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Ethics, Leadership, and Technology: Social Change in the Global Society of the 21st Century

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COURSE CONTENT

Without civic morality, communities perish; without personal morality, their survival has no value.
--Bertrand Russell (English mathematician and philosopher, 1872-1970, from **Ethics Newsline™**

THE COMING ETHICS REVOLUTION

A social change in the global society of the 21st Century will come by way of an "ethics revolution." The "ethics revolution" of today will become what the "quality revolution" was in the 1970s and continues into the twenty-first century.

Leaders must become aware of the ethics revolution taking place, its affect on leaders, and learn to embrace ethics. In its simplest form, ethics is doing what is right rather than what is wrong. Should ethics not be voluntarily embraced, governmental authorities will seek to mandate ethics codes and ethical conduct. Moreover, ethics must be applied to technology or the consequences will be severe.

Sarbanes-Oxley Act (SOX)

A prime example of mandated "ethics" by the U. S. government was the passage of the Sarbanes-Oxley Act of 2002, commonly referred to as SOX. The lack of ethics in the wake of corporate scandals, such as Enron, WorldCom, Arthur Anderson, Health South, and others, caused immense pressure on the U. S. government to strengthen honesty and integrity and to require compliant and ethical behavior in corporate America. Moreover, in conjunction with SOX, amendments to the Federal Sentencing Guidelines were passed and the Principles of Federal

Prosecution of Business Organizations was issued by the U. S. Department of Justice.[1]

SOX was passed to create greater financial accuracy and curb corporate wrongdoing. SOX was the first legislation to govern corporate conduct outside of the health care industry by imposing criminal liability directly on executives for defrauding investors. Moreover, SOX requires corporate managers to *personally* attest to the accuracy of corporate financial statements.[2]

Further, SOX provides "whistleblower" protection for those honest employees who provide evidence of corporate wrongdoings. Companies are forbidden from discriminating against employees who engage in "whistle blowing" activity. The prohibited retaliatory acts include threats, harassment, suspension, demotion, and discharge. By providing a safe harbor for "whistleblowers," SOX encourages employees to come forward, especially if they may be involved in corporate wrongdoings.[3]

Compliance with SOX is not cheap. Valero Energy estimated the first year costs to comply with SOX were $10 million, which included external consulting fees, internal cost of people dedicated to SOX implementation, increased external auditor fees, and costs for computer hardware and software to run special SOX compliance software.[4]

Why was SOX necessary?

The most significant financial legislation in 70 years was enacted largely in response to major corporate and accounting scandals involving numerous prominent U.S. companies. The result of these scandals was an unprecedented public lack of confidence in the financial markets and a loss of public trust in corporate accounting and reporting practices. Moreover, the scandals went well beyond ethical violations into law breaking criminal violations. In SOX, the U.S. government brought about the most extensive reform of U.S. financial markets since the Securities Act of 1933 and its cousin the Securities Exchange Act of 1934.[5]

SOX impacts every industry and service sector. Perhaps, the most challenging aspect of SOX Section 404, Management Assessment of Internal Controls, requires most publicly registered companies and their external auditors to report on the effectiveness of the company's internal control over financial reporting.[6]

There are two ways to view SOX Section 404 compliance; one, as an administrative and compliance exercise, or, two, as an opportunity to improve the effectiveness of business practices. The later position would: (1) improve effectiveness and efficiency of internal control processes; (2) provide better information for investors; and, (3) enhance investor confidence.[7]

SOX Section 404 creates significant challenges for corporate boards and management. Management challenges require significant time and resources to ensure compliance, require management to evaluate and report annually on the effectiveness of internal control over financial reporting, require external auditors to evaluate management's assessment of the effectiveness of its internal control over financial reporting, require assessment of the implications of reporting new information to the marketplace, and require board of directors and audit committee oversight of management's process, findings, and remediation efforts pursuant to its SOX Section 404 plan.[8]

SOX Impact

A purpose of SOX was to help directors and senior executives embrace anything that minimizes risk from the financial statements they must sign-off on. There is some evidence that many executives do view SOX as minimizing risk. According to Whitesox Consultants, 79 percent of 222 financial executives recently surveyed by Oversight Systems reported that their company had stronger internal controls after complying with SOX. Seventy-four percent said that their company benefited from compliance with SOX and, of those, 33 percent said that compliance lessened their risk of financial fraud. Whitesox Consultants citing Compliance Week, stated 27 companies with revenue of more than $75 million disclosed material weaknesses or significant deficiencies in internal controls during the month of January 2005, compared to only seven that made such disclosures during the same month in 2004. Data appears to show that SOX is creating a real and positive impact on controls.[9]

SOX affect on other countries

The SOX Act affects the United States for sure, but what about other countries?

