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Information Technology (and Demographic Necessity) Will Transform Healthcare

by David Pearce Snyder, Consulting Futurist

As an apprentice futurist at the RAND Corporation back in the 1960's, I worked on a project to identify the criteria by which people assess the quality of their lives. The principal investigators on the project were Olaf Helmer and Norm Dalkey, the inventors of the "Delphi" survey technique. In our study, we used the Delphi methodology to solicit quality of life (Q.O.L.) factors from a sample population. After three rounds, the responses to our initially open-ended question had coalesced around nine Q.O.L. components, whose relative importance was reflected by a consensus of numerical weights assigned by the respondents (*see table on page 4*).

Snyder

Our original sample of respondents – mid-career civil servants from a dozen Federal agencies – scarcely constituted a representative cross-section of the U.S. public. However, in our research, we found a number of scholarly papers in ethnology and cultural anthropology reporting Q.O.L. criteria remarkably similar to ours among Polish coal miners, Bedouin tribesmen and Pacific Islanders, with "Health" always the top factor by a wide margin. Since our original survey, the opinion polling industry has compiled similar sets of criteria, by which people – in all walks

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Systemic Visioning and Innovation for Equitable and Sustainable Socio-Economic Development[1]

by John 'Zac' Zachariassen
President, The Solertia Institute

INTRODUCTION

Visions, innovations and inventions are cornerstones of the development of human society. To take root and flourish they need to be embraced by a critical mass of stakeholders, whether those be individuals, communities, businesses, institutions or governments.

To result in equitable, sustainable development the innovations need to be conceived, developed and applied with integrity and functional wisdom. Concurrently, they need to be supported and supplemented by ample, relevant and timely learning, knowledge and information.

Securing extensive acceptance is a major challenge unless constructive innovation becomes part of the predominant culture. In many cases success can be achieved by ethically rewarding the support of new initiatives for the common good. However, the social and bureaucratic context of innovation is often not ready for

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Mack

From the Desk of Tim Mack, *President, World Future Society*

I get asked an amazing number of questions as President of the Society, and I was asked recently to speculate on what the world would do without the Internet. While free floating thought experiments are often a part of disciplines like science fiction, I am more comfortable with more probable futures and I decided to take a less fantastic tact in answering the question. The most interesting part of such an answer is the energetic discussions it might stir up and I would be very interested in hearing from anyone reading this who has an opinion on this matter – or much more interesting, thinks I am completely wrong about the matters I discuss below. Get back to me anytime at tmack@wfs.org

The loss of the Internet for days, weeks or permanently would mean more that just an end to annoying spam and being cut off from the ideal way to settle arguments in bars. The ongoing explosion of virtual Internet business services of all sorts, accounting, payroll, and even sales would come to a halt, and so would many companies. Customer services could still be handled by phone, except where the phone system was Internet-based. Much more severely affected would be complex project management between companies, especially those projects based on shared CAD (computer assisted design) files or even shared PERT (Program Evaluation and Review Technique) files. On the other side of the discussion, however, only about 20% of those asked in an Internet poll on potential systemic failures thought that loss of Internet corporate communications and collaboration would be catastrophic and 10% thought it would have no effect at all.

Of course, there are lots of jokes to be made about the loss of Internet, like "people would read books again…or talk to their family!" But the changes we have seen in Western culture are the result of wide-ranging forces (including cultural and economic factors), and not the impact of a single technology. However, the permanent-loss fantasy is just that, a fantasy (barring a larger global catastrophe) in light of past responses to global cable failures where the outage was a day or two and no more (even on transoceanic cables). The reason for this is that the Internet has become indispensable to most of its users, both for business systems and for personal information. The users of any computer-dependent system such as the Internet should have backup capability, and a recent poll showed in fact 70% of businesses do have an Internet failure response plan, where any gap in service would be largely bridged or at least minimized. New forms of e-government, critical research and modeling (for example climate change data) and an incredible evolving social/enterprise network are changing the nature of the globe and perhaps even the future of the nation state. To paraphrase Tom Friedman, it has brought us all together in ways we still don't fully understand, but will change the way that humans learn and create worldwide. It is not likely the human race would be willing to go back to those earlier times before the Internet for very long.

What this thought exercise did make clear to me is how important dialogue and vigorous debate are to good futures work, especially when done on a global scale. Putting out important questions and getting thoughtful answers are essential undertakings. Insight can come to experienced analysts, but no one individual understands all the nuances and cross-impact implications of a trend or set of circumstances. Accordingly, the cooperative organizational network has become one of the more powerful players in the global economy, whether for governments, nonprofits such as NGOs, or private sector corporations. One viable definition of such networks in a business setting is "a learning community dedicated to improving business outcomes by making the most out of 'cooperative' advantage." And much the same appears to be true for other types of organizations as well – i.e. an effective way of gathering and utilizing enough intelligence and resources to meet organizational goals, using cooperative versus competitive methods. This development has largely been driven by the emergence of the global marketplace – the result of enabling technology. While it is now technically possible for any organization to expand its presence and influence globally, very few have the resources or experience to accomplish that effectively. Accordingly, organizations of all types are looking to define their unique strengths and turning to cooperative partners for the information, technology and human capital resources to fill in the gaps. This is most often happening in areas like research and development, where technology advancement often outstrips the ability to transform these advances into practical applications…and therefore joint programs prove essential. Other areas include communications strategies in new geographic or social arenas where the cultural nuances are not fully understood…and especially where language translation is required. When a marketing program or a public affairs campaign depends for its success on persuasive shades of meaning, local assistance is critical.

Global project management is another arena where cooperation trumps competition again and again, and the explosive growth of organizations like the Project Management Institute provides testimony to its value. But it is the indirect political and cultural implications of the growth of cooperative networking that may have the most far-reaching implications. While no one seriously imagines that the nation-state model will be gone tomorrow, the success of international hybrid organizations (with business, government and NGO elements) will do much to extend global fabrics of mutual interest and mutual understanding. While change always brings challenges in its wake, this set of changes seems to bring hope as well.

FUTURE*takes*

FUTURE*takes*, an independent publication providing futurist thought and education to the World Future Society (WFS) chapters and members worldwide, brings professions, disciplines, nations, ethnic groups, and cultures together to study the future from a non-partisan perspective. Its articles and program synopses generally explore alternative futures as well as the cross-cutting implications of social trends, technology advances, and policy decisions. In addition, **FUTURE*takes*** is an educational resource, complete with discussion points to inspire student and faculty thinking, articles, and research projects. Distribution includes interested individuals as well as selected think tanks, other professional societies, other WFS chapters worldwide, and selected educational institutions.

FUTURE*takes* welcomes articles that contribute to a reasoned awareness of the future, advance serious and responsible investigation of the future, and promote the development of futures studies methodologies. In addition, **FUTURE*takes*** publishes book reviews, future studies exercises, discussion threads, letters to the editor or equivalent correspondence, and summaries of chapter programs. All published material will normally follow the guidelines delineated herein for contributed articles.

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of life – measure how satisfied they are with their lives. "Health" consistently turns up at the head of *each* list.

If we accept all this feedback (and why shouldn't we?), it would help explain the enormous amounts of money that people – individually and collectively – are willing to spend on health and medicine. In the language of behavioral economists, the marketplace demand for health is "price elastic." That is, health is so important to the quality of our lives that increasing the price of medical care does not reduce the demand for medical care. Society's demonstrated willingness to consume growing amounts of rapidly-inflating healthcare since 1980, *in spite of stagnant or falling median household income*, can be regarded as a text book example of price elasticity. Unfortunately, price elastic demand provides little incentive for suppliers to reduce their costs or improve their productivity in order to hold prices down. As a consequence, access to healthcare in America is increasingly being "rationed" by patient income – and this situation will get predictably worse – unless there is some sort of political intervention in the marketplace.

Of course, political intervention is exactly what America's financially strapped healthcare consumers are currently looking for. U.S. opinion polls routinely show that affordable healthcare is now the second most important voter concern (after the Iraq war), and between 2/3 and 3/4 of voters believe that equitable access to affordable health insurance should be an entitlement. How best to achieve this goal is already one of the major debating points of the 2008 U.S. elections. But, by focusing our collective national attention on finding an actuarial "fix" for the high cost of healthcare, we are failing entirely to appreciate the rapidly approaching convergence of long-term demographic, economic and technologic trends that is about to coerce transformational change throughout the nation's largest industry.

COMPONENTS OF THE QUALITY OF LIFE
DERIVED FROM A DELPHI SELF-ASSESSMENT SURVEY

COMPONENT OR FACTOR	MEDIAN WEIGHT
1. HEALTH	20
2. STATUS	14
3. AFFLUENCE	14
4. MEANINGFUL ACTIVITY	12
5. SOCIALITY	9
6. FREEDOM	8
7. SECURITY	8
8. NOVELTY/NEW EXPERIENCE	7
9. AGGRESSION/DOMINANCE	6

from: ***Studies in the Quality of Life***, by Norman Dalkey, Daniel L. Rourk, Ralph Lewis and David Snyder, Lexington Books, 1972, p. 87.

