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Stewarding Engagement, Harnessing Knowledge: Keeping the Future in Reserves

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"If you are not using the imaginative capacity in foresight, you are doing something wrong".

Michael Osborne OECD Futures Programme and Global Science Forum.

Introduction

The foundation of this paper is based on work that supported the Chief Military Personnel (CMP) Fight of the Future HR2028 project, examining the possible future implications for the military personnel system within a 20 year horizon.

This paper aims to explore the implications of key drivers of change upon the future of military personnel management in the CF and the Reserves. There are of course, many other factors existing today as well as those that will emerge in the future that will shape culture, society, systems and organizations in unpredictable ways. As well, there will be many unpredictable challenges posed by the Future Security Environment. However, the future of the workplace and personnel management in the CF will be significantly influenced by at least four major interacting factors – one demographic and three technological trends:

- The tectonic (massive, slow/imperceptible) change in the traditional demographic age pyramid;
- The pace of scientific and technological progress;

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- The challenges of bio-technology related changing and enhancing human performance (including the ethical issues); and
- The challenge of network technologies to reshape how we design how work is accomplished and how we marshal collective human effort.

Because the future is of course unpredictable, the object is not to predict the future but to mitigate surprise and perhaps the best way for that is to imagine possibilities that can help to shape the future in optimal ways – to ride the currents to the future opportunities rather than fight them in efforts to hang on to habitual decreasingly functional models.

This paper will outline the four change drivers, elaborate briefly the related implications and conclude with a discussion focused on a broad recommendation of a social strategy that aims to address potential future opportunities in an integrated way.

The basic argument that the paper makes is that the Internet and emerging social media capabilities represent new modes of production and enabling architectures of participation. Architectures, that require new sets of rules based on an unprecedented collapse of traditional costs associated with communication and coordination of the large collective and collaborative efforts of people and organizations.

This phase transition is engendering a ***shift*** in concepts about organizational structure and human development including:

- From Place-Centric to Person-Centric world;
- From Training to Learning-How-To-Learn;
- From Authority-Down to Bi-Directionality;
- From the Transfer of knowledge to Knowledge Co-Creation;
- From Orchestrated Capabilities to Emergent Capabilities;
- From the Power of Individual Learning to The power of Real-Time Collective Learning;

- From Individual Intelligence to Intelligence Amplification and Collective Intelligence

Hyper-connectivity has many implications including: the growth of creative engagement, participation and collaboration, as well as the growth of new forms of techno-dependency. A more radical development has been called the participatory panopticon, where everyone can see everyone else[1].

The wicked problem for defence and security is the challenge of developing a social strategy consistent with an open society that enables an internal space for richer, more agile 'cloud-labour'[2] and 'talent-commons' providing 'just-in-time' group-forming and peer collaboration within and between organizations. A social strategy that can extent the military network would increase the capability to search a larger solution space, enable knowledge to flow and increase human and social capital and trust. These critical factors set the conditions for current and future operational agility.

The benefits of:

- Reduced transaction, coordination, control and opportunity costs (time, effort, people, capability) – more teeth less tail.
- Integrate continuous learning, and thus power effective operational agility.
- Leveraging much more of the human capital that we already invest so much to develop.
- Increasing the pool of available skills, knowledge and judgment that can be brought to bear – to allow the organization to marshal more of its human capability/capital for productive and operational ends.
- Better capability to generate integrated security solutions.

[1] One can see early signs of this in examples such as the 'Rodney King tapes', the use of twitter recently in Mumbai and even the 'dog-poop girl' (see in the article "Internet Vigilantism" http://en.wikipedia.org/wiki/Internet_vigilantism)

[2] The concept of 'cloud-labor' is based on the concept of cloud-computing, where computational capability becomes a more like a utility and applications are delivered through an Internet browser rather than being resident on an individual computer. The term cloud-labour is meant to complement the concept of crowdsourcing with a more permanent pool of distributed personnel able to connect via the Internet and social media capability.

The shift is about an appropriate organizational paradigm to implement a social strategy that can enable:

The right person to be connected to the right situation at the right time.

The future will require new ways of designing how things get done and that organizations will have to be significantly better at assessing, developing and using it human capital in new ways in addition to traditional methods of organizing collective human effort. Rather than a concept of retention, the concept of stewarding engagement and harnessing knowledge better frame the future direction of managing personnel.

Demographics

The emerging demographic landscape is one key domain of challenge that will face DND, the CF (regular and reserves). Current projections indicate that in the coming years the type and size of the workforce will change significantly.

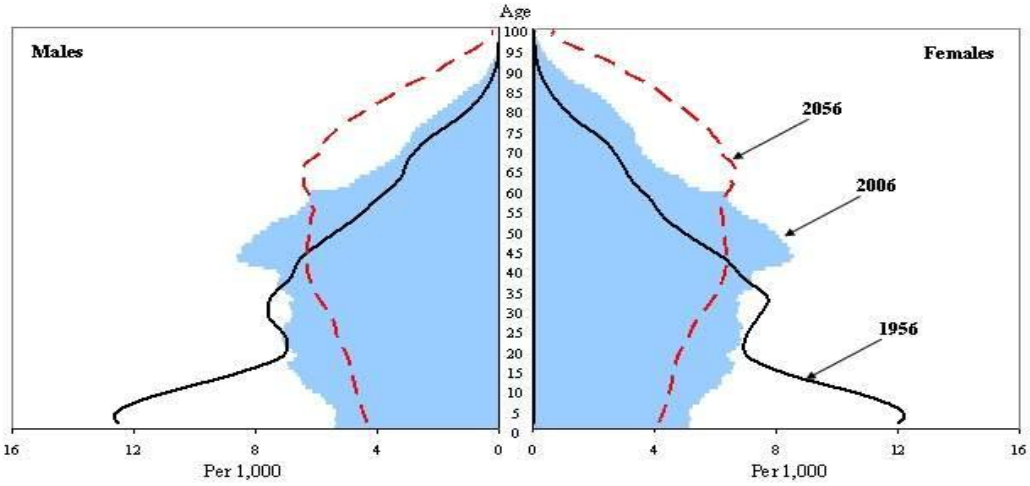

Figure 1: Unprecedented Transformation of the Age Pyramid.

In figure 1[3] above, we can witness an unprecedented change in the demographic pyramid – an inversion of the classic broad base and narrow pinnacle. What we are

[3] **Figure 21 Changes in the age structure of the Canadian population by sex, 1956, 2006 and 2056.** http://www.statcan.gc.ca/pub/91-003-x/2007001/figures/4129870-eng.htm

experiencing is a transformation from the broad based pyramid of the 1950s to the top-heavy pyramid of the 2050s. How broad the pinnacle will be may depend on continued scientific medical progress and whether there is a 'natural' age limit that cannot be exceeded.

The dramatic transformation that is reversing the traditional population age pyramid is not only the consequence of the baby boom bulge but represents an unprecedented demographic situation in the developed nations of 21st Century. In conjunction with other trends (e.g. science/technology/medicine) we are heading, as a society into unchartered territory.

Age Inflation[4]

It is accepted practice to adjust economic statistics into 'real dollars' in order to account for inflation and other changes to purchasing power. Similarly, changes in health and life expectancy require an adjustment in order to determine 'real' age when considering the formulation of policy and strategy based on demographics. We conventionally measure age by years since birth, however with changes in health and longevity chronological age can change in its 'value' – this effect has been called age inflation. Age inflation suggests the need to develop alternative ways of measuring age.

One way of measuring 'real' age is comparing mortality rates from different periods of time. Mortality risk indicates the chances of someone dying within a year. For example, using US data, a 59 year old in 1970 had the same chances of dying within a year as a 65 year old in 2000. Thus, the 65 year old would have a 'real' age of 59 (if 1970 was deemed to be the baseline year). Another way of looking at this is to consider that the normal age of retirement in 2004 (US data) would have to be about 73 (age gender blended) in order to be the same 'real' age of 65 when mandatory retirement was enacted in 1935.[5] What age inflation shows us is that not only is Canada as a society aging, but also in a very real sense we are remaining young despite becoming older. The popular phrase 40 is the new 30 is not so far off the mark. In fact a recent study

[4] See Shoven and Goda. 2008.
[5] B. John Shoven, Gopi Shah Goda, *Adjusting Government Policies for Age Inflation.* 2008 NBER WP #14231. http://papers.nber.org/papers/w14231, p. 12.

found that older people tend to feel about 13 years younger than their chronological age (Berlin Aging Study – forthcoming Journal of Gerontology).

