleton-Kelly, 2003a; Caldart and Ricart, 2004; Snowden and Boone, 2007). This self-organisation (SO) characteristic underlies the others mentioned above, and forms the fourth facet. Self-organisation is ever-present in the background of the CAS, waxing and waning in importance, as internal and external factors continually change. The 'loose/tight' properties of management control mentioned by Peters and Waterman (1982), may affect the self-organisation characteristic.

In addition to this, various levels of organisation could be considered as CASs (groups, teams, departments, subsidiaries, etc., which are open to multi-level interaction) and as such (and referring to the above characteristics) there can be massive entanglement of relationships, which influences the complexity and dynamics (Barabasi et al., 2002; Eoyang, 2004).

The above mentioned distilled list of CAS characteristics, formed into four facets, was used as a CAS 'lens' for analysis as part of the research project discussed below. The CAS 'lens' allows us to see the organisation and its behaviour in a new light, which gives deep insights to some of the interactive processes taking place. The CAS 'lens' is used to focus on the strategy development process, seen as at the core activity of what an organisation does.

Conceptual Framework

A conceptual framework was developed based on the above explanations of the SDP model and the CAS characteristics, and this is explained as follows (Figure 5).

[*Figure 5. about here, please*.]

By studying what is known about the strategy development process via the SDP model from the perspective of the organisation as a CAS, with its sixteen characteristics, it becomes clear that some further aspects of the organisation may need to be taken into account when considering how strategy is developed in practice. The SDP model, based on the feedback control system concept, does take into account some characteristics of the CAS as a system: for example, 'connected open systems' and 'large numbers' of people and relationships. Also, the 'uncontrolled inputs' SDP element could be seen as a 'catch all' for any unspecified element (internal or external). It is proposed that these further aspects, summarised below, which are mainly people related and specific to the organisation, are also of practical importance to the process of strategy development:

- The development of CASs can be positive or negative. The complexity may provide not only negative elements, requiring coping measures, but could also provide positive elements that facilitate the organisation's development.

- The people, groups and the CASs have histories, and these influence each other's development and limit or offer opportunities in relation to change options and/or the choice of change options.

- There is continuous, non-linear, co-evolution of people and groups within the organisation and with other external people, groups and organisations and the relationships between these.

- The related development of patterns in the relationships and consequential organisational behaviour are always changing, but at different and varying rates and with varying time-lags, all of which are not accurately predictable.

- There is whole system ignorance, in that no one person or group has complete knowledge of the CAS, which leads to inherent uncertainties and risks.

- All characteristics of CAS are interrelated (in a non-linear manner), so that nothing can be changed purposefully, or otherwise, without some impact on other parts of the CAS, or the CAS as a whole. The impacts could range from small and insignificant to profound and very significant, depending on non-linearities.

- Parts (or all) of the CAS can self-organise, under appropriate circumstances.

The above further aspects complement the SDP by providing an organisation-specific perspective, which is based on a substantial body of CAS theory. It is proposed in this paper is that CAS theory offers specific and rich opportunities to provide a better understanding of the strategy development process and thereby contribute to the existing theories and a better informed practical strategy development process for organisations.

Case Study

To demonstrate the potential of incorporating the CAS theory into the thinking behind the SDP model, we have conducted an exploratory and interpretive, case study based on the research question:

'Could complex adaptive systems theories facilitate the understanding of the strategy development process?'

The case study organisation (CSO) is a small, 'new' University College in the UK, which has approximately 6,000 students, five departments and 500 staff. The CSO had recently been through a development phase and it is consolidating its position and structure. It is a 'Dual Institution' serving both Higher and Further (HE & FE) educational sectors. Studying HE and FE institutions always provides a challenge due to the nature of the organisation (Tapinos et al., 2005a). Nevertheless, a number of authors (Pettigrew, 1992; Jarzabkowski and Wilson, 2002) have highlighted that growing competition between such institutions, in an increasingly more businesslike environment, has made them very interesting cases for examining strategy related concepts. In the following section we present how the case study was conducted and some preliminary findings which aim to highlight the potential usefulness of our conceptual model.

