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If you go down to the woods today you are in for a big surprise: seeing the wood for the trees in online delivery of career guidance

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If you go down to the woods today you are in for a big surprise: seeing the wood for the trees in online delivery of career guidance

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Arguments about online delivery of career development are too frequently couched in polarising terms setting traditional face-to-face guidance practice against online systems. The focus has been on the alleged dehumanising impact of technology and the speed, economy and efficiency of online systems. The possible synergies delivered by the appropriate integration of online systems into career development need exploring. The potential of eguidance, elearning, social media and online information and assessment systems has been insufficiently explored. The user experience has been overlooked, despite evidence that user-interface issues and usability are critical factors in the effectiveness of online systems. The application of artificial intelligence remains largely under-researched in career development. The potential for online systems to assist individuals respond to their chaotic careers has yet to be adequately addressed.

Keywords: career development; career counselling; career assessment; online counselling

Introduction

This paper sets out inclusive arguments based on the open-systems thinking approach of the Chaos Theory of Careers (CTC; Bright & Pryor, 2005, 2011, 2012; Pryor & Bright, 2011) to highlight how internet-based services open up a new world of possibilities in service provision that enhance the effectiveness of career services, and at the same time enhance the profile of the discipline and those who practice within it. It is argued that by paying attention to the user in the development of client-centred service provision, many of the arguments about dehumanising technology can be largely addressed. Understanding that the imperative to tailor the user experience is just as strong with Information and Communication Technology (ICT) Systems as it is with face-to-face counselling, which offers the possibility of more effective and useful systems.

Whilst some in the counselling field have argued for a radical re-thinking of how career counselling is conducted (e.g. Amundson, 2009), the field as a whole has been slow to adapt to the biggest technological revolution in service delivery since the formalisation of the field 100 years ago. The irony for a profession focused on helping individuals adapt to and manage change in their lives should not be lost on us. It is argued that we have yet to see the full potential of ICT Solutions in career development, and the

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field of Artificial Intelligence is highlighted as an example of where ICT Solutions may have a great impact on career development.

When considering 'career development' ICT we immediately run into questions of what constitutes a career development resource, or indeed what we mean by career development. Extant definitions and descriptions tend to be all encompassing such as 'Career development is the lifelong process of managing life, learning, work, leisure and transitions in order to move towards a personally determined and evolving future. It applies to people of all ages.' (CICA, 2014). This is a very broad definition and it is difficult to envisage what ICT resources might fall outside of its purview. Other definitions place a greater emphasis on process, in particular, learning. Learning about self, others and the world to take action to create a future is emphasised in Law (2001). While narrowing the focus to learning and action, the content encapsulates all of life. The recently established Career Development Institute UK offers a functional description of what career development professionals do: 'to affect a wide range of career transitions. These may be associated with life and career stages, including the development of the career ideas of young people' (CDI, 2014). Patton and McMahon (2006) provide a good account of the historical and varied definitions of our field. What emerges from this consideration is that career development is complex. However, consistent themes are the connection of the person to community generally (not just the labour market), and people's actions, transactions and transitions within and between themselves and the community over time. Consequently, while almost any ICT resource (or indeed any act in life) could conceivably have a career development connection, those ICT resources whose purpose or focus begins with these considerations are for the purposes of this paper what are understood to be career development ICT.

Characterising ICT integration in terms of change and complexity

The acceptance of new ICT in a profession is not unlike the reaction to a new theory. First, it is ignored, then it is resisted and then it is passé. However, in the case of career development and ICT there is a risk that a truer description might be first it is ignored, then resisted and then it passed us by. Recent research appears to support this contention. Vuorinen, Sampson, and Kettinunen (2011) conducted longitudinal focus groups assessing counsellors' perceptions of ICT in career development over the last decade. Encouragingly they report 'increasing use' (p. 39) of ICT; however, they also report that after 10 years of exposure to ICT in career development that it was still being used 'for delivering career information rather than promoting career management skills from a life-long guidance perspective' (p. 44). In a similar vein, Bimrose, Hughes, and Barnes (2011) found that:

> Despite a steady increase in the integration of ICT in careers practice, its most common usage relates to the dissemination of information … Where ICT has been integrated into guidance practice, strands of delivery are kept more-or-less separate (i.e. telephone guidance, email guidance, web-based, etc.). Full integration seems some distance away. (p. 27)

If the findings of Vuorinen et al. and Bimrose et al. are representative, it suggests that the dramatic developments in ICT over the last decade such as social media, smart phones, iPads, voice over internet protocol (VOIP), webinars and wikis have largely by-passed the career development community. It is reasonable to ask why it appears that the

response to the fast shift in ICT has been met with a slow shift response from the profession (Bright & Pryor, 2008).

The integration of ICT in career development has the potential to alter radically not only the way career development services are accessed and delivered, but also the very nature and scope of career services. The extent of the change the career profession is facing is profound. It goes to the nature of the composition of the workforce that will be required in the future to deliver career services. In turn this has implications for training, re-training and ongoing training of this future workforce. The introduction of ICT may 'alter the tasks for which they were designed, indeed alter the situations in which the tasks occur and even the conditions that cause people to want to engage in the tasks' (Carroll and Campbell 1988, p. 4). As Bimrose et al. (2011) point out:

> Technological, social and cultural factors are all elements that have to be considered and negotiated when contemplating change involving ICT (Williams & Edge, 1999). Irrespective of which explanation of technological change dominates, the process of its integration in careers work and organisations is complex. (p. 24)

In short, the reason the careers profession has been slow to change is that complexity is to blame (Pryor & Bright, 2011) and an understanding of complexity may assist in encouraging more widespread and creative integration of ICT.

Pryor and Bright (2011) adumbrated the CTC that characterises the contemporary career experience in terms of complexity, change, chance and constructedness. What follows from this is that due to complexity careers are not predictable in the longer term, that change is inevitable, and that change will often be unpredictable and experienced as chance. Due to this complexity, we seek to construct patterns of reality that are always partial and subject to change. The theory provides a framework for understanding reactions to change and to encourage a more adaptive and helpful approach to embracing change. The CTC characterises people as complex dynamical open systems interacting with other such systems and also embedded within bigger complex dynamical systems. ICT is one of those other systems.

ICT is a rapidly changing, multi-faceted inter-connected dynamical open system that presents with all of the characteristics of chaotic and complex systems, namely: it is highly interconnected – innovations in one area rapidly influence other areas; it demonstrates non-linearity – teenagers in their bedrooms can and do create innovations that radically alter the ICT landscape such as Steve Jobs and Steve Wozniak with Apple (Isaacson, 2011); it demonstrates self-organisation – new technologies emerge and rapidly systems form around the new technology – for instance, the app store for the iPhone and iPad or the hardware integration of iPads into everything from maritime navigation to kindergarten classes; it experiences phase shifts – for instance, the sudden demise of the netbook and the rise of the tablet computer; and the rise of the smartphone.

The challenges of integrating fast changing and complex ICT into careers work (Bimrose et al., 2011) become more pressing when considering the broader sociological changes that career development must address. In particular, there has always been a challenge in the field of reaching more people and ICT has provided on-demand, often immediate services in a range of other areas – for instance, music and film downloads and online medical diagnosis systems, these initiatives in parallel fields lead inevitably to greater expectations for career development services. ICT also offers the possibility of reaching more people more quickly. At the end of May 2014, the University of London released the first Massive Open Online Course (MOOC) in careers and employability

(University of London, 2014). On the first day 122,144 people had enrolled and 34,408 had begun to access the course (Winter, 2014).

The University of London MOOC provides a good example of how governments may be able to address, in part, the challenge of services limited in scope and rationed by funding exigencies. Furthermore, the development of a significant suite of such resources may also address the challenge of the growing numbers of independent practitioners who may lack the capacity to generate or provide such resources to clients, as well as partially addressing issues of standards of service delivery in such a diverse workforce.