Social Structure

A new social structure is emerging that contains stages of life that have not been researched before – 40 maybe the new 30 but it is a 30 with an extra 10 years of life experience. We are seeing the advent of a society with a quarter of its population over 'retirement' age, and yet still healthy and actively involved in their communities.

Given that the acceleration of scientific advance will not diminish, it is plausible that this new structure may become a permanent feature of a developed society. The human genome was not completely sequenced until 2003 (at a cost of hundreds of millions of dollars), in the last four years the cost of sequencing DNA has fallen by a factor of 10 each year and this year the cost of sequencing a human genome will fall to $10-5,000. It is a safe bet to assume that within a decade the cost of DNA sequencing will fall to $500 and this will initiate a phase transition in our approach to health and health research. In the forthcoming decades we will continue to live healthy, longer and more productive lives.

The confluence of increasing life-expectancy, age inflation, and low fertility rates (very possibly accelerated through bio-medical, scientific and technological advance) has significant implications for a dramatic change in social structure consistent with the unprecedented reversal of the age pyramid. Structural changes include:

- An extended and productive retirement – what will the baby-boomers do regarding community and political involvement and activism?
- A greater range and complexity of family structures – increasing number of 4 generational, multi-marriage, blended/extended/networked families
- Novel and un-researched life stages as mass numbers of people reach extended age while still healthy, engaged in the world and productive

- A greater proportion of the elderly may also mean a more extended period of socially defined 'youth'.

In addition, Canada is now and will increasingly be a "3 M" (multi-cultural, multi-linguistic, multi-religious) country. In fact this situation makes Canada, not a 'nation' state, but rather a 'national' state, which means that the Canada is less about unifying the founding nations of people and more about an increasingly diverse range of peoples that must be bound together by sharing a set of national values. While not addressed in this paper, diversity is and will remain a salient issue for the DND/CF regular and reserve.

A key question for the CF concerns how it can leverage the 'hard-won' knowledge and experience of our own personnel, our veterans, those in the security community and other Canadian citizens. Possible methods for doing this will have large impact through significantly increased capacity to harvest returns on the investments made to develop human capital. Answers to this question are important in facilitating both the 'whole-of-government' and the comprehensive approach (currently being discussed in modern military concept development). This question is even more salient when we consider network and other technologies in the related sections below.

Technology

A number of observers including Marshall McLuhan have noted that humans shape tools and tools shape humans. Technology is inseparable from culture and the human environment. Advances in science and technology are the general context of a global economic shift that links economic growth to major technological changes – the knowledge-based economy.

Pace of Change - Acceleration

The acceleration of scientific and technological advance both fuels and is fuelled by the interactive convergence of the proliferation of scientific disciplines and technology innovations. We can formulate this as: Proliferation of S&T + Convergence = Acceleration of S&T.

The acceleration of science and technology poses a significant challenge for any large organization dependent on technology including the CF because of the stress such change creates on the occupational structures. Advances in science create new convergences and new specializations which means the emergence of whole new disciplines and the transformation of old ones. Similar changes in technology means the emergence of new occupations.

A consequence of accelerating change is the inability to predict what occupations will be vital in 5, 10, 15, 20 years that do not exist currently. Or which occupations will be obsolete, or need to be skilled-up, or skilled-down. The technological framework of the military drives its occupational structure, therefore accelerating technological change applies increasing pressure on the development of an agile occupational structure and the corresponding capacity to recruit, retain and develop human capital (expertise, skills, experience, judgement, etc.). The human career is now the most significant planning horizon and investment framework, this may be especially so for the CF (since people represent over half of budget allocations). Given senior officers must be 'grown' that they can't be hired ready to go, the CF is recruiting people that will have to be competent for types of work and in occupations that do not yet exist.

The result is not only the need to have agile recruiting for new occupations but a very agile training and education capability to address the need to both train new recruits and to continually be ready to re-train current personnel for new capabilities. This is a challenge to the individual training and education system, and a more complex challenge to the development of the military occupational structure and career management system that can be agile enough to adapt to continual changes to the skills, knowledge and competencies of CF personnel.

Enhancing Performance

Science and technology advance also poses other challenges, for instance, the wide range of issues related to human performance enhancement. There is a very real possibility of an ever expanding horizon of how much human performance can be enhanced which in turn invites the operational imperatives to use all the capability within our means, holding in mind that existing ethical boundaries in Canadian society are already being challenged since human enhancement has already taken hold of

popular imagination, despite or along side of ongoing controversy. In addition to the ethical limitations, are the related difficulties of inducing appropriate cultural and organizational adaptations necessary to enable the full exploitation of emerging science and technological capabilities? For example, it is only a few short years ago that the full participation of women in the CF was hotly contested on 'natural' and ethical grounds.

What are the cognitive sciences? They are the distinctly human and social sciences which also integrate with the other sciences and technologies to further our understanding of the complex human dimension. We could define them as the sciences applied to the study of the nature of intelligence, but this may suggest too narrow a view. It would be more accurate to think of the cognitive sciences and their related technologies as a more comprehensive the study of intelligence encompassing the human, social, cultural and physical embodiments and contexts. These sciences include and draw on multiple disciplines, including psychology, philosophy, neuroscience, linguistics, anthropology, computer science, sociology and biology (as well as mathematics and physics). In many ways the field of the cognitive sciences represent the most important domain, as it is the nexus for the integration of advances in other fields in ways that can best further human flourishing, purposes and capabilities.

One of the key breakthroughs of the last decade has been the development and widespread acceptance of a new model of the brain – the plastic dynamic brain (e.g. Doidge, 2007)[6]. In this view the brain is not rigidly 'set' in early infancy but continues to develop new neural pathways and is even capable of generating new neural cells. New imaging technologies have and are allowing exponential increases in our understanding of how the brain functions (the mapping of cognitive processes), even to the point of developing cognitive exercises designed to develop specific neural connection related to overcoming certain types of damage or other disabilities. The implications of this are that learning is not simply the 'pouring' of knowledge into preformed brains. Instead we will be able to understand that teaching and learning are processes of changing/developing brains, a process that can become more effective when it is more integrated with diagnosis, repair and enhancement of human performance. Here again

[6] Norman Doidge, M.D. 2007. *The Brain That Changes Itself.* Penguin.

we see, the opening horizon of challenges to traditional definitions of what it is to be human.

In conjunction with computational sciences, cognitive sciences are advancing the capabilities of language translation, artificial intelligence, software and increasingly capable robotics, with considerable implications for CF personnel in operations, their training/development and related systems and for the military occupational structure. To ease the human burden and amplify human capability, the cognitive sciences will hold the key to the necessarily human-centric design of the person-system interface in the developing ubiquitous digital environment. For example, the advances in cognitive science increase the value of more intensive – deeper, forms of individual assessment – physiological, genetic, personality, cognitive capacities, etc. The value of deeper assessment will enable a much greater customization and extension of individual training and development.

More importantly, the cognitive domain (currently referred to as the Human dimension) is now recognized as a distinct operational concern (permeating the traditional operational environments of Land, Sea and Air and the more recent domains of Space and Cyberspace). As a distinct operational dimension, the human dimension will require a concerted research collaboration of many sciences.

Related to the cognitive sciences are the possibilities emerging in the field of biology. Biology is now widely considered to be an information science. This is in part due to the increasing reliance on a convergence of many sciences which in turn depend on computer, nano and other technologies to pursue research and implement advances. Computer models and simulation are becoming standard methodologies in biological research such as in the research on proteonics – the large scale study of proteins (structures, folding and functions). The proteome is the entire complement of proteins produced by an organism or system, similar to the genome being the entire complement of genes.

As noted above, among all the startling advances in the biological sciences perhaps the most significant is the progress that has been made and continues ever faster is developments in the domain of genetics. In 2000 the first working draft of the human genome had been completed to identify the genes in human DNA. The

sequencing was only completed in 2003 and the entire project had cost hundreds of millions of dollars and great human effort. For the last four years, however the cost of DNA sequencing has been decreasing by a factor of 10 each year. In 2009 one company, Complete Genomics[7], promises to provide a service to sequence someone's DNA for five thousand dollars[8]. While this makes DNA sequencing affordable to the reasonably wealthy, the cost remains a significant barrier to more widespread use. However, given the rapid decrease in cost in the last few years we can conservatively estimate that within a decade the cost will be significantly lower. (Figure 2[9]).