CANADA

A bill that mirrors SOX called Bill 198 was passed in Canada and is so close to the purposes and requirements of SOX that it is referred to as Canadian SOX or CSOX. Initial legislation occurred on CSOX for an effective date of October 1, 2003. Since then, the Canadian Securities Administration (CSA) released for comment the Multilateral Instrument 52-111, Internal Control Instruments, and a proposed repeal and replacement of Multilateral Instrument 52-109, Certification Instrument, in 2005. Combined, these proposed Instruments substantially reflect the requirements of SOX, Section 404, and Section 302. The Internal Control Instrument (52-111) will be phased in over four years and require: (1) an evaluation by management of the effectiveness of internal control over financial reporting against a suitable control framework; (2) maintain evidence of reasonable support for the evaluation of the effectiveness of internal control over financial reporting; (3) report material weaknesses in internal control over financial reporting; and, (4) require an external audit of internal control over financial reporting.[10]

Repeal and replacement of the Certification Instrument (52-109) will cause changes to all issuers other than investment funds, and those "required to comply with the Internal Control Instrument must also certify that they have disclosed significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting and fraud, if any, to their audit committees and auditors."[11]

AUSTRALIA

In July 2004, Australia enacted the Corporate Law Economic Reform Program Act 2004, referred to as CLERP 9. The Australian government in September 2002 released a discussion paper entitled, *Corporation disclosure-strengthening the financial reporting framework*, which developed into CLERP 9. Essentially, the CLERP Act would have three bodies oversee financial interests; a Financial Reporting Council to oversee standard setting for audit and accounting; an Australian Stock Exchange's Corporate Governance Council to oversee the development of best practice guidelines; and, a Shareholders and Investors Advisory Council to provide for the consideration of retail investors' concerns.[12]

The goal of the CLERP 9 legislation is to provide a reasonable, balanced and considered initiative by the Government to improve transparency and consistency in auditing services, foster accountability and corporate governance awareness,

promote an informed market and build investor confidence in capital markets and in investing in Australian securities.[13]

UNITED KINGDOM

In 2006, the United Kingdom passed the Companies Act of 2006. The massive Companies Act of 2006 contains some 700 pages and approximately 1500 clauses making it one of the largest pieces of legislation ***ever*** passed in the United Kingdom. The legislation codified a large body of common law, but mandated new duties on corporate directors. The new director duties came in response to investor demands of better corporate accountability. In order to provide a safer investment climate, new fiduciary duties were prescribed for directors.[14]

The new law has a significant change in philosophy from the previous common law. Previously, under common law, directors were required to act in the company's best interest. Under the new law, a director has a duty to act "in a way he considers…most likely to promote the success of the company," thus requiring consideration of the long term rather than just the short term.[15]

Moreover, the Companies Act establishes a list of social factors that directors must consider when making business decisions. These social factors include a decision's impact on employees, surrounding community, and the environment.[16] In short, establishing ethics and the *golden rule*; do to others as you would have them do to you.

A purpose of the Companies Act is to require directors and executives to consider long term consequences of their decisions on the company's future, and affects on constituents, including shareholders, employees, customer, and the public. The Companies Act of 2006 is frightening responsibility for some, but long overdue social responsibility for others.

As shown, country after country has moved toward legislating more corporate accountability and responsibility for its actions. Numerous countries, such as Bermuda, India, New Zealand, Virgin Islands, etc., that model their corporation law after the United Kingdom have recently changed their corporate laws. The changes have been rapid and sweeping in an effort to mandate, in large part, corporate ethics. Thus, the mandated "ethics revolution" is underway and spreading globally.

SOX is not enough

Don A. Moore and others maintain that SOX allows for the "moral seduction" of outside auditors. Corruption can still occur despite SOX due to the lack of auditor independence. Corporate executives control the hiring and firing of external auditors, thus discouraging critical reports. [17] Something more is needed.

In the long run, mandated ethics will not work. The root of the problem is that individuals must "think, act, and be ethical" personally and professionally, both at home and at work. As we will see, ethics must be an adopted mindset, rather than mandated rules. A person must be personally ethical before becoming professionally ethical. Moreover, leaders must be personally and professionally ethical to lead the new type of workers on the horizon.

When leaders are not ethical, followers will not be ethical. Moreover, firms or employers must be ethical if employees are expected to be ethical. As we shall see from Aristotle, ethics must flow from top to bottom, and bottom to top. If the person in charge is perceived as *not* meeting high ethical, no compromise standards, others, accountants, and managers, will use these low exemplar standards as their own. Low ethical standards permeate throughout the organization until, at some point, independent auditors discover violations of prudent practices or, worse, legal violations.

