

# The Chaos Theory of Careers: Emerging from Simplification to Complexity, Certainty to Uncertainty

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**Abstract:** The Chaos Theory of Careers (Pryor and Bright, 2003ab) was first published 15 years ago. At that time the authors were dissatisfied with the extant approaches to career development. In particular they highlighted that the dominant approaches belied their positivistic assumptions of rational decision-making, and relatively stable and unchanging decision-makers operating within a relatively stable and predictable environment.

The Chaos Theory of Careers (Pryor & Bright, 2003a, 2003b) was first published 15 years ago. At that time, the authors were dissatisfied with the extant approaches to career development. In particular, they questioned the assumptions underlying these approaches including those of rational decision-making and relatively stable and unchanging decision-makers operating within a relatively stable and predictable environment.

Probably the two most dominant approaches at that time were reflected in the work of Holland (1997) and Super (1980). Both of these approaches emphasized the logical and deterministic nature of decision making (Holland; e.g., Nye, Perlus, & Rounds, 2018) and career development (Super; e.g., Savickas, 2011).

For Holland, the central idea is the concept of a fit between a person's vocational interests and occupations that are assumed to provide congruent outlets for the expression of those interests (Arnold, 2004; Hesketh, 2000). Holland's approach, and those of the legion of subsequent impersonators (including the vast majority of online career quizzes), is a triumph of reductionism. That is, the theory aims to explain complex phenomenon in terms of simple constituent parts. Interests are classified into six categories and further distilled into a

three-letter code representing a person's strongest measured interests. These can be readily compared to pre-existing classifications of occupations, and a list of matching occupations can be instantly generated.

The model is simple in concept, easy to learn and to describe to clients, and yields a fast and generally unambiguous answer. The process can all be done on a computer. This approach has many seductive features: it is labor-saving, quick, cheap, and yields a clear result. It is not surprising that this model became so popular, and that it remains deeply rooted, in one form or another, in most career development services around the world.

Super's life-span life-stage model (e.g., Super, 1980, 1993; Super, Savickas, & Super, 1996; Savickas, 2005) simplifies development to discrete age-defined life stages. These are predictable with the next stage inevitably proceeding from the current stage. Identifying these stages is supposed to be helpful in understanding the arc of a career and also the preoccupations of people in the various different stages.

Vocational (or Career) Maturity is a key concept within Super's model. The career mature person has explored systematically, gaining sufficient levels of occupational and

self-knowledge as well as insights into their decision-making.

Super's (1980) model is also relatively straightforward and intuitive. The developmental aspect of the model has proved attractive to educators and policymakers in particular. The idea that growth and exploration within career are generally completed by a person's mid-twenties and then followed by the Establishment stage is reflected in major career development policies. Overwhelmingly, the focus of career development support services is squarely on the young as they complete their formal education and further, higher or vocational education. For instance, the Canadian Blueprint for Career Development and its many imitators (e.g., the Australian Blueprint for Career Development) have three distinct phases addressing the career needs up to early adulthood and only one for the whole of the remainder of a person's life.

These two very influential approaches to career development share some fundamental assumptions about the nature of the world and careers. They both are reductionist in philosophy, modeling people in simple terms as three-letter codes, or as a series of age and stage generalizations. The reductionist nature of Holland and Super's career frameworks raise concerns about oversimplification of individuals when their interpretations of self and the world carry complex relations to their career pathways.

Both the Holland (1997) and Super (1980) approaches assume that decision making is a rational process, that sufficient self-insight is not only achievable but necessary, and that being decided and having a plan is in all circumstances and at all times important. This is illustrated by the following recommendation for using Holland's approach:

Students with a dominant artistic code may have problems selecting a major because of their preference for a non-rational approach to decision making ...Persons with such diagnostic

indicators will likely need significant time for professional, individualized assistance in career problem solving and decision making. Students who are unsure about the discipline to pursue might benefit from a thoughtful examination of the institutional context of their educational and career options. (Reardon & Bullock, 2004, p.119)

This is almost tantamount to blaming the person for having a particular interest and attempting through 'professionalized assistance' to confirm them to the mold of a theory. However, people and the world in which they live do not readily give up this unambiguous information. Both people and their worlds are subject to change and are not entirely rational.

Neither model acknowledges the role that circumstance, chance or serendipity may play in a person's career. Indeed, these models seek to minimize such events, and treat them as errors in planning, information gathering or decision making. We can ask whether this characterization is reasonable, justified or even helpful. We can also question the almost completely exclusive emphasis on career decision-making as a task for the young in a world where job insecurity and change at work are constants for people of all ages. This motivated the authors to develop the Chaos Theory of Careers (e.g., Pryor & Bright 2003a, 2003b, 2011), which we described as follows:

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. (Pryor & Bright, 2014, p.4).