Methodology

Examining strategy development in an organisation requires highly detailed study. It also requires some time to sense the people relationships and interactions (Eisenhardt, 1989a; Yin, 2003). For this reason a longitudinal, in-depth case study was initiated with the organisation, where access to the appropriate, top-team people and documents was possible. This allowed data gathering covering operational cycles and various series of events in the development of the case study organisation. It gave the opportunity to explore the context, the organisational character and the environment in which it operates; the content, the nature of the strategy; and importantly the process of how the organisation changes within its changing environment (Pettigrew, 1990). Data gathering included mainly document analysis and face-to-face, semi-structured interviews (44 x 60 minutes, average), which allowed the exploration of specific themes appropriate to the

research, while simultaneously preserving sufficient flexibility to investigate unexpected but relevant items of information (Yin, 2003; Kvale, 1996; Saunders et al., 2003).

The topics used for the semi-structured interviews were based on the 'seven essential elements' of the SDP model, and the four facets of the CAS 'lens' mentioned earlier, in an effort to find out how the organisation develops its overall strategy. All members of the top team and significant other people involved in the SDP in the organisation were interviewed between June 2005 and June 2010. Notes were taken on all the interviews immediately afterwards, and audio recorded interviews were transcribed.

For the analysis, attention was paid to the themes and patterns detected; particularly to those that coincided firstly with the SDP elements, and then secondly with the CAS characteristics (Attride-Stirling, 2001; Saunders et al. 2003; Yin, 2003). Sequences of events were also sought with an effort to detect points in any potential causal chain (Abbott, 1995; Yin, 2003; Buttriss and Wilkinson, 2006). Following this initial analysis, the information gathered per respondent was classified according to a seven element SDP model template. Comparisons were made between those of each respondent and similarities and differences were noted for confirmations and contradictions. The SDP model was also used as a Diagnostic Tool (comprising the seven elements and two additions, each with progression stages of 'increased effectiveness') to detect elements of the SDP model for potential improvement (Dyson et al. 2007, p.20).

A second analysis perspective was then undertaken for the data per respondent and classified according to the CAS 'lens'. This allows the data to be viewed from the perspective of the organisation as a complex adaptive system in an holistic manner (Kelly, 1999). This means that other additional aspects of the strategy development process to the SDP model, specifically those mentioned in the conceptual framework above (CASs offer positive and negative aspects; CASs and people have histories; continuous, non-linear co-evolution of people and groups; behaviour

patterns develop; whole system ignorance; all characteristics inter-related in non-linear manner; and, self-organisation), could be detected.

In effect this means that the data has been analysed from two different perspectives: via the SDP model and via the CAS 'lens'. A final analysis was undertaken to look for comparisons between the information found via the CAS 'lens' and the SDP model, focused on the conceptual framework.

Preliminary Findings

This section includes some preliminary findings from the case study towards a "proof of concept" to help show the potential practical use of such an approach.

It seems clear that using the CAS lens extends the understanding of the strategy development process of the case study organisation (CSO) as exposed by the SDP model. Despite there being no formal strategy development process in the CSO, it was possible, via the SDP model, to detect process elements imbedded in the very many informal interactions between the small core top management team (TMT) members. The SDP model, used as a Diagnostic Tool (Dyson et al., 2007, p.20), also helped explain SDP element areas that the TMT could improve upon. However, because the SDP model does not take into account people factors, such as their backgrounds and experience, for example, it misses significant practical elements of the strategy development process. The CAS lens does take these factors into account, and together with the established and emerging behaviour patterns exposed, it allowed detection of both positive and negative limiters to strategy options and their selection process in the CSO.

The CAS lens provided a useful perspective of the wider, unstructured aspects of the specific organisation's behaviour and the strategy development process. In particular the CVI (continuous varying interaction) facet of the CAS lens, in this case, showed the imbalance of

strong bottom-up information flows for sensing the internal and external environments, compared to the weaker top-down communication flows, informing staff about direction and strategies. Via the PD (patterns development) facet, six main patterns were detected, all of which have positive aspects and two of which also have negative aspects, which could be hampering efficient working of the organisation. An example found with the PD facet of the CAS lens, was the detection of a 'Values and Beliefs Implementation' pattern, as evidenced by:

> "*There is a genuine balance at (the CSO) between being a (hard) profit-driven operation, versus (soft) ensuring those with potential benefit from our courses whatever their background. There is also an overriding desire to ensure that the students have the chance to benefit from the best facilities and staff that we can get.*" (Respondent B quote).

This explains the loose/tight management style of the organisation: very tight control of the important things (finances and funding), but looser for the flexible and responsive interactions with stakeholders (for example, students).

