HIGH TECH, NO TECH AND CAREER TECH

THREE PATHS TO THE FUTURE THROUGH REVOLUTIONARY TIMES

by

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HIGH TECH, NO TECH AND CAREER TECH

Three Paths to the Future through Revolutionary Times

I. All training and education is preparation for the future . . . ,

but, what will the future be like?

II. On one hand, large numbers of people – including political and business leaders, economists, academics, etc – believe that we are currently in the middle of a genuine techno-economic revolution of historic proportions that will eventually change how and where most of us live and work, much as the Industrial Revolution transformed agricultural societies a century ago.

Alternatively, large numbers of people also believe that the computer is just another whiz-bang product of the Industrial Age, like the automobile and the television; we'll all buy them and use them, but life with computers will be no more different from life today, than life today is different from life in the 1950s and 1960s, when they first began to talk about "paperless offices" and a "cashless society."

So before I go any further, it will be useful to know where YOU all stand on the future:

> "How many of you believe we are passing through a genuine techno-economic revolution that will change where and how most people live and work within your lifetime?"
>
> > CONVERSELY,
>
> "How many of you believe that the future, within your lifetime, will more-or-less be a high-tech version of the present?"

Well, I believe that you are on the right track, because we ARE in a revolution! It's just that techno-economic revolutions take a lot longer
than political revolutions. In fact . . . .

• New technologies typically take about half a century to mature to the stage that they become cheap, reliable and easy to use. For much of this incubation period, immature technologies actually serve as a drag on economic performance, causing productivity improvement rates to stagnate and prosperity to fall.

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• Ultimately, after a technology has been around 50 years or so, it finally matures to the point that it becomes HYPER-productive, causing a general improvement in economic performance, with a rising tide of prosperity for most – if not all.

• The computer – the basic technology of the Information Revolution – turned 50 in 1996. Simultaneously – and more importantly – the addition of color, graphics, sound and data transmission transformed the Internet text messaging system into an infrastructure – or "info-structure" – for the computer, and THE crucial enabler of the information economy. At this point, productivity improvement in the U.S. and elsewhere began to rise, while inflation rates fell sharply around the world.

> THESE INDICATORS SUGGEST THAT WE HAVE NOW ENTERED THE HYPER-PRODUCTIVE YEARS OF THE INFORMATION REVOLUTION, WHICH SHOULD LAST A QUARTER CENTURY OR MORE!

III. NOW ENTERING THE FUTURE . . .
   (Be prepared for delays, detours and sudden change.)

A. PRODUCTIVITY-ENHANCING APPLICATIONS OF THE WEB

• ELECTRONIC TRANSACTIONS - reduces unit overhead costs for checks from $1.07 to 1 cent; electronic wallets & "e-cash;" Singapore to go cashless in 2008.

• PAPERLESS PROCUREMENT - reduces purchase order overhead costs from $50 - $125/ea. to $5 - $25/ea.

• WEB PHONING - VoIP offers average 30% cost reduction from traditional phone service; will assimilate all telephony in 10 to 15 years.

• GRID COMPUTING - reduces system costs of new computing capacity 25% - 35%; "Super-computing for the masses."

• OPEN SOURCE SOFTWARE - 30% - 40% average reduction in computer systems operating costs from using proprietary software; SoftWars ahead!.

• INFORMATION UTILITIES - average 25% to 55% savings over in-house computer systems; offered by IBM, H-P & SUN.

• VIRTUAL TRAVEL: VIDEO CONFERENCING & TELE-COMMUTING -95%+ savings in time and money over actual travel. Overhead costs of high speed Internet access by 75% to 100%; WiMax & Mesh Nets = the "People's Web," RFID spawns $ trillion industry.

• WIRELESS WEB ACCESS – WiFi cuts overhead costs of high speed Internet access by 75% to 100%; WiMax & MeshNets = the "Peoples Web;" RFID spawns a $trillion industry.