Open- and closed-system thinking

The implications for the practitioner confronted by these open-systems realities is that life is uncertain. Ideas and practices that are held dear, that work effectively and with which they are both comfortable and confident suddenly are confronted with competing alternatives that promise to be faster, more accurate and cheaper. A common reaction is to attempt to control their working environment by creating a closed system comprising their current practices and seeing ICT in competing terms. The implications are to lock-in what works and to resist new approaches for fear that these approaches will supplant their systems and ultimately themselves. This is not a promising approach to embracing change. Closed-system thinking about ICT has been evident over the last decade or more and is a form of self-limited thinking.

From a CTC perspective, assisting people to overcome self-limited thinking about ICT is part of the challenge of integrating ICT into career development. This may be part of the 'culture change' that Bimrose et al. (2011) argue is required for the delivery of careers services. They identify training as the way to address cultural change; however, self-limited thinking about change and uncertainty may also need addressing through counselling. First, it is necessary to identify the types of closed-system thinking evident in the debate over ICT integration.

Pendulum thinking

One of the most common reactions to complexity is to attempt to control and predict it by reducing complexity to simpler closed systems. Limiting the operation of a system to a closed system takes characteristic forms known as attractors (see Pryor & Bright, 2007). One of the most common strategies of simplification is to reduce complexity to two competing choices – an either-or binary choice.

Probably the most common closed system trap is to think of ICT as an alternative to counsellor-led services. This is a form of pendulum attractor thinking. This type of thinking is manifest in debates about the relative merits of websites and face-to-face careers services, e.g. Hooley (2014) argues that presenting ICT as replacing face-to-face guidance as 'unhelpful' and 'polarising'. It is also evident in the political debate in the House Lords on 25 February 2014, where Lord Nash contrasted face-to-face careers services in schools with an alternative of 'employer engagement' (George, 2014).

Within the fields of engineering and ergonomics, simplistic pendulum thinking has been evident for many years when considering how humans interact with technology. Men (sic) are best at/Machines are best at or MABA-MABA thinking (e.g. Chapanis, 1965) has been around for over 50 years. In essence the issue that engineers have wrestled with during this time is the same as the one Career Development faces today. Consistent with Hooley's (2011) injunctions, Dekker and Woods (2002) argue that

MABA-MABA formulations are overly simplistic and deny the psychological complexities of the interaction. It relies upon a fixed idea of human and machine strengths and weaknesses. Such thinking they argue fosters 'the idea that new technology can be introduced as a simple substitution of machines for people – preserving the basic system while improving it on some output measures (lower workload, better economy, fewer errors, higher accuracy, etc.)' (p. 241). However, they argue that introducing technology to overcome or improve upon a human weakness actually creates more human strengths and weaknesses. Thinking in pendulum terms ignores the synergies between the alternatives. In other words, simple interventions in complex dynamical systems have unpredictable consequences. Complexity is to blame.

ICT technology will change career development practice, but in turn career development practitioners will change how the technology is deployed with divergent local practices. Dekker and Woods conclude:

> The question for successful automation is not 'Who has control over what or how much?' It is 'How do we get along together?' Indeed, where designers really need guidance today is how to support the co-ordination between people and automation. In complex, dynamic, non-deterministic worlds, people will continue to be involved in the operation of highly automated systems. The key to a successful future of these systems lies in how they support cooperation with their human operators – not only in foreseeable standard situations, but also during novel, unexpected circumstances. (p. 243)

This raises the issues of usability and client-centred service provision.

Usability and client – centred service provision

In counselling, listening to the client and being 'present' is strongly encouraged. It can be argued that online systems have the advantage that they are always listening and present. They offer 24/7 access in a way that is simply beyond even the most excessively funded careers service. The access to the internet is effectively universal in western countries, if not at home then in schools, libraries or internet cafés as well as on personal digital assistants (PDAs). However, as Hooley, Hutchison, and Watts (2010) contend 'digital exclusion' (p. 8) goes beyond considerations of access to the internet, to issues such as digital literacy. They argue that digital literacy leads to an 'exponential' (p. 8) increase in capacity to extract information from the internet.

