

The Chaos Theory of Careers (CTC): Ten years on and only just begun

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Abstract

The developments in the Chaos Theory of Careers (CTC) are outlined for the last decade since the publication of the original formulation in this journal in 2003 (Pryor & Bright, 2003a). The history of the development of the CTC and the major theoretical constructs of the theory including context, complexity, change, chance, attractors, emergent patterns and fractals are described. The empirical evidence directly relevant to the CTC formulation and its efficacy as a counselling approach are reviewed. Practical tools to use with a CTC approach such as assessments, card sorts and counselling strategies are described. The impact of the CTC approach on practice and theory is discussed. Future applications of the CTC related to adaptability and cultural diversity are highlighted. It is concluded that the CTC provides the most coherent and comprehensive current account of career development behaviour that can incorporate both modernist and post-modernist perspectives. The last decade has demonstrated the theoretical and practical value of the CTC, but there remains enormous untapped potential to explore in the next decade.

Keywords

Chaos Theory of Careers, theoretical developments, research support, counselling techniques, future directions

Introduction

This paper seeks to outline the last decade of work proceeding from the first adumbration of the Chaos Theory of Careers (CTC) (Pryor & Bright, 2003a). Actually the authors' thinking about what was to become the CTC (Pryor & Bright, 2011) commenced in the late 1990s with our disquiet about the prevailing theories of career development. Our fundamental objection to these theoretical formulations was that they did not relate very well to life as it is lived. The extant theories did not seem to relate well to realities beyond the immediate challenge to make career decisions, to incorporate the whole of the rest of a person's life or the context in which such decisions were to be made. What was needed was a theoretical formulation which was consistent with not only career development but also with the way in which the whole universe operated. Why should the influences on career development be different from those that brought about life or which shape our cosmos? Around this time, we had a research grant and started to investigate issues relating to the multiplicity of

influences on career development including context, background and geography. We also wanted to investigate the significance of chance events on careers. While undertaking this research, we fumbled around looking for a theoretical framework that could accommodate the kinds of questions we were asking. At one stage (Pryor, 2003b), we thought of naming the theory as 'the natural theory of careers', 'the ecological theory of careers' or the 'contextual theory of careers' (Bright & Pryor, 2002), but these did not capture what we had in mind.

In effect what was sought was a formulation which provided a coherent account of the following:

- Context, that is, that was holistic;
- Complexity since our research confirmed the over-determined nature of career development;
- Connection, which was not segmental and partial but rather emphasised the recursive nature of the world;
- Change, since everything is ever always in some state of flux and change can be non-linear;

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- Chance, that is, which took into account the impact of the unplanned and acknowledged the limitations of all human control and knowledge.

Increasingly, our reading was taking us into the realms of more general science rather than an exclusive focus on the career development literature. There we found that chaos theory provided theoretical possibilities which incorporated much of our thinking and which presented the opportunity to link career development with the overall functioning of the natural world. Chaos theory fundamentally conceives of the world as composed of complex dynamical systems. Some complexity theorists (e.g. Bloch, 2005; Page, 2009) prefer the term 'adaptive' rather than 'dynamical'. We chose dynamical since it emphasises the changeable potential of such systems but does not presuppose if such change is adaptive or maladaptive, since it can be either.

The Chaos Theory of Careers

The CTC initially published in the current journal in 2003 (Pryor & Bright, 2003a) was our attempt to apply the idea of complex dynamical systems to individuals seeking to develop careers and to the contexts in which such development occurs. In passing it should be noted that Bloch's (2005) formulation of careers as complex adaptive systems makes an ontological error in ascribing to one's career an existent status when in fact career is an emergent property from the interaction of individuals with their contexts. In formulating individual career development in terms of complex dynamical systems, chaos theory is able to integrate notions of complexity, connection, change and chance. Such systems function on the interplay between order and disorder, stability and change, and predictability and uncertainty (Pryor & Bright, 2004). Such systems have a range of specific characteristics in the way they function viz:

- They are aperiodic – that is such systems function in generally similar patterns but these patterns are never exactly the same and therefore have the potential for change;
- They are bounded – that is such systems are recognisably coherent and function within limits or a finite range of values;
- They are causal in their function – that is such systems are regulated by deterministic principles and yet their complexity enables them bring about outcomes which could not have been predicted;
- They are sensitively dependent on initial conditions – that is, any two systems no matter how close in their starting positions will evolve in differing ways since changes with these systems are typically non-linear due to the level of connection of influences within and outside each system.