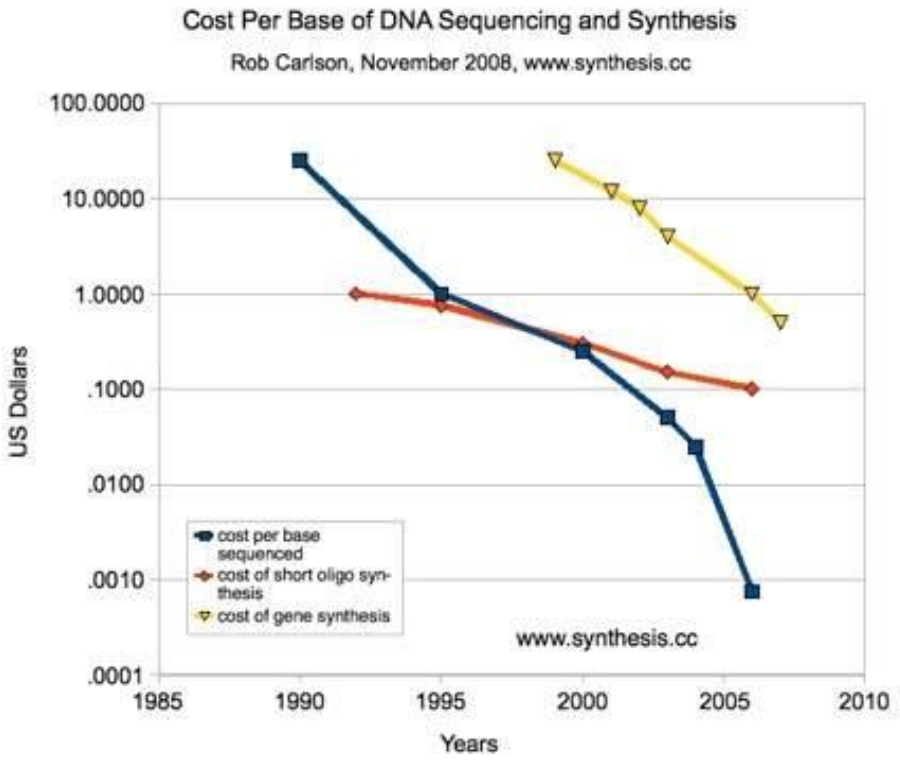

Figure 2: Cost Per Base of DNA Sequencing and Synthesis.

[7] http://www.completegenomics.com/ see http://www.nature.com/news/2008/081006/full/news.2008.1151.html for claim of $5,000 genome sequencing.

[8] http://www.newscientist.com/article/dn16552-company-will-sequence-your-dna-for-5000.html?DCMP=OTC-rss&nsref=genetics

[9] http://www.kk.org/thetechnium/archives/2009/01/open-source_dna.php

Currently the most inexpensive commercial (partial) genome testing is provided by the company 23andMe[10] for $400. Prices for this type of genome testing will continue to drop, while the number of genes included in sequence test will rise. What is important to consider is the 'tipping point' in cost where DNA sequencing becomes a standard health care procedure. This will likely engender a phase transition in health care with unprecedented possibilities in pre-emptive treatment in order to prevent ill health.

The sciences and technology related to genetics represent a fundamentally new capability to manipulate life as genetics becomes an 'informational code'. Like other major phase transitions in human history such as the domestication of plants and animals, human mastery of the genetic code will enable the domestication of bacteria and other basic life forms. Domesticated cellular life, in conjunction with nano-technology will enable the development of efficient and very inexpensive new ways to manufacture medicines and materials; to alter current life forms and to develop entirely new life forms. In essence, humanity has entered a post-species age[11]. Stem cells are well on their way to providing new forms of treatment – from curing or preventing the onset of congenital diseases to growing new teeth, organs or tissues. Further, with radically inexpensive DNA sequencing there comes unprecedented and almost unimaginable new research capabilities, to customize food sources to enable optimal growth in local environments and currently inhospitable environment (such as areas of high salinity or previously inappropriate climates). DNA has become or is becoming code that human can manipulate and thus the entire earthly gene pool becomes a data base.

At minimum the human implications of bio-technology advances include longer, healthier life spans (extended beyond trends noted in the demographics section). Given this we can ask the question: "Will there be an end to the drive to enhance human experience and performance?" We are entering a period of history of unparalleled possibilities: Gene Therapy; Computer Implants; Nano-technology biological agents; Hyper-Connectivity and Connectivity with dispersed sensors; Biological and

[10] https://www.23andme.com/

[11] While we have shaped life since we learned to domesticate plants and animals we are now able to extend our efforts at domestication by combining species that were never able to be combined – for example a fish gene in tomatoes extends its self life, cow and goats able to produce milk with spider silk protein, or enhancing capacities of food (e.g. more vitamins, amino acids, etc.) through recombining DNA.

Pharmaceutical augmentation; Cloning; Radically New Science - and a lot more as new sciences and technologies continue to emerge separately and through interaction. More radically, these -technologies anticipate fundamental advance of human capability and more choices about how we choose to **be** or **become** – to the point of challenging our definitions of what it is to be human.

Will human societies be able to maintain the pace of change? Can organizations afford to remain unchanged? It is fairly self-evident that Canadian society and the CF will need to consider a large spectrum of ethical and policy issues in order to properly use these technologies.

Techno-Economic: Social Network and Media Technologies

Almost a decade ago (just after the infamous dot.com bubble) many people were still considering whether the Internet was simply a fad. Today, despite being only about 6,000 days old[12], it is clear that the world is in the midst of a phase transition. This is a phase transition based on connectivity as the Internet is becoming integrated with all other forms of electronic and digital communication. The vast growing global network connects not only people with people and with information, but people with things, things with things (dumb sensors networked into smart systems), and information with information (e.g. artificial agents). Network technologies and the current emphasis on social networking may be the most dramatically evident disruptive source of social transformation – as we will discuss below, in the section on the Long Tail. Furthermore, the Internet has also been instrumental in the acceleration of science and technological advance by facilitating novel forms of mass sharing and collaboration (e.g. grid and cloud computing, linked networks of sensors, huge online databases, and portals for rapid dissemination of pre-publication of results, and more). In fact, universities were co-pioneers with the military in establishing the first foundation of the Internet. And

[12] For a fascinating and brief presentation on this idea, by Kevin Kelly see: http://www.ted.com/talks/kevin_kelly_on_the_next_5_000_days_of_the_web.html

yet, we can be certain that we have not yet seen the most dramatic changes that promise to be the inevitable consequences of this continuing the trend of network technologies. The next 6,000 days will be radically different from the first 6,000.

We tend to think of the Internet as composed of connected computers, however with the advent of the iPhone, the Android and other 'smart personal appliances' we see the convergence of all digital forms of communication. The cell phone illustrates the speed of the phase transition[13] in connectivity that we are experiencing. It took about 20 years for the first billion mobile phones to sell worldwide. The 2nd billion sold in 4 years, and the 3rd billion sold in 2 years, in 2008 half the world had a mobile phone. Further more, currently 80% of the world's population now lives within range of a cellular network, which is double the level in 2000. Today the cell phone is a phone, camera, music player, data storage, a banking device, access to the internet – for chat, games, text, TV. In essence, it is a platform for connectivity.

In Figure 3, we see a depiction of the development of three broad domains of network technology. In the blue wedge we see those networks largely based on connections between machines. In the grey wedge we see the more recent development of what has been called the Web 2.0 networks, which are largely between people. In the middle wedge are the network technologies that have been under development for almost the last decade – the semantic web. The semantic web aims to create the development of 'smart' data, data that can 'communicate' with other data such that their inter-operability is seamless. Data communicate with other data by means of 'meta-data' (In other words, data about the data – for example, through a standard definition of terms). The semantic web represents an extremely complex undertaking and will likely take many more years to have the impact that the Web 2.0 has currently attained. But once underway, it will bring another level of unimaginable possibility.

The extension of the internet into mobile devices also represents a phase transition to emergent social capabilities. Already evident in the rise of the Internet is the transformation of the consumer economy into one that enables a much greater level of creative participation. Observers have termed this shift one from consuming to prosuming (where more people both produce-and-consume). In fact, the internet has

[13] The long tail outlines the nature of the phase transition.

been largely constructed from the work of hundreds of millions of individuals rather than by the professional' than the initial business model had anticipated.