The embrace of technology offers the possibilities of enhanced career development services that may free up career professionals to address more complex client issues. Consequently, the career development workforce may change to embrace a more digitally literate outlook from higher skilled professionals addressing clients in their complexity – rather than treating them as simple issues of matching interests to occupations.

ICT integration requires ongoing training of counsellors in ICT (Bimrose et al., 2011). 'Part of the process of increased professionalisation of the sector, which is at the heart of the recommendations proposed by the Careers Profession Task Force in England (commissioned by Government in February, 2010), is the need to strengthen the competence of the workforce for the use of both LMI and ICT (Department for Education, 2010)' (p. 5). The Task Force drew on recently published research that had identified the particular skills and competencies required by practitioners using ICT to deliver careers support for young people in England (Bimrose et al., 2011, p. 5) that had concluded career practitioners: 'will need, increasingly, to demonstrate a level of proficiency in internet-based technologies at least equal to those of the young people

accessing their expertise' (p. 5). The emphasis on the need to provide training in digital literacy for both users (Hooley et al., 2010) and practitioners (Bimrose et al., 2011) addresses only one side of the equation.

The emphasis on training and attendant policies assumes that educating users is the primary method of leveraging internet services. However, this exclusive focus on the user neglects the central and critical role that system usability and interface design contributes to extracting the full potential from ICT. This oversight seems odd when considered in the context of the remarkable impact that companies like Apple, Microsoft, Google and Samsung have had on device usage driven strongly by close attention to the user experience. Apple's design philosophy captured in the slogan 'it just works' is to make the interface so intuitive that instruction manuals are not required. Indeed some of the relative failures in terms of user acceptance in recent times such as Microsoft Vista and Windows 8 operating systems has in large part been due to the poor user experience with their interfaces.

The current state of online career development services from a usability perspective are patchy at best. Too often many of the existing sites are crammed with information with dubious or oblique navigation systems and some do little more than link to government statistical labour market information presented in highly technical statistical terms such as stanines despite them being aimed at 15- to 17-year-olds unlikely to have been taught sufficient statistics to understand the information.

Perhaps because they are moderated before release, some of the more recent developments such as iPad apps have significantly better and more usable interfaces. For instance, the app CareerHunter from Queensland Australia developed by the consortium of State and Federal Government Education departments, Government agencies with the Smith Family charity, is an outstanding example of high levels of usability (The Smith Family, 2013). The app presents labour market information in an attractive, understandable and accurate fashion. Navigation of the iPhone and iPad app is intuitive making use of swiping and touch interfaces. It also uses the GPS capabilities of these devices to deliver local employment and training opportunity information. The app is aimed at 'young people' and aims to make links from school to industries where there are skills shortages. The landing screen on the iPad version consists for four large photographs depicting 'Other services', 'Information Media and Communications', 'Retail Trade' and 'Education and Training'. Tapping on the last of these, the next screen displays graphically using cutouts of male and female figures the participation by gender in this area (31% make, 69% female), swiping to the next screen shows more attractive graphics depicting the total number of people in the workforce, the percentage of the workforce as a whole, average wages, predicted new jobs and so on. At the bottom of the screen is a button to jump straight to viewing the 'top' jobs. This brings up links to jobs beginning with Primary School Teacher through to School Principal. Tapping on 'Education Aide' brings up a job description, labour market information and a button that links to an Apprenticeship finder site, while another button brings up training requirements and shows on a map the nearest educational providers to one's current destination. The system is intuitive, flows smoothly and conveys complex information attractively, intuitively and clearly.

An attractive feature of the app approach to career development ICT is that it eschews the approach adopted by monolithic sites that attempt to be compendia and comprehensive vademecum for all career ills. Apps lend themselves to being more focussed on a particular aspect of career development, or potentially a specific industry or occupational

area. This provides much needed flexibility and capacity to offer specialised and targeted career development services.