Quality Assurance and Ethics

Until the late 1970s, the United States had a competitive advantage in quality and performance of its products. In the late 1970s, Japanese companies began to penetrate the U.S. marketplace. Japanese companies assaulted the U.S. markets with a substantial increase in the quality of their products coupled with low cost. In the mid-1980s, U.S. companies drastically changed the way they thought about quality and began to increase their quality. The improvement in the quality of products changed the marketplace and started the "quality revolution" now joined by Korea and China[18]

Today, international standards for quality are being adopted globally. Quality Management Systems, ISO 9000:2000 standardizes quality globally between countries (International Organization for Standardization).[19] The marketplace

requires that global standards are used for global trade. Likewise, the marketplace will require global ethical standards for global trade.

In fact, new global ethical standards are being drafted in the form of ISO 26000 Social Responsibility. It is expected that the Social Responsibility standard will be finalized and effective in 2009. ISO 26000 is intended for use by all types of organizations, government, profits, and non-profits. The current definition for Social Responsibility is:

> "Social Responsibility is the responsibility for an organization for the impacts of its decisions and activities [including products and services] on society and the environment, through transparent and **ethical behavior** that; is consistent with sustainable development and welfare of society; takes into account the expectations of stakeholders; is in compliance with applicable law and consistent with international norms of behavior; and, is integrated throughout the organization."[20]

Although, ISO 26000 will be a voluntary standard, without a certification process; it, undoubtedly, will have a tremendous organizational marketing impact for global markets. It will help assure global ethics for those organizations that adopt the standard. Those organizations that do not adopt the standard will be frowned upon by the market place. Essentially, ISO 26000 will spread the "ethics revolution" globally throughout the world.

Ethics and social responsibility are already taking a foothold in the market place. Despite Nobel Prize winning economist, Milton Friedman's proclamation that "the social responsibility of business is to increase its profits," corporate leaders poured over $10 billion of their shareholders money into social causes in 2005. Money that might have gone to employees, shareholders, or back into the business was spent on social causes. Why? Corporate social responsibility (CSR) has become political and marketable. Companies are supporting social causes because they consider it a shrewd investment.[21]

Importantly, companies have figured out that being perceived on the wrong side of social and ethical responsibility can be disastrous. Take for example Coca-Cola. Coke was pleased when it had a profit of $1.84 billion for the quarter ending July 2006, which was up seven percent from 2005. Unfortunately, the next day Coke's stock plummeted. Why? TIAA-CREF, the largest retirement fund in the United

States sold $52.4 million of Coke stock after Coke was removed from a list of good CSR companies published by the research firm, KLD Research & Analytics.[22]

Thus, the "Ethics Revolution" will become to ethics what quality has become to the "quality revolution" in the 1970s and continues into the twenty-first century. Ethics is more than a buzz word. Ethics is a mark that every man, woman, child, and leader will be known by. Moreover, just as the SOX type legislation spread around the world, the "Ethics Revolution" will become global, country by country. However, unlike the SOX legislation, ethics in the "Ethics Revolution" is not new.

Aristotle and the Polis

The top to bottom, bottom to top, two way ethical street has been discussed for centuries. Aristotle over twenty-three hundred years ago realized that both the individual and the *polis* (city, state, government) had to be ethical. His model of happiness and ethics [eudaimonia] was in the context of community; and, linked politics and ethics together. Aristotle's *polis,* must create laws, constitution, and institutions that encourage each citizen to make right choices to become excellent, accomplished citizens. Reciprocally, citizens must be ethical in their actions toward the *polis.*[23] Today there is an intermediary called the corporation, firm, or company, but the requirement is still the same two way ethical street.

Rushworth Kidder's commentary *The Changing Face of Business Ethics* is an ethical warning. Kidder concludes: (1) Corruption destroys nations, in part by destroying the investment climate; (2) Businesses fail because of bad ethics (Enron, WorldCom); (3) The CEO's role is vital in promoting or degrading ethics; and, (4) Ethics training by itself does not solve the problem.[24] [Most ethics training involves training centered on an "Ethics Code." Unfortunately, most ethics codes miss the fundamental requirement of personal ethics---a person must think, act and be ethical personally and professionally.]

Rushworth Kidder poses "the key question: If bad ethics destroys countries and corporations, and if CEOs need (but don't always have) a commitment to integrity, and if ethics training isn't the answer, then what's needed?" Kidder's answer lies in an "Ethical Culture."[25]

Part of the "ethical culture" solution will come from global ethics. The United Nations (UN) is implementing its *Convention Against Corruption* (2005) that

creates a culture targeting corruption central to the integrity of both the private and public sectors.[26] Kidder agrees the global community is dictating global ethics. Further, Kidder also sees a shift from personal to organizational ethics that builds strong individuals and cultures of integrity across entire businesses led by some of the multinational corporations, the UN, and other world organizations.[27] (This is the two way ethical street again dating back to Aristotle.) The UN's *Global Compact* (2000), part of which contains the *Convention Against Corruption* (2005) calls for the world's private sector corporations to partner with social organizations to achieve a more sustainable and inclusive global economy. Hundreds of corporations around the world are joining the *Global Compact*.[28]

Although it can be argued that companies can make profits despite their ethical behavior, it will be in the short term. Enron clearly demonstrated high profits in the short term, but not in the long term. Bank robbers make profits in the short term, but they are almost always caught; it just takes time.