• GROUPWARE - Peer-to-Peer file-sharing [P2P], Instant Messaging [IM], Web Logs [Blogs] & Wikis [Wikis] make all work more collaborative, collegial, efficient and productive.

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B. "GOOD NEWS**"** and "BAD NEWS" about IT

• GOOD NEWS – Goldman Sachs forecasts that current Internet applications, by themselves, are so productive that -- even if no other breakthrough innovations occur in workplace technology, global productivity will stay high, inflation will remain low, and the GDP of mature industrial economies will expand 5% faster for
at least a decade.

• BAD NEWS – Workplace research shows that only 8% to 15% of
all IT projects actually achieves its objectives, or tangibly
improves organizational performance. **WHY?**

C. THE ACTUAL COSTS OF SUCCESSFUL IT PROJECTS

• Hardware and software ⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯10% of costs

• Training⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯20% of costs

• Organizational restructuring, process
   re-engineering and job redesign⋯⋯⋯⋯⋯⋯⋯⋯⋯70% of costs

D. SO. . . adding to computers to a traditional, authoritarian, hierarchical, compartmentalized institution would appear to be about as purposeful as adding sparkplugs to a steam engine.

Clearly, to get the maximum value from IT, we will have to re-invent our institutions!
But how?

IV. POST-INDUSTRIAL PRINCIPLES OF ORGANIZATION

A. COASE's LAW: "The cost of gathering information determines the size of organizations."

> [Prof. Ronald Coase, *The Nature of the Firm* – a lecture to the
> College of Economics and Commerce, Dundee, Scotland, 1932]

Throughout most of the 20th Century, inter-organizational communication was slow, expensive and time-consuming, leading most large organizations to be "vertically integrated" and self-sufficient.

But, as the Internet has made communications fast, cheap and convenient, large enterprises have begun to outsource non-mission critical overhead activities to superior specialist suppliers, while concentrating resources and management attention on their core competitive competencies.

> [Dr. Coase was awarded the 1991 Nobel Prize in Economics for his 1932
> insight, and the resulting notoriety helped launch the outsourcing revolution.]

B. Organizational Efficiencies – Since information gathering costs determine the size and "contents" of an organization – as the Internet makes it easier for organizations to find and partner with suppliers who are able to provide higher quality/ lower cost services than those

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which the organization can perform for itself, growing numbers of private and public enterprises will outsource many of their in-house functions and activities – human resources management, computer and Internet services, financial management, logistics, facilities and equipment, recruitment and training, etc. – because

- **Adam Smith was right! For any individual task, specialists always outperform generalists. As a result . . .**

- "extra-preneurships," networks of superior suppliers, producers and buyers – virtually integrated via the Internet – are replacing the vertically-integrated enterprises of the Industrial Age.

BECOMING AN EXTRA-PRENEURSHIP

1. Outsource the things that you ARE NOT *particularly* good at to people who ARE (i.e. specialists);

2. Focus freed-up resources and management attention on your core competencies, (the things you do well);

3. Collaborate on-line with your contract partners to create a virtually integrated network of superior performers;

4. Dialogue on-line with your customers/stakeholders to improve all aspects of your performance.

- The most successful distributed enterprises will include their clientele in their networks, so that streams of customer feedback informs the design of products and service delivery.

- This transformation of the multi-national corporations, already well under way, is described in detail in three recent management books:

    Digital Capital – Don Tapscott
    MetaMarkets – Grady Means
    X-Engineering the Corporation – James Champy

"IN THE NEW ECONOMY, THE NETWORK WILL BE THE ORGANIZATION."
    Grady Means

V. THE NEW MODEL/PARADIGM OF ORGANIZATION IS THE DISTRIBUTED ENTERPRISE or "EXTRA-PRENEURSHIP" – in which 1/3 of the workforce will be employed by *core* organizations, 1/3 will be employed by *contract* suppliers or franchisees, and 1/3 will be *contingent* or self-employed. BUT. the Internet "Info-Structure" that is making this paradigmatic transformation possible is also facilitating economic globalization.

