

The Role of Leapfrogging in the Future of Youth Work and Workforce Preparation©

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Abstract: *Coping with unprecedented rates of change and complexity requires the ability to Leapfrog existing assumptions and practices regarding the roles of youth, enterprises, and societies in work and workforce preparation. Legacy systems must be continuously rethought, and routinely discarded, in order to persistently spring-board youth into rapidly evolving personal development roles and work situations involving partnerships with enterprises and governments. This paper examines the nature of the emerging new economy and the future of work and workforce preparation in the context of a youth-oriented Leapfrog paradigm.*

Change is driving the future: Global change is appearing in many forms. Bits are replacing atoms, telecommunication is instantaneous, and digital technologies are ubiquitous. Capital flows freely around the world twenty-four hours a day, every day. And, the Internet is forming a global communications network that is always on, offering e-commerce on demand. No society, enterprise, or individual is immune to this erupting change. In this milieu youth stand poised to enter the emerging new economy as digital natives in a new world.

This period of transformation is driven by two principal factors: the accelerating *rate* of change and the unprecedented *complexity* of change. Together, these factors are radically challenging traditional assumptions about the nature of work, workforce preparation, and who creates value. It is in this milieu that youth around the globe are eagerly creating and sharing their own content, points-of-view, and ideas. In their venue, the world is becoming a massive research and development (R&D) landscape in which they are continuously engaged in Leapfrogging what *is*, to what *is becoming*. The challenge of societies everywhere is to develop this latent resource and partner with it to create value.

Leapfrog Strategies—Redefining Youth Worker Preparation and Participation: Educators, societies, and enterprises everywhere are struggling with the critical question of how to prepare youth for life and work in the 21st century. The time-honored response of education has been to develop students with three categories of inter-related skills: basic literacy skills, immediately marketable occupation-specific skills, and acceptable social-civic-cultural skills. This established view generally holds that:

- Knowledge, facts, values, and institutions are *real* and *unchanging*.
- What needs to be known can be memorized over time *before* performance is required.
- The aim of education is to prepare *future* workers for entry-level positions in relatively *static* occupations.

The problem with this approach is that it is frequently based on uncomplicated understandings of 19th and 20th century industrial societies and work requirements. It assumes that slow, adaptive responses to change can be indefinitely accommodated and equally important—youth should be effectively separated from work and value contribution. Unfortunately, this view of workforce preparation is much too narrow for success in the emerging and fast-changing 21st century network-based global economy, in which rules constantly change, facts are understood in multiple ways, and innovation is prized regardless of its source.

In striking contrast to tradition, the *Leapfrog approach* centers on preparing youth for both immediate *and* life-long participation in a continuously changing synthesis of value-adding life and work performances. For example, *Leapfrog strategies* are specifically concerned with learning for:

- *Change* (where truth and facts are unstable and interpreted);
- *Complexity* (where reality is ultimately unknowable); and,
- *Chaos* (where outcomes are uncertain and unpredictable in detail).

Leapfrog strategies emphasize the changing the nature of learning from being *about* reality (i.e. verification and replication activities) to the *creation* and ordering of new realities (i.e., creativity and design). In this milieu, Leapfrog strategies emphasize the ongoing process of *becoming* (constructing new meaning and context) among youth, rather than processes of *acquiring* (e.g., memorization of existing content). Leapfrog emphasizes the continuous creation of new ideas and patterns while de-emphasizing universals and laws.

Leapfrog learning and workforce preparation requires engaging curriculum and curriculum delivery capability that is continuous, relevant, adaptive, and customizable for individual learners and value creation. The curriculum must also provide new opportunities for youth to engage and collaborate with others—anywhere, anytime to develop and share open source innovation. When this is coupled with the increasing availability of progressively smarter, more powerful, networked, and easier-to-use machines, it enables a greater portion of the world's youth to directly engage with other established providers (e.g., enterprises and public organizations) to produce new value in the marketplace. This *Leapfrog approach* to integrating youth development with value production provides a distinct opportunity for partnerships between enterprises, societies, and youth as knowledge and idea co-collaborators.