Ethics and Leadership, Leadership and Ethics

William D. Hitt in *Ethics and Leadership* shows the affect of ethics and leadership:

> "Ethics and leadership go hand-in-hand. An ethical environment is conducive to effective leadership, and effective leadership is conducive to ethics. Effective leadership is a consequence of ethical conduct, and ethical conduct is a consequence of effective leadership. Ethics and leadership function as both cause and effect….
>
> Beginning the chain of causal relations is the role of the leader, because leaders are the persons who influence others. Leaders do this in a number of ways: through their ability to acquire power and use the power to achieve worthwhile ends; through their vision and their ability to transform vision into action; and through their enthusiasm and their ability to empower others…leaders have influence…it is more meaningful to say an effective leader is one who casts a *light* (emphasis in original) on the organization."[29]

Hitt's Light, Kidder's Ethical Culture, and Trust

Hitt's *light* reflects on the organization and provides Kidder's "Ethical Culture." Ethical culture means the way things are done and provides the ground rules, written or unwritten, that drives the organization. If ethics is promoted in the "culture," it builds trust.[30]

Trust is the key ingredient in any relationship. If trust is missing in a relationship; the relationship dies. It does not matter if it is a husband/wife, employer/employee, politician/voter relationship, if trust is lacking the relationship is problematic. Moreover, trusted leaders will be followed. Conversely, leaders will never be as effective as they could be without trust.

This light, ethical culture, and trust are certainly consistent with Aristotle's top to bottom, bottom to top, two way ethical street.

Pressure Causes Unethical Behavior

Unfortunately, today, pressure to succeed causes unethical behavior. Successes and failures are magnified by increased expectations, tougher competition, instantaneous communications, global economies and competition, and higher technology leveling the playing field. Moreover, the unethical conduct of others causes considerable harm to many and has a cascading affect on those far removed from the source. The scandals of Enron and WorldCom clearly evidence ethical and criminal violations, but many other smaller examples abound.[31]

Our Cheating World

Everybody knows there are corrupt counties in our world. Typically, it is presumed, the "corrupt countries" are normally governed by dictators where graft, corruption, and bribery are the business norm. The corrupt countries motivated the UN, and the rest of the world, to develop the *Convention Against Corruption.*[32]

Even a perceived ethical country, that ranks within the top ten countries of the world in ethical behavior, cheats. In *The Cheating Culture: Why More Americans Are Doing Wrong to Get Ahead,* David Callahan concedes cheating is a difficult subject to research. Meaningful data is lacking that would allow comparisons of different forms of cheating. We know cheating happens, but nobody is keeping track of it. In order to study cheating, Callahan compiled interviews, surveys, court information, and professional journal information for his book.[33]

Cheating is not a new event. Callahan points to cheating in the ancient Olympic games. Moreover, in ancient China, civil servants cheated for their jobs, despite the fact that the penalty for cheating was death. It appears cheating in America is increasing. Unfortunately, many countries in the world view the U.S. as a world leader and model their behavior after the U.S. The U.S. may be creating a world of cheaters.[34]

Callahan asserts, "Everybody does it," and believes America's morals became defined differently in the '80s and '90s. Americans became too pre-occupied with moral problems of crime, drugs, premarital sex, and divorce, while overlooking moral problems of greed, envy, materialism, inequity, and inequality.[35]

Despite opinion polls that assert Americans are concerned with personal responsibility, cheating continues to increase. Callahan defines cheating as breaking the rules to get ahead academically, professionally, or financially. Some cheating involves violating the law while other cheating does not go that far.[36]

Callahan opines, Americans are using two moral compasses. One moral compass directs American behavior toward sex, family, drugs, abortion, and traditional crime. A second American moral compass points in the ethical or unethical guidance of career, money and success.[37] Not surprisingly, other countries are having similar moral problems.

Almost on cue, as I finalize this section, a cheating story broke entitled, "MIT dean resigns for her lies on her resume." Marilee Jones went to work for MIT 28 years ago and had been Dean of Admissions at MIT since 1997. At various times Jones had asserted she had degrees from Union College, Rensselaer Polytechnic Institute, and Albany Medical College. The truth was she had only attended Rensselaer on a part-time basis and had no degree from any of them.[38] This is but another example of America's cheating culture that has surfaced publicly.