A. THE FORMULA FOR GLOBALIZING THE WORLD'S ECONOMIES

$$GATT + WWW + VoIP = GV$$

GATT   The 1948 General Agreement on Trade & Tariffs

+ WWW   The WorldWideWeb becomes the single international info-structure linking the world's businesses in 1994

+ VoIP   Voice over Internet Protocol that is currently integrating the world's telephone and cell phones with the WorldWideWeb

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= GV   The Global Village -- a single electronic marketplace where 1/3 of the world's population and ALL of the world's businesses will be able to engage in commerce by 2010 – 2012

B. NOW THAT THE GLOBAL INFO-STRUCTURE IS IN PLACE . .

• Because human resources average 65% to 75% of business operating costs in mature industrial countries, labor-intensive production - especially labor-intensive information work – can increasingly be expected to migrate from high labor cost countries to low labor cost countries.

• Over time, direct international competition in the international electronic marketplace by producers of information products and services will gradually drive labor markets worldwide to pay **comparable wages for comparable work.**

• Increasingly, in order to earn significantly more than the comparable global wage, U.S. rank and file workers will have to add **incomparable value** on the job.

**C**. This moment in time **. . .**

History indicates that our transitioning industrial economies will eventually create a large new class of middle-income jobs. **BUT, this has not yet begun to happen!** Until it does, automation, info-mation, outsourcing and off-shoring will continue to reduce the numbers of middle-income jobs in Europe, North America and Japan.

D. The Bust Before the Boom . . .

Historically, rising tides of technology-based productivity improvement that lift all boats have been preceded by what economist Joseph Schumpeter once called:

"a wave of creative destruction. . ."

Joseph Schumpeter
Business Cycles –1939
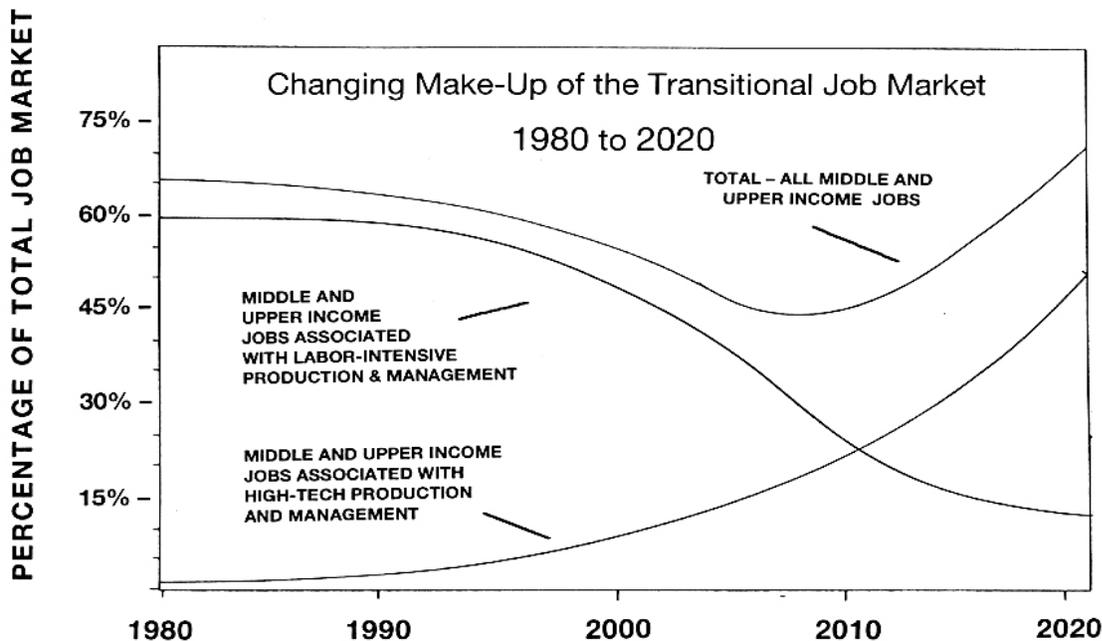
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E. THE MATURE INDUSTRIAL ECONOMIES ARE CURRENTLY IN, OR APPROACHING, THE "TROUGH" OF SCHUMPETER'S "WAVE."