THE REAL FUTURE OF AMERICAN HEALTHCARE

"Healthcare" is, in fact, America's largest industry, currently accounting for 16.5% of the nation's GDP and 15.5% of all U.S. employment. The U.S. Bureau of Labor Statistics (BLS) expects "Healthcare" to employ 18.6% of all U.S. workers by 2014, and the National Center for Medicare and Medicaid Services estimates that "Health care" will generate 20% of our GDP by 2015. Three out of 10 new U.S. workers between now and 2015 will be employed due to growth in healthcare or medicine. The continued rapid growth of healthcare is largely seen as inevitable, as a direct consequence of our aging population. And, economists cheerfully regard healthcare as a guaranteed source of future new jobs that cannot be automated or off-shored.

Many policy-makers, on the other hand, see the projected rise in healthcare expenditures and employment as an emerging crisis that will only get worse in the future. U.S. healthcare spending over the past 10 years has risen 2 to 4 times faster than overall inflation and shows no sign of moderating. Medical bills are already the primary cause of bankruptcy among older Americans, and the high health insurance costs of U.S. factory workers seriously disadvantages its manufactured goods in global competition.

What's more, labor demographers forecast that the growing demand for health workers will substantially exceed the supply, causing an untenable shortage of professional care givers – including a projected deficit of 1 million nurses in 10 years. Such shortages would not only compromise the quality of American healthcare, but economists estimate that the resulting wage inflation among care providers would cause annual health spending increases to double – from 7.7% *p.a.* in 2006 to 15% *p.a.* or more – by 2020.

The most promising practical approach to reducing U.S. healthcare costs and labor requirements involves using information technology (IT) to create an electronic medical records system (EMRS), which proponents argue would cut healthcare costs by at least 20%, while reducing medical errors by 50% or more. In 2005, President Bush announced a Federal initiative to complete a nationwide EMRS by 2014.

Mr. Bush had good reason to promote EMRS. Over the preceding decade, the U.S. Veterans Administration (VA) had installed EMRS as part of a 10-year modernization of its 1,400 hospitals, clinics and nursing homes. As a consequence of the modernization, the VA has been able to double the number of patients it treats each year (from 2.5 million to 5.3 million), while maintaining an

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average annual per-patient cost of $5,000. During the same period, the cost of comparable private care rose 40% to $6,500 per patient. Not only was the VA able to reduce staffing by 13% (10,000 employees), but its over-65 year old patients have a 40% lower risk of death than do over-65 Medicare patients in private facilities.

In spite of its proven benefits, there is widespread opposition to EMRS throughout the medical profession and healthcare industry in general. Most practitioners refuse to accept the standard forms and definitions required by an automated system, while privacy advocates fear compromising patients' medical records and pharmaceutical companies are concerned (justifiably) that a single nationwide data base of patient records would reveal the side-effects and relative effectiveness – or ineffectiveness – of their medications. In fact, some policy makers worry that more accurate data on the nation's health would reveal shortcomings in the current system that would ultimately require even more expenditures on medical treatment. Overarching this debate is the fact that no source of funding has been identified to underwrite the billions of dollars that EMRS would cost.

MORE PATIENTS, FEWER BEDS

Absent any productivity-enhancing innovation, the prognosis for U.S. healthcare clearly indicates continuing employment growth. But the BLS biennial 10-year jobs forecasts reveal shifting employment within the industry itself. In particular, comparison between BLS 2002 and 2004 10-year projections indicates a sharp decline in the forecast employment growth of "Nursing and residential care facilities," which is offset by a projected increase in employment by "Home healthcare services." The principal clientele for both of these segments of healthcare are the elderly.

Because Americans have been staying healthier longer, a declining share of elderly is requiring institutional care until late in life. However, because the average U.S. life-span is continuing to increase, growing numbers of older Americans are finding that the high cost of institutional elder-care often consumes their retirement savings long before they die. These twin realities are leading a growing share of elderly people and their principal care providers – their children – to opt for aging at home. And, because home care costs are considerably less than those for institutional care, state and Federal funders of elder care have altered their policies to underwrite home care for the elderly – in response to both public demand and mounting political pressure.

Three out of 10 new U.S. workers between now and 2015 will be employed due to growth in healthcare or medicine. The continued rapid growth of healthcare is largely seen as inevitable, as a direct consequence of our aging population.

The movement to care for the chronically ill and elderly at home has been accelerating since the Internet made possible the remote monitoring of patients by doctors and hospitals. In 2000, Medicare and Medicaid changed their funding criteria to cover the costs of "telemedicine" services and their associated technologies. Major IT firms Honeywell and Philips Electronics are each introducing a line of home health monitors, while Intel is developing specialty microchips for use in telemedicine.

Early assessments of telemedicine clearly show that it reduces both the cost and staffing of comparable institutional care, while significantly improving patient outcomes. In anticipation of making wider use of telemedical monitoring to oversee the post-operative recovery of patients at home, US. hospitals have reduced the nation's inventory of hospital beds by 2% (18,000 beds) since 2000. Over the coming decade, costly institutional care will increasingly be reserved for the critically ill, and for patients undergoing major surgery, while the care of convalescent and chronically ill people will largely take place in the home. Telemedicine will enable millions of people to care for themselves – or be cared for by others – in their homes rather than being institutionalized.

LONG-TERM PROMISES VS. NEAR-TERM NECESSITIES

We frequently hear that the future of medicine will be an exciting, hopeful place, filled with genetically engineered vaccines, cancer fighting nanobots, biomimetic prostheses and drugs that cure mental illness. But most of these breakthroughs are still works-in-progress. In the near-term future, innovation in healthcare will be driven by demographic necessities, and the need to provide quality care for a rapidly growing patient population with a slowly growing labor pool.

Some medical diagnostics and clerical work – as well as some surgery – will be off-shored to modernizing 3rd world nations. In 2004, *The Wall Street Journal* reported that in 2003, 600,000 patients from developed nations traveled to South Asian and Middle Eastern countries for low-cost operations. The *big* innovation in U.S. healthcare, however, will be the "outsourcing" of chronic and convalescent care to patients' homes. Telemedicine via the Internet will permit hospitals, nursing homes and individual practitioners to serve more patients throughout a community, while producing superior patient outcomes.

Current patterns of social, institutional and technological adaptation strongly suggest that the foregoing scenario is already gathering momentum. Moreover, a growing impatience in Washington with the healthcare profession's reluctance to use electronic patient records has forged a bi-partisan coalition committed to forcing the issue. To "jump start" EMRS, the Federal government can be expected to

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issue "smart cards" to all Medicare/Medicaid recipients by 2010-12, and to mandate electronic reporting by large care-providers – in hopes of capturing some of the improved patient outcomes and cost efficiencies experienced by the Veterans Administration. If the nation's private health practitioners and providers were able to achieve a performance improvement approximating that of the VA care delivery system, it would be the public health equivalent of reversing global warming.

Once national EMRS reporting standards have been established, scientists and statisticians will quickly set up on-line networks to access and share the newly available data reflecting the actual collective practices and outcomes of American healthcare. Early revelations will lead to numerous changes in medical practices and procedures, and provoke widespread support for a national health information network ("HealthNet") that would mobilize all EMRS performance data to provide timely feedback for "evidence-based" public health policies and practices.

HealthNet would obviously be an invaluable asset when we confront future pandemics (epidemiologists are certain this is just a matter of time). Of course, if we do not have a HealthNet when the first pandemic hits, we are sure to have one in time for the second pandemic. A HealthNet would also be a powerful medium for "preventive care," providing public access to reliable medical information and wellness education. Best of all, a national HealthNet will require no new technologic breakthroughs: it can be done with commodity systems and software.

The creation of a U.S. HealthNet would represent a national commitment on the scale of the Interstate Highway System. However, since sectoral economic projections commonly show that healthcare will be generating one-quarter to one-third of our GDP well before 2050, such an investment would be entirely appropriate. Given the scale and complexity of such an undertaking, it is probable that any national HealthNet/EMRS project would best be organized like the on-line collaboration of user volunteers that created the superior open-source (OS) software system (Linux), which is currently capturing a growing share of high volume commodity IT applications worldwide.

If we start now, an OS HealthNet/EMRS could be operational by around 2015, about the time that some of today's promising medical breakthroughs will finally be reaching the marketplace. But, before we enjoy the promised benefits of the long-term future of healthcare in America, we will have to get there first. And because health is the most valuable quality of life, the successful management of healthcare's near-term future will be a more important achievement for society than any medical breakthrough.