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Can We Learn From History?

Cheating, loss of moral virtues and values has a long term affect on all societies.

History argues the Roman Empire was the greatest and longest empire to ever exist. There are probably as many reasons as there are opinions for the collapse of the Roman Empire; but, perhaps the most important reason was the decline in morals and values. Morals and values that kept the Roman legions together and protected the empire were falling apart toward the end of the empire. Cities were made unsafe because of violence. Public health and environmental problems abounded. Poor people living on the streets spread disease because they were in continuous contact with one another. Alcohol abuse undoubtedly contributed to the demise. Political corruption became rampant. Before Rome fell, the Praetorian

Guard (an elite guard that protected the emperor) gained complete control of determining the next emperor. The emperor, in turn, rewarded the guard. Eventually, the position of emperor went to the highest bidder. During the empire's last years, unemployment, inflation, and urban decay contributed to the collapse. Basic research and new ideas in technology declined. Lastly, military spending was a constant drain on the treasury. Frustrated Romans no longer defended the great Roman Empire.[39] These reasons are supported by Ramsay MacMullen in *Corruption and the Decline of Rome.*[40]

MacMullen analyzed the fall of Rome on a regional basis within the empire. Different regions corrupted at different times, which made the collapse difficult to determine. However, MacMullen proves a key factor was the corruption by officials and military persons that destroyed control and purpose over the government and military of Rome.

Comparisons between the Roman Empire and the United States have been made. Similarities abound between Romans and Americans. Americans patterned themselves after Rome. So, writes Nicholas Meyer in his article, *'Rome' wasn't just television. It's us.* George Washington patterned himself after the Roman general Fabius. Fabius defeated Hannibal by running away and fighting another day. During the American Revolutionary War, George Washington became famous by running away from the British and fighting another day.[41]

The United States Senate was modeled after the Roman Senate. Any sightseeing trip to Washington, DC, clearly illustrates Roman Architecture in and around the U.S. Capitol.[42]

Perhaps the most important "good" attribute the American founding fathers captured from the Romans was their "abstract notion of Virtue, modeled along Roman conceptions of the word: of right and selfless action on behalf of the people and the republic….Republics are hard to sustain, requiring as they do a continual infusion of Virtue and commitment to selfless, incorruptible public service---as difficult then as now."[43]

If history repeats itself, the U.S. could be proceeding toward a collapse similar to Rome's collapse. A U.S. collapse could be triggered with a decline in ethics. U.S. Comptroller General David M. Walker's article, *Spending Is Out of Control* compared Rome with the U.S.:

> "The Roman Empire fell for many reasons, but three seem particularly relevant for our time: (1) declining moral and ethical values and political comity at home, (2) overconfidence and overextension abroad, and (3) fiscal irresponsibility by the central government. All these are certainly matters of significant concern today."[44]

Walker's comparison between the U. S. and the Roman Empire is clear and cause for concern. Will history repeat itself?

Social change in the global society of the 21st Century must include a change, for the better, in global ethics, including the U.S.

LEADERSHIP

As we have seen from Kidder and Hitt, social change in the 21st Century will come by way of ethical leadership.

Promoting Ethics, Leadership, and Trust

Len Marrella, *In Search of Ethics,* exemplifies numerous leaders to support his thesis "ethics is essential to effective leadership." Marrella argues, "In order to get commitment from those you lead, you must be trustworthy. You must earn trust by being ethical. This means acting in accordance with good positive values [ethics], the values your followers share and respect."[45]

A leader must promote an ethical culture by: (1) Understanding ethics and its affect; (2) Serving as the role model for followers; and, (3) Developing and supporting an ethical culture for followers.[46]

Should the leader do nothing, the ethical culture defaults into a morass of multiple individual ethical stages. Followers are working in different ethical directions, sometimes at odds with their peers. Therefore, it is vital for a leader to establish good ethical values for others to follow.

Leadership as Influence

John Maxwell defines leadership as, "Influence." Moreover, Maxwell insists, "The key to success in any endeavor is the ability to lead others successfully."[47] Leadership, i.e., influence, is applicable from the most menial job to the highest

CEO, from the mom and pop shop to the largest global corporation, from the smallest town to the largest city, and from the smallest to the largest country.

The best leader is the one grounded in reality, including ethical reality. The best leader knows what the worst case scenario is and how to compensate for it, but is optimistic enough that the job will be accomplished by her/his followers. Reality is determined by experience. Experience allows you to look ahead based upon what has been seen before. An inexperienced leader must learn vicariously, by experience through others, research, study, and interviewing people in similar circumstances.