VANISHING MEDIAN INCOME JOBS
Old Education's Failure or New Economic Structure?

"It is changes in the quality of jobs, not a shortage of higher order worker skills, that explains the growth of wage inequality. Service sector employment requires higher average skills but pays lower average wages than manufacturing or other male-dominated jobs in primary industries. The resulting misdirected public policy debate has generated a level of concern over worker skills that is disproportionate to that warranted by a sober assessment of the evidence."

[Michael Handel, *Worker Skills and Job Requirements: Is There a Mismatch,* Economic Policy Institute, 2005]

F. WHAT ABOUT THE SHORTAGE OF "SKILLED" WORKERS?

Are Employers Looking for Aptitude or Attitude? "Despite the absence of hard evidence to support such claims, there is no lack of observers and researchers willing to assert that cognitive workplace skills demands are increasing substantially, whether due to the spread of computers, employee involvement programs, or – in the case of interpersonal skills – the growing share of service sector jobs. But, cross-sectional studies suggest that employers are less concerned about cognitive skills deficits than they are about what they consider poor work habits, motivation, demeanor, and attitudes."

[Michael Handel, *Worker Skills and Job Requirements: Is There a Mismatch*]

(IN FARNESS, THESE CONCERNS ARE NOT WITHOUT MERIT.)

G. MOST DESIRABLE JOB ATTRIBUTES cited by U.S. College Students

•Flexibility (by which they mean the job should not infringe on their personal/social life.)
• Freedom from supervision
• Stimulating environment
• Opportunities for personal creativity
• Immediate satisfaction of their customers' pleasure

[*The Substance of Style*, Virginia Postrel, Harper-Collins, 2004].

VI. NEW TOOLS, NEW RULES, NEW KINDS OF SCHOOLS

A. THE MOST IMPORTANT NEW TOOLS -- GROUPWARE

•**PEER-TO-PEER FILE-SHARING (P2P)** – Originally created for on-line workplace collaboration, P2P file-sharing was first used by 37 million teenagers around the world to nearly bankrupt the global music industry. Now a mainstay of project management throughout business (Lockheed-Martin, IBM), and gaining currency in government, especially for inter-organizational work teams (NASA, DoD).

•**INSTANT MESSAGING (IM)** – A real-time variation of e-mail for immediate communication among two or more people who are on-line; use of IM has dramatically reduced long-distance business telephone call volumes and is quickly turning cyberspace into a "virtual bull pen." Since 2000, IM has become the **fastest-adopted technical innovation in the history of U.S. business**; 84% of large North American firms report making formal use of IM by December, 2003 (Nasaw 2003). In 2005, IM's original text-messaging capabilities were augmented to include instant video-conferencing.

(It should be noted that the unusually rapid assimilation of IM by business has not been the result of management initiative, but was almost entirely due to IM's mass adoption by millions of rank-and-file employees across many industries and professions. IMing has universal appeal because it is an unusually efficient communications medium: fast, easy to use and – like most groupware – down-loadable free from the Internet. Meanwhile, young people on both sides of the Atlantic have also been quick to adopt IM for – among other things – cheating on tests in school.)

• **WEB LOGS ("Blogs")** – Originally an on-line platform for technology wonks, Blog-ware is now used by firms to host on-line experts and to serve as information sources for customers, employees, and the media. Available both as software and as an on-line service, Web logs also loom large as future gatherers of market research, as a powerful news medium, and an unusually effective teaching/training tool.

• **WIKIS** – Freely down-loadable software for collaboratively creating new knowledge bases – dictionaries, glossaries, encyclopedias, etc. – for previously un-examined issues, problems or fields of study (TWiki.org; Wikipedia.com). The need for such systems will increase exponentially throughout the foreseeable future, as the accelerated expansion of human knowledge – made possible by our rapidly-spreading use of IT – forces us to study new problems, apply new technologies and explore new options.