As human commerce and learning quickly migrate to the realm of cyberspace, many youth are already experimenting with, and engaging in, the value-adding production of cultural, product, service, and experience outcomes. Growing numbers of youth distributed throughout the globe are currently developing e-marketplace strategies and outcomes that are fast-moving, flexible, and playful—ideal essentials of 21st century work. It remains for enterprises and societies everywhere to assist, develop, and engage youth as emerging 21st century Leapfrog resources.

The emerging new economy: One of the primary manifestations of this period of accelerating change is the emerging *new economy*. This new economy embodies a global transformation that is redefining the nature and means of creating value (Friedman, 2005). It is an *e-economy* that increasingly relies upon *virtual, networked, and innovative* approaches to economic production and transactions. The keys to competitiveness in this emerging new economy are:

- Rapid cycles of product and service innovation.
- Continuous creative construction and deconstruction of competitive advantage.
- Innovative applications of digital technologies to rapidly develop and test low-cost models, simulations and prototypes.
- On-going excellence in knowledge creation, dissemination, and application.
- Workers that are always leading-edge and world-class at points of performance—first time and every time.
- Workers capable of rapidly and continuously *Leapfrogging* the competition.

Economies have historically relied on the use of *physical capital* (e.g., land, labor, and machines) to produce value. In contrast, the new economy places a premium on *intellectual capital* in the form of knowledge, innovation, and ideas as the means of production and the basis of value generation (Amidon, 2003). It extols new forms of agile enterprises, quickly reconfigurable smart technologies and software, near-real-time value creation and customizability, always-on connectivity and networking, click-stream customers, progressively smart products and services, and workers that are increasingly mobile, networked, vocal, and leading-edge. Global youth represent an emerging force in this new economy. They are the new generation of e-prosumers and active creators of a kaleidoscope of innovative new micro-markets.

The role of youth in this new form of capitalism is not readily understood by economists. Unlike earlier economies, the emerging new economy encourages constant experimentation, unconventional thinking, and activities in the margin. These new economy characteristics are already inherent in today's youth cultures.

The changing nature of work: A major icon of the emerging new economy is its focus on flexible task performance rather than traditional definitions of static jobs and repetitive work (Pink, 2005). Addressing this condition, the Leapfrog paradigm asserts that with appropriate technological assistance, every person can perform well the first time, and every time, in both novel and complex task environments. This approach asserts that:

- Traditional concepts of work are shifting from jobs that are stove-piped and statically defined to *performance roles* that are high flux, networked, and project-based.
- Electronic performance enhancement systems can enable previously excluded segments of populations (e.g., those with diminished skills, incomplete education or experience; or second-language workers) to engage in leading-edge performance roles.

Coupling the already rich and diverse outpouring of creativity by youth, with developing trends in self-organized and distributed ways of working, portends the opportunity for new blends of enterprise-youth-society partnerships that both develop youth and create value in the new economy.

Enterprise changes: Large enterprises have a lengthy history of hierarchical structuring, top-down communication, elimination of deviation, and the pursuit of efficiency. However, these legacy traditions are facing growing challenges in the emerging new economy. Increasing market volatility, rapid changes in the means of value creation, and increasingly sophisticated customers, are forcing these same organizations to become agile, innovative, and *virtual*. Organizational development literature identifies this process as *reinvention*. This paper presents it as a *paradigm of Leapfrogging* in which global youth play an increasingly critical role.

Today's enterprises are becoming more virtual and less physical. They are experiencing greater digitalization, more low-cost competitors, decreasing scales of production, greater involvement of prosumers and stakeholders, shrinking life cycles, increased outsourcing, and shifting envelopes of competitive advantage. Two additional trends are apparent:

1. Even the largest enterprises are no longer able to *internally* and *persistently* generate the levels of knowledge and innovation necessary to ensure long-term success; and,
2. Individual enterprises are increasingly unable to attract and retain critical masses of leading-edge talent within their organizational orbits.

To meet these challenges, enterprises and societies must learn to partner with youth in recognition of their accelerating contributions to global knowledge, innovation, and ideas. Tapping the youth resource provides new impetus for both global value creation and more encompassing global youth development.