Training, ethics included, adds to experience. Training instills knowledge and confidence. Training is particularly vital to followers. For example, sports teams spend vast amounts of time and money training. Training together builds teamwork, allow trainees to know one another, and build character and ethics.

Perhaps the greatest benefit of training as a team is the building of trust. Trust is that fundamental ingredient of all relationships. Trust starts with good ethics. Trust influences people and influence is leadership.

Leadership for the Future, Change Is Coming

Thomas Friedman beautifully illustrates change in *The World Is Flat* by describing a scene from the U.S. military command center in Iraq. The scene takes place around a large flat-screened TV. On the TV are enemy moving behind a house. The TV picture was in real time from an overhead camera. On the right side of the TV was an instant-messaging chat room. The overhead camera was mounted on a pilot-less U.S. Predator drone being flown by a person located at Nellis Air Force Base in Las Vegas, Nevada. At the same time, the video was being watched by the U.S. Marine 24th MEU in Iraq, the U.S. Central Command headquarters in Tampa, Florida, U.S. CentCom regional headquarters in Qatar, the Pentagon in Washington, D. C., and elsewhere. The military traditional chain-of-command had been "flattened" by everyone viewing the same events at the same time, real time. There was no passing on of information, everyone was on the same page at the same time. Privates and generals alike, all viewed the events unfolding. Information was not passed down, it was horizontal and spread out to everyone.[48]

What similarity does the flat-screened TV illustration have with leadership and followers? The military with its rigid chain-of-command structure was "flattened" by instant and simultaneous information sharing, from the lowest rank to the

highest rank. Decision making was more democratic. This "flattening" Friedman describes, is happening in leadership, business and economics. Everybody knows what everyone is doing instantaneously, and this is true in leadership, business and economics, globally.

This "flattening" causes today's leadership to change in the future.

The New Knowledge Leadership

Peter Drucker predicts that the information technology era will demand knowledgeable users who will transform the organizational structure of business and leadership, particularly for large corporations. The day of the "Knowledge Worker" and "Knowledge Management" has arrived . Large corporations of the future will employ half the levels of management and one-third the managers as today.[49]

Work will be done by specialists, "knowledge workers." Moreover, leadership, coordination and control, will depend upon influencing worker's willingness to produce and be disciplined in their approach, i.e., professionalism. Together, this will be knowledge leadership and management. The knowledge leadership and management will dictate a new form of organization in the future.[50]

Businesses have no choice except to become information based. Information makes business much more dynamic. The internet connects everyone globally. Professional outsourcing associations are involved in outsourcing as customers, providers, and advisors, spread globally.[51]

Peter Drucker states, "Information is data endowed with relevance and purpose. Converting data into information thus requires knowledge. And knowledge, by definition, is specialized."[52] Accordingly, these specialists become knowledge workers in the new knowledge leadership.

A Change From the Past, A Look to the Future

Peter Drucker in *Managing In The Next Society*, attributes the new economy and new society to fundamental changes in both developed and developing countries. Attributing factors are: (1) the information revolution, discussed above; (2) demographics, falling birth rates and fewer young workers; (3) manufacturing decline, in terms of wealth and jobs; and, (4) transformation of the work force.[53]

The bases for Drucker's opinions start with the Industrial Revolution. He likens the Information Revolution at the same stage as the Industrial Revolution in the early 1820s. The Industrial Revolution gave rise to the working class in the factories, and changed society.[54]

The Industrial Revolution took the worker away from the family and into the factory. The factories for the most part started in the cities where the labor supply was located. Jobs attracted those from outside the cities and caused a shift away from farms into the cities.[55] This shift is prominent in China today.

The railroad created a new economy and a new mentality regarding distance. Society had true mobility. Shortly after railroads came, telegraph, photography, and the fertilizer industry followed. New social institutions developed from the new technologies. Psychologically, society was different.[56]

In America, a new social mind-set welcomed "inventors." Inventors were American folk heroes and rewarded both socially and financially, as the new "technologists." America and Germany overtook England as the predominant industrial economy, by the 1850s. The reason was social. England never accepted the "technologist" socially. Further, England failed to develop the venture capitalist that financed the unexpected and unproven inventions. England lagged behind with a more formal, rigid system for scientific advances.[57] Like American acceptance of the technologists, global change requires acceptance of the Information Society.