B. THE MOST IMPORTANT NEW RULES –

- SIX EMERGENT SOCIAL TECHNOLOGIES of the information economy
- Open Knowledge – 1985
- Open Source Software (OSS) – 1991
- Communities of Practice (CoPs) – 1998
- Open Innovation – 2002
- Embedded Learning – 2004
- Rank & File R&D (RF/RD) – 2004

• COMMUNITIES OF PRACTICE (CoPs)

Most productive employees maintain a "community of practice," an informal personal network of peers – present and former co-workers, former supervisors, teachers, and class-mates, plus friends and family members, etc. – whom they can call on to validate and augment their personal workplace knowledge and judgment. Their employees' communities of practice will be crucial to all organizations' abilities to master changing realities and to deal effectively with innovation on the job.

• A "TECH-KNOW-LOGIC" ECONOMY

"A world of accelerating change will call for a workplace in which EVERYONE must be attuned to the consequences of innovation – not only to be responsive to the unintended impacts that will inevitably arise from our intentional actions (N.B. Edward Tenner's "law of unintended consequences"), but also to the rapidly-expanding body of human knowledge generated by the pervasive, ubiquitous use of IT – forcing us to ask new questions, study new problems and explore new options."

["Extra-Preneurship," David Pearce Snyder, *The Futurist,* July/Aug 2005]

• SMART BUSINESSES

Networked enterprises managed as multiple "communities of practice" will devote more discipline, resources and incentives to achieving superior performance than will the Industrial Era command-and-control hierarchies they supplant.

> [*Smart Business: How Knowledge Communities Can Revolutionize Your Company*,
> Dr. Jim Botkin, Free Press, 2002]

• SPONSORING ON-LINE RANK & FILE COLLABORATION

Large, multinational employers like IBM, Mittal and Schlumberger are able to mobilize hundreds of targeted *communities of practice*s in-house over their IntraNets. But small employers, by definition, do not provide a context for in-house CoPs. For the employees of such small employers – industrial job shops, independent fast-food franchisees, town governments, service stations, family farms, etc. – a number of "umbrella" organizations could sponsor or operate a CoP Network portal, including:
  • Professional Societies
  • Labor Unions
  • Trade & Industrial Associations
  • State & Local Economic Development Agencies
  • Career Tech Programs
  • Employment Agencies (Kelly Services, Manpower, Inc.)
  • NGOs

C. NEW KINDS OF SCHOOLS

  • Outsourcing can give ANY INSTITUTION an intellectual and operational "edge," including career, technical and vocational (CTV) learning institutions.

  • Assuming that your institutions were to outsource all the things that they're **NOT** particularly good at; what would you have left?

  •What are the core competencies of career and technical education – and its practitioners?

  • Let me tell you what rigorous research says about the most productive modes of education:

    1. The Walberg Data – Herbert J. Walberg, Hoover Institute,
                              Stamford University

      Out of 170 instructional modalities evaluated over 40 years, only
      three consistently doubled student learning in clinical settings:

      • Quality Instructional Materials (scripted teaching)
      • Peer Tutoring/Team Learning
      • Contextual Learning/Project Work – including Apprentice, Intern,
         Co-op, Community Service, Lab Research, etc

2. Matching instructional styles to individual students' preferred/effective learning styles.

The Center for the Study of Learning and Teaching Styles, at St. Johns University, has found that only 25% of the general population are primarily "passive-auditory learners," who learn well in a classroom lecture mode. By comparison, 30% of us are primarily "visual learners ," who learn most effectively by watching demonstrations or simulations or by reading textual and graphic materials, while 45% of us are predominantly "tactile-kinesthetic," or "contextual learners," who learn most effectively through physical engagement with the curriculum content: apprenticeships and internships, team learning, lab work, community projects, etc.