Shift from physical to virtual work environments: Work environments in the new economy increasingly involve combinations of physical realities, augmented realities, and virtual realities. A primary benefit of using this blend of realities is the ability to apply virtual realms to invent, test, and communicate information, knowledge, and ideas in safe and non-destructive ways. In addition, the application of *blended realities* eases the complexity in learning and working by transforming data and ideas into experimental environments. This approach facilitates the involvement of youth in the new economy by:

- Providing new arenas in which emerging ideas about leading-edge work and learning can be negotiated in *fail-soft* environments.
- Enhancing human ability to translate abstract concepts into understandable experiences.
- Softening the transformation between thought and action.
- Providing alternate contexts for developing actionable knowledge, ideas, and decisions.

Youth have proven to be especially adept at accumulating digital experiences using simulative environments. Their participation in these e-environments demonstrates native abilities for rapid absorption of information, quick decision-making, and multitasking. Youth do not need to adapt

to virtual work environments. As increasing numbers of youth become digital natives, they are already *plugged in*.

Workers in the new economy: Workers in the 21st century are experiencing many changes in the traditional concept of work. Increasingly, human capital is envisioned in new ways:

- Workers as *free agents* or *contingent workers*
- Rise of *portfolio workers*
- Workers that telecommute or work virtually
- Job-sharing and *virtual teaming*
- Work conducted by temporarily aligned project teams
- Employment in intermittent short-term projects

Demographics are also expected to impact the nature and mix of workers in the new economy. Growing efforts are being made to involve the full spectrum of potential workers throughout the globe—including the young and the elderly. This requires rethinking some long held assumptions regarding youth and work.

Child labor in the Industrial Age commonly meant exposing the young to extreme physical labor under dangerous conditions, often at the cost of their health and education. In contrast, the Leapfrog approach permits the young to safely engage in digital work that complements, or is a part of, their educational and general learning experiences. By creating new software and web pages, generating blog content, or contributing to the design of new technologies, young people around the globe are already meaningfully participating in the global economy and becoming portfolio workers. Simultaneously, they are preparing themselves for future work and learning in the 21st century by routinely integrating *doing with learning* to Leapfrog themselves into the future. This paper asserts that a growing portion of global youth have either already evolved, or are quickly evolving, from thinking in industrial and information-age terms to engaging in the interconnectedness and constant innovation that is indicative of 21st century knowledge, innovation, and idea cultures.

Capturing the value of young knowledge and innovation workers: The new economy is reaching a tipping point where low-cost collaborative and open-source infrastructures are permitting the young to participate in the economy in new ways and in larger numbers. *Credentialed* knowledge and innovation workers are rapidly being joined by these young digital natives who are disrupting established networks of value creation and collaboration. Youth are linking together using blogs, wikis, pod-casts, and other technologies to create networks that are temporary, fuzzy, and self-organizing in nature. This growing density of e-collaboration among youth today is creating three outcomes. Today's youth are: 1. Producing and disseminating new knowledge and innovation at incredible rates; 2. Rapidly developing from passive consumers to active creators, or co-creators, of new products and services; and, 3. Creating an invaluable resource for creativity that is essential to sustaining the emerging new economy—an economy

that is dependent on the continuous and rapid sharing, adapting, and updating of knowledge and innovation to create value.

The Leapfrog paradigm asserts that the hypercompetitive global economy is changing the reality of who is innovative and knowledgeable, and under what circumstances. As enterprises and societies confront this reality, they repeatedly encounter the emerging youth sector as a vibrant source of vital new content and idea production. According to Tapscott and Williams (2006), the current youth generation is inherently innovative! It values newness, collaboration, speed, and openness. It adopts new technologies faster than other sectors of society, and it is an unrelenting source of change and value in the form of new knowledge, innovation, and ideas.

Changing performance expectations: As the time float between anticipation and realization drops to near-zero in value-adding activities, *Leapfrog strategies* are concerned with the delivery of continuous peak performance, first time and every time. The demands of the emerging new economy are driving this requirement. According to many observers, the new economy requires workers capable of producing: leading-edge products and services, reduced cycles of time to market, increased quality, greater customer involvement and service, and fewer errors.