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POINTS FOR THE CLASSROOM

(send comments to articles@futuretakes.org):

- *What will healthcare support look like in your part of the world in 2020? Employer-subsidized? Tax-subsidized? Individual fee-for-service? The traditional Chinese system, in which the doctor is paid only when a patient is healthy and not when he/she is ill? To what extent will the fee structure be matched with medical necessity?*
- *Will the demographic, economic, technological, and social trends identified by Snyder lead to widespread utilization of complementary and alternative healthcare services? Preventative healthcare? If so, who will pay the fees?*
- *The author notes that medical costs are the primary cause of bankruptcy among older Americans. In 2020, what will be the primary challenges that elderly people face in your part of the world and elsewhere? Also, what will be the leading causes of (personal) financial insolvency, by age bracket, at that time?*
- *In the US, people are living longer on average (sometimes outliving their savings), and they are also working longer, often to maintain healthcare coverage or because of retirement plan failure. However, the "senior years" are when health challenges are often greatest, notwithstanding the fact that Americans are on average staying healthier longer. In addition, the workplace and work culture itself can be a source of unhealthy stress for some (albeit a social network for others). What are the long-term implications of this seeming mismatch? Will the next generation have more or fewer retirement years than the present generation?*
- *Related question: considering also the demise of "careers for life" in some occupations, will the pattern of postponing retirement migrate to other parts of the world, or will another working-living-retirement pattern become more prevalent?*
- *Snyder points out that the health insurance costs of US factory workers puts the US manufacturers at a disadvantage in the global marketplace. To what extent is this disadvantage a factor in the US transition to a service economy (with healthcare itself a key service), especially considering that the US has been relatively attractive to outside investors in recent years? In which nations or regions will most manufacturing be found in 2020 – and with what implications?*
- *Related question: what long-term challenges will face nations that are primarily industrial economies? Service economies? Agricultural economies?*
- *As Snyder observes, labor demographers project a deficit of healthcare providers – in nursing alone, a deficit of one million in ten years. What countertrend, if any, will reverse this deficit?*
- *In addition to the trends discussed in the article, what other trends and developments will impact healthcare in the next 15 years?*
- *Also, visit www.futuretakes.org/FutureTakesContents.htm for articles on related topics.*

Book Discussion

• • • **FUTURE*takes*** is pleased to publish synopses of World Future Society chapter programs. The following book review/discussion synopsis is from the Futurist Book Group of the Washington DC chapter.

by Nassim Nicholas Taleb
400 pages
Random House Trade Paperbacks, 2007, 400 pages
ISBN-10: 081297381X
ISBN-13: 978-0812973815

The Black Swan:
The Impact of the Highly Improbable

Synopsis of the October 2007 meeting of the Futurist Book Group (Washington DC Chapter); summarized and reviewed by Ken Harris

Interestingly, this is one of a line of recent books we have read that recommend new patterns of thinking, including *The Wisdom of Crowds* by James Surowiecki (October '04 meeting), *Why Most Things Fail* by Paul Ormerod (May '06), and *The Long Tail* by Chris Anderson (January '07).

We were drawn to this book because it directly addresses the question of how much we can really know about the future. The essence of Taleb's argument is that we can know a lot about the future, but what we can know is not very important. He argues that the really important events are "Black Swans," which have the following three characteristics:

- They lie outside the realm of regular expectations because nothing in the past can convincingly point to their possibility.
- They have extreme impacts.
- Human nature makes us concoct explanations for their occurrence after the fact, so that their occurrence is explainable and predictable.

Indeed, in the Prologue after defining Black Swans, he says, "A small number of Black Swans explain almost everything in our world from the success of ideas and religions to the dynamics of human events to elements of our own personal lives." In accord with this theory throughout the book, Taleb is extremely critical of economists', sociologists', historians' and financiers' claims to expertise about how the world really works. He is overly critical of "experts" like college admissions officers who do not practice hard disciplines, saying in effect that they are all charlatans. Yet, surely such people do learn some things through experience even if they cannot operate under hard rules like the laws of physics. World Future Society members should be concerned about his criticism because modes of studying the future resemble the social science disciplines of which he is so critical. Taleb does not mention futurists or futures studies anywhere in the book, and, no doubt, he would be skeptical of their value if asked for comment. But, if he were told that futurists consider many possible alternative futures, consider the possibility of very beneficial and very harmful wildcard events, and look for weak signals in the present of what may come in the future, he might

See Black Swan, continued on page 8

Useless Arithmetic:
Why Environmental Scientists Can't Predict the Future

by Orrin H. Pilkey and Linda Pilkey-Jarvis
Columbia University Press, 2007
230 pages
ISBN-10: 0231132123
ISBN-13: 978-0231132121

Reviewed by Jay Herson

This seems to be a year to sell books that beat up on statisticians and applied mathematicians. As a statistician and a futurist I can appreciate these arguments but I still sit on the fence. This book is similar in spirit to Nassim N. Taleb's book *The Black Swan* reviewed elsewhere on this page, but where Taleb deals with the world of finance, this book deals with mathematical modeling as applied to environmental natural science problems defined broadly to include fishing, storing atomic waste, sea levels, beaches and coastal issues, acidic rivers and lakes, and invasive plants and species.

The book's take home message comes as a quote from Danish physicist Per Bak who wrote "Don't predict. Adapt." The authors feel that we are both prisoners and beneficiaries of our experience but this limits our ability to make predictions of the future that are of any value. They value qualitative models (futurist approach) over quantitative (mathematical prediction). For the latter the shear complexity necessitates that important variables are left out of models. Some of these variables are known by scientists and some variables and events are unknown. In qualitative models only the direction of change is predicted, not the precise numerical quantification of change. Moreover, quantitative modelers are guilty of not evaluating the accuracy of their models over time, finding shortcomings, reporting them to the public and revising the models. However, the policy makers and the public like numerical results because of the feeling that they are more precise than qualitative models.

In the case of fishing policy for

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be more accepting of our discipline and us.

Part 1 considers how humans deal with knowledge. Taleb contrasts "Mediocristan" and "Extremistan." In Mediocristan, things are predictable. They are predictable because they are amenable to analysis by conventional bell curve statistics. They include things like height, weight, and age of a population. The number of observations is so large that no single observation with an extreme value can shift the value for the entire population very much. On the other hand, phenomena in Extremistan are not amenable to conventional statistical analysis because a single unit can affect the entire population disproportionately. Of course, Taleb argues that Extremistan phenomena are the really important ones. In fact, the world is continually becoming more like Extremistan and thus harder to predict. This contrast between Mediocristan and Extremistan is a very effective way of getting across Taleb's thesis that we cannot predict things that are really important.

Professions that deal with the future and base their studies on the non-repeatable past have an expert problem…The problem with experts is that they do not know what they do not know.

In later chapters of Part 1, Taleb discusses why people make some of the errors they do in trying to explain how things really happen. One is that by "living in Mediocristan" we eliminate Black Swan surprises from our thinking. This in turn leads to the errors of focusing on pre-selected segments of things we see and generalizing from that to things we cannot see. Another is that we have a natural inclination to look for instances that confirm our theory and vision of the world, and in so doing, we may overlook things that are really important. Then, there is what Taleb calls "the narrative fallacy" in which we tend to make up stories to explain what we have seen simply because getting and storing the information we really need for a full explanation is costly and difficult. Another common error, says Taleb, is the ludic fallacy – the false assumption that succeeding in real life is like succeeding in a game of chance in which you know the odds. In reality, you don't know the odds.

Taleb begins Part 2, "We Just Can't Predict," with the statement, "I find it scandalous that in spite of the empirical record we continue to project into the future as if we were good at it using tools and methods that exclude rare events." Chapter 10 is where he addresses "the expert problem." He gets to the essence of his problem with experts when he says, "Professions that deal with the future and base their studies on the non-repeatable past have an expert problem (with the exception of the weather and businesses inventing short-term physical processes, not socioeconomic ones)…The problem with experts is that they do not know what they do not know. Lack of knowledge and delusion about the quality of your knowledge come together – the same process that makes you know less also makes you satisfied with your knowledge." Surely, this is an exaggeration. People who Taleb says are experts who tend not to be experts – for example, college admissions officers, psychiatrists and court judges – learn some valuable lessons from experience that they can and do apply later.

Chapter 11 makes the very good point that the most consequential discoveries are often inadvertent such as Flemming's discovery of penicillin. He goes on to discuss more generally the problem of predicting the behavior of a system which, like most in real life, has three or more variables. Here he says essentially that the complexity of such systems makes predicting their behavior impossible. However, he neglects the possibility that increasingly powerful computers do permit continually improving modeling of such systems. He further objects to the idea of predicting such multi-variable systems that include humans because humans have free will, and "You cannot predict how people will act." Many psychiatrists and psychologists would take issue with that statement.

In chapter 13, Taleb expounds a philosophy of life based on the existence of Black Swans and our inability to predict the future. He clarifies that he is really arguing against the idea that predicting the behavior of large systems is impossible. He advises the reader to "be human" and make predictions in running one's own affairs but not to listen to economic forecasters or predictors in social science. He advises us to "be prepared" for any eventuality. In finance, this means to have both a hyper-conservative and hyper-aggressive strategy in which you put most of your money into very safe investments like Treasury bills and the rest, say 10-15%, into riskier investments. He lists 5 "tricks" for effective dealing with Black Swans in your life:

- Learn to distinguish between activities in which a lack of predictability can be or has been extremely beneficial and those where failure to understand the future can cause harm.
- Work hard to let contingency enter your working life.
- Seize any opportunity or anything that looks like opportunity.
- Let governments predict but do not set much store by what they say.
- Do not waste time fighting forecasters, stock analysts, economists and social scientists except to play pranks on them.