Much information from this case study was detected via the PF (people factors) facet of the CAS lens. The background and work experience of the main strategist (CEO) and his core TMT are very strong influencers on the strategy development processes and the strategy content. In particular, in this case study, the 'CASs and people have histories' characteristic, showed that the previous strategic decisions to move the 'centre of gravity' of the CSO towards a dual FE and HE institution, and the decision to ally with a large UK university and confer their degrees, has strong positive and some negative limiters to strategic options and choices. In a similar manner, the early strategic decision to run operations very tightly with regard to finances, so that surpluses are made and accumulated and no debt is incurred, has had very important positive and some negative limiters to strategic options and choices. This latter decision is clearly from the early upbringing of Respondent A (the CEO), who said "*Neither a borrower or lender be*" as he

emphasised that the CSO has not incurred any debt in the last 26 years and has consequently "*not been beholden to anybody but ourselves*". It is interesting to note that Respondent B (TMT member) offered an explanation for this particular strategy of the CSO, mentioning the conservative, cautious and prudent background: "[He] *has a Scottish Presbyterian upbringing*". The history and set of values illustrated by the above evidence shows that radical financial strategies are effectively 'locked-out', and conservatism, caution and prudence are 'locked-in' to strategy options.

The conservatism, caution and prudence mentioned above, which underlies the financial stability of the organisation (detected via the PF facet) links to a general pattern of 'no significant shifts in the direction of the CSO', except for possible initiatives that are very closely related to the focal areas of usual business activities (detected via the PD facet). Combining the two facets (PF and PD) helps develop an understanding of how the origins of the strategists within the organisation and their previous strategic choices and decisions shape current and future strategies. The CSO has been very stable in its direction, conservative in its choice of new activities, and steady in its growth as evidenced by its performance measures, and the explanation of this can be seen as a clear pattern of behaviour.

Summary and Conclusions

By combining the two perspectives (via SDP and via CAS) to collect and analyse the data, and by comparing the results, it is apparent that more information becomes available than by using only the SDP approach. The approach via the SDP model allows a clear picture of how an organisation develops its strategy within the 'seven essential elements' of the model. However, there are additional forces at play that are peculiar to organisations when considered as complex adaptive systems, as outlined in the conceptual framework. From the case study, it is clear that

the CAS lens provides the possibility of broadly anticipating some of the future strategies of

organizations, or at least exposing the potential positive and negative limiters, to their strategic

choices. This can be of practical use in understanding the future directions of organizations, their

competitors, customers, suppliers and other stakeholders. The CAS lens highlights these and

provides a rich picture of what really goes on, in practice. Use of the CAS theory to complement

the SDP model is proving to be insightful, and is generating useful information upon which

theories and practical methods may be based. We hope that the OR/systems community can take

up the challenge and investigate the possibility of developing models and tools that complement

the SDP with CAS theory, thereby helping practicing organizational managers live with

complexity. An empirical case study paper is planned as a follow-up to this theoretical paper.

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Figure Captions

Figure 1. – Theoretical Framework – diagram

Figure 2. – Strategic Development Process (Dyson et al, 2007)

Figure 3. – The Cynefin Framework (Kurtz & Snowden, 2003)

Figure 4. – 16 Characteristics of Complex Adaptive Systems (CAS)

Figure 5. – Conceptual Framework - diagram

Figure 1. - Theoretical Framework - diagram

Strategic Development Process

1. Direction setting
2. Performance measurement
3. Sense-making
4. Creating strategic initiatives
5. Evaluating options
6. Rehearsing strategy
7. Selecting and enacting strategy

Resources

Uncontrolled inputs

3. Sense-making

Implementing strategic change

Managing the organisation

Exploring internal and external environments

MODELS OF THE ORGANISATION

Assessing strategic ideas

5. Evaluating options

1. Setting strategic direction and goals

4. Creating Strategic initiatives

6. Rehearsing strategy

Learning from virtual and current performance

ENACTING STRATEGY

Learning from current performance measurement

2. Performance measurement

Figure 2. Dyson et al (2007)

Figure 3. - The Cynefin Framework (Kurtz & Snowden, 2003)

Complex
Unkown Unknowns
• Probe
• Sense
• Respond

Complicated
Known Unknowns
• Sense
• Analyse
• Respond

Disorder

Chaotic
Unknowables
• Act
• Sense
• Respond

Simple
Known Knowns
• Sense
• Categorise
• Respond

Unordered

Ordered

Unorder
(Emergent)