Individuals characterised in these terms are self-organising systems which seek both survival on the

one hand and purpose and meaning on the other. A career is a fundamental way in which in a social context such self-organisation can occur, hence its importance to individuals, communities and nations. An individual's career development therefore is the interaction of one complex dynamical system (the person) with a series of more or less generalised other complex dynamical systems including other individuals, organisations, cultures, legislations and social contexts (Bright & Pryor, 2011).

A new vocabulary for career development

Savickas (2013) has pointed out that new developments in the career development field are typically characterised by changes in the vocabulary used to describe and explain the new vision of the discipline. The CTC has contributed to this process of seeking to come to terms with contemporary career development challenges including inter alia, the widespread use of information and communication technology, the rapidity of change, the internationalisation of employment, the interdependence of economies and especially financial institutions throughout the world and the contractual and episodic nature of much contemporary employment. The CTC has both introduced new terms to the field and been able to integrate some recent concepts into a coherent theoretical framework. Some examples include:

- Emergence – the occurrence of new discernible order out of a series of apparently random events (Pryor & Bright, 2012b);
- Fractals – the traces and patterns evident from the operation of complex dynamical systems including individual traits and skills, labour market trends, family influences and employer prejudices (Pryor & Bright, 2007b);
- Attractors – characteristics of the patterns of complex dynamical systems especially individuals seeking to come to terms with career development and life more generally through either open or closed systems thinking (Bright & Pryor, 2007);
- Complexity – due to the linkages between systems, the potential for such systems to be influenced by a multiplicity of other factors, exogenous and endogenous, has increased dramatically in the new millennium;
- Phase Shift – the process of radical transformation of the structure and functioning of complex dynamical systems either gradually (as in developing new skills through education and training) or as a result of sudden change (as in changing companies, having employment terminated or major injury). Bright and Pryor (2008) used this concept as a basis for adumbrating major changes required for contemporary career development counselling;
- Non-linearity – in CTC terms, this does not simply refer to a less than linear career development pattern which has been its most common usage;

instead, in systems theory, non-linearity refers more generally to the potential disproportionality of cause and effect, such that an apparently minor change in one part of a complex dynamical system can concatenate out in a major impact within the system and beyond. This is the so-called 'butterfly effect'. This has been used to develop a career education technique to facilitate students' thinking about the nature of contemporary careers (Borg, Bright, & Pryor, 2006);

- Chance – one inevitable consequence of complexity is the loss of predictability and the impact of unplanned events on individuals' lives and careers. As Krumboltz (1998) observed, the stress on rational decision-making in past career development theory and practice actually neglected the often crucial role that chance events can have on individuals' lives and careers;
- Spirituality – along with attendant concepts such as purpose, meaning, intention, mattering, values and ethics, has become more prominent as a basis for career development. Conceptualising spirituality in terms of the boundaries of complex dynamical systems enables the CTC to integrate such motives particularly by reference to the 'strange attractor' (Pryor & Bright, 2007b);
- Feedback – because career development is an ongoing process and since the outcomes of actions cannot be guaranteed in advance, the importance of gaining information about the progress and outcomes of actions taken has risen greatly. Complex dynamical systems function largely in terms of either positive or negative feedback and the recent work of Pryor and Bright (2012b) has drawn attention to the importance of the development and utilisation of feedback systems especially in developing adaptive responses to uncertainty.

Development of the CTC

Throughout the development of the CTC, attempts have been made to spread both attention and effort fairly equally across the three domains of theory, research and counselling practice.