The potential of apps to provide focussed information that is automatically and readily updatable goes towards overcoming a traditional problem with labour market information of how to provide more than generalised information by focusing on specialised labour markets. They also offer much greater opportunities to update labour market information – potentially as frequently as daily, for instance in the case of casual labour hire.

Instead of focussing on yet more training and the ongoing costs of training as the primary approach to ICT engagement, the career development profession needs to become more fully engaged with usability and interface design concerns. This is an example of how the skill requirements for the career development community are changing. Increasingly working with developers to produce websites, apps, streaming video and interactive online learning environments will be core skills for an increasing number of career practitioners.

Thinking about design issues also requires fresh eyes in terms of research and development. The preoccupation in career services of surveying target groups, such as youth to develop aspirational wish lists of features for careers ICT, is a hangover from the customer-focus emphasis from the Total Quality Management theories that began to flourish in the 1980s (e.g. Feigenbaum, 1961). It is generally not a good idea to design an interface by committee. Henry Ford was reputed to have once said 'If I'd asked customers what they wanted they would have told me, "a faster horse"'. Steve Jobs, CEO of Apple, argued that 'customers don't know what they want until we've shown them' (Isaacson, 2011, p. 143). In areas that are so dynamical, fast moving and unpredictable, the danger of an overreliance on market research is that it acts as a form of negative feedback to maintain the status quo and so set up a closed system. Innovation is stymied, and very rapidly the ICT offering can appear dated or it will be surpassed by better systems. Instead of asking target groups like young people what they would like to see on a website, ask, encourage and support them instead to design the websites and apps.

It may appear paradoxical to be advocating open-systems approaches on the one hand while urging the adoption of good design and usability practice. However, this apparent paradox is resolved in a chaos and complexity framework through the concept of bounded infinity and fractality. Mandelbrot (1975) posed the question how long is the coastline of Britain. The answer it turns out is infinitely long – as the unit of measurement gets smaller, the estimate becomes larger. Thus while there is a clear boundary around Britain, it bounds an infinite length. Similarly, good design principles create more freedoms than constraints. Apple have very tight constraints and standards for apps in their App store; however, the result has been an explosion in the number and variety of Apps available – over one million at the time of writing. In this sense, a call for user friendly design is not unlike a call for good English. A grammar may limit how we construct sentences, but not the number of sentences we can construct. Placing constraints on ICT in terms of quality benchmarks should serve to raise the standard and usability of ICT career Apps, and in turn improve their effectiveness for career development.

Further examples of closed-system thinking have been evident in the tendency of governments around the world to develop their own in-house ICT career development systems. While this has been successful in areas where governments have traditionally had a strong presence such as the provision of labour market information, initiatives to provide the sorts of functionality found in social media sites such as Facebook, Google,

Linkedin and Twitter have been less successful. It is questionable that government departments have the depth of programming experience necessary to produce compelling sites with outstanding user interfaces, and it beyond question that they do not possess the budgets to deliver, maintain and update products of comparable quality.

The need for accountability and control – essentially establishing a closed system is a strong government instinct to resist, hence the tendency to embark on ambitious career projects with insufficient expertise, budget or longer-term commitment. When this author suggested that students be allowed to use Facebook for career development in their schools at a major international conference opening plenary session in 2011, it was met with incredulity by some government bureaucrats. Their response was not recorded the following day when a state education department announced that was precisely what they were planning to do!

Leveraging existing platforms such as Facebook and Linkedin that are already used by the relevant target groups is a way of providing low-cost, high impact services using the high-quality interfaces and existing networks established on these sites. It also minimises costs in development and maintenance and provides an important form of control for ICT systems namely having the agility to establish, move and re-establish sites as technology and trends dictate. It is unlikely that such an outsourced approach will supplant government-maintained sites; however, a mixed model of delivery utilising available social media sites, and allowing for grass-roots development projects like the CareerHunter app may point to more responsive, open-systems future for ICT delivery and development.