Today, the Information Society

The Information Society is here. Processes are routine, saving time and money. Psychologically, learning has taken a tremendous leap. Children are developing computer skills with their toys. E-commerce is changing the economy, society, and politics. Distances have shrunk to insignificance. Businesses are competing in a global market. Websites provide information on almost everything. Information is a mouse click away. E-commerce has changed how customers buy and what they buy. E-commerce has changed consumer behavior, banking, savings, industry, and the entire economy.[58]

Peter Drucker is convinced a drastic change in the social mind-set is required in the future. Just as the leadership in the industrial economy drastically changed from the agrarian social norm to the industrial revolution's shift in social processes, so

too must the Information Revolution create social changes. He asserts the Information Revolution is really the Knowledge Revolution and the social position of knowledge professionals and social acceptance of their values is key to maintaining leadership. If employees are to remain as traditional employees, socially those organizations will slip back like pre-1850 England's non-acceptance of technologists era. The results will be similar. Those countries that fail to accept the Knowledge Revolution will fall behind countries that do because of their failure to change socially.[59] One of the key social changes will be trust brought about by ethics and values.

New Society and New Organizations

The creation of knowledge workers requires a new society and new organizations. Satisfying the knowledge workers' values, social recognition, and social power will have to be added to knowledge worker compensation. Knowledge workers will demand satisfying values, social recognition and power, that transforms them from subordinates into fellow executives, and from employees into partners.[60] Knowledge workers will not want to be know as liars, cheats, and thieves. These are negative values and the new knowledge workers will want positive values. If knowledge workers' values are not met by one organization, they will migrate to the organization that does meet their values.

Leadership Change

Leaders can no longer rely on their competitive advantage of knowledge because technology spreads knowledge, globally and instantly. Time and resources are required to produce knowledge workers and keep them knowledgeable.

To succeed, leaders must lead suppliers, customers, partners, and volunteers. Successful leaders will guide people to assess the reality of a situation and develop a beneficial course of action, then influence them to carry out their mission. Where leaders do not have direct control, they must influence others by teaching them to be leaders. Oftentimes, people on the front lines know more than the people at the top about the specifics of any part of an operation and are most likely to see challenges and opportunities first. This team approach is essential in the new organizations of tomorrow. Without direct control, trust will be vital in a leader's influence. Thus, ethical behavior is a must for the global society of the 21st Century. Trust must be built by ethical behavior.

SOCIETY, ETHICS, LEADERSHIP, AND TECHNOLOGY

In the 20th Century mankind developed an ability to transport people around the world in a matter of hours and voice communication became instantaneous to any part of the world. As never before, societies can feed, transport, entertain, clothe, heal, and **kill** each other by technological means.[61]

Technology can be a detriment or a benefit to society. Technology is a two edged sword. Technology has compelled huge changes to society. Society has changed socially and has been influenced by technology. Thus, technology is leading society. The shift in population to the cities, buildup of giant corporations, organization of labor, mass production, higher standards of living, world wars, growing dependence of national strength on technology, and the competition between government control and free enterprise, all, really gained strength in the 20th Century and are continuing into the 21st Century.[62]

Technology, as a leader, was welcomed as good for society and brought advancements. Unfortunately, the other side of the sword seems to be surfacing; technology is creating societal and social problems. A simple example is TV. TV produces millions of dollars, provides jobs all over the world, and communicates more than its inventors ever envisioned. However, TV now dominates presidential elections. Today, presidential contenders must have a good TV presence and appearance in order to be credible and considered as presidential material. TV shows, such as *The West Wing*, may shape the thoughts of what a president should look like, act, and be. TV also educates the youth for good and for bad. TV and videogames have usurped the attention of our young and influences, thus, leads the youth. TV, as a youth leader, determines our political leadership and education for the next generations. The desirability of the social affect of TV was not considered by society, it just happened. TV technology did not have a controlled response by society; it had an uncontrolled response by society.[63] TV influenced and lead society.

Similarly, computers and the internet are shaping societies globally. Pornography dominates society as never before. Is modern society becoming decadent? Is society facing the same ethical issues that caused Rome to decline and fall?

Technology Creates Ethical Issues

Technology can produce horrible detriments to societies. Pesticides and fertilizers expand the food supply, but carelessness creates risks. Some technological advances produce cancer risks without a universal cure for cancer. Moreover, advances in medicine have increased costs in medical services and hospitalization such that a health care financial crisis looms on the horizon in the U.S. and other countries. Technology has not produced jobs for everyone and has not produced cheap sources of environmentally clean energy. Nuclear power as a cheap source of electrical energy has fizzled amongst societal pressures feared by the unknown.[64]

Overarching, regulatory bureaucracies have been established by governments, globally, to deal with the unacceptable harm emanating from technological advances. High technology may *not* be seen as a way to a better life.[65] Moreover, ethics in high technology is questioned. For example, there is an ethics dilemma associated with "designer babies" and "cloning" on the horizon.

The Technology Triangle

Simon Ramo graduated with a Ph.D. from Cal Tech at age 23, worked for Howard Hughes, and co-founded the giant defense firm TRW (he is the R). Ramo was the chief scientist for the U.S. International Ballistic Program and chairman of the President's Committee on Science and Technology. He was a visiting professor at Cal Tech and Harvard's Kennedy School of Government.