Theoretical developments

One of the major applications of CTC to career development is in the identification of 'attractors'. Essentially an attractor is a description of a system's functioning. Attractors can be understood as characteristic trajectories of a system, its feedback mechanisms, its end states, its boundaries, its reality vision and its balance between equilibrium and fluctuation (Pryor & Bright, 2007b). Bright and Pryor (2005) applied the four general classifications of attractors to the processes of career development as descriptions

of how people respond to the challenges of working in the twenty-first century. The four attractors are:

1. Point attractor – the motion of the system is to a fixed point. In career terms, this is goal-directed thinking and behaviour;
2. Pendulum attractor – the motion of the system is characterised by periodic swings between two points. In career terms, this is conceived as thinking and behaviour such as dichotomous thinking, approach-avoidance, role conflict and priority balancing;
3. Torus attractor – the motion of the system is complex but predictable, repeating itself over time. In career terms, this is thinking and acting in set, organised, often very disciplined patterns, such as routines, set procedures, habits, traits and dispositions;
4. Strange attractor – the motion of the system is complex, self-similarly repeating but not in exactly the same way each time through the motion cycle. Such systems are characterised by sensitivity to change such that inherent in their operation there is the potential to transform into another pattern over time. As Pryor and Bright (2011) write

Psychologically, the strange attractor is the 'edge of chaos' where the human potential to adapt, develop and grow is manifested along with human limitations of knowledge and influence. (p.45).

In career terms, this is thinking and acting in light of both the predictable and the unpredictable dimensions of reality. It is about being logical and rational in planning and decision-making while at the same time taking into account, utilising, adapting to and recovering from unplanned events as they impact lives and careers.

These attractors can be characterised for career development purposes into closed and open systems thinking (Pryor & Bright, 2007a). The point, pendulum and the torus attractors are all different ways to gain control over career development reality on the following false assumptions: all outcomes are predictable, life should be fair, humans are in control of their circumstances, the future will be a reflection of the past and anything exceptional is an aberration that time and effort will resolve back to the 'normal' functioning of the system. Each assumption is false in the sense that it does not apply to all situations, all of the time, even though in the short-term it may appear to be an effective strategy to deal with the world and the challenges of career development.

The problem with closed systems thinking is that there are no really closed systems. While systems have

boundaries these boundaries are always permeable since all things are connected (Barabasi, 2003). As a consequence change can be multifaceted, overdetermined and non-linear, resulting in limitations on our capacities for knowing and controlling outcomes. Thus life, though self-organising, is at the same time uncertain, contingent, stochastic and unpredictable. The CTC constantly directs both practitioners and clients back to this reality, which may offend our pride, undermine our grandest aspirations of understanding and capability or alternatively offer hope and opportunities beyond our imaginings and predictions (Pryor & Bright, 2012b).

One of the stark consequences of the open-systems nature of reality is the inevitability of failure (Omerod, 2005). In an uncertain world, it is simply unrealistic to think that all career decisions will achieve the outcomes expected and the successes craved for. Therefore, failure in career development needs to be considered normal, expected, not feared and not internalised (Pryor & Bright, 2012a). Instead, failure should be valued, taken into account, monitored, evaluated and responded to as appropriate. One way to do this is adumbrated in Bright and Pryor (2012b).

Research developments

Influence of context on career decision-making. Despite contextual influences being increasingly acknowledged, most research has chosen to focus on a narrow range of influences such as parents, socio-economic status and teachers. From a CTC perspective, it is not only the number of influences that is important, but also the complexity that results from the simultaneous impact of these influences. Bright, Pryor, Wilkenfeld, and Earl (2005) provided data that confirmed that a range of contextual influences including perceptions of the impact of parents, siblings, friends, teachers, geography, the media, films, sporting stars and politicians, as well as objective associations between parental employment and children's actual career choices may influence career choice.