It should be pointed out that in raising these questions and objections we are not alone or the first to voice these issues (e.g., Amundson, 2009; Patton & McMahon, 2015; Savickas et al., 2009). Nor by raising these issues are we seeking to diminish the significant contribution these eminent theorists made and the practical utility of their ideas. Rather, we seek to build upon their insights to provide approaches that enhance the utility of career development practice and offer further insights in career development.

The two fundamental problems that career development theory in the twentieth century misconceived were the problems of complexity and uncertainty. In fact, it might be argued that most theorizing during that century was premised on the idea that uncertainty was a transient state that could be eliminated or minimized through thoughtful and careful planning and that complexity could be reduced and therefore understood, predicted, and controlled by a focus on simpler component parts. Career development theory in the twentieth century fell into the trap of oversimplification.

There are two imperatives that drive oversimplification and hence an underestimation of complexity: the need for certainty, and the need to make a decision. These are inter-related since it is assumed that making the decision ends the career uncertainty. Once the decision has been made to pursue either taxidermy or taxi driving plans can be made to obtain any required training, licenses or positions. However, the uncertainty of career direction may be eliminated only to be replaced by the uncertainties of selection processes into courses or jobs, second thoughts, self-doubt, economic downturns, injury, illness, unexpected novel opportunities, love, parenthood, and an almost unlimited list of other potential sources of uncertainty. It is a mistake to assume that

making a decision ends uncertainty. Nowotny (2016) coined the term the “cunning of uncertainty” that is “pervasive, (and) written into the script of life” (Nowotny, 2016, p.1).

Characterizing career decision-making as a once-off process is another form of oversimplification. It has long been subject of critique, for instance, in relation to school career counseling programs. McCowan (1996) argued that it was delivered in short bursts of disjointed activity at major crisis points rather than developmentally. The emphasis evident in both of the major models on making a career decision (singular) and being “decided” inevitably contributes to this “once-off” mentality. Such a perspective fails to sufficiently appreciate the dynamic nature of people and their environments. It is another form of oversimplification. The reality is that people and circumstances change, and this change is continual, varied and sometimes unpredictable. These realities are not addressed in the dominant models.

Career development continues to be seduced by the possibility of providing clarity about the future through oversimplification. More recent formulations continue to hold out the possibility of predicting or controlling the future. Savickas et al. (2009) claim that “life-designing interventions assist individuals to identify all of their subjective identity....It aims to help people become fully aware of the ways in which they articulate their salient life roles and domains” (p. 18). Within the narrative counseling context in which Life Design is embedded is the notion of “writing the next chapter,” identifying the control parameters of the system, and extrapolating from preoccupations to occupational choices.

These approaches are wedded to the view that career counseling can provide increased certainty for clients through rational thinking about personal circumstances and context. They maintain the implicit model that self-insight and environmental scanning lead to

increased certainty. These assumptions can be questioned.

Ultimately the problem with these approaches is that they treat career development as though it was either a simple or a merely moderately complicated machine. As Snowden and Boone (2007) point out, “circumstances change, however, and as they become more complex, the simplifications can fail” (p.4). He identifies five decision-making contexts: simple or obvious, complicated, complex, chaotic, and disorder. Simple (or obvious) decisions reside in a world of simple cause-and-effect relationships. Applying force to the pedal of a bicycle will induce forward propulsion. Applying force to the wheels in the form of a brake pad will slow that propulsion. The system is simple. It is not difficult to identify a course of action, and easy to predict its impact.

Complicated systems are in Snowden’s (2011) terms, the domain of experts. Here reside problems that are solvable but require advanced knowledge or reasoning. For example, if we wanted to know the impact on executive functioning of frontal lobe damage then neuropsychological assessment is likely to be very useful. In the career development discipline, we have characterized the presenting problems of clients as requiring the expertise of counselors. We have also held out that a clear solution or resolution is possible. Most career development theories operate in this domain.

Complex systems do not have apriori clear solutions. Snowden (2011) contrasts a Ferrari motor car with an Amazonian forest. The car can be disassembled and reassembled in the same way since nothing changes. Whereas that would be impossible with the rainforest where things are constantly changing. When confronted by problems in this domain, any “solution” must emerge from a process of trial and error, or in Snowden’s terms “let the path ahead reveal itself.” Trying to impose order in this domain will result in failure. Rather, one must “step back a bit, and allow patterns to emerge.”

Snowden (2011) contrasts this with the Chaotic domain, which is characterized by a lack of clear emergent patterns that are replaced by “turbulence.” Here, the recommendation is essentially for crisis management to “stem the bleeding,” acting first to establish some order to wrangle the situation back into the complex domain. This might be, for instance, assisting a client to get any available job simply to attenuate a financial crisis, before subsequently trying to address the client’s underlying career concerns and desires.