Part 3 deals with the more technical, mathematical aspects of predicting. Curiously, Taleb says these are the more non-essential sections of the book and chapters 15 and 17 and the first half of chapter 16 can be skipped without any serious loss to the thoughtful reader. The most important lesson of this part of the book is understanding the limited usefulness

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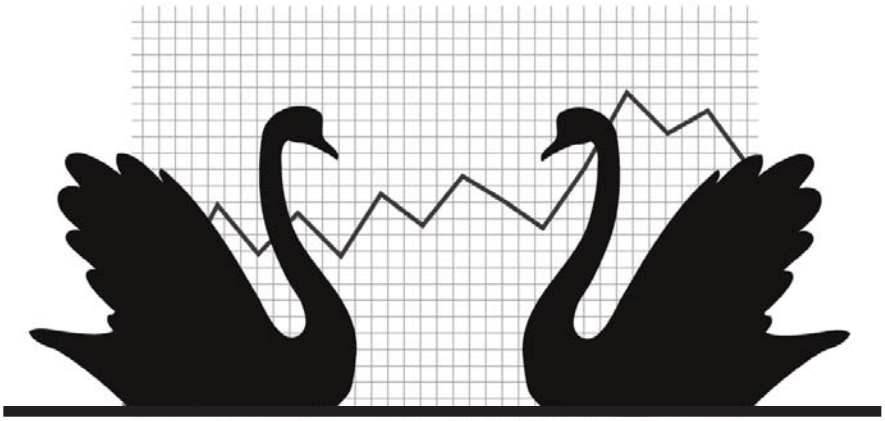
of the Gaussian or bell curve in statistics. Taleb says it useful for limited purposes like analyzing crime and mortality statistics. He is much more supportive of the more powerful Mandelbrotian approach, but his explanation of it is not as clear to the non-statistically trained reader.

This book in a mostly entertaining fashion deals with many subjects, all loosely connected with the notion that we cannot predict truly consequential events the author calls Black Swans and how to live fruitfully with that in mind. Read it to become more careful and thoughtful in your thinking about the future and especially in evaluating what others say about it.

POINTS FOR THE CLASSROOM
(send comments to articles@futuretakes.org):

- *Taleb observes that the world is becoming harder to predict. Will this lead to a resurgence of qualitative methodology and/or the advent of a new methodology – in preference to statistical models and possibly managerial metrics?*
- *Taleb discusses "the expert problem," specifically, that they do not know what they do not know and that the same process that makes them know less also makes them satisfied with the knowledge that they do have. Considering the limitations of prediction, "information overload" – and the fact that even science and mathematics are proving their own limitations – what will "experts" be in 2025?*
- *Consider the first of Taleb's "tricks" for effectively dealing with Black Swans. What fundamental characteristics, if any, separate the "wild cards" that can lead to beneficial consequences from those that can lead to harm?*
- *Also see related "Points for the Classroom" in book review of* Useless Arithmetic*, this issue, and "Cornelia Daheim's article, "Futures Studies Activities in Germany: Toward a Perspective of Foresight," Spring 2007 (thematic) issue.*



Useless Arithmetic

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allowable catches, with cod fishing in Canada as the principal example, the authors contend that modelers concentrate on single species and ignore effects on the entire marine ecosystem and that some modelers know their predictions are inaccurate but use them to convince politicians of funding levels and to reduce pressure from politicians and recreational fisherman.

For Yucca Mountain predictions of atomic waste disposal, the authors attack models for even claiming they can predict what will happen tens of thousands of years from now due to the huge time span covered by the models, lack of knowledge of the role of time in chemical reactions and degradation of waste containers, uncertainty of climate change and complexity of the natural processes involved. Models have been accepted because of the need to come up with a rational solution soon. The authors contend that an alternative would be at least to predict for a shorter period of, say, 200 years, and then use adaptive staging meaning to predict for another 200 years based on what has been learned in the previous 200 years and so on.

In the area of beach erosion, the authors provide a long list of variables that have been ignored by quantitative modelers and indicate the role of "black swans" in this field. When models fail predictions, the modelers blame "unexpected" storms as the reason for failure. Just as Taleb would claim the authors point out that these black swans are not so unusual at all and must be considered in some way. This is another field where people with a vested interest use quantitative models that they know are wrong or severely limited – to make a point to policy makers who are eager for the presumed precision of the models.

Ground waters at the site of abandoned mines can become acidic over time due to the open pit mining process. Models have continuously failed and government agencies that promote mining also regulate mining giving them a conflict of interest and a reason to accept positive predictive models. While the consequences of an unfavorable model can be disastrous on the stock price of a mining company, there are no consequences for a mistaken model itself.

Modelers have failed in risk assessment for invasive species of plants and animals on local ecology. Surprisingly biological scientists have realized the shortcomings of quantitative models imposed on them by engineers. They point to "black swans" such as the impact of African dust as a source of pathogens in South Florida and expansion of Johnson grass from the subtropics to the subarctic. These factors in addition to human behavior have been unexpected but not unusual in their effects on ecology. These biological scientists have turned to qualitative modeling as a solution.

In a concluding chapter, the authors rate modeling for beach and coastal issues to be the worst and those for global sea change and invasive plants to be among the best used. The

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Useless Arithmetic

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latter pass muster because qualitative models have been accepted here. Errors in characterization, omission of important processes and ignoring the possibility of black swans are the principal reasons for failure of quantitative prediction. Alas, the authors indicate that qualitative models using the futurist tool of scenario creation are the best method for environmental policy making. They advocate making scenarios that cover a range of outcomes – bad outcome, continuation of current trend, good outcome – and make contingency plans for each. This approach would be called adaptive management, which the authors advocate for Yucca Mountain and for fishery management. Scenario planning can exploit uncertainty, is compatible with long term planning, and can allow for multiple answers and black swans.

Environmental health readers may be disappointed that the book does not cover modeling of air pollution or drinking water supply and quality. Although their arguments are convincing even to a practicing statistician, the authors think it necessary to abruptly leave the field of earth science to bring in Taleb's *The Black Swan* example of the failure of derivative modeling by Long Term Capital Management due to the impossibility of predicting human behavioral response to economic trends. It is not clear why this example was needed. The quantitative horse was already dead.

This book is useful to the general reader to understand the pitfalls of quantitative modeling and introduce them to scenario planning and adaptive management.

Jay Herson *is Managing Editor and a frequent contributor to* **FUTURE*takes***. *He is also Senior Associate at the Johns Hopkins Bloomberg School of Public Health, Baltimore MD and the Institute for Alternative Futures, Alexandria VA.*

POINTS FOR THE CLASSROOM
(send comments to articles@futuretakes.org):

- *According to the reviewer, the authors feel that because we are prisoners (as well as beneficiaries) of our experience, this limits our ability to make predictions of the future that are of any value. One example of this is the historical tendency of nations to prepare for the most recent war instead of for wars that may happen in the future. Furthermore, people tend to interpret events in terms of their past experience. In addition to qualitative models, how can people – especially futurists – transcend that limitation?*
- *Is the need for a "rational solution soon" universal among nations and peoples, or is it more prevalent where thinking is "reductionistic" than where it is holistic? In answering this question, consider national and regional demographics, particularly in regard to professions.*
- *The authors present an "adaptive staging" approach that uses modeling in increments – for example, 200 years in the case of nuclear waste disposal. Do you anticipate that this approach will be a preferred one for futurists, and for policy makers, in 2020 – and if so, for which applications (considering the present limitations of some models, e.g., economic, meteorological, that often focus on shorter timeframes)?*
- *By 2020, will there be a resurgence of interest in qualitative methods among policy makers who do not favor such methods now?*
- *In your favorite field of study or interest, what are the key variables that models fail to consider?*
- *Also see related "Points for the Classroom" in book review of* The Black Swan*, this issue.*

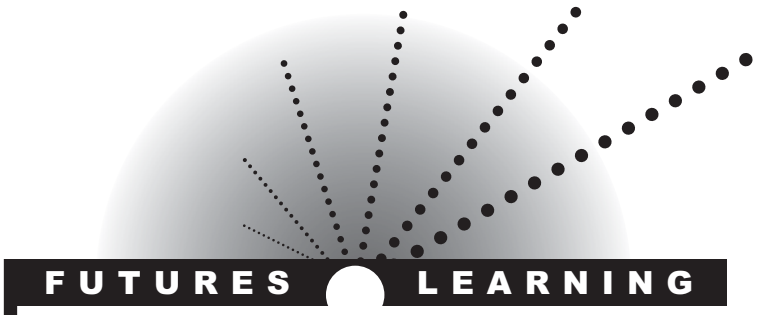
Note of Appreciation

2008

As the New Year approaches – and with it, the holiday season (for many) – we want you, our readers, to know that we appreciate your continued confidence in FUTURE*takes. It is to your continued support and interest that we owe our successful transition from an organizational newsletter to a respected international magazine and educational resource.*

Also know that we regard FUTURE*takes as belonging to the authors, editors, and readers across the globe who make it possible. After all, it is your publication!*

The Editors



WFS Futures Learning Section *Bulletin*

Fall 2007

World Future Society

by Steve Steele, Peter Bishop, and Dave Stein

Now in its early months, the WFS Learning Section has made considerable progress in establishing several functional networks of educators and other interested parties. We now have a listserv in place, a page on the World Future Society website, and space in this international magazine, **FUTURE*takes***. These nominal first steps have great potential value, and a key objective is to ensure that these resources and our emerging structure are thoroughly used to support our primary objectives, which are two-fold – promoting and supporting futures studies in the classroom, and identifying trends and drivers that will influence education in the next two decades.