Chance in career decision-making. The CTC may appear to be closely related to, or a variant of, Happenstance Learning Theory (Krumboltz, 2011). However, it should be clear that the CTC covers significantly more theoretical ground, than a singular focus on chance events. Notwithstanding this, the contribution of Happenstance Learning Theory has been to suggest the central importance of chance events in career development. The CTC has been a conceptual stimulus for ongoing research into the role of chance in career development (e.g. Bornat, Henry, & Raghuram, 2011; Bright & Pryor, 2012a; Bright, Pryor, & Harpham, 2005; Bright, Pryor, Chan, & Rijanto, 2009; Hirschi, 2010). These studies provide empirical support for the ubiquity of chance events in

careers. The evidence from empirical studies shows that the majority of people studied report chance events in their careers ranging from 64.7% (Hirschi, 2010) to 82.3% (Bright et al., 2009). Furthermore, there is some evidence that most people experience multiple chance events in their careers, and more often than not one chance event leads to another (Bright et al., 2009). Evidence based on subjective accounts supports these findings (e.g. Bornat et al., 2011; Krumboltz & Levin, 2004; Peake & McDowell, 2012; Walmsley, Jameson, & Thomas, 2007).

Hirschi (2010) reported results very similar to those reported in Bright et al. (2005). This replication within a different culture represents an independent validation within the career development literature. Hirschi (2010) provides further support for the CTC model reporting that people report chance events in career development, irrespective of the amount of career planning they had engaged in. That chance events are so commonly experienced in people's careers should no longer be surprising and it underlines the need for approaches such as the CTC which provides a coherent account of their nature and role as well as supplying a conceptual framework for researching chance more thoroughly.

The effectiveness of chaos counselling interventions. Evidence for the efficacy of counselling using the CTC has been reported with high school and university students. Borg et al. (2006) reported positive feedback from Year 11 students and parents after the introduction of a butterfly model of chance and planning derived from the CTC. Similarly, Loader (2011) outlined how the incorporation of CTC units for Year 10 students enhances career education.

Davey, Bright, Pryor, and Levin (2005) showed short videos to university students containing interviews with recent graduates highlighting key CTC concepts in their recent careers. Measures of career decision-making self-efficacy and career exploration including decisional stress were used as measures of impact. Career decision-making self-efficacy and environmental exploration were significantly enhanced and decision-making stress levels declined.

McKay, Bright, and Pryor (2005) reported on a randomized wait-list control study, where students seeking career assistance were randomly allocated to a traditional trait-factor, a chaos group or put on a waiting list. The traditional group received career counselling focussed upon strengths and weaknesses, measured vocational interests and matches to congruent occupations. The chaos group were encouraged to reflect upon complex influences on their career decision-making, and unplanned events in careers. Measures taken pre-post and one month later indicated that the chaos group remained more satisfied with their counselling and satisfied with the outcome compared to the traditional group. Irrational thinking

about careers declined for the chaos group over the month following the counselling, but actually increased for the traditional group. In terms of career self-efficacy, the chaos group reported more and greater sustained increases compared to either the traditional or control groups. Recently, Borg, Bright, and Pryor (in prep) have found very similar patterns of results with a chaos-based high school intervention.

Career development practice

The CTC has contributed to career development practice across three domains: strategies for counselling, techniques and assessments.

Strategies for counselling. Because the CTC emphasises complexity and connection as fundamental to dealing with the world, a strategy of multiple perspectives is advocated for career counselling. Two dominant perspectives have been adumbrated: the convergent and the emergent (Bright & Pryor, 2007). Both perspectives need to be used in the collaborative process of counsellor and client seeking to meet career development challenges. The convergent perspective focuses on the probable, the stable, the measurable, the informational and the shared. This would include labour market information, educational entry requirements, academic achievement levels, assessed skills and traits, hobbies and past employment. The emergent perspective focuses on the surprising, the idiosyncratic, the intuitive, the numinous and the possible. This can include stories, games, parables, spirituality, meaning, purpose, adaptability, resilience and response to failure. More details of the CTC counselling strategy can be found in Pryor (2010).

As noted above, the reality of failure is fundamental to the dealing with an uncertain world. Using the CTC, Pryor (2013) outlined a strategy for career development to confront the challenges of human limitations and failure based on complexity theories – exploration and exploitation:

1. Work out what really matters now and how work fits into that;
2. Keep the mind open to opportunities;
3. Generate and try several possibilities;
4. Expect that some of them will fail;
5. Make failure survivable;
6. Seek and examine feedback to learn what works and what does not;
7. Utilise what works and examine what has emerged;
8. Combine and add as seems likely to improve career prospects;
9. Iterate the process starting back at 1.