Networks, self-organising systems and emergence

Open systems necessarily entail networks that can never be fully described and captured. Open systems allow possibilities (Pryor, Amundson, & Bright, 2008), whereas closed systems confine people to predictable probabilities. Open systems do not try to specify all of the rules or parameters in advance, rather when the systems are established with a set of basic rules that are repeated throughout the system – for instance, values or purpose statements, the systems can evolve spontaneously into dynamically stable self-organised systems.

This emergence into self-organised systems is a characteristic of social networking sites. Patterns of activity spontaneously emerge – for instance, the establishment of Linkedin discussion groups, comments threads on Facebook or the emergence of blogs or wikis. Some of these become long running well-established sites on the web, whereas others serve a purpose for a short period and die out. The unpredictable nature of these self-organising systems allows for serendipitous events and happenstance learning (Bright, Pryor, & Harpham, 2005; Krumboltz, 2011).

The natural networking that occurs on these sites can be harnessed and leveraged by skilful counsellors working with their clients. This shifts the paradigm from the counsellor assisting in the development of fully specified career plans, and instead has them operating not to control a closed system but rather assisting their clients to try to influence a complex system. Therefore, there is an opportunity to re-frame career counselling in line a more realistic view of the open systems realities of their client's lives.

Some not so new future directions

Bright and Pryor (2008) identified 11 shifts for the career development profession derived from the CTC to acknowledge the open systems realities of a world where shift happens.

These were: from prediction to prediction and pattern making; from plans to plans and planning; for narrowing down to being focussed on openness; from control to controlled flexibility; from risk as failure to risk as endeavour; from probabilities to probable possibilities; from goals, roles and routines to meaning, mattering and black swans; from informing to informing and transforming; from normative thinking to normative and scalable thinking; from knowing in advance to living with emergence; and from trust as control to trust as faith.

All of these 11 shifts apply to the embrace, development and engagement with ICT. ICT when implemented imaginatively offers the potential for individuals to understand the patterns of complexities and possibilities of the complex dynamical world in which they live. The potential for immediate feedback and asynchronous feedback from multiple sources brings the planning process to life and encourages a mindset of ongoing planning activities. Scenario planning and war-gaming of options is possible with simulations and interactive sites. Consequently, ICT may offer the best chance to rid career development of its outdated attachment to the singular career transition plan in favour of developing skills for ongoing reinvention and planning. The result is a more flexible workforce for the public good, and increased stability and continuity of employment for the private good (see Hooley et al., 2010).

The globally interconnected nature of the internet enhances the possibilities for focusing on openness, recognising possibilities and developing flexibility to take advantage of ever changing opportunities. This helps develop opportunity awareness (e.g. Neault, 2002; Pryor & Bright, 2011). The interactive nature of the internet permits simulations and the development of appropriate risk-taking behaviour in relation to career options. More career simulators with enhanced artificial intelligence (e.g. The Real Game, see Jarvis & Keeley, 2003) can enhance this career skill. Furthermore, simulators can assist decision-makers understand the dynamic and ongoing nature of decisions and their implications. Over time simulators can reveal hidden contingencies and reveal limitations of knowledge.

The complexity of the internet means that it is possible to go beyond what we know we know, we know we do not know to discover what we do not know we know and ultimately to have revealed to us, as Taleb (2007) calls them, the Black Swans of what we do not know we do not know. In so doing we can appreciate the scalable nature of the internet, and appreciate the impact of non-linearity – that sometimes things can change out of all proportion, or not. This in turn encourages an immersive experience where we live with what emerges as we interact and search online. Through this there is the potential to develop flexibility, opportunity awareness, resilience and improvisation – making it up as we go along. This shifts the emphasis from trying to control and predict our careers to having faith we have the skills, resources and connections and to have faith in our ability to take opportunities or deal with setbacks (Bright & Pryor, 2008). This may sound like reification of the 'internet', but the internet is not an abstraction. It is corporeally real. The six African countries on the wrong side of the internet cable dragged up from the Indian ocean seabed by a badly dropped anchor in 2012 experienced the immediate impact of a loss of the inter-connection created by real people interacting with real computers that are materially connected to one another. (*Daily Mail*, 2012).