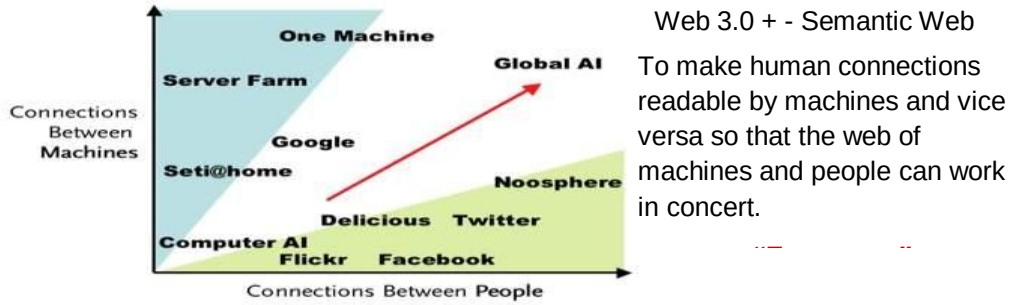

***Figure 3: Three types of Internet Connection - Between Machines, People, Information*[14].**

Enabled by a veritable tidal wave of new technologies and their associated (and accelerating) adoption rates, consumers seem to be achieving a level of control never before seen. They increasingly expect to redefined the interplay of communication, relationships, brands, technology and media. This is Consumer 2.0, who has moved from a single front door, mail address and house phone number to multiple email addresses and mobile phones. Network technologies are an infrastructure that inciting a shift toward a person-to-person society and economy – a shift to a personalized world of networked individualism[15]. This is a world where people connect as individuals, independently using networks for information, collaboration, business, support, sociability, and sense of belonging, sustaining the traditional core close ties but augmenting these with an unprecedented large network of loose ties. Employees in networked organizations will tend to have multiple and shifting work partners, and partial involvements within dispersed work relations that can often extend globally.

Increasing hyper-connectivity carries other significant social implications including: the growth of creative engagement, participation and collaboration (and expectations for such), as well as the growth of new forms of techno-dependency. A

[14] This is a modification of Kelly's at
http://www.kk.org/thetechnium/archives/2009/01/two_strands_of.php
[15] For example see Wellman 2001, 2002, 2003, 2004.

more radical development has been called the participatory panopticon, a capability for everyone to see everyone else[16].

As Terranove states:

> *I believe that if there is an acceleration of history and an annihilation of distances within an informational milieu, it is a creative destruction, that is a productive movement that releases (rather than simply inhibits) social potentials for transformation. In this sense, a network culture is inseparable both from a kind of* network physics *(that is physical processes of differentiation and convergence, emergence and capture, openness and closure, and coding and over-coding) and a* network politics *(implying the existence of and active engagement with the dynamics of information flows) .*[17]

The Long Tail

The Long Tail[18] is both an emergent technology and new economic institution and model. This is section is long but we consider it one of the most important trends to understand, if one is to be prepared for the future of work and the effective and full use of human capital.

The Internet and particularly those aspects that emerge out of the social network capabilities of Web 2.0 represent an unprecedented collapse of traditional costs associated with communication and coordinating the large collective and collaborative efforts of people and organizations. Perhaps the best depiction of this collapse of

[16] One can see early signs of this in examples such as the 'Rodney King tapes', the use of twitter recently in Mumbai and even the 'dog-poop girl' (see in the article "Internet Vigilantism" http://en.wikipedia.org/wiki/Internet_vigilantism)

[17] T. Terranova,. *Network Culture: Politics for the Information Age*. London ; Ann Arbor, MI, Pluto Press , 2004, p. 3.

[18] This concept is covered in detail in below. In essence the long tail represents the collapse of communication and coordination costs that enables (and perhaps requires) the transformation of organizational architecture. For example see *The Long Tail* (Chris Anderson), and *Here Comes Everybody* (Shirky). For a very interesting view of an economic model of the long tail see Clay Shirky's TED presentation "*Institutions versus Collaboration*" at http://www.ted.com/index.php/talks/clay_shirky_on_institutions_versus_collaboration.html however, in Shirky's presentation he does not clearly define the difference between the institution and organization. Despite this, the presentation is well worth the 20 minutes it takes to watch.

coordination (and other transaction) costs is in the concept of the Long Tail[19]. The Long Tail represents a new set of rules enabled by the dramatic reduction of transactions costs as a consequence of network technologies and architectures of participation. Transactions costs include[20]:

- The quantity of people, time, effort and money involved in getting things done
- The types coordination required shaping how things are done
- The controlling of what is done – the quality involved, the enforcement of agreements, standards and codes
- Opportunity costs of not using the organizational and human capital available

Douglass North, a Nobel Laureate economist, states that the first requirement of the study of institutions and their change is the separations of institutions from organizations.[21] He defines institutions as the rules of the game, while organizations are the players in the game. The interaction between the rules and the players is what shapes institutional change. For North, it is institutions that impose the human constraints on human interaction. He defines the opportunity set of a society as

[19] There is a very rapidly growing literature concerning network technologies and architectures of participation, both academic and popular, many which document the accelerating emergence of new uses. For comprehensive academic treatment – Yochi Benkler's "The Wealth of Networks" is foundational - http://www.benkler.org/; also see Taziana Terranova's "Network Culture" http://www.press.umich.edu/titleDetailDesc.do?id=114847 . Popular books include: *Wikinomic* (Don Tapscott), *We are Smarter than Me* (Libert, Spector, Tapscott), *Groundswell* (Li, Berhoff), *The Long Tail* (Chris Anderson), *Tagging: People-Powered Metadata* (Smith) and *Here Comes Everybody* (Shirky). For a great view of the next 15 years of the web see Kevin Kelly's TED presentation at http://www.ted.com/index.php/talks/kevin_kelly_on_the_next_5_000_days_of_the_web.html
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[20] For other benefits see Verdon, Forrester and Tanner, 2007.

[21] D. C. North, *Understanding the Process of Economic Change*. (Princeton, N.J., Princeton University Press, 2005), p. 59.

composed of the institutional frameworks conjoined with the other standard constraints of economics and the physical environment.

Organizations on the other hand bring individuals with some common interest together into groups, whether economic organizations such as firms, unions, cooperatives, or political ones such as parties, agencies, governing bodies, or social ones such as religious bodies, clubs and associations. It is the institutional matrix which determines what varieties and number of organizations that can arise, but it is individual innovators that seek to induce institutional change through efforts to change the rules – directly through political means or indirectly by technological, economic or social means or by deliberate (or accidental) efforts to change the effectiveness of enforcement.

The dramatic emergence of network technologies as a new mode of production has provided a context for a new type of institution (as a new set of rules). This new institution – the Long Tail, is best understood through a contrast with traditional forms of organization derived from what we call the material institution. The depiction of the material institution is presented in Figure 4.

Essentially both the material institution and the long tail are illustrations of a power-law relation. Power-law relations, also known as the 80-20 rule, characterize a staggering number of naturally occurring phenomena. The 'rule' states that, for many events, 80% of the effects come from 20% of the causes. This is a rule of thumb, rather than a 'law' and in fact many classes of phenomena can be found to fit more as 90/10, 70/30, and 95/5 "rules". The important point is that a sort of clumping – few large versus many small, relationship between elements or factors is what does occur in most phenomena.

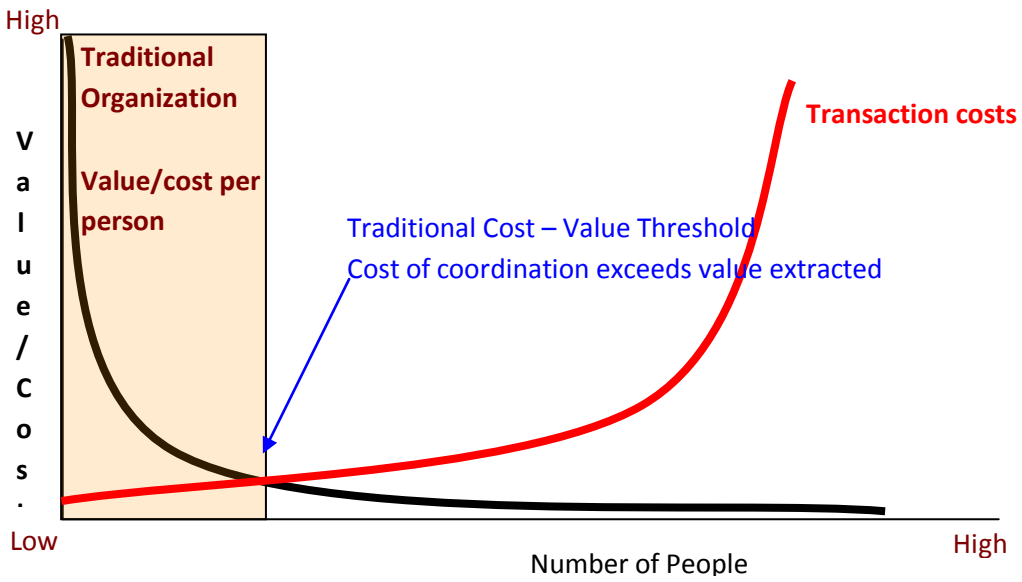

Figure 4: The Material Institution.