To meet this challenge, workers are increasingly expected to deliver expert-level performance, leading-edge innovation, world-class knowledge generation, tight thought-to-market cycles, and quality deliverables that are on-time and on-budget (Amidon, 1997; Schrage, 1995). The Leapfrog approach asserts that the continuous delivery of this level of task performance requires technology and software-based performance and learning support that are available on-demand, anytime and anywhere. Even as widespread educational attainment increases, the global workforce as-a-whole remains insufficiently skilled and lacks the numbers to satisfy employers in the growing global economy. The need for early involvement of leading-edge technologies in the form of smart mobile phones, PDAs, and hand-held computers is critical to the rapid development of youth and involvement of major segments of the global population that have been educationally by-passed. In particular, the rapid innovation adopting characteristics of youth are well-suited to the use of performance enhancement technologies for both learning and doing.

Competency has become a moving target: The new economy requires leading-edge competencies that are based on world-class knowledge, innovation, and ideas. As the quantity of globally generated information explodes in volume and complexity, cognitive skills are rapidly displacing physical labor as the basis for value creation. In this view:

- The growing global economy requires increased participation and competency from a greater portion of the world's population, including those traditionally excluded—e.g., global youth and the under-educated.

- The historical gap between high-skilled and low-skilled workers can no longer be tolerated, as technology increasingly provides the means for closing the gap between them.
- The half-life of acquired skills will continue to dangerously shorten—unless skills are continuously updated through densely networked technology and software.
- Work involving repetitive, slow changing tasks or low skill levels will become increasingly automated or outsourced to countries with lower wages.

Overall, as knowledge, innovation, and ideas become swiftly networked and open-sourced, the gap between *credentialed* and *amateur* workers will become less sharply defined. This recognition increases the opportunity for an expansion of *Leapfrog producing partnerships* between enterprises, societies, and youth as knowledge and idea collaborators.

Requisite variety—a strategy for emerging complexity: Ashby’s *Principle of Requisite Variety* is a robust approach for addressing the growing challenge presented by global change and complexity. Requisite variety is defined as the internal diversity that a system must exhibit to deal effectively with increasing environmental complexity (Beer, 1975). The Principle of Requisite Variety states that vigorous environments continuously generate variety and novelty in the form of complexities not previously experienced. For a system (e.g., a society or economy) to remain viable under these conditions, it must address the continuous manifestation of environmental complexity and variety by increasing its own variety. With exploding global diversity, the youth sector represents a major resource of responsive individuality and uniqueness. In other words, variety is required to absorb variety. A three-part strategy for developing requisite variety and Leapfrog capability among global youth is outlined in the following sections.

Strategy #1—Innovative systems thinking: For three centuries, the Newtonian paradigm of science and mechanistic-reactive thinking has served the world well. It has provided the framework for advancements along broad fronts of science and technology, and guided noteworthy developments in capitalism (e.g., scientific management, value chains, and six sigma processes). However, the Newtonian paradigm is no longer adequate to address the growing complexity of the modern world. Just as relativity and quantum science have joined Newtonian science as frameworks for understanding physical phenomena, new frameworks of thinking are needed for participation in the 21st century workforce (Flood, 1999). Today’s youth already understand this requirement. For example, as gamers they must engage in learn-as-they-go gaming where the game is never the same and gamers must learn to quickly absorb new information, rapidly convert it into knowledge, and then synthesize this knowledge into new forms—often to be shared with fellow gamers. These skills are essential to societies and enterprises that must continuously develop and engage workers capable of Leapfrogging competitors.

Multiple observers have noted the importance of addressing both structured and uncertain situations in the emerging new economy using multiple frameworks of sensemaking. In this context, the importance of innovative systems thinking is quickly emerging in the literature of leadership, policy development, decision-making, customer relationship management, knowledge creation and management, strategy development, market creation—and *education*. It is increasingly apparent that innovative systems thinking is a requisite resource for learning and participating in emerging and novel work environments, and Leapfrogging global competitors. Here are some of the differences presented in the four frameworks of innovative systems thinking.