In terms of shifts in ICT that career development practitioners could leverage, some obvious possibilities seem to me to include, the use of expert systems (mimicking counsellors), and artificial intelligence more generally to provide an enhanced and interactive advice and guidance system beyond information provision. Perhaps monolithic information heavy websites will be supplanted or at least complimented with more

apps and local groundswell initiatives. Crowd-sourcing for local targeted career information may be possible. Holographic technology may get to a point that allows holographic counselling sessions. Online testing may eventually leverage the interactive nature of the internet to provide adaptive testing that allow rapid and deeper exploration of specific career interests, skills or abilities. Online narrative analysis systems already exist (e.g. Cynefin, Cognitive Edge, 2014) and it is only a matter of time and imagination before such systems become available more widely in career development. Tools to help people tell their own stories and anecdotes and make sense of them seem reasonably plausible. Review systems akin to TripAdvisor for travellers might provide labour market reviews of different occupations. These are merely a few humble suggestions and no doubt others will offer many more creative examples.

This paper has presented ICT for career development within the framework of the CTC (Pryor & Bright, 2011) because this approach developed from chaos and complexity theory provides a principled account of the operation of complex dynamic open systems. ICT, especially the web, is precisely that – a complex dynamical open system. Extant traditional theories of career development based on matching, stages or the more recent Constructivist approaches have little or nothing to say about ICT. They provide no account of networks, or complexity, and nor can they account for ICT phenomena such as non-linear and rapid change, self-organised systems and emergence, tipping points, distributed networks, dynamic stability or a range of other phenomena that are the hallmarks of ICT and the CTC. Thus there is in my view a very strong and compelling argument that CTC provides a natural framework for consideration of ICT in career development. Understanding both the user and the ICT in terms of complex dynamical systems provides insights into design, usability, limits and potential for ICT to be more fully and effectively exploited within career development.

Given the foregoing, any attempts to predict the future of ICT in career development is fraught with difficulties, because the systems we are talking about are complex and dynamical and do not lend themselves to long range deterministic predictions. Like all attempts at futurism they are likely to be banal and conservative on the one hand or absurdly optimistic and fanciful on the other. Perhaps it is better to leave the visionary stuff to people like Clifford Stoll (1995) writing in *Newsweek* in 1995:

> Visionaries see a future of telecommuting workers, interactive libraries and multimedia classrooms. They speak of electronic town meetings and virtual communities. Commerce and business will shift from offices and malls to networks and modems. And the freedom of digital networks will make government more democratic. Baloney. Do our computer pundits lack all common sense? The truth is no online database will replace your daily newspaper, no CD-ROM can take the place of a competent teacher and no computer network will change the way government works.

Career development and ICT are now intimately intertwined, and it is time to work out how we can best get along and make the most of it, and to stop ignoring or resisting the potential of ICT to transform our practice. Change can be difficult and the impulse to hold on to the old certainties can be hard to resist. However to do so would be to deny the realities of our work and world. We live as, with and within complex dynamical open systems. Attempting to control these by creating closed-systems approaches to our work, will leave us vulnerable, unprepared, unskilled and possibly by-passed by ICT. More importantly, there are tremendous and historically unprecedented opportunities to transform career development by embracing ICT and so to help our clients by going

beyond informing them to helping them to transform and take their place in a complex, chaotic and dynamic world. In order to do this we need to be as open to change, open to new skill sets and as creative and imaginative as the clients we help with their own reinventions. In short it is time to reinvent career development, embrace complexity, to welcome the central role of ICT in career development and to become producers of user-friendly high-quality ICT solutions.

Notes on contributor

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