 3. And how about the data on post-secondary education?

According to research conducted by Daniel Rock at the Educational Testing Service, in Princeton, N.J., among 95 undergraduate institutions surveyed, graduates from 13% of the Physical Science programs, 8% of the Social Science programs and 20% of the Humanities programs consistently achieved 1/5 to 1/2 higher scores on the Graduate Record Examinations than did the graduates of other programs surveyed.

The characteristic features of the superior undergraduate programs were:

- Most were *not* expensive; did not represent "a prestige school;"
- Performance was not dependent on cost of buildings or facilities; size of library, etc.
- Key factor is *the intensity of the learning process* – the meaningfulness of the curriculum, and the amount of time spent, and the degree of engagement by students in *learning- related activities,* such as:

  - Student involvement in faculty projects
  - Extra usage of lab/research time
  - Strong interactions: active classrooms, class debates, peer review
  - Out-of-class learning in a diversity of settings

D. U.S. CENSUS BUREAU STUDY (1998)

1. Relative turnover rates among entry-level workers**:**
        (25% among employers with School-to-Work programs --
        apprentice, intern, mentor, etc. -- vs. 50% among employers
        without such programs)
2. School-to-Work participants have 10% lower drop-out rates
3. School-to-Work programs are not cheap for employers, but in the
         workplace, a 10% increase in overall educational input leads
        to an avg. 8.6% increase in output, vs. an avg. 5.6% output
        increase for a 10% increase in the number of employees, and an
        avg. 3.4% increase in output for a 10% increase in expenditure for
        new plant & equipment.

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E. U.S. OFFICE OF PERSONNEL MANAGEMENT (1980-82)

Long-term research by Hunter and Schmidt for the U.S. Office of Personnel Management has found that, as predictors of on-the-job performance and career success,

• grades are only 4% better than flipping a coin

• performance on job tryouts or workplace simulations is 16% better predictor than flipping a coin, . . . more than

4 TIMES AS ACCURATE!

F. COMMUNITY SERVICE-LEARNING LIFTS STUDENT PERFORMANCE (1999-2000)

In a series of studies, the Education Commission of the States has found that, in 80% of U.S. schools with structured service-learning programs, community service linked to classroom curriculum has proven particularly powerful in reducing drop-outs, raising grade-point averages and increasing the % of college-bound graduates. Community projects are spreading throughout all levels of U.S. education: e.g., Baltimore derelict property project, U.S.G.S. Mississippi River baseline data project, The GLOBE Climate Project of NOAA/NSF/NASA, and San Diego's "High-Tech High," etc.

The beneficial effects of contextual learning in general – and community service-learning, in particular – presage AN EMERGING REVELATION: Schools function especially well when they engage students in learning the curriculum by involving them in local real-world tasks, issues and problems. Ideally, schools should function as "educational centers with civic circumferences."

What's more, it would make a great deal of sense for schools *at all levels* to "out-source" their non-classroom learning, since classroom-based institutions aren't particularly good at *non*-classroom instruction. Basically, this is exactly what over 600 U.S. and Canadian post-secondary institutions are doing in offering cooperative work/study degree programs. (Note: The speaker holds degrees awarded by two such institutions: Antioch College, Yellow Springs, Ohio; and U.C. Irvine, in Irvine, California.)

G. CTV EVOLVES FOR THE 21ST CENTURY

Most of the faculty and leadership of career, technical and vocational education (CTV) in the high schools, in community colleges and technical training institutions, in the private sector as well as the public – are already actively engaged in introducing new content, new formats, new media, new learning sites, and new personnel, etc., . . . to every dimension of their operations, largely because they understand that the future for which they are preparing their students will be dramatically different from the recent past. As they forge ahead, CTV leaders are fortunate to be broadly supported by their stakeholders – teachers, students, parents, politicians, employers, etc. – most of whom share some common perceptions of the goals of career and technical education and the competency of existing CTV institutions to meet those goals

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VII. THE RACE FOR THE FUTURE OF EDUCATION

Today, of course, education in all mature industrial countries is faced with the *transformational imperatives* of our newly-matured information technologies.