Simon Ramo created the Technology Triangle. The Technology Triangle consists of Society—Technology—Liberty/Individual. Society must humanize its technology. If the results of technology are not suited for society, society must organize to lead technological advances, rather than follow. Society must be the master of technology, not the other way around. How objectives and priorities are selected for decision making will determine success with technology. Objectives and priorities are the critical requirement for social innovation, organizational innovation, and innovation in a way to maximize benefits from science and technology. Further, these objectives and priorities must be ethical to benefit society.[66] Leaders and technology must be ethical to benefit the global society of the 21st Century.

Ramo proposed an innovative philosophy for society to follow when making technological advancements and decisions. The overarching goal is to humanize the technological society. Civilization has created two competing foci. One focus is on *Liberty/Individual*. *Liberty/Individual* is the innate desire of human beings to

be free and to decide their best interests independently of others, free choice. The other focus is on *Society*. *Society* develops a rule of law, accepted ethics, and patterns of organized approaches to societal problems. *Liberty/Individual* and *Society* are opposite forces, but allow people to co-exist.[67]

Life works best when *Liberty/Individual* and *Society* are in balance. Thus, when *Liberty/Individual* freedoms are relinquished, and the regulations or laws mandated are acceptable; and, *Society* releases control of the individual, civilization becomes optimal for everyone. Life causes a constant "give and take" between *Society* and *Liberty/Individual.*[68]

To improve life and the long-term future for mankind, societies must become an organized global society through coordination and cooperation. This coordination and cooperation will involve a continual conflict between individual freedom and government and/or multinational control.[69] Coordination and cooperation between societies in the global society of the 21st Century must rely on trust and ethical interaction.

Unfortunately, according to Ramo, technology requires more than just the balance between *Society and Liberty/Individual*. Technology requires a third focus; that is *Technology* itself. The *Society—Technology—Liberty/Individual* can be thought of as a triangle with each vertex dependent on the other two vertices as shown in Figure 1.

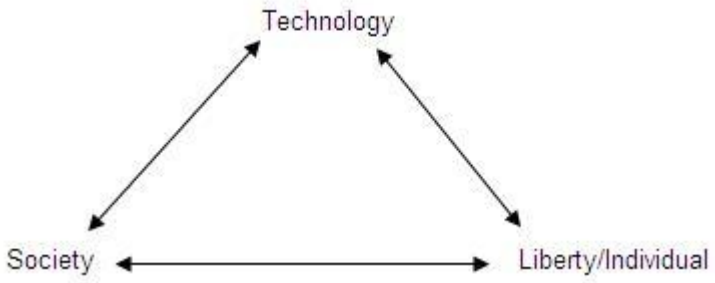

Figure 1. *Technology Triangle*

Technology depends on *Society* which depends on *Liberty/Individual* which, in turn, depends on *Technology*.

Scientific discovery drives *Technology* and is dependent on *Society* for its resources and to *Liberty/Individual* for thought and pursuit. *Technology*, to some extent, is independent because it develops from natural law, which *Society* and *Liberty/Individual* can not change. ($E = MC^2$ in spite of what congress says.) Accordingly, once *Technology* is discovered, it is accepted by its nature.[70]

Ramo maintains the *Technology Triangle* involves big and small issues and, small communities to the global society. For example, picture the orderly flow of traffic through an intersection. Some measure of individual liberty is given up to stop at a red light in the interest of societal safety. Some societies allow individuals to own guns, but prohibit ownership of other weapons. Societies have organized procedures for controlling pharmaceutical drugs. *Technology* produced information that identified smoking as a cause of cancer and other associated diseases. However, *Society* deems it necessary to only issue warnings because *Liberty/Individual* insists on freedom to choose. *Society* on the other hand governs nuclear power plants, cable TV practices, and places safety and environmental limits on cars.[71]

Globally, the *Technology Triangle* applies to individual nations not to act unilaterally, restricting their freedom. The nations of the world give up some of their freedoms to act and are required to cooperate. Thus, nations have accepted procedures for allocating bandwidth or radio spectrum for the good of all. The cooperation of nations is easily identified by global, multinational, corporations and governmental organizations of the United Nations, World Trade Organization, World Bank, International Monetary Fund, and others that balance the *Technology Triangle* and nation states.[72] Thus, there is a "give and take" between world organizations and nations. This "give and take" requires a mutual trust and ethical behavior or the delicate balance will be lost.

New Technology

Ramo has three criteria required for technology: (1) The technology must be readily and feasibly extendable; (2) The cost to implement must not exceed its value; and, (3) The technology must have social acceptance.[73]

First, as part of the feasibility, technology must deal with the dangers, excluding and minimizing possible hazards. The science and technology of safety, health, and