Order
(Structured)

Figure 4. - 16 Characteristics of Complex Adaptive Systems (CAS)

Continuous Varying
Interactions (CVI)

Patterns Development (PD)

Unpredictable
Pattern
Origins

Chaotic &
Orderly
'Chaordic'
Patterns

Non-Linear
Interactions

Positive &
Negative
Feedbacks

Local &
Remote

Whole
System
Ignorance

Large
Numbers

Stable and
'Far-from-
Equilibrium'

Patterns
Emerge

Relationships
Co-Evolve

Continuous
Interaction

Connected
Open
Systems

Space
Possibilities

People
& CAS
Histories

Rich
Interactions

People Factors (PF)

Self-Organisation

Figure 5. - Conceptual Framework - diagram

Strategy Development Process
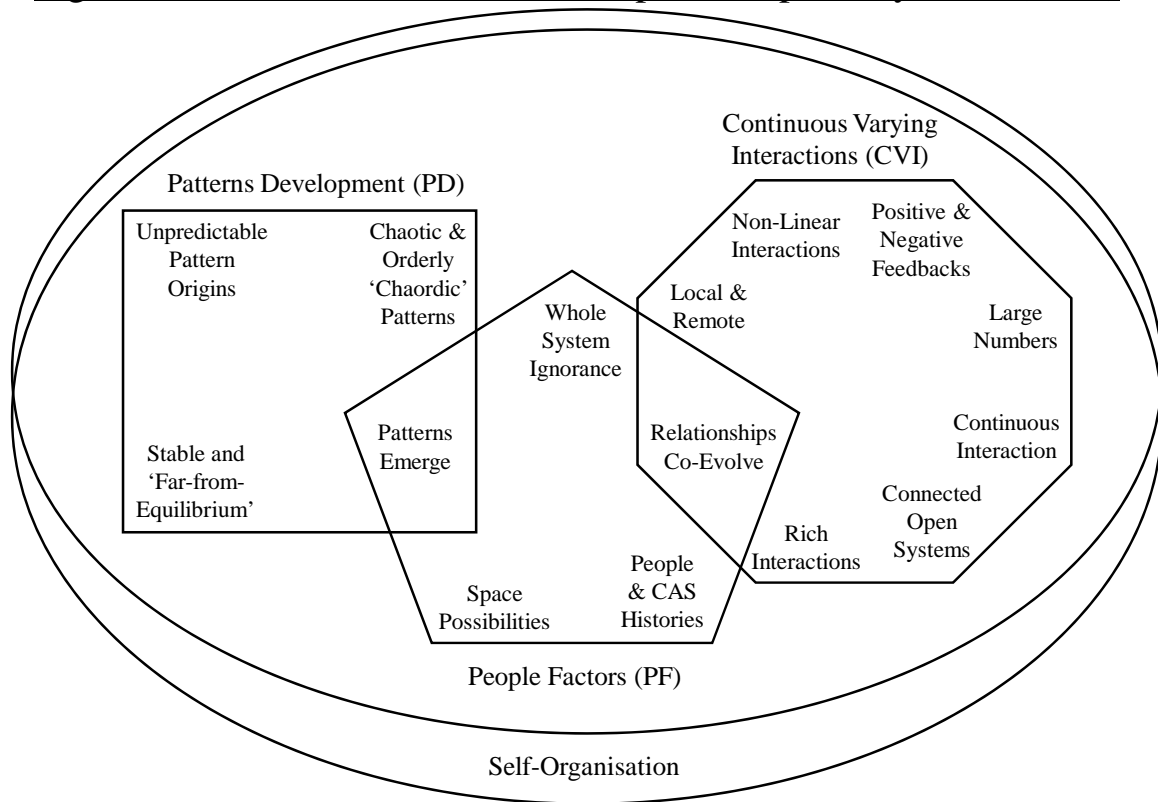
Complexity & CAS

- CAS offer positive as well as negative aspects
- CAS and people have histories which limit and offer opportunities
- Continuous, non-linear co-evolution of people within and external to the CAS
- Behaviour patterns develop, continually and sometimes unpredictably
- Whole system ignorance – no one has complete knowledge of the CAS
- All characteristics are inter-related in a non-linear manner
- CAS can and do spontaneously self-organise