### **The Chaos Theory of Careers and Deficiencies in Theory**

The Chaos Theory of Careers (CTC; Pryor & Bright, 2011) has much in common with Snowden’s (2011) “Cynefin” framework while recognizing that the Cynefin framework is an oversimplification in that even “simple or obvious” domains are ultimately complex with the potential for chaos. A bicycle’s simple braking system, might be obvious, but the potential for catastrophic material failure is ever present, if thankfully, relatively rare. The fifth domain of uncertainty (Snowden’s Disordered system) in CTC terms would be inherent in all of the other domains. Most importantly, this needs to be acknowledged rather than “managed.” The CTC characterizes career development problems as covering all four (or five) domains.

However, the framework does illustrate the problem with much career development theory in that it rarely considers career problems beyond the “obvious” or at best the “complicated”. The simple elegance of Holland’s (1997) model is both its strength and also its weakness. In particular, as Holland acknowledged, it rests on the ceteris paribus assumption “other things being equal applies to the entire theory,” and you can ignore this “but don’t complain to the manufacturer if things go wrong!” (Holland, 1992, p. 12).

Unfortunately, outside of the closed-system confines of a psychology laboratory other things

are not generally always equal. Career misfortunes and lucky breaks do not even themselves out. Many people are in the right or wrong place at the right or wrong time and this has immense implications for their career. Characterizing a career decision solely in terms of a match between a three-letter code and a corresponding occupation ignores the complex, chaotic, and complicated nature of career decision making.

Pryor and Bright (2011) have repeatedly adumbrated some of the key aspects of careers that are not adequately captured by traditional models. They can be summarised as: complexity, change, connection, and chance. Systems can become so complex that there are simply too many ways in which the component parts can interact to be able to calculate their combined effects and, hence, predict system outcomes. Inevitably, this creates uncertainty and is experienced as chance events.

Parsons (1909), in his seminal work, *Choosing a Vocation*, recognized chance events in career development: “boys generally drift into some line of work by chance, proximity, or uniformed selection” (p.4). However, chance events were largely ignored in subsequent theorizing or evidenced as the product of poor planning processes. Crites (1969) remarked dismissively that “the accident theory of vocational choice is largely a popular theory: it is the layman’s explanation of how he entered his occupation” (p.79). However, Super (1957) perhaps provides the best illustration of the positivist view that chance events were mere errors of planning. He devotes only several paragraphs in his textbook to chance events, dismissing them out of hand: “given sufficient knowledge, there is no such thing as chance” (Super, 1957, p.278) and

Being hit by a car or having a brick fall on one’s head from the roof of a building does appear to be chance factors in the true sense of the word. But even these contingencies can be predicted, in the sense that their incidence in the

general population and in certain classes of population are known (Super, 1957, p. 277).

Perhaps it is not surprising that chance events were largely neglected as a legitimate focus of research after that until the late 1990s.

Chance events have attracted an increasing amount of research attention in the last 30 years and the results are very clear: the majority of people report chance events have had a significant impact on their career (e.g., Borg, Bright, & Pryor, 2006, 2014; Bright, Pryor, Wilkenfeld, & Earl, 2005; Krumboltz & Levin, 2004; Hirschi, 2010; Williams et al., 1998). A comprehensive theory of career development must provide a coherent, as distinct from an ad hoc, account of the role of unplanned or chance events in people’s career development given the ubiquity of their occurrence in human experience. This applies equally to more recent formulations that rely on narrative as the primary basis of understanding clients. Pryor, Bright and McIlveen (in press) argue that “narrative may underestimate the prevalence of chance events or seek to provide an account that explains such events in causal terms as a form of post hoc rationalization.”

Chance events can be considered examples of discontinuous change where the system is unexpectedly influenced or transformed. Within complex systems, these transformations can be non-linear. That is, that small alterations to the parameters of the system can result in disproportional outcomes and, less frequently acknowledged, that large changes to parameters can result in little or no change to outcomes. This so-called non-linearity is seen in accounts of people’s careers where a chance meeting led to a whole new career path. For instance, the story of Harley Windsor, the first indigenous person to represent Australia in ice skating at the 2018 Winter Games (Cooney, 2018, February 9). Harley discovered ice skating at the age of nine when his mother took a wrong turn and was forced to stop at a MacDonald’s restaurant opposite an ice-skating rink. He ventured inside

and that was the beginning of his ice skating career.

Despite the occasional acknowledgment of non-linearity in careers, most theories - traditional, modern and postmodern - provide no intelligible explanation for either its occurrence or impact on individuals' career development. This is also reflected in the normative view of "career success" as an upward linear path with the expectation of people climbing to ever increasing rungs of the corporate ladder (e.g., Amundson, 2010).

Patton and McMahon (2015) argue that "the 'successful' career continues to be characterized

as one of vertical advancement rather than sideways moves, and even that "a 'backward' career move remains in the literature" (p.256). Wilensky (1960) defined a career as "a succession of related jobs, arranged in a hierarchy of prestige, through which persons move in an ordered, predictable sequence" (p.554). It is ironic, therefore, that such a definition took hold given that the career path of Frank Parsons, the pioneer of career development, was characterized by such unmistakable non-linearity. Parsons' career path is set out in Figure 1.