Framework for Innovative Systems Thinking				
Paradigm	Mechanistic	Chaotic	CAS	Teleogenic
Driving Principle	<i>Reactive</i>	<i>Adaptive (fast)</i>	<i>Adaptive</i>	<i>Proactive</i>
Exemplar	<i>Machine</i>	<i>Environment</i>	<i>Organism</i>	<i>Human</i>
View of Future	<i>Predictable</i>	<i>Unpredictable</i>	<i>Unpredictable</i>	<i>Unpredictable</i>
Understanding of Competitive Landscape	<i>Lawful, Knowable</i>	<i>Volatile, Unknowable</i>	<i>Dynamic, Interdependent</i>	<i>Dynamically Created</i>

Although several categories of innovative systems thinking are identified in the literature, this paper does not recognize any single category as inherently more important or effective than any other. The categories are presented here as contrasting *cognitive frameworks* whose boundaries are frequently amorphous, leaky, and poorly behaved. However, it is apparent that creating and sharing multiple perspectives of systems organization and complexity provide a distinct advantage to workforces facing rapid change and escalating complexity. It is presented here as a *basic competency* for individuals, enterprises, and societies that seek to employ Leapfrog strategies.

As previously outlined, youth cultures are exploring this approach in a variety of ways. For example, simulational environments are routinely embedded in virtual reality-based games and role-playing activities. These e-environments require multiple forms of sensemaking to meld creative, virtual, and physical world views and sensations. The outcomes are enhanced user interaction and rapid information uptake, knowledge generation, problem solving, and decision making—the basic ingredients of survival and value creation in the new economy.

Strategy #2—Growing application of digital technologies: The growth of digital technologies is facilitating the ability of youth to engage in the global creation of a spiraling variety of new experiences, knowledge, products, services, and micro-markets. The accelerating speed and memory of computers, growing bandwidth of connections, and expanding power of software is

radically impacting both the development potential of global youth and their ability to *see the world as a research and development laboratory*. Specifically:

- Youth are more intensely collaborative as a result of the Internet and ubiquitous telecommunications.
- Computers and telecommunication are making learning multi-dimensional—*playful* and *motivating*.
- Astounding developments in electronic gaming are enabling youth to stretch their knowledge and idea generating capabilities in new and unexpected directions.
- Open-source software is greatly enhancing the ability of youth to readily and virtually model, test, and rapidly prototype new ideas, experiences, and outcomes.

The mounting interconnection of digital resources is also linking everything and everyone (people, machines, toys, vehicles, and buildings) in ways unheard of a short time ago (Kurzweil, 2005). Intelligent and smart processor chips and software are increasingly embedded into machines and environments that assist a wide range of ongoing work and learning activities. More than a billion people are now connected to free long-distance, multi-media, learning services that range from lessons in basic health care to advanced seminars in particle physics. The opportunities for youth to collaborate and participate in this environment are unbounded!

Strategy #3—Emerging role of Electronic Performance Enhancement Systems (EPES):

Electronic Performance Enhancement Systems (EPES) are rapidly emerging, technological-based, systems designed to enhance human ability to learn and perform cognitive-based work. These *performanceware* systems are comprised of hardware and software that work together to fuse the processes of learning and doing, and make it available to learners and workers anywhere, anytime (Rosenberg, 2001). This resource enables an increasing number of global youth to immediately engage in leading-edge performance situations and eliminates extensive pre-training as a precondition for performance. The overall intent is to amplify and augment both professionals and novices in any environments—physical or virtual, and to enable peak performance under any conditions. Electronic Performance Enhancement Systems are the basis of 21st learning (e.g., Education 3.0 and Education 4.0) and 21st century work.

Summary: The world is poised for a great explosion in performance and productivity. As *digital natives* of this new world, growing numbers of global youth stand ready to emerge from their historically limited economic roles to become major players in the new global economy. In this venue, the *Leapfrog approach* provides a proactive paradigm that frames new opportunities for partnerships between enterprises, societies, and youth as knowledge and idea collaborators and knowledge generators. This paradigm asserts that new combinations of innovative systems thinking, digital technologies, and electronic performance enhancement systems, coupled with new ways of learning and working (conducted through simulation, gaming, and open-source collaboration), are hugely relevant to developing workforces capable of continuously *Leapfrogging* global competitors.

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