Techniques for counselling. The CTC has given rise to a range of new counselling techniques and the adaptation of existing techniques to explore new dimensions of career development highlighted by the theory. These techniques include the following:

- Mindmaps – Pryor (2003a, 2003b) used mindmaps to explore the fractals for medico-legal purposes. On the basis of the CTC, Brooks (2009) suggested mindmaps to explore possible selves as an adaptive approach to uncertainty;
- Reality Checking Checklist – Pryor and Bright (2005a) suggested that these 20 belief statements can be used to identify open or closed systems thinking;
- Archetypal Narratives – Pryor and Bright (2008) used the work of Booker (2004) on narratives to illustrate ways in which counsellors could help clients faced with career development obstacles due to complexity, to begin to tell themselves new stories and so find new career development paths;
- Card Sorts – Pryor (2007) demonstrated how an interest card sort could be used to ‘assess complexity’. Pryor and Bright (2009c) developed the Creative Thinking Strategies cards to assist clients explore probabilities, possibilities and plans as ways to use non-linearity in career development. Pryor and Bright (2005a) indicated how the ‘Sometimes Magic’ cards could be used to generate new career narratives. Other card sorts used for CTC purposes are outlined in Pryor and Bright (2011).
- Career Education Models – Borg et al. (2006) used a Butterfly Model for career education purposes to illustrate the reality of the Strange Attractor. Bright and Pryor (2012a) outlined various chaos-based strategic techniques to meet the challenges to contemporary career education.
- Other techniques described for the use of the CTC in career counselling include parables (Pryor & Bright, 2006), films (Pryor & Bright, 2005a), collage (Pryor & Bright, 2011), forensic interviews (Pryor & Bright, 2005a), the visual arts (Pryor & Bright, 2011) and the Signature exercise (Pryor & Bright, 2006).

Assessment for career development

Two inventories have been developed derived directly from the CTC. The Complexity Perception Index (Bright & Pryor, 2005b) was constructed to assess key concepts from CTC including the four attractors, emergence, non-linearity, complexity and spirituality. The Luck Readiness Index (Pryor & Bright, 2005b) was constructed to assess dimensions arising from the need to recognise and be able to utilise the impact of unplanned events on individuals’ careers using dimensions including flexibility, self-efficacy, risk, optimism and persistence.

Impact of CTC

Measuring the impact of a theory is a somewhat arbitrary and subjective exercise, especially for those most closely associated with the theory. However, the CTC has had a significant impact on career development theory, practice, research and education as the following examples show.

The CTC was included and described in detail in Brown's 9th and most recent 10th editions of his textbook and is listed in Table 2.1 (2007, 2011, p. 29) "A Century of Career Development Theorizing". This table begins with Parsons and concludes with CTC. It is notable that this is the only non-North American entry. The CTC is also featured separately in the most recent edition of the *Handbook of Vocational Psychology* (Walsh, Savickas, & Hartung, 2013). The CTC has been consistently reviewed in terms of its contributions to the career development field in the annual reviews of career development by nominated authors in *The Career Development Quarterly* since 2005.

Douglas Hall, most closely associated with the notion of the Protean career, used the CTC and in particular the concept of attractors, as a way of explaining complex career issues (Zikic & Hall, 2009). They argue for career development approaches that embrace chaos.

We propose moving away from seeing career exploration solely in terms of the static and positivist foundations typical of contemporary career theory and, instead, focusing on examining the process of career exploration as embedded in the current notions of complex, "chaotic" (Bright & Pryor, 2005a), non-linear, and unplanned influences on an individual's career (p. 182).

Bland and Roberts-Pittman (2013) argue that the CTC is a more suitable career model for today's 'working world' because it promotes 'career adaptability, vocation/calling (beyond job) and moral responsibility in work in the postmodern era' (p. 1). They conclude that:

Like emerging constructivist/narrative approaches... the existential and CTC models emphasize a process of emplotting a seemingly disparate set of micronarratives into a cohesive story in the interest of deconstructing, reconstructing, and coconstructing clients' sense of career identities. However, the existential and CTC models go a step further by providing sets of philosophical principles that serve as motifs for guiding the counseling process. (p.15).