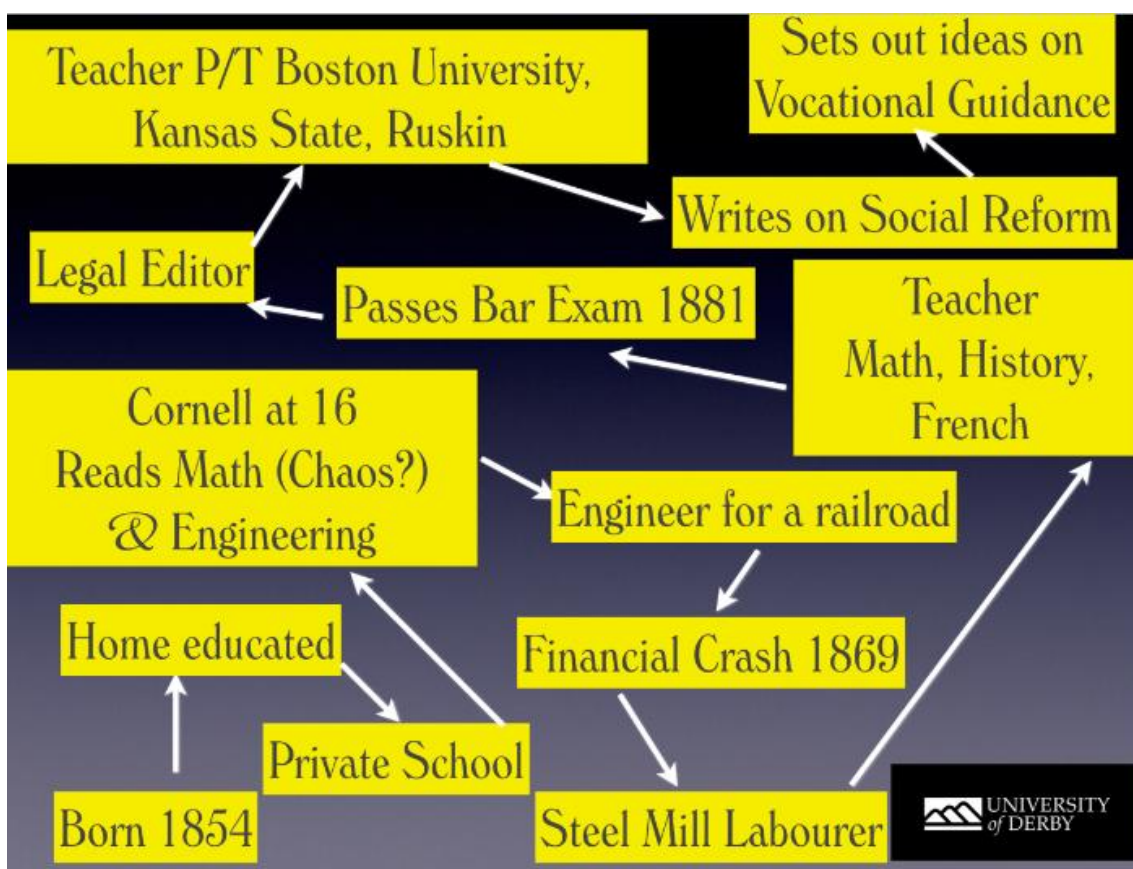


Figure 1. Frank Parsons career path.

In fact, a close reading of Parsons (1909) seminal text, *Choosing a Vocation*, reveals that Parsons acknowledged the role of complexity, change, chance and uncertainty in career development. He clearly saw the world as complex: "we guide our boys and girls to some

extent through school then drop them in this complex world" (p.4). He recognised the role of environmental factors in career choice: "boys generally drift into some line of work by chance, proximity, or uniformed selection" (p.4)... "never the less it must not be forgotten that all

such indications [ancestry, family, education, reading etc] are only straws, hints to be taken into account with all the other facts of the case” (p.8).

Parsons (1909) understood the presence of continual change: “a man cannot be fully successful, nor secure against change constantly occurring in the industry, unless he knows a good deal besides the special knowledge applicable to his business” (p.12). Finally, Parsons identified the key role of adaptability well before Donald Super and others since: “the fundamental question that outranks all the other is the question of adaptation” (p.13). It is not fanciful to speculate that, had Parsons been working today, he might have been a chaos theorist!

### **The Chaos Theory of Careers (CTC): An Outline**

The CTC was developed to address the deficiencies in theory adumbrated above. Chaos Theory is a special form of systems theory – sometimes referred to as complex dynamical systems. Readers are directed to Pryor and Bright (2011) for a more comprehensive adumbration of the theory, however, some of the key ideas will be introduced by way of illustration and practical applications of the theory. To do so, we need to review the idea of systems thinking.