Here in Figure 4, we illustrate the parameters of material institution that generally constitute the organizational boundary, which is the point at which organizational viability is challenged when costs exceed the value extracted. This threshold/boundary can be exceeded by some organizations, for example a military organization's boundary is less vulnerable to the simple cost/value parameter as its mandate of providing national security is an overall cost measure only by the value of national security. However, even the largest national militaries are eventually challenged by a cost/value threshold.

In Figure 5, is an illustration of one traditional organization derived from the material institution – the typical book store and its sale of books. To the right is the long tail of books with very few sales, to the left are the few books whose sales dominate (the Head).

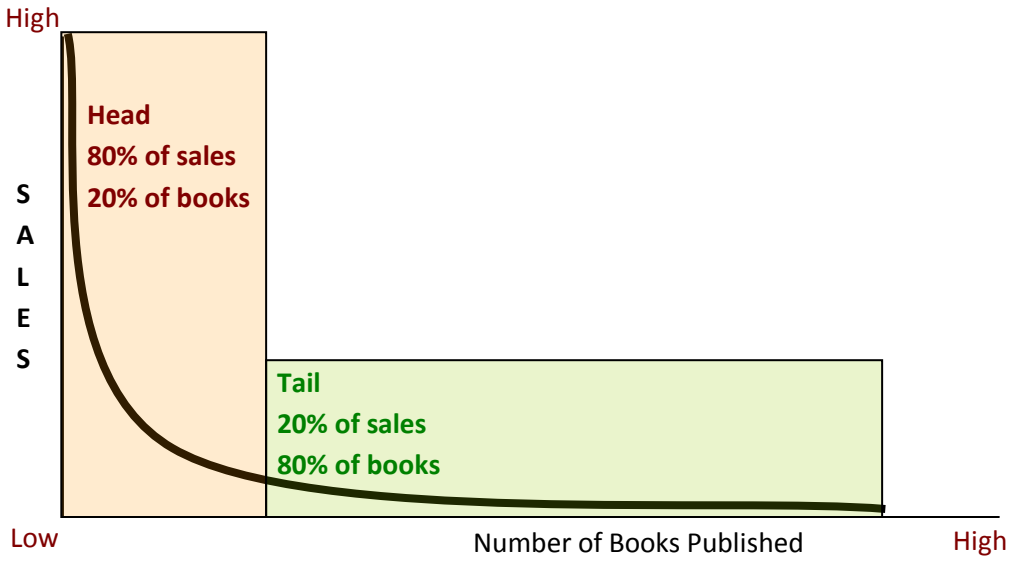

Figure 5: The Traditional Long Tail of Book Sales.

This graph presents the classic sales profile of many types of goods. The graph therefore provides the 'natural' incentive structure (institution) guiding business to aim for 'mass producible' 'blockbuster' type products (the 20% which generate 80% of sales) in order to leverage the industrial capabilities of mass production, or to also develop a niche specialty that could attract enough customers to create a niche market for some of the long tail type products. This of course posses a dilemma for any retailer with limited shelf space – can they afford to stock too many books from the long tail area?

The dilemma can be presented below, where we can see the increasing costs of coordinating sellers in the long tail with interested buyers in the long tail. As the organization tries to link (coordinate) more sellers with buyers the costs of negotiating, transacting, holding inventory and coordination increase in a power-law curve (Figure 6, red curve).

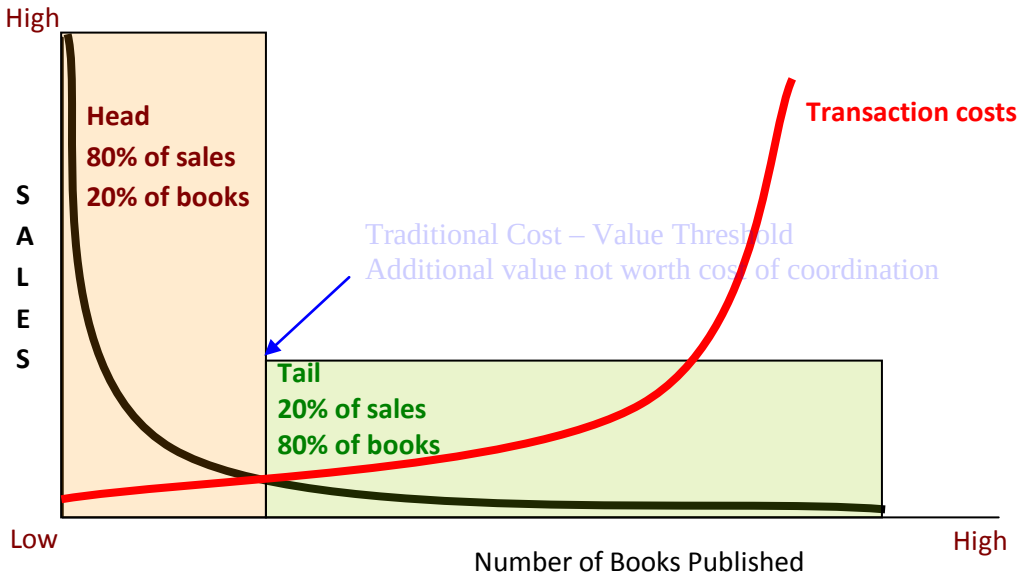

Figure 6: The Long Tail of Book Sales versus Transaction/Coordination Costs.

The intersection between decreasing sales and increasing costs represents an organizational threshold, beyond which the traditional organization can no longer be viable and thus represents the institution shaping traditional hierarchic organizations.

The interesting experience of Amazon.com in developing an online (networked) book business was that once the network was built, transaction/coordination costs collapsed. Amazon discovered that they were able to make as much or more money in the long tail (in aggregate) as they were making in the head of the curve[22]. The ease of linking sellers of unique products (a book only one person would be interested in buying) with customers interested in those products was essentially an unanticipated costless additional capability falling out of establishing their online store (see Figure 7). It is true that sellers cannot generally make a living selling from the long tail (unless the product/prices permit). However, the long tail creates or enables a larger, richer, more diverse market to arise where none had existed before. This new market provides a very low barrier to entry and a competitive/collaborative arena offering the possibility to move up toward the head of the curve to the possibility of achieving mass market. As we will make clearer, this model offers a completely new incentive structure for

[22] As Anderson (2008) say in the title of his updated book - *The Future of Business is Selling More of Less.*

specialized divisions of labour that are not tied by geographical or the traditional transaction cost constraints.

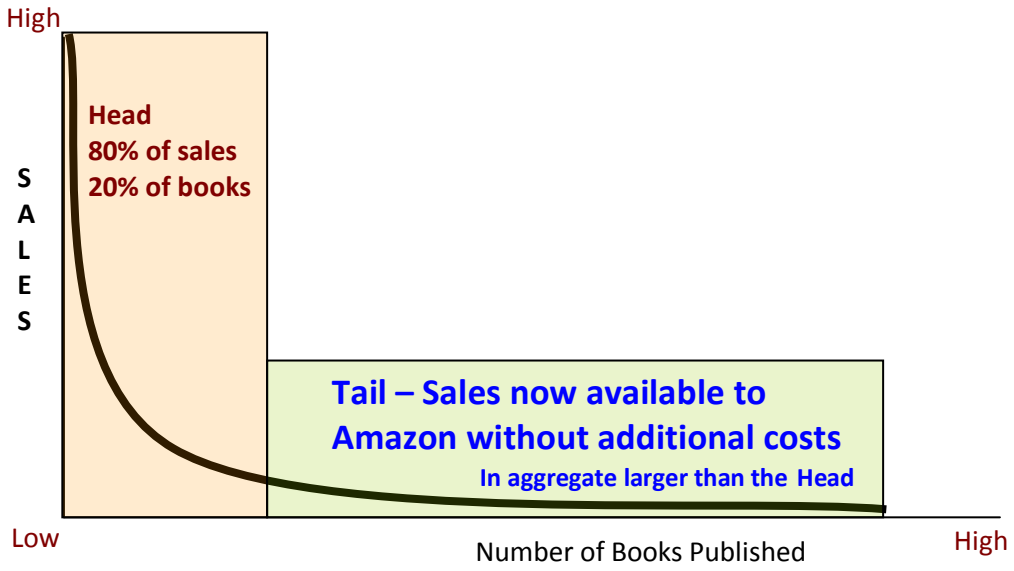

Figure 7: The Network-Based Long Tail of Book Sales.