A key initiative for 2008 is the "Education Summit," which will be featured at the 2008 World Future Society meeting in Washington, DC. The summit outline has been submitted to the WFS conference staff by Kay Strong (Initiatives for the Future at Bowling Green State University – Firelands) in late October. The final structure and content of this event are now in the hands of the conference staff.

In addition, action teams have been established in key areas of major emphasis for 2008, and we are asking each action team to establish a goal for 2008. These teams include:

- Best Practices
- College and University Education
- Community Futures Education and Leadership (to promote grassroots thinking)
- Cross-cultural Futures Education
- Education Standards
- Education Summit (at World Future 2008)
- Programs and Products
- Secondary Education

We invite your participation in these teams. To get involved, contact the team leader for your area of interest. Team leader names and contact information are available at *www.wfs.org/futureslearning*.

As an educator and/or futurist, you have additional avenues in which you can participate and help move the WFS Learning Section forward:

1. Join and participate in the listserv

Send your LISTSERV subscription request to LISTSERV@LISTSERV.UH.EDU with the command

sub FuturesLearning Your Name

as the body of the message. Because LISTSERV verifies mailing paths for new subscribers, it is preferred that users subscribe themselves by the method outlined above.

If you are unfamiliar with LISTSERV and its associated commands, I suggest that you add the commands

INFO GENINTRO
INFO REFCARD

as additional lines of your message.

LISTSERV will then send you a file containing a General Introduction to Revised LISTSERV that will give you some instruction on the service and a Quick Reference Card of the various commands.

After you are subscribed, make an effort to post something to the listserv once each month to continue the flow and exchange of new ideas.

2. Visit the WFS Futures Learning webpage

Go to *http://www.wfs.org/futureslearning*. Sign up to keep informed on Learning Section activity.

3. Leverage the global reach of this *WFS Learning Section Bulletin* and FUTURE*takes*

Send news items on your learning activities, classroom discussion threads, and other contributions, to *articles@futuretakes.org.*

4. Stay tuned to IF@AACC

Steve Steele will organize a timely Futures Learning newsletter with a fourth quarter issue by December 2007 and sequentially thereafter. Far from "just more email" for you the purpose will simple to "keep you in the loop" on the emerging section.

5. "Step up to the plate" – consider a leadership role

By May of 2008 we will be looking section leaders to direct the learning section in its infancy. If you wish to take a leadership role please get in touch with Steve Steele at *sfsteele@aacc.edu*

These vehicles provide a means to social interaction that can produce our future. To maximize their value, your participation and action are needed.

Futures Learning Tool
Visualize the Future!

by Stephen F. Steele,
sfsteele@aacc.edu
Institute for the Future at Anne Arundel Community College ("IF@AACC"), Arnold, Maryland, USA
www.aacc.edu/future

This is a simple but powerful first exercise to get learners focused on the future. It may be used any time in a learning experience to draw attention away from and beyond the present. Experience in teaching courses and modules on the future has indicated a tendency among learners to regress to the present throughout the course. In all fields of study, from time to time it is helpful to move learners beyond the present and refocus on the future. This little exercise can help participants start thinking "like futurists."

Instructions:
Using the information that you have gained in your course, module, or other learning experience, post to a listserv (or otherwise provide if in a live discussion) the following:

Part I

1. Add five years to today. Write a brief paragraph about a few things that might be happening that day.
2. Add ten years to today. Write the top news story for that day (assuming that there will be 'news!').
3. Now, reflecting on the material in this experience (brief statements), list the top 5-6 things that you learned from your course or module.
4. After you have posted your response, respond to or comment on another learner's posting. Your goal is to "add value" to the posting to enrich the learning experience of the readers.

Part II

5. To continue the activity and the flow of ideas, make an effort to post something new at least once per month.

To provide "global reach" to interested participants and their ideas, **FUTURE*takes*** has agreed to publish selected discussion threads.

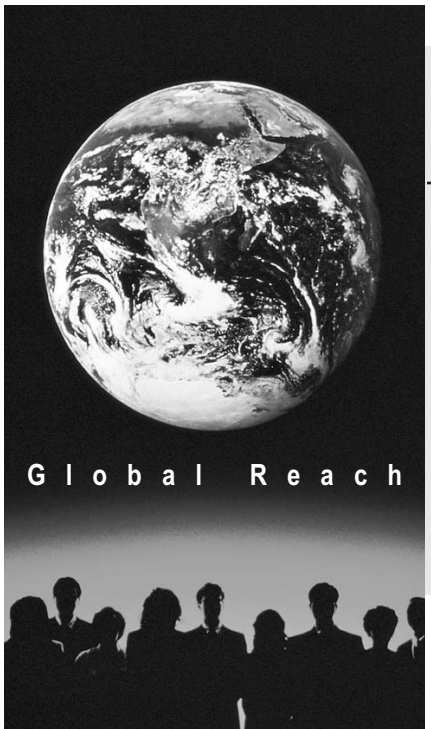
IF @ AACC is pleased to offer additional learning tools that professional instructors have actually used in "real time" learning experiences. Tools from this growing list can be downloaded from http://ola4.aacc.edu/soc/TeachingFuture/futuresexercisesIFaacc.htm.

Global Reach!
Share Your Nation's or Culture's Perspectives and Lessons for the Future!

To accommodate several new prospective authors who have expressed interest in contributing to our 2008 thematic issue, "International and Cross-Cultural Perspectives on the Future," **we've extended the article deadline to February 29, 2008**. We are particularly interested in articles that focus on lifestyle and cultural values – that is, which ones are likely to survive in 2025 and beyond and which ones will become marginalized or extinct. However, articles that present any cross-cultural perspectives on the future are welcome.

As for our first thematic issue (available at www.futuretakes.org), planned distribution includes embassies as well as various other international, ethnic, and cultural organizations. This is in addition to our normal distribution to WFS chapters across the globe and to selected educational institutions, international think tanks, and professional societies.

The issue will be published in May 2008. For further information, contact us at info@futuretakes.org. Send articles to articles@futuretakes.org.



Professors and Teachers

We Want to Hear from You!

If you are using **FUTURE*takes*** in the classroom, we invite you to share your observations and experiences with us. In addition, we're interested in your ideas as to how we can better serve your educational needs. Send your comments to Jay Herson at managingeditor@futuretakes.org.

Innovation

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change. The resistance met in a village, a corporation, or public institution may have cultural, social, economic, political or multiple causes.

The remarkable American vision and accomplishment formulated by President Kennedy in 1961: "*I believe that this nation should commit itself to achieving a goal, before this decade is out, of landing a man on the moon and returning him safely to earth,*" mainly involved the purposeful and innovative mustering of a few sectors of American society. The project primarily involved academia, high-tech industries and the military. An overall national approach was not necessary.

On the other hand, the Malaysian *Vision 2020* launched in 1991 requires the activation and involvement of all parts of the nation. It states that "*the ultimate objective that we should aim for is a Malaysia that is a fully developed country by year 2020... It must be a nation that is fully developed along all the dimensions: economically, politically, socially, spiritually, psychologically and culturally. We must be fully developed in terms of national unity and social cohesion, in terms of our economy, in terms of social justice, political stability, system of government, quality of life, social and spiritual values, national pride and confidence.*"[2] Such a vision is truly among the grandest and most encompassing of visions for any country, including all of those that identify as developed countries today.

For any nation to be well on its way towards objectives comparable to those stated in the Malaysian Vision 2020, it would need to adopt a systemic approach to development and implementation of innovation. This should include all of its major components: population, systems, resources, the environment and a host of other stakeholders and key factors. For such an ambitious nation it is not enough to involve only a few operative sectors. It needs to embrace a culture of innovation for the common good.

In the following I shall outline some key areas of human society that need to be in the forefront promoting and practicing visions and innovations. Direct accounts from real life often make it easier to emphasize points than theoretical statements. So I shall mention a few classical case stories. And I will also include some of my personal observations and hands-on experiences, as I have lived most of my life with visions, innovations, inventions and issues of socio-economic development around the world.