Systems thinkers understand people not as a series of isolated elements, such as their knowledge, skills, interests or abilities, but rather as a structure comprised of elements that interact and mutually influence each other. In simple systems, there are few elements interconnected in simple ways that are easy to follow and understand. Such systems are “closed” systems since all of the elements that comprise the system are fully specified and understood in advance and no external influences can affect the operation of the system. A traffic light is a simple closed system. The lights go from green to amber to red, then red to

amber to green. The system repeats exactly and is completely predictable.

More complex systems are “open systems” where all of the elements that comprise the system are not known in advance. In open systems, external factors can and do influence the system. Human beings are a good example of an open system. If we were a completely closed system we would not need to or be able to take in food and air to live, learn, or interact with our environment. However, due to the nature of open systems, it becomes more difficult to predict how such systems will operate. In effect, none of us knows what the future is going to be like. It is amusing to see how wrong early films were in predicting the future of our world.

In fact, humans are also dynamical systems because they are continuously changing. They are complex because they are made up multiple systems within systems – for instance, we each house a lymphatic, neuronal, and vascular system. We are each embedded in systems beyond ourselves, such as families, communities, professions, and cultures. These systems are also open, complex, interconnected and continuously changing.

From this perspective, it should be apparent that the number of factors that might influence our behavior is immense both within a person and within the context in which they operate. This means, for instance, from a practical perspective, that considering a person’s vocational dreams in the absence of an understanding of labor market opportunities is unlikely to be effective.

More fundamentally, the CTC highlights the limitations of personal control and predictability in our careers. However, that does not mean that CTC characterizes people and our world as essentially random or completely unpredictable. A key feature of complex dynamical systems is their propensity to self-organize. Dynamically stable patterns emerge from the operation of complex and chaotic systems. These patterns

are characterized by being self-similar and operating in repeating but never identical ways. This can be seen in cell regeneration in the human body. Over time a person continues to look the same while at the same time subtly changing due to the vagaries of age and fluctuations in weight. Over the course of a day, we vary in height by about ½ cm. From the age of 40, we lose on average of 1cm in height per decade. Thus, we are continually changing, yet paradoxically remain self-similar. These self-similar emergent patterns are known as fractals (e.g., Briggs 1992; Mandelbrot, 1983; Pryor & Bright 2011, 2017). These fluctuations and changes may have a trivial impact on our lives (e.g., we wrinkle), or alternatively, changes in our body can have profound impacts (e.g., we die of cancer).

Generally, the patterns that emerge from the complex operation of dynamical systems cannot be predicted in advance but can be appreciated as they emerge. The implications of this aspect of complex dynamical systems are often misunderstood or not fully appreciated. It severely constrains, indeed resists, attempts to predict system behavior or accurately model the system.

Models are forms of reduction based on what are assumed to be the most important elements in a system. However, the non-linearity inherent in chaotic systems means that seemingly trivial or left-field elements can and do have profound impacts on system performance. Determining apriori which elements are likely to be influential is impossible. This level of system understanding only comes after the fact, or from ongoing interactions with the system.

It also challenges notions like career maturity and rational decision-making based on the advance collection of information. US General Dwight Eisenhower famously remarked that, in battle, plans are useless but planning is indispensable (Nixon, 1962). This neatly captures the reality that being able to interact with the system (i.e., the battlefield),

having the capacity to adapt in the face of feedback, and being prepared to try new strategies is the only realistic approach. It is not unlike the old jazz musician's adage that improvisation is merely composition speeded up. In other words, successful management of complex dynamical systems involves an element of going with the flow (Niles, Amundson & Neault, 2011), seeking to influence rather than control the systems, and making it up as you go along.

### **Attractors**

A starting point for understanding a system is to identify or appreciate a system's limits. Complex dynamical systems are constrained in their operation by attractors. Systems are observed to be "drawn to" or operate within "basins of attraction." In chaos theory, there are four major forms of attractors that range from simple closed-system attractors to more complex open-systems attractors (Pryor & Bright, 2007, 2011).

The simplest way of constraining a dynamic system is to force it to move toward a clearly defined endpoint. The Point Attractor is observed to be operating when the system behaves in this manner. The classic example in physics is water running through a plug hole. The plug hole acts as a Point Attractor. When we set (and rigidly stick to) a goal we are, in effect, imposing a Point Attractor on our behavior.

Point Attractors offer the possibility of predictability since it is clear what the endpoint is supposed to be. This is considered to be motivating and removes the uncertainty of distraction or stalling when choosing between competing alternatives.