Now let's look at a more complex illustration of the power of network technologies and architectures of participation to unleash human capital in productive ways. Two examples can illustrate this very well – Linux versus Microsoft Windows (MW) and Encyclopaedia Britannica (EB) versus Wikipedia. In these illustrations, depicted in Figure 8, the axis are productivity and number of producers. The tan box represents the head and the green box the tail. If we assume that productivity follows the same type of 20-80 rule than we can imagine people interested in developing an encyclopaedia or an operating system will follow the same rule. In this case the tan box represents the traditional organization such as EB or MW, they will hire the most productive people within the constraints of the cost-value threshold (perhaps in this case more like 1 to 5% of the most talented people available). However, what Linux and Wikipedia illustrate is by leveraging network technologies and architectures of participation they can utilize the whole curve of potential productivity. So even if they were to hire the most productive people they could, they are also open to reaping the aggregated value of the many people who only make one contribution (Figure 8).

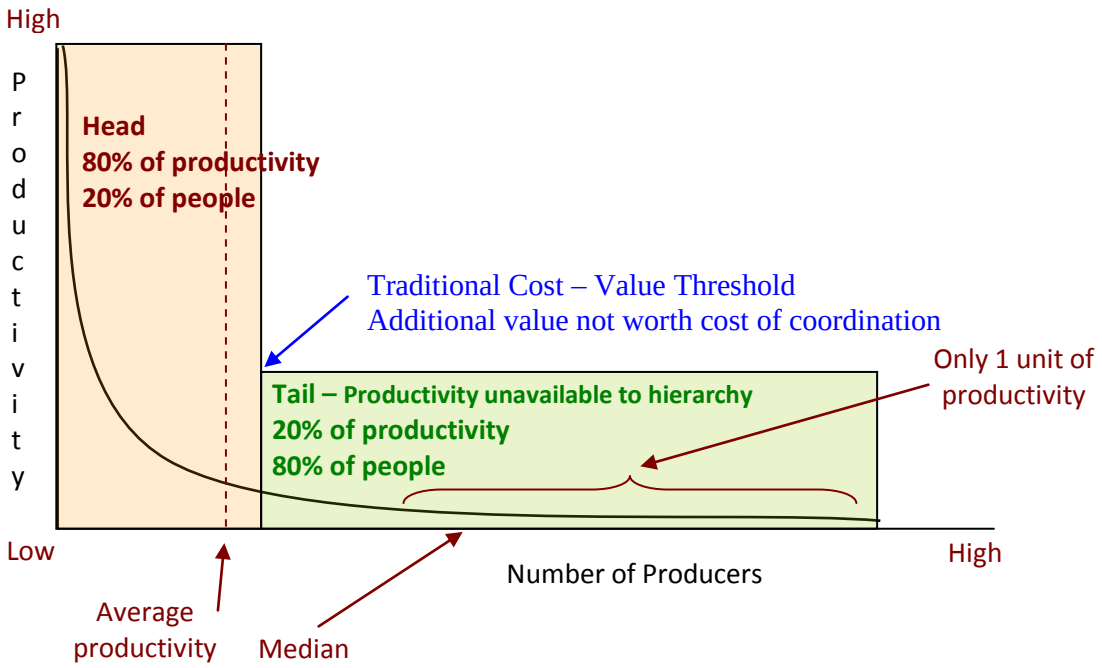

Figure 8: The Long Tail of Coordination and Transaction Costs.

Furthermore, despite the same power-law relation whereby a smaller portion of people are responsible for larger portion of the work in all these organization, it is only the long tail organizations that are able to harvest the immense productive capacity or more importantly to harvest the intrinsic motivation of the many.

To further illustrate this point[23], Steve Ballmer, chief executive of Microsoft, stated that Microsoft had examined the efforts behind the development of Linux and scoffed that the overwhelming majority of contributors had only made one contribution. The response was – well maybe that one contribution was fixing a serious security bug, how much is that worth? Could Microsoft afford to hire someone to work in their organization and do nothing for three years until she/he fixed one bug? Even if this was priceless and worth three times the money they paid the person, would their business model allow this? Would they tolerate this type of worker? The consequence is that perhaps Microsoft should be very scarred of an operating system that can harness the potential contribution of millions available to it without additional transaction and coordination costs.

[23] This scenario was taken from Clay Shirky's TED presentation: http://www.ted.com/index.php/talks/clay_shirky_on_institutions_versus_collaboration.html

In the case of Wikipedia, the capacity to fix errors and keep articles up to date far exceeds the capacity of EB to do the same. For instance, EB's most recent edition (the 15th) was published in 1985[24] – Wikipedia didn't even exist until 2001 and is now the world's largest encyclopaedia, with over 14 million articles in 271 languages[25] and all accomplished because of the self-organization enabled through relatively costless coordination and the transparency of the wiki medium. In fact, Wikimedia has enabled a large number of related projects including: Wiktionary (wiki-dictionary), Wikibooks (making public domain and creative commons books available online), and Wikinews (the collaborative reporting and summarizing of news from a neutral point of view).

But more importantly for personnel management Figure 9 presents another way to view this situation. We can think of the tan box as a single job in an organization – where we could formulate the rule that 20% of jobs would generally use 80% of human capital (the 'head'), whereas the long tail would represent 80 % of jobs using only 20% of available human capital (or less). By human capital, we mean all explicit and tacit knowledge competencies, talents, skills, experience and judgment that an individual has developed and can demonstrate in some way. I think it is a safe assumption that most people would feel very fortunate to have a job that actually was able to utilize 50% of their skills, knowledge, dexterity or judgment. However, that job (as most jobs) would naturally be designed to use 100% (or more) of our time, but not necessarily be able to engage our full interests, passions, knowledge, or capabilities, etc.

[24] See http://en.wikipedia.org/wiki/Encyclopedia_Britannica New version are issued every few years.
[25] As of 22 Nov. 2009. For current statistics see http://meta.wikimedia.org/wiki/List_of_Wikipedias

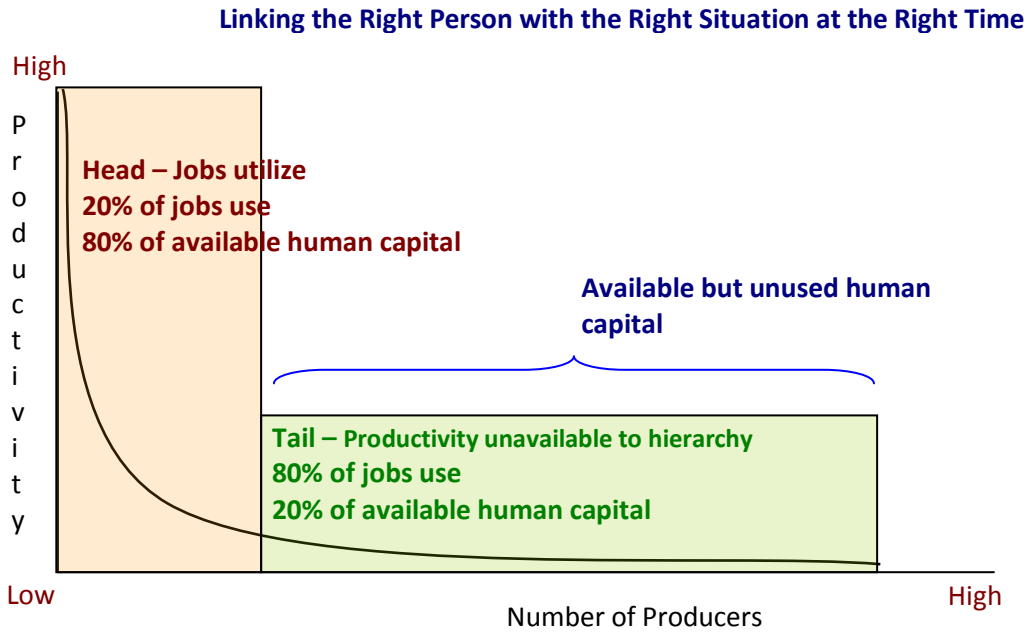

Figure 9: The Long Tail – Collapse of Coordination Costs.

However, due to coordination costs implicit in the control hierarchy approach to organizational architecture people are fit as best as possible into jobs (cogs-in-the-machine). As a consequence the organization looses or wastes a considerable amount of human capital because trying to use it would exceed the traditional cost-value threshold.

Thus far we have made a case that network technologies, architectures of participation and the institution of The Long Tail presents a fundamentally new mode of production – with new rules based on the radical collapse of traditional constraints (e.g. geographical, transactions, communication and coordination costs, etc.). The corresponding co-evolution of other social, cultural and political institutional frameworks and structures will also pose challenges to the successful integration of responsible autonomy within a more complex organizational architecture. This new mode of production includes the transparency that is inherent in the digital environment, sets conditions for broader and more equal market for many more people to exchange anything, with anyone, anytime – allowing a ubiquitous expectation that the right individual can connect to the right situation at the right time.