A. CURRENTLY, THERE ARE 3 COMMONLY-EXPRESSED VISIONS FOR THE FUTURE OF EDUCATION COMPETING FOR THE HEARTS AND MINDS OF PARENTS, POLITICIANS, EDUCATORS, AND VOTERS. THESE VISIONS DERIVE LARGELY FROM DIFFERING VIEWS OF THE ROLE OF COMPUTERS IN OUR FUTURE

 • "**High-Tech" Schools** – The supporters of this vision hold the view that computers will become an added "layer" on all current forms of work and social life; proponents of this view believe that computers should be added like a veneer to existing school and classroom activities they are at present, an *option* in life and work, and thus, should remain an option in schools.

• **"No-Tech" Schools** – Proponents of this future believe that computers will continue to be, as they are at present, an *option* in life and work, and thus, should remain an option in schools.

 • **Career Tech Schools** – In the Career Tech vision of the future, information technology (IT) will be so pervasive in daily life and work that it will not only require new common personal competencies, but also new expectations and ways of thinking for everyone. To prepare all students for **this** future, IT and the coherent use of information must be integrated into every aspect of the learning process. For existing classroom-based institutions to engage **all** students in mastering such higher order reasoning skills, schools will have to incorporate characteristically "non-routine" real-world activities and virtual simulations into their cognitive learning processes whenever possible.

B. STRATEGIC OPPORTUNITIES FOR CAREER TECH

• CTV is already on the right road to the future, and needs only sustained commitment, not redirection, to get there. In particular, most career/tech programs are further down that road than mainstream K-12 OR the 4-year institutions.

• While career-tech is still largely classroom-based, CTV instructional philosophy is comfortable with outreach, and with collaboration between the classroom and the community; i.e., the "real world." SO, YOU ARE THE ONES WHO ACTUALLY CAN – AND DO – BRIDGE SCHOOL AND WORK.

• Most important of all, as educators, most CTV faculty accept change. Indeed, you EXPECT change. In the K-12 and 4-year post-secondary institutions, many stakeholders believe that the most important skills imparted are timeless and unchanging, but you understand that, as the world changes, preparation for that world must also change. Above all, you are not afraid of computers in the classroom; you have embraced them.

C. CAREER AND TECHNICAL/VOCATIONAL EDUCATORS CAN – AND SHOULD – "LEAD BY EXAMPLE" by fully assimilating IT throughout all career and technical learning programs as rapidly as possible.

CTV is uniquely placed to "walk' while others 'talk"; other educators mostly just propound policy while you set up working programs with training to support the programs. You can provide the rest of education with a successful role model of constructive innovation.

D. In particular, career/tech faculty should aggressively pioneer the use of Peer-TO-Peer GROUPWARE to create a genuine lifelong learning process rooted in classroom experience. Peer-to-Peer (P$_2$P) FILE SHARING, Instant Messaging (IM), Weblogs (BLOGS), & Wikis WILL CHANGE EDUCATION OVER THE NEXT 5 TO 7 YEARS, by changing.:

- Faculty-student relationships
- Faculty-faculty collaboration
- Student-student collaboration
- Faculty-graduate relationships
- Graduate-graduate collaboration-relationships
- Faculty-student-graduate community

VIII. ABRAHAM LINCOLN AND THE MISSION OF THE FUTURIST

Abraham Lincoln once observed, "If we could first know where we are and whither we are tending, we could better judge what to do and how to do it." – Principled and visionary leadership has not changed all that much since Lincoln's time. The mission of the futurist is to provide society with as clear as possible a sense of "where we are and whither we are tending," so that institutions and individuals will be better able to judge what they must do and how best to do it. Thus informed, it becomes a mission for each of us to do our part to speed the pace of constructive innovation, and to forestall or avoid potentially harmful developments on the way to our collective future.