When complex systems, such as human beings, are constrained by the operation of a Point Attractor, it represents an attempt to impose a closed system on a naturally open-system. For instance, a deadline might motivate us to work toward it, but our plans might be sent off course when a key team member falls ill. The short-coming of the Point Attractor is that it

underestimates complexity and can lead to myopic and inflexible behavior in the face of change - including denying that the goalposts have moved. We have concluded that goal setting is both over-recommended and uncritically accepted in career counseling as a solution to individuals' career development challenges. One of the benefits of understanding human behavior through the lens of complexity is to appreciate that goal setting is actually an attempt to tame complexity and that it fails more frequently than its advocates generally acknowledge (e.g., Bright & Pryor, 2012).

The second simplest form of Attractor is the Pendulum or Periodic attractor. As its name suggests, this describes a system that oscillates between two defined points, like a pendulum. Clients who tend to dichotomize their thinking into black-and-white categories can be described as captured in the pendulum attractor, as can clients who reduce career decisions to two competing alternatives.

The Pendulum attractor is another closed-system attractor. It benefits from being apparently predictable and controllable due to its simplicity. However, once again it represents an oversimplification of reality since the world does not come in exclusively binary categories. It is well-established in counseling and clinical psychology that dichotomous thinking can be very self-limiting and even damaging for clients (e.g., Ellis, 1994).

More complicated systems move through a series of well-defined stages before repeating the sequence exactly. The firing of cylinders in an internal combustion engine follows an exact sequence and timing when the engine is running properly. People attempt to recreate this precision in their behavior by adopting routines, procedures, habits, rules, and laws. This response to complexity once again benefits from increasing perceived predictability, since imposing a regimen means establishing a closed system. When this happens, a Torus Attractor is said to operate.

Torus Attractors overcome a lot of the rigidity of the point and pendulum attractors, and offer many different possible states for the system to move through. This makes them both useful and seductive since the apparent changes in the system can be mistaken in the short-term as a completely open and flexible system. However, as anyone who has ever labored in a bureaucratic system will appreciate, exceptions to the rule emerge over time, and the routines, procedures, and policies of the system become ineffective at handling the changed realities.

In career terms, the Point, Pendulum and Torus attractors appear to offer varying solutions to uncertainty by over-estimating the sufficiency of both human knowledge and human control. However, if career counseling, life coaching, vocational assessment and career education rely exclusively on these closed system attractors, the result will be a failure to equip people with the skills for dealing with an open systems reality. The emphasis will be on goals, outcomes, procedures, cycles, and plans. In other words, the Goal attractor of a Holland code match or the Torus attractor of a Super cycle. What will be missing is an emphasis on adaptability, change, creativity, flexibility, resilience, and risk taking – the very skills that are necessary for twenty-first-century career development.

The final attractor is called the Strange Attractor. It describes the operation of an open system. It is in operation when emergent, self-organizing, fractal patterns are observed. It is the signature of a complex or chaotic system. The Strange Attractor follows a self-similar but never identical pattern. In that sense, it is like a “looser” Torus Attractor. However, unlike the Torus Attractor, the Strange Attractor also exhibits unpredictable phase shifts where the whole of the system is transformed. Sometimes these phase shifts are very fast and dramatic – such as acquiring an injury in a motor vehicle accident that transforms one's life and career. However, these phase shifts can also come on more slowly, for instance, the flipping of the

earth's magnetic fields, which occurs about once every 10,000 years or less frequently.

From a CTC perspective, every person is seen as a complex fractal (Strange Attractor) pattern that has other fractal patterns contained within it, and is itself embedded in broader fractal patterns. Savickas et al. (2009) have also acknowledged the fractality of career patterns. Ultimately, these patterns can never be fully predicted in advance, although their self-similarity will provide (generally) for some short-term stability. From this perspective, personality traits are seen as self-similar fractal patterns. They may show high levels of stability over time at global levels, such as the Big Five. However, people's personalities may also change over time, as people are said to mellow or harden while some are transformed by external events or an epiphany.

The CTC counselor or coach helps clients to gain a better appreciation of their Strange Attractor. This includes an exploration of some of the limits of the system - including beliefs and circumstance - as well as some of the open-systems possibilities (see also Pryor et al., 2008). The aim is to help people remain at a point sometimes called the "edge of chaos" - where they benefit from sufficient stability and predictability of closed system operation but at the same time are sufficiently open to recognize the potential of initiated or imposed change and the challenges that these may bring. This, logically, leads to an emphasis on developing skills that might be useful in confronting these challenges, such as adaptability, change, creativity, flexibility, resilience, and risk taking.

The Attractors are a powerful formulations because career development theory must do more than recognize or state that reality is complex. Without clear practical counseling strategies to proceed under conditions of complexity, counselors will inevitably fall back into the basins of the closed system attractors - namely the Point, Pendulum, and Torus. In other words, we will revert to an over-reliance on goal-setting (Point Attractor), either-or

thinking (Pendulum Attractor) and static plans (Torus Attractor).

This has clear implications for how we go about career counseling, life coaching, vocational assessment, and career education. We briefly set out some of these implications in the following sections to provide a sense of the potential of the CTC.