However radical the promise of the long tail is (in its potential at least), cultural change can be difficult due to the constraints of path dependence – what the past imposes on the present and future and so engenders a resistance to radical attempts to transform. Institutions spawn organizations which depend for their continued survival on the perpetuation of the originating institutions and will therefore expend considerable effort and resources preventing change which the organizations perceive as threatening.

But by providing a mode for new organizational forms and an incentive structure for their proliferation, individuals and even organizations have available to them a richer variety of associations to reduce their isolation and increase the possibilities of self-actualization driven by intrinsic motivation. The richer the variety of association and organization (complexity) available the richer are the types of expertise and divisions of labour that can develop, the richer the exchange that can ensue and thus the richer and deeper the sense of common intent that must be developed. The institution of the long tail provides a basis for richer experience where working for others becomes a known and thoughtful ethical mode of life – creating the organization that creates the member and thus also embodies the ground of and for responsible autonomy.[26]

Structure of the Labour Force

The structure of the labour force has also been undergoing seismic[27] change that will likely continue in the next decades. Beyond those changes induced by rapid scientific and technological advance, structural changes include:

- Changing patterns and proportions of part-time, shared, self-employment

[26] See Verdon, Forrester and Wang, 2009 for a detailed elaboration of how the concepts of complexity, market systems of impartial exchange, network technologies, the long tail, organizational architectures and mission command converge and require new approaches for the full harnessing of our investment in human capital.

[27] It may be argued that this is too strong a descriptor, however, observation of how the Internet continues to challenge the business models of all traditional media (music, film, television, print/news) we can find many similar description by media insiders and commentators. It is not a significant stretch of the imagination to begin to apply the concept of 'revolution' to a wider portion of the labor force.

- Changes in the ease and cost-effectiveness of Telework from any location
- New ways of designing how work can be accomplished e.g. Crowd sourcing
- Continuous international operations
- Non-linear career path – multi-career and multi-occupational working lives
- A greater need to integrate formal educational periods throughout the working life
- Self managed careers

As we noted in the demographics section, Canadians are living longer and healthier lives – 1 in 7 workers are 55+ (~14%), in 2020 this is projected to increase to 20%. There can now be up to 4 generations in a workforce at any time with significant implications for increased complexity of work related relationships.

By 2011 even the most optimistic scenario shows a decline in the proportion of workforce in Canada and the decline is expected to continue past 2028 – projected to be about 62% by 2031. The situation would be worse if not for the large numbers of women and immigrants joining the workforce. For the CF, which does not match the national averages for employment of women and immigrants, the situation will be more challenging especially in competition with other organizations. This changing nature of the population will affect how we recruit train and retain personnel as well as the culture of the organization. Therefore new methods will be required to attract the talent required in the future defence institution.

This potential decline in the traditional working population also brings with it a financial impact on Canadian government financial outlook suggesting significant shifts in tax revenue and spending priorities. This will have an impact on all government activities including defence. This type of environment will challenge DND/CF's ability to generate of defence capability unless it is able to develop the most effective and efficient methods to exploit with agility both its personnel and material.

The traditional entry cohort to the future workforce will be a proportionately smaller one, and specific to the CF the traditional recruitment cohort (15-24 year old) will also be smaller. In addition, this cohort will be subject to increased competition

among employers who seek young skilled workers in high demand occupations such as healthcare professionals and skilled trades. Further, post-secondary education enrolment and completion is projected to continue to increase. For Canadian society and for the CF this demographic shift represents the need for significant policy decisions regarding issues related to educational costs and access.

Digital Ecosystems – Social Media Platform as Immersive Virtual and Augmented Reality

> *We are witnessing what amounts to no less a global exodus to virtual worlds and other online (gaming) environments.*
>
> Edward Castronova, economist[28]

Jane McGonigal (among others) makes a case for the power of games to transform skill and attitudes. These researchers argue that learning to be good at a game can improve a person's ability to be good at life, to be good at changing the world. Gaming integrates skills that favor an ability to reinvent one's working and living environment (e.g. in games, one plays against a given environment). In games, a person can imagine and experience the ripples of potential events across massively multiple domains.

Currently there are about 500 million global gamers, of all ages playing all sorts of games[29]. McGonigal suggests that by the time many of today's young people reach 21 they will have experienced 10,000 hours[30] of gaming. Clay Shirky as estimated that Wikipedia represents about 100 million hours of intellectual effort from a highly diverse

[28] Quoted by Jane McGonigal http://www.ted.com/talks/jane_mcgonigal_gaming_can_make_a_better_world.html . This TED talk by McGonigal as well as the talk by Jesse Schell http://g4tv.com/videos/44277/dice-2010-design-outside-the-box-presentation/ provide a fascinating and interesting account of the potential for games to be a highly disruptive technology and in this way contribute to the new mode of production represented by network technologies.

[29] Jesse Schell http://g4tv.com/videos/44277/dice-2010-design-outside-the-box-presentation/

[30] Many accounts emphasize that expertise develops through long periods of deliberate practice. In many domains of expertise estimates of 10 years experience or 10,000 hours deliberate practice are common.

knowledge community. This is equal to only five days of participating gameplay in the global game – World of Warcraft (WoW). McGonigal estimates that WoW represents about 5.93 million years of human effort, she notes this is about the same amount of time since the first human ancestors stood up.

> *Video games train people to work harder while enjoying it. The success of online games illustrates how seductive and concealed the work treadmill can be.*[31]
>
> Nick Yee

Social media platforms, including games, provide a technological capability for participation at extreme scales as well as the capacity for relatively easy evolvability (the long tail illustrates the collapse of coordination cost facilitating this). McGonigal's analysis suggests that the virtuosity developed by gamers is a combination of attitude and ability. She summarizes this virtuosity as:

- Building (maintaining- assuming) Social Fabric – require facility to develop / sense trust
- Blissful Productivity – A considerable amount of effort is required to become successful, the fact that this effort is also fun can instill a sense that work can/should also be as enjoyable
- Urgent Enthusiam
- Epic Meaning

Thus, online games provide the experience at extreme scales of collaboration – of satisfying work with a real hope of success, becoming good at something, spending time with people (that one can grow to like, who provide better feedback and improve sense of social fabric), establishing methods of trust and the chance to be part of something bigger that generates constant awe, wonder and curiosity. Of course the online gaming experience also has considerable degrees of frustration and disappointment. But the interesting point is that it takes very little time for a gamer to

[31] Quoted by Jane McGonigal http://www.ted.com/talks/jane_mcgonigal_gaming_can_make_a_better_world.html . Nick Yee is a research scientist at the Palo Alto Research Center (PARC), his research background is focused on online games and immersive virtual reality.

learn that success is built on many many instances of failure and thus that persistence brings success.

The key potential related to social media platforms is that they can be used to harness social and intellectual/cognitive surplus, for example as has been discussed in the Long Tail section, Wikipedia harness the contributions of millions of people. McGonigal suggests that games can be structured to provide both educational content as well as to explore the potential for finding solutions to many types of 'wicked problems'. Combining cognitive resource (people & hours) with cognitive diversity (masses of many different people / points of view) with an engaged intensity (immersion in an experience that can simulate innumerable variables and vast time and space horizons) can deliver in a relatively short time unparalleled human computation while simultaneously educating participants about the nature and content of the problem.

> *There's real value in being pushed toward global awareness and looking long-term. That's one of the things that I find very useful about games…. I think these are the timelines we need to be looking – the 100 or 200 year horizons. Because most of the really bad stuff that's happening right now is the result of very short-term thinking*[32].
>
> Will Wright

Workplace

Three fundamental technologies will likely shape workplace in the next few decades:

- The 'hardware' of network technologies that are already present in abundance;
- The software that will enable and further enhance collaborative and collective effort of people and things using the hardware network; and

[32] For example see http://www.ted.com/talks/will_wright_makes_toys_that_make_worlds.html . Will Wright is game designer who invented a genre of computer game that involves neither winning nor shooting, yet has generated colossal hits. Among them: SimCity (which earned its publisher $230 million), The Sims, and Spore.

- Most importantly, the organizational will need to develop and integrate the cultural and institutional frameworks that are necessary to empower people to fully use the tools at hand in the most powerful, effective and self-organizing ways.

At the heart of the new workplace is the need to re-conceive the fundamental relationship of the workplace structure – the relationship between the individual and organization, from which all others relationships unfold as do the entailments of the personnel management system. In essence, the industrial age organization was based on a contract specifying the expectations forming the employment exchange. To attain the perpetual agility required by the workplace of the future and to be able to fully use the human capital that the long tail promises a new type of concept for the relationship between individual and organization will need to be developed.