The CTC approach has been incorporated as a practice model in several leading university career and student service departments including Vanderbilt University in Nashville, Simon Fraser University in

Vancouver and the University of Florida. It is also being incorporated at the University of Boulder, Colorado and at the Australian Catholic University amongst other places. It is also being used in a variety of high schools in New South Wales and Victoria.

The CTC approach has been cited in the newly released draft national curriculum for the Year 9–10 Work Studies developed by the Australian Curriculum and Reporting Authority (R. Randall, personal communication, October 15, 2013). In addition, the Department of Education and Child Development in South Australia included CTC in their Careers Strategy Implementation project in 2013. (DECD, 2013). The CTC approach has been recognised as valuable in understanding careers in Geriatric Medicine (Bornat et al., 2011), in Nursing (Price, 2008) and in the hospitality and tourism industry (Walmsley et al., 2007).

Future directions

Fractals

The importance of patterns in career development has been highlighted by the increasing emphasis on narrative and metaphor as key concepts. In chaos theory, fractals represent the emergent patterns of the person's interaction with the world. In this sense, a person's life is a fractal and a career is an embedded fractal within that larger pattern. Pryor and Bright (2007b) characterised fractals as the traces of attractors. In this sense, fractals are representations of systems' characteristic trajectories (habits, traits and abilities), the end states to which they move and reality visions (how people see the world) of individuals. The future challenges for fractals are how to effectively identify such patterns in order to be able to measure them, to empirically research them and to more effectively use them in counselling.

Cultural diversity

As the ambit of career development as a discipline continues to extend globally, issues of cultural differences in conceptions of inter alia, values, work, communication and tradition have attracted increasing amounts of attention. Culture is conceived in chaos theory, as an emergent pattern derived from the interaction of individuals in a particular society with their world. From a counselling perspective, cultural differences present significant challenges since issues including those of kinship, responsibility, shame, individualism and choice may vary very substantially across cultures making many of the assumptions of the Western tradition of career development questionable, irrelevant and sometimes inappropriate. The CTC provides a theoretical framework in which such a clash of systems can be conceptualised dynamically.

Adaptability and resilience

The acceptance of chaos ideas such as complexity, connection and chance have heightened awareness among career counsellors of the need for more flexible responses to uncertainty in life and work. The articulation of the dimensions and processes of adaptability and resilience have begun to receive increased attention (Pryor, 2013). The CTC challenges traditional notions of goal setting (Bright & Pryor, 2012b) and matching (Pryor & Bright, 2009a) as strategies to deal with chance, change and uncertainty. Instead, the CTC draws attention to the evolutionary processes of exploration and exploitation (Pryor, 2013) and the use of failure (Pryor & Bright, 2012a) as constructive approaches to career development in a changing and uncertain world. The elucidation of these processes, their practical applications and the evaluations of interventions based on them remain ongoing challenges for the future.

Concluding remarks

The CTC's emphasis on complexity entails the need for multiple perspectives in career development and counselling (Pryor & Bright, 2011). Sampson (2009) lamented the apparent 'divorce' of modernist and postmodernist approaches to career development. He noted some areas of potential conflict including that modernist perspectives are based on standardised approaches to career assessment and counselling, whereas postmodernist perspectives focus on individualised approaches. Using the idea of systems within systems, the CTC accounts for counselees as both specific individuals as well as members of larger groupings with which they are similar. Another issue is that of matching, which Sampson rightly indicates is a process not an event. Pryor and Bright (2009b) argued from a CTC perspective for the positive aspects of matching to be supplemented rather than supplanted by postmodernist techniques, on the basis that the world in which career development occurs comprises both objective and subjective contexts. In fact, it is the contention of the authors that the CTC offers the most coherent theoretical, research and counselling perspective for the integration of modernist and postmodernist approaches to career development (Pryor & Bright, 2011).

Declaration of conflicting interests

None declared.

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