### **Counseling and Coaching Implications of the CTC**

The counseling and coaching implications of the CTC have been covered extensively in Pryor and Bright (2011, 2015) and the reader is referred to these sources for a more extended treatment. Pryor and Bright (in press) identify five implications of CTC for counseling:

1. Career development occurs in the complex and connected contexts of individuals' lives, including family, friends, location, spirituality, and health.

2. Career development occurs in the complex and connected contexts of the environment, including the labor market, organizational structures, transport, economic conditions, cultural traditions, national and international politics, and workplace ergonomics.

3. Successful career development requires the development of thought processes and skills which allow individuals to negotiate both planned and unplanned changes effectively. The nonlinear nature of change in chaotic systems highlights the significance and potential for both positive and negative consequences of changes in individuals' careers.

4. Uncertainty can be construed as a threat from which we shrink or an opportunity to construct a meaningful life creatively.

5. Failure in career development, at some points, is almost inevitable. The challenge is how to minimize its potential incidence, make failure survivable if it does happen, and maximize the benefit in terms of learning and renewal when it does occur.

From these implications it follows that a greater emphasis needs to be placed upon

assisting clients in learning the skills of planning, while less emphasis must be placed on deciding upon a singular plan, or even a plan A and a plan B. The skills of planning or “planmanship” (Bright, 2012), as set out in the RAPID-CPR model (Hooley, Bright & Winter, 2016) that should be taught, are how to Revise, Abandon, Pause, Implement, Devise, Copy, Promote and Revive a plan. Placing a greater emphasis on these skills will result in greater levels of adaptability, flexibility, and, ultimately, resilience. It will boost opportunity awareness.

More generally, given the inherent uncertainty and irreducible reality of the world in which we live, we must make decisions and develop our personal and working lives. In practical terms, this means that counseling and coaching strategies based on trial and error, small experiments, contingent choices, retrievable failure (Pryor & Bright, 2009, 2012) and persistent monitoring and adaptation are preferable to developing once-off “career plans.” Coaching clients in skills of creativity, reinvention, opportunity awareness, failing successfully, persistence, curiosity, resilience, and developing a capacity and tolerance for risk are much more helpful interventions than trying to identify an “ideal” occupation from a consideration of nothing more than a person’s vocational interests, age, or developmental stage.

Encouraging trial-and-error behavior, conducting small experiments, or “probing” the system (Snowden & Boone, 2007) are appropriate methods to explore options and arrive at a decision. This requires fostering curiosity as a way of exploring and discouraging notions of there being one “correct” answer to a person’s circumstances. From this perspective, interest test results, for instance, would be considered as a probe - like one form of convergent evidence (Pryor & Bright, 2017) rather than a solution per se.

It follows that developing opportunity awareness or “luck readiness” (Pryor & Bright, 2005) including flexibility, persistence, risk taking, strategy self-efficacy, and optimism are

important goals of counseling and coaching. While we do not eschew the use of influential post-modernist approaches based on narrative construction, deconstruction, and reconstruction (e.g., Savickas et al, 2009), we have argued that such approaches, while useful, are insufficient for twenty-first-century career counseling (Pryor, Bright & McIlveen, in press). For example, the literature on narrative counseling appears to neglect the consideration of intuition. Of course, intuition in the past was typically associated with female lack of logic as compared to male rationality, and as a consequence, frequently devalued. However, despite what decision-making theorists have often sought to preach about the rational approaches to choice, the empirical literature indicates that humans are limited in their rationality (Dawes, 1988). We often make decisions that satisfy rather than optimize, we take shortcuts, we use developed heuristics and rules of thumb, and we reason analogically from our past experience to choose between options. The principal reason for this is complexity. The world is simply too complex for the human mind to be able to take into account the range of all the potential influences, the non-linearity of their interactions, or the multitude of possible outcomes associated with many of the most significant decisions we have to make. Put simply, our problem is one of pattern recognition.

In systems theory, pattern recognition is fundamental to our understanding of the ways that the components of the system interact. This may not always be a totally conscious process. Klein (1998) has demonstrated how, in quite different emergency contexts, both firefighters and doctors and nurses will, on occasion, sense that something is not as it seems and, on this basis alone, seek to investigate situations in much further detail. In fact, sometimes the best predictor of patient intervention needs, without vital signs of abnormalities, was the concern of an experienced nurse.