The personnel management mission of the future will include (among other things) the capacity to connect the right person, to the right situation at the right time. The expectations embedded in this capacity can never be even partially captured in the traditional contract. The workplace and the organization of the future will be made and transformed by the individuals in the organization in unpredictable ways and in turn the organization will transform these individuals.

Implications for the CF Personnel System?

The CF will have to develop an Enabling Governance System that will:

- Enable agile, effective decision-making, and execution at all levels
- Focus on a more inclusive personnel generation and support system
- Enable deep and comprehensive personal evaluation integrated with training, education, and learning
- Empower comprehensive networks of key personnel, supported by effective collaborative information technology
- Enable the synchronization of personnel functions in a larger, more inclusive Personnel Generation System

With the aim of – ***Connecting the right person to the right situation at the right time.***

The traditional functions such as health services, well being, work/life balance, compensation, rewards and recognition, spiritual and religious support, personal development and family support remain fundamental. However, the aim of right person, right time, right place and right way will require exceptional situational awareness which can only be achieved with comprehensive human networks supported by effective collaborative information technology.

Stewarding engagement and harnessing knowledge in the context of the future will lead to an increased blurring of the boundaries between traditional personnel functions. The need to synchronize increasingly complex personnel functions and consider them as part of a larger, more inclusive Personnel Generation System will grow.

The current discussions of concepts such as a of whole-of-government and the comprehensive approach suggests a ***likely emergence of a corresponding concept of the Defence / Security Professional*** that would span beyond the 'Defence Team', beyond regular force (and reserves), and beyond indeterminate employees. Thus a personnel concept for the near future suggests a more fully integrated planning, development and employment of military and civilian personnel.

Identity and Commitment

Those who give themselves to a military career must of course be prepared to fulfill an ultimate commitment, in return the CF, DND and Canada must also be prepared to fulfill obligations inherent in honouring the social commitment with our members, employees and contractors. This makes the military (and related organizations) different.

In most other organizations the relationship between the organization and its people is founded on the concept of contract. The concept of contract is ubiquitous in

our society, shaping (concretely and metamorphically) not only the traditional 'labour-management' relationship but can extend s into the realms of personal relationship as well as to the relationship between the citizen and the state (e.g. the Social Contract). The concept of contract has become largely defined as a legal agreement involving the domain of lawyers.

The employment contract also underlines the traditional industrial era approaches to job descriptions and compensation, when it was more possible to specify the terms of the exchange within a contract. However, in the world of accelerating change, where organizational agility becomes imperative to deal with both change and complexity a rigid contractual approach becomes a liability impeding agility.

Organizations with increasingly permeable boundaries (intra and inter), have become a 'space-of-flows'. Organizations reconfigure themselves with increasing regularity; work changes with new technology, processes and divisions of labour; as people move from position to position for reasons of career opportunity, interest, and organizational change. It is increasingly evident that very few people work to a specific job description – as work becomes defined by the competencies required rather than by tasks that constitute a 'job'. Furthermore, it is increasingly the case a great deal of work necessarily depends on dynamic informal networks/networking.

If we imagine a future shaped by the trends that have been outlined, it seems self-evident that the concept of contract – as (even one with relatively few details) specifiable exchange that can encompass a career is untenable. What is clear is that in the span of a career, there is a dialectic evolving relationship where people will shape/create the organization and simultaneously the organizations will shapes the individual. Within such a relationship all participants require a basic assurance, a security of the mutual agreements that are the foundation of the use of will, ability, talent, and actions necessary to get things done that need to be done. The organization as well as the personnel system must become more responsive to the needs of the individual, just as the individual must also be responsive to the organization.

Therefore, rather than the concept of a contract, a more useful and appropriate foundation of this mutual assurance is a concept of Commitment. Commitment is a more progressive view of mutual relationship & responsiveness between member(s)

and organization. It represents a more organic relationship as source of both trust, mutual ideals, goals beliefs. In this way agility is enabled by the creation of a 'space' to do "the right thing" for our people, engendering the return commitment that our people will be engaged to the point that they too will "go the extra mile", will be enabled to operate with responsible autonomy, to ensure successful completion of the Defence Mission.

Recommendation – The Need for a Social Strategy – "The Golden Blackberry"

Given the convergence of demographic and technological trends outlined above the conditions seem right to challenge traditional thinking with a grander vision of the reserves for the DND/CF, for Canada and for the reserves themselves. A grander vision requires a social strategy[33] that extends beyond the boundaries of the organization's strategies, and shapes them. The goal of a social strategy is to create a broader, more powerful vision of the use of social tools – to enhance the reserves role in society in mutually constructive and socially advantageous ways.

Organizations that can sustain stronger and broader communities stand to gain significant capability and information advantages. Social and social media tools, used effectively can help traditional organizations to be more meaningful for supporting communities as well as to harness more capabilities to become more agile[34]. The social commitment between military people, DND/CF and Canada involves a web of elements that include people, truth, identity, reputation, and values that are rooted in community which in turn is the foundation of national will.

What is offered here is not a full fleshed social strategy but really a concept to serve the envisioning of what such a strategy could be. The concept of the 'Golden Blackberry' is a play on the idea to the traditional retirement gift – the gold pocket watch. However the Blackberry is aimed at representing a continuing relationship after retirement – a relationship that would enable the reserves and DND/CF to support the

[33] I am grateful to Umair Haque's blog for the concept of a social strategy.

[34] See Verdon, et al 2009 for an extended discussion of complexity, the long tail and responsible autonomy in relation to increasing organizational agility and the fuller harnessing of human capital.

concept of connecting the right person to the right situation at the right time. Sustaining the relationship with our retired alumni can help harness knowledge, memory and experience in new ways and provide just-in-time advice and mentoring.

The power of the concept of the golden Blackberry however, is to expand this sustaining connection to all reserve members and even further to citizens who may wish to serve in a more limited but useful way. By considering a much broader range of ways of serving the Reserves could potentially create a much larger, more diverse pool of talent. The golden Blackberry is essential a social strategy to enable a crowd sourcing approach to providing needed knowledge, experience, skill and judgment in a wide range of functions, from operations to training to education to administration. The vision extends to a way to engage more Canadians who for a many different reasons may wish to contribute or volunteer their knowledge and skill to a purpose that serves a greater good.

The golden Blackberry represents a capability for the Reserves to use social media in powerful ways engage many Canadians, to enable retired personnel to continue to contribute their expertise, and to help recruits learn from a wider web of knowledge and experience. The concept represents a capability to create significant pools of talent, to harness a 'cloud' human capability.

Conclusion

What is clear is that the historical dominance of place-based organizational dynamics is being overlaid with a network capability of a Person-to-Person-centricity – of a capacity to connect the right person, to the right situation at the right time. The personnel management implications are related to the need to add a "person-best-able" capability to the traditional "person-in-job" approach to managing people and designing how work gets done. New capabilities to harness the wisdom of crowds and the power of crowd sourcing, a talent-commons, will require much more attention to more extensive definitions and measure of human capital – knowing what people 'know' and enabling that 'knowledge' to be contributed wherever it is needed in the organization.

One very significant implication for the personnel system that follows from the acceleration of science and technology is that occupational structures, including those of the CF will be extremely challenged. Advances in science create new convergences and new specializations which means the emergence of whole new disciplines and the transformation of old ones. Similar changes in technology means the emergence of new occupations. Given the speed of change we are unable to predict what occupations will be vital in 5, 10, 15, 20 years that do not exist currently. Or which occupations will be obsolete, or need to be skilled-up, or skilled-down. The result is not only the need to have agile recruiting for new occupations but also a very agile training and education capability to address the need to both train new recruits and to continually be ready to re-train current personnel for new capabilities.

People are now the CF's longest investment framework. It generally takes a minimum of 20 years to grow senior NCMs and officers. The CF's capacity for operational agility will be largely depended on how we use network technology to train, develop and harness CF personnel and how we enable our network and organizational structures and processes for optimal individual and collective intelligence.

Relative to the power of network technologies and harnessing the dynamics of the Long Tail, the CF along with other militaries and organizations are currently exploring national access to any web 2.0 application or tools within DND and a number of smaller scale explorations are underway. A few well known examples include the US's Intellipedia, an intelligence wiki by FBI, CIA, Homeland Security to share intelligent data and collaborate on intelligence work as well as CompanyCommand.com. In Canada, the Communication Security Establishment has implemented their own version; Treasury Board has created GCPedia (government Wikipedia) and GCConnex (a government wide Facebook or LinkedIn).

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