For many people innovation is most frequently associated with technological inventions. Yet innovation and invention in other fields are certainly of no less importance to the development of society. But the issues arising with technological innovation are often strongly reflected in other fields, including governance, conflict resolution, economics, environment, education, culture, organization, legislation, transportation, etc.

TECHNOLOGY INNOVATION

Many believe that important technological inventions can be conceived only in corporations with very substantial research & development (R&D) capacity and budgets. On the contrary, many major inventions have actually come into existence in very modest environments such as kitchens, basements, or shacks, on shoestring budgets. This fact contains a very important message, not the least for developing communities, regions and countries.

It is said that major R&D organizations are likely to be minor sources of major inventions and major sources of 'improvement' inventions.[3] This statement well illustrates the prevailing situation in many major industries during the past century and more.

At the same time it should be realized that many inventions require very high development and other costs to become successful. That is a major reason why, especially in high-tech sectors, numerous innovative upstart enterprises are taken over by large corporations with the capital necessary for development, production and marketing.

Important inventions can offer exceptional new possibilities. They can also cause disruption far beyond their original field. In many fields even very recent inventions risk being quickly overtaken by still newer and better ones, or sometimes even by old inventions applied in new ways. Today information technology and other industries are filled with scary examples of almost instantaneous obsolescence. *The need for reliable and up-to-date knowledge, curiosity, foresight and wisdom is boundless. Adaptability becomes imperative.*

The following three examples relating to kitchen sinks, dairy machinery, and office copiers are good illustrations of how difficult it can be for even the most respected specialist or organization to make sound forecasts, let alone realistic plans, reaching years into the future of any business or industry.

Example # 1: Production of kitchen sinks

A countryman of mine with only rudimentary schooling made an invention that until then had been declared scientifically and technically impossible by leading technical universities. It was a process for deep-drawing stainless steel sheets to produce among others: kitchen sinks. Since that technological breakthrough there have been produced tens of millions of kitchen sinks based on his invention. When asked how he did it, invariably he answered with a wry smile: 'Well, I just did it. I did not know that it was impossible...'

Example # 2: Industrial butter production

For decades manufacturers had competed intensely about who could invent the most ingenious device for getting butter out of churns and move it further on in the process. A great many contraptions – including various versions of screw conveyors – were invented, duly patented, and in use. But none of them properly solved the problem of how to easily and regularly clean the rather complicated equipment from the sticky butter.

Then suddenly occurred an elegant

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solution, which leading manufacturers adopted without hesitation: to attach external vibrators to the churns and other equipment. A few seconds of vibration and all of the butter was out of a churn and further on in the process without any visible trace.

The amusing part of the story is that the new solution could not be patented – because it was based on public knowledge. Had a construction worker, used to vibrating concrete, passed by years earlier and learned of the problem, he would very likely just have turned around and said casually, "why don't you just fix vibrators to the outside of the equipment to get your butter out?"

One of the lessons from this story is that *incessant curiosity, association of ideas, and ample occasion to learn about methods and technologies used in fields far apart are most important ingredients during the processes of invention and innovation.*

Example # 3: Office copying machinery

A famous example of how such a mechanism was not in place at the right time in leading organizations of an industry is the story of Xerography, the dry-copying process that fundamentally changed office procedures the world over. It gave The Xerox Company a virtual monopoly on office copying for many years until the key patent expired and the world was inundated by the products of competing corporations using that same technology.

Who invented it? Employees of Xerox? No! Employees of a major player in the photocopying business taken over by Xerox? No again. The inventor was a certain Mr. Chester Carlson, who developed his invention largely in his kitchen... For years he tried in vain to sell the invention to more than twenty of the largest corporations in the office machinery business including IBM, Kodak, General Electric and RCA. None were interested. They did not have the right procedure (and open-minded spirit) to grasp the unique occasion right in front of them.

There can be enormous opportunity cost to being wrong. A key decision in any direction causes a cascading effect through a company, or industry, or even country that affects future values and future risk. The ideal is a rational balance between two extreme goals: optimize for "low risk" or optimize for "high reward." But rationality is in the context of the specific information and knowledge available for a decision.

Zachariassen

This principle of rationality being specific to context of course also applies to every decision involved with innovation in general. Products, processes and systems are obviously not just the results of innovative minds free of constraints. Usually one way or another they also have built into them the current laws, technical norms and standards, available services, price and tax structure, incentives and disincentives/levies, and of course also: agreements on the labor market, typical ergonomic measures, social and cultural factors, climatic conditions and other specific traits of a particular country, and place and time of origin.

The results of an innovation process, related to any kind of development, are usually optimized for a particular context. That means, they may not be as wonderful, or even be relevant, in a different context. Because of such largely invisible features, in many cases it is quite likely that the function of a product, process or system in the least will be less satisfactory than expected by many, when used outside of the original frame of reference.

Generally speaking, we live in a world where the effects of what we are doing go way beyond the place of origin of anything. Whether it is a thought, a process, a product, a rule, a model, or whatever, we have to have knowledge and understanding of – and openness towards – many other contexts and environments than our immediate one, in order to be able to contribute positively to development outside our home base. We also must realize that there is an optimal frame of reference for everything. To avoid mistakes we should all learn about this throughout our life-long learning and education. It has to do with safety, with environment, cost, opportunity, and so on. And not the least it has to do with due respect and concern for other human beings.

KNOWLEDGE POLLUTION

Proven, timely, appropriate, adequate, and easily understood and applicable information and knowledge is of paramount importance to every individual, community, enterprise or nation wishing to progress. Even in our days of supposed enlightenment giant man-made catastrophes happen because of lack thereof.

New knowledge is created continuously everywhere. Some of it may only or mainly have ad hoc or very localized relevance but most knowledge has importance far beyond time and place of origin. At the same time our environment of information and knowledge is immensely polluted, just as our natural environment is in its own way. This phenomenon is so much the more critical for developing countries, communities and people vitally dependent upon the quality and adequacy of the knowledge directly available to them.

An enormous amount of knowledge and information, including countless very valuable innovations in the form of ideas, designs, models, programs and processes, etc, is today available via the Internet or otherwise. Just as an example, millions of expired patents are in this way openly accessible and available for free use. However, much or most knowledge and information of any consequence require reliable verification, and are not yet available in a form and language compatible with the needs of most potential end-users wherever they

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may be, not the least in developing countries.

When people have needed information at hand in a suitable form, it becomes much easier to adapt to a situation, or conversely adapt a situation to their needs, and those of their families and communities and so on.
The complexity in the modern world is most often solved by indirection, usually known as "middlemen," but that breeds what generally proves to be a most costly dependence to the delight of middleman industries. However quite often the complexity is unnecessary or it can be significantly reduced through rules of thumb or other focusing mechanisms, and through increased easy availability of appropriate information, knowledge and training.

As an example, when involved in a project in India relating among others to both Mumbai (Bombay) and the foothills of Himalaya, I discovered that the cost of 20 ft Bamboo poles for construction was about 25 Rs in Bombay, while the cost in the forest areas up north from where many of the poles originated, was only 0,05 Rs, that is a ratio of 500 to 1!

Expanded use of innovative tools can make a significant difference in broadening the base of empowered individuals and communities.

To illustrate more precisely what I mean, I like to tell you an eye-opening experience I had many years back in a country in the Middle East. I was negotiating the purchase of a second hand power station for use in connection with a hospital. In came a man from an oasis in the desert. He wanted to buy a cable. 'What kind of cable?' asked the salesperson. 'An electric cable,' was the reply. 'What for?' 'We want electricity,' was the reply. 'And how do you get electricity when you have such a cable?' asked the salesperson. Well, it transpired that a high-tension electrical transmission line passed by some kilometers from the oasis. So, with a cable they could get electricity into the community...!

'What should be the size of that cable?' asked the salesperson. After some palaver, the visitor indicated the cross section of the cable with his fingers, stretching his hand towards the salesman. And thus the conversation went on for a while.

'How many households are there in your community,' I asked? 'What about school and marketplace, and workshops?' And after some further questions, using rules of thumb and basic formulas I was able to make a very rough first estimate of the needed generating capacity of an initial power supply for the community. Probably within the range of +/- 35%.

The man from the oasis was an intelligent and trusted representative of his community. He and his fellow villagers just had not been given the tools that could have guided *them* to do their own preliminary feasibility study, including approximate costs of alternative solutions, and how to proceed with the process. The know-how could also include how to set up and run a small electric supply company in the community, how to fix pricing, etc. What I happened to be able to do in that instant, he himself could have done and much more, had the right predigested information and knowledge been available to him in or near to his community from the very beginning. At the same time, the nearest municipal authority, credit union representation or other trusted points of contact with the outer world, should likewise be in touch with the knowledge base and beyond, in order to be able to be constructive partners in the process.

To my knowledge no major school system anywhere in the world has yet been designed specifically to broadly develop pupils' innate capacity for invention and constructive innovation!

Insufficient knowledge and knowledge pollution together with indirection and lack of cooperation and coordination of development efforts are today decisive impediments to rapid socio-economic development.

EDUCATION FOR THE FUTURE

Since my days as an engineering student, when I was head of the student council at my university, I have been intensely interested in the organization, form and content of education. In countries and institutions around the world I have had countless occasions to skim through local textbooks at all levels – and widely different areas – of schooling, from pre-school to post-graduate, in order to understand what kind of societies these children and young people were being prepared to function in, and how.

Somehow one particular school left a very special impression on me even though what I observed was only all too typical. It was in a small town far from the capital of a country south of Sahara. The town had no electricity and no other public amenities visible to me. But the school was new, and already an out of town contractor and his crew were building additional school buildings.
I visited some of the classes during hours, and the very clean and keen children demonstrated their skills. The faces of the teachers were beaming. The children read for me, they recited, and they made calculus. I asked the teachers whether they profited from the occasion that construction was going on around them to teach the children about tools, materials, planning and design. 'Of course not,' was the reply. That was certainly not their line and assignment.

I became very depressed. During my lengthy drive back to the capital I thought of the future of these children and that of their community. Next day I bought a small box full of tools, some of each, and sent it to the children. In the covering letter I thanked them for the wonderful occasion I had had the previous day witnessing how well they were doing in school. In

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return I was sending those tools asking the children to request the teachers to somehow help them to learn how to use them, so that in the future the children could participate in building other buildings and houses in their town.

Of course I have found happy exceptions, but generally most education systems anywhere are still in many ways extrapolations of the old religious and tribal ways of teaching dogmas, and a world picture and history as it has been agreed to being interpreted and told. No doubt, most conflicts between peoples have their roots in such traditional educational schemes.

Moreover, current education is largely functioning as an incubator of manpower for static industry, services and government. 'Innovation' is still in many ways mainly a smart catchword.

Nevertheless, quite some progress has happened in a number of institutions and countries since a special panel of experts set up in the nineteen-sixties to advise the Secretary of Commerce of the United States of America about the situation of invention and innovation in the USA. They concluded by then that there is an '*abundance of ignorance about the processes of invention, innovation and entrepreneurship*.'

As occasionally I have taught invention and innovation to professionals, many years back I had the opportunity as a volunteer through two semesters to teach fourth graders in a Danish municipal school 'how to make inventions.' It was a most interesting experience. Within that school year the constructive-creative abilities of the children as well as their self-confidence developed greatly, and I too developed in the process.

Subsequently organizations of school principals and schoolteachers, as well as the Danish Ministry of Education, became interested, and the ministry financed me in developing and running courses in innovation and invention for school principals and teachers. The principals wanted tools to apply in their administration and further development of the schools. The teachers wanted to learn how to teach the subject.

However, I dare state, that till this day, practically anywhere in the world, there is still an abundance of ignorance about the processes of developing the constructive creativity of people. *To my knowledge no major school system anywhere in the world has yet been designed specifically to broadly develop pupils' innate capacity for invention and constructive innovation!* This may cause amazement since the mental and practical processes are by now quite well understood. The world is full of problems and challenges that require truly innovative and inventive thinking and action. This should be a great challenge to visionary governments, not the least in developing countries.

In fact, many developing countries may have a substantially better background for adopting this new line within their educational system than more settled countries, once they see how such innovative educational initiatives can help underpin and accelerate the processes of development.

On another note I see a need to upgrade the teaching and training of the pupils in how to function better in their local environment. As an example, easily learned knowledge about locally occurring soils and water, topography, conditions of the ground, and the weather can likely help reduce the occurrences and magnitude of localized weather and ground related disasters, including flooding and earthquakes. Simultaneously, most of that same knowledge can be useful in connection with construction, public works, sanitation and agriculture. Obviously, such knowledge should be part of the local 'public goods,' not just delivered piecemeal from the outside.

Finally a note on the curricula at large. As indicated above, there may be a need to take an 'innovative look' at many of the subjects already taught as well as to the way they are taught. As an example, when my son was learning calculus in high school, I told his teacher that I assumed that he was giving the students good illustrative examples of what integrals could be used for in real life. Regrettably, the answer was just a resigned expression on the teachers face. He did not know …! Just think of how much more interesting and useful it would have been if he had been able to give a few exciting examples …

GOVERNANCE CULTURE

An integrated national program of innovation would necessitate that government and many public and private sector institutions and organizations earnestly commit to and identify with the program. I am fully aware that this will not be easy to accomplish. But it is possible to build powerful innovation-promoting mechanisms into almost any organization.

Legislation, and technical standards and norms are of course areas of special importance. It is not particularly difficult to develop legislation that supports innovation in the private sector, at universities and other institutions. Also, it is quite straightforward to establish by law institutions specially dedicated to the promotion of innovation. It is much more challenging to adjust existing laws, regulations and government procedures to make room for yet unknown innovations.

Possibly the biggest challenge though is to subject legislation as such to innovation, both with regard to form, to make laws easy to understand for those it concerns, including lay-people of course, and with regard to the way people are informed of their rights and duties. And also to insure that legislators and officials truly understand the full implications of the laws and regulations they create, and that there are never internal or external inconsistencies. To secure through each and every law that if literal application of a law or regulation in certain specific circumstances would lead to absurd and clearly unintended consequences, then it is the intent behind the law, not the letter, that overrides the other.

It is so necessary to build up rule systems that people can easily understand and navigate and will know how to apply in relation to all aspects of individual and community life. This is

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an area where complexity can be most effectively treated at its source.

One example from my own experience may illustrate how one kind of tools can greatly facilitate understanding of and communication relating to development and use of rules of law.

When creating a manual on design, construction, maintenance, etc., of sewage systems, at a time when my country had just established its first comprehensive law for environmental protection, I found it useful in the manual to list all the laws and regulations with a summary of contents governing sewage projects. I had an assistant working several weeks to read the laws with matching regulations, and extract the essentials. When I got those summaries, I myself had great problems in absorbing the knowledge. To aid my own overview I started sketching and using graphic symbols to illustrate the procedures – for instance to call for a public meeting, to publish a proposal, to make a final decision on a project, to study the project and forward recommendations but not take the final decision, to just give comments to a proposal, etc., that is: symbols depicting all the typical functions of public institutions and others in relation to the handling of a project. I came up with a list of in all 23 various basic procedures plus the respective procedures of appeal, directly relating to sewage alone, and decided to use the symbolic descriptions in the manual. I asked the people at the ministry of environment to help proof the draft.

A few weeks later when I came back to hear the result, the reaction was "Wow! If only our people had had these symbols since long ago to help grasp very quickly the content of the laws, they could have saved great amounts of time." I am certain that with such symbols not only lay people can understand the procedures they need to follow in a particular case. Also the legislators and government officials can work with the symbol in their creation and negotiation of the laws and making sure that there are no inconsistencies. To my knowledge, along the way the symbols introduced in the manual actually contributed to some simplification and weeding out of contradictions among the rules and procedures.

The graphic symbols are culturally neutral, and can be learned instantaneously as well by people in China, as in Peru, or wherever. Moreover, they can be used in contracts. It is a beginning of a universal language that can be expanded to be used in many other areas. As a consequence of the symbol language being part of the reference material I was creating, several hundred municipal engineers and many other professionals became familiar with that innovation within a few weeks at brief training courses, and the system was then used by every single municipality in Denmark as well as by consulting engineers, contractors, community organizations, etc.

Providing common legislative transparency, simplicity, consistency, and clarity, and giving primacy to functional objectives, are major elements of risk reduction and innovation promotion, as it can be directly influenced by one of the major products of government.

At this point relating to governance in a broader perspective, I shall emphasize the importance of eliminating adverse rivalries between government institutions, including ministries, and to promote constructive collaboration among such ministries regarding new innovative initiatives.

Such collaboration between ministries was only partly in place in the late 1980s in Denmark when I initiated the involvement and support of several government ministries as well as the European Union in a pilot eco-community. Most of the ministries showed exceptional flexibility, and the new community was started up in harmony and cooperation with the original community of the area.

Unfortunately one of the ministries, though seemingly not negative towards the project as such, was not ready to practice a lawful but liberal interpretation of one of its regulations in order to secure full synchronization of the various constituents of the scheme. That delayed important parts of the project for several years. Later, in 1995 the eco-village went on to obtain the highest recognition, including a European first prize for participatory community planning.

Also, intergovernmental organizations, such as those of the United Nations system, as well as governmental and non-governmental international and national development aid organizations, need urgently improve their mutual cooperation and synchronization of efforts, among others through constructive delegation and sharing of responsibilities. The formal structure of governance can contribute significantly through constructive coordination and synchronization of such development related efforts. Also within this field there is scope for a lot of courageous and constructive innovation.

CAPABLE COMMUNITIES

Communities are the basic building blocks of human society, whether they be neighborhoods in cities and towns, villages in the countryside, or groups of nomadic people. Homeless people like the pavement dwellers in Mumbai, India or elsewhere, also constitute communities that have their own structure and life, however agonizing that may be.

Just as government initiatives constitute a top-down approach to introducing and encouraging systemic visioning and innovation within society, a community-based approach would be the complementary bottom-up effort that clearly has the potential for near and immediate impact for individuals in the community.

Visions and innovations specific to individual communities and micro-regions can help turn marginalized communities around, from utter despair to well founded optimism and progress within a few years. Each community needs a few capable, committed and inspired people to lead the charge in close cooperation with outside stakeholders who can help in the process. But that alone is not enough to create scalable and sustainable development. A replicable, integrated,

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and flexible approach is obviously necessary to achieve scalability, and a good value for the effort. The challenge is how to do this.

Even though I have been involved for decades in socio-economic development in many countries and cultures, I have never been able to find, even with extensive research, a fully integrated and replicable model which I believe is necessary in order to substantially accelerate the development process. Too many development efforts are point programs without any integration, for example sector-specific (building roads, schools, hospitals, factories, introducing IT, etc.), or has a limited development objective (fight illiteracy, hunger, AIDS, etc.). However commendable such efforts are, this is not replicable and self-sustainable, does not cover all aspects of development touching the entire life of a community and its people, and perhaps most importantly does not develop people's self-confidence and trust in, and ability to create, their own future. In many instances even such point programs have been seriously counterproductive, among other ways through accelerating migration by many of those people best fit to spearhead local development.

In the apparent absence of approaches satisfying these concerns, I have spent my time the last few years developing and executing a systemic approach that is applicable to communities in almost any context.

A primary focus of the approach is on the local community and 'micro-regional' level, operating through specific localized community development programs:

- to enable the broad and active participation of community members,
- to encourage the constructive, focused and coordinated involvement of civil society, the private sector, and all levels of the public sector, and
- to promote the coherence and cost-effectiveness of all outside aid.

The participatory processes include starting in motivated and representative communities, and spreading from each of these through combined demonstration and proliferation programs to neighboring and other communities with comparable cultural, social and/or other determining characteristics.

All significant actual and latent human, natural and other resources and barriers within or otherwise of consequence to these communities and clusters of communities are determined, and creative, focused and coordinated efforts are then applied to build on and further develop the resources while removing or alleviating the barriers.

The approach is flexible and has substantial capacity for serving local uniqueness, variations in context over time, and spontaneous innovation. It can also be used as a framework in combination with other models and methods focusing primarily on more specialized aspects of development, such as natural disaster prevention and mitigation, or combating infectious diseases.

A core feature of the approach is a model program that serves as the paradigm for the creation and realization of each local community development program. The model program has multiple overlapping phases that go from bootstrap activities including creation of support structures, to maturity and proliferation.

Organizational, technological, social and financial components of the model program are adapted as appropriate to the particular local conditions of each community or cluster of communities.

In order to further well-informed choice and action, all members of the communities and all others concerned will have easy access to relevant and timely information, knowledge and training in a locally understood form and language. This is provided through a combination of social and technological facilities and services to be openly available and useable for everyone, including for people of limited or no formal learning and of widely diverse cultures and languages. Each community will have their own local Internet development portal with both practical and catalytic functions.

The new local support structures and services include: a multi-purpose center for community development (including facilities for the development of new products, processes and services based on the special resources available), an information and communication infrastructure, support structures for economic and non-economic development, and a support structure for coordinated development financing.

The support structures and services then enable the startup and realization of a multitude of practical projects and other activities that become the drivers of socio-economic development and quality of life improvements in each community.

The proliferation of the approach is prepared in the first phase of each specific local program. Thus, representatives from neighboring communities take part as trainees and otherwise in the demonstration operation of the first community in order to be able to participate with special knowledge and experience in the staggered start of the approach in their respective home communities. New communities joining the program will equally host trainees from subsequently joining communities.

In the larger context, the communities will benefit from sharing resources, delegating responsibilities among themselves, and from being part of a shared dynamic community development movement.

CONCLUSION

It *is* possible to advance a community, an organization or a country towards very impressive levels of accomplishments through common purpose, vision and innovations applied with integrity and functional wisdom.

Just extrapolating from what we have been doing until now will not do. Constructive systemic changes in thought and action will be necessary to realize the latent potential of socio-economic development. This is the

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kind of effort that leaders in any size community, whether local, national, or international, can champion. *Someone* has to muster the necessary operative visioning and innovation, to get started, and root it in the social consciousness, to succeed.

John 'Zac' Zachariassen *has a M.Sc. in civil and structural engineering from the Technical University of Denmark. He has conceived, developed and implemented a number of internationally recognized and applied technological, social, educational and informational innovations and inventions, and has carried out assignments in more than 30 countries for governments, many United Nations Organizations, and non-governmental organizations, including federations of industries and trade unions, as well as businesses and communities. One of Zachariassen's inventions, the DIS simultaneous interpretation system has been utilized in about 100 countries. Zachariassen is the president of the Solertia Institute.*

POINTS FOR THE CLASSROOM
(send comments to articles@futuretakes.org):

- *How can the need for a culture of innovation be reconciled with the near-term mindset in some parts of the world – specifically, politicians wanting to maximize re-election prospects and corporations cultivating a "quarterly earnings statement" mindset? Is there a more fundamental issue involved, such as an instant gratification culture?*
- *As Zachariassen points out, an overall national approach was not necessary for the US to put a man on the moon. Others have observed that at least in the case of some nations, going to war does not require a full national effort. What level of consensus is needed for a culture of innovation?*
- *Diverse examples suggest a trend toward mediocrity and risk aversion, trends that generally do not support a climate of innovation. Examples: (1) In government, academia, and corporations alike, "tinker-at-the-margins" managers are more common than true leaders. In fact, it has been speculated that the great generals and admirals of WWII would not survive in today's ranks. (2) A number of established scientific journals publish "progress report science" papers and are not receptive to those papers that challenge mainstream paradigms, even when such papers are themselves based on good science. For their part, professors on a tenure track are sometimes fearful of publishing papers that challenge the prevailing paradigms, even though the professors are then in their most creative years. (3) Companies are often founded on a "wild idea," but when they mature, they become more risk-averse and less receptive to new ideas. For this, some eventually pay the ultimate price of going out of business, but that does not deter various other companies from risk aversion. All considered – in your part of the world, what is the future of innovation vs. risk aversion? Another question – is risk-aversion cultural, or is it a consequence of the fact that long-term creative is often short-term disruptive?*
- *Research and development (R&D) budgets are shrinking in some companies that are more interested in near-term profits as reflected in their quarterly earnings statements. However, the rate of technology growth and proliferation is accelerating rapidly, perhaps approaching "the singularity." Zachariassen refers to instantaneous obsolescence – and indeed today, the shelf life of a commercial or military advantage may be relatively short. What will be the tipping point that will reverse the trend of shrinking R&D budgets in some established corporations? Also, what will be the primary sources for R&D funding in your part of the world in 2020 – venture capital, government, or other?*
- *Considering all of the trends that are impacting education – for example, the knowledge explosion, the advent of new fields of study and knowledge, and the demise of at least some "careers for life" – what will education look like in 2020? For example, will it be more "real life" focused and more supportive of outside-the-box thinking, and in what ways? If so, will the traditional subjects continue to be taught? In 2020, will education help people think beyond hidden assumptions more so than it does now?*
- *In 2025, what percent and types of innovation will be by large corporations? Small companies? Individuals?*
- *In one case discussed by the author, "the right predigested information and knowledge" would have been an enabler had it been available. Although accurate, well-managed information can be useful, in what circumstances can it be counterproductive to innovation and to cultural diversity – specifically by encouraging a "one size fits all" approach to problem solution? Is the resulting "prosperity" or other "success" defined in Western terms that may not be optimal for the developing nation?*
- *Zachariassen discusses the complementary approaches of top-down vs. bottom-up approaches to systemic visioning and innovation and observes that "Communities are the basic building blocks of human society..." Will this be even truer in 2025, and will the level of group identity support visioning and action at the community level? Or will there be more of a tendency toward aggregation of identity and effort? In other words, "fission" or "fusion"?*
- *What factors support or inhibit a climate of innovation in your part of the world?*

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1 The point of departure of this article is the paper: "Systemic Development and Implementation of Innovation: Towards Vision 2020" presented by Zachariassen in 1999 when invited to offer input to the official Malaysian Plan 2001-2005 within the framework of Malaysia's Vision 2020.

2 Extract of the working paper "*Vision 2020 - The Way Forward*" presented by the prime minister of Malaysia, Dr. Mahathir Mohamad at the inaugural meeting of the Malaysian Business Council held in Kuala Lumpur on February 28, 1991.

3 D.Hamberg: "Invention in the Industrial Research Laboratory," – *The Journal of Political Economy, Vol. 71, No. 2* (Apr., 1963), pp. 95-115.