“Intuition is fundamentally about pattern recognition and pattern matching based on our past experience” (Roberto, 2009, p.21). Such pattern recognition is very often the unconscious process of sensing influences or perceiving outcomes that are not, at the moment, obvious to the conscious mind. For far too long in the career development field, it is the conscious which has been the only focus of attention. Early attempts (e.g., Brill, 1949) to relate the unconscious to careers focused on hidden motivations behind choices (such as sadism) being sublimated into vocational choices (such as butchers and surgeons) proved incredulous to counselors and unempirical to researchers. However, if complexity is to be taken seriously in career development, we must be open to the potential importance of clients’ hunches, gut feelings, apprehensions, instincts, and presentiments. Such intuitive processes may be crucial to individuals’ perceptions of themselves, their situations, and proposed courses of action - even though such individuals may not at present be able to precisely articulate what their concerns may be. Individuals should be encouraged to explore their intuitions rather than have them dismissed. They may need to be given time to elucidate what they currently just feel. They may need “psychological space” with the counseling process to revisit their intuitions to see if other considerations covered in counseling prompt the content of their apprehensions. It may also be that exploration of intuitions will uncover repressed fears or insecurities that need to be addressed before further career counseling can proceed.

### **Career Assessment Implications of the CTC**

Assessment implications are covered in greater detail in Pryor and Bright (2015), however, in general terms, the reality of non-linear change serves as a caution against over-reliance on the adage that past behavior predicts future behavior. It is not that this is completely untrue but, rather, that the predictive validities of combined forms of assessment rarely exceed the 0.4 to 0.5 range. This means that at least

75% of the variance in outcomes is not accounted for even using the very best assessment instruments. The reasons for this from a CTC perspective are obvious: it is due to complexity!

This is not an argument to abandon testing. Pryor and Bright (2015) point out that quantitative and qualitative methods can be more constructively seen as complementary and as capturing quite distinct elements of a person’s fractal. Indeed, assessment from a CTC perspective strives for a deeper and more reliable understanding of a person’s Strange Attractor or fractal pattern. Chaos approaches to assessment do not buy into an “epistemic war” (Pryor & Bright, 2011 citing Savickas, 2005) between modernist and postmodernist, quantitative and qualitative approaches. Snowden (2011) sums it up well, “the goal is to utilize the rich context of narrative to inform sensemaking, and also to create objective data in which cognitive bias is minimized and we can place some reliance on the conclusions drawn” (p.228).

Traversing both the fields of career counseling and career assessment is a further development arising from the CTC. As an additional way to endeavor to come to terms with complexity, we have espoused the need for multiple perspectives (Pryor & Bright, 2015, 2017). Others have made similar arguments (e.g., Amundson, 2010). Complex dynamical systems have two intrinsic properties apart from complexity: one is the capacity and sensitivity to change (hence, “dynamical”), the other is self-organized structure (hence, “system”). Career assessment and counseling must find ways to incorporate both these properties into the processes of individuals’ career development. The CTC proposes the twin perspectives of convergence and emergence (Pryor & Bright, 2011). These perspectives are not viewed as points along a continuum on which clients’ thinking may be located between two extremes. Instead, they are orthogonal, that is, a person having one such perspective has no

effect on the nature of that person's perspective on the other perspective.

The Convergent Perspective is focused on the stable and systemic dimensions of complex dynamical systems. The emphasis is on processes of information gathering, analysis, deduction, evaluation, timing, and goal setting. It utilizes information gleaned from those stable aspects of the individual as a system, such as measurable traits, physical capabilities, occupational information, past behaviour, and biodata. Conversely, the Emergent Perspective focuses attention on change, potential, creativity, metaphors, intuition, subjectivity, and opportunities. The aim is to create possibilities, to explore options, to imagine processes and outcomes, to take risks, to think non-linearly, to derive purpose and meaning, to focus on the unique or idiosyncratic, and to develop intuitive processes.

The CTC views both these perspectives as perpetually relevant to the processes of career development since such development is a result of the constant interplay of stability and change within the complex dynamical systems that constitute the reality in which humans interact with the world. For career practitioners seeking to assist individuals, this will mean the creative use of quantitative and qualitative assessment tools in combination - both to assess stable characteristics and to stimulate creative exploration of possibilities (Pryor & Bright, 2015; Schlesinger & Daley, 2016a, 2016b). In terms of career counseling, using multiple perspectives can allow counselors to: identify strengths and blockages to individuals' career development, implement strategies to develop and utilize those strengths, and to redress, ameliorate and overcome those blockages. A detailed description of such counseling can be found in Pryor and Bright (2017).

### **Summary**

The Chaos Theory of Careers has been in development for almost two decades (Pryor & Bright, 2014). Hutchison (2015) has suggested

that the theory may seem complex and somewhat abstract, however, this is inevitable if a theoretical formulation is to reflect life as it is really lived and reality as it actually is. Anything less fails to do justice to either human experience or the world in which they live and is a distorted over-simplification of human lives and careers. All of the unexpected twists, turns, and complexities of life reveal that the CTC approach captures the nature of people and their environments more holistically and accurately than its more reductionist forebears. We hope to have illustrated that our approach does not invalidate the insights and value of the work of either Holland or Super; their theories continue to have significant theoretical and practical worth. Though neither is incompatible with the CTC, we believe the CTC gives a richer understanding that emphasizes more centrally the kinds of career development challenges that people face in the twenty-first century, including change, chance, complexity, and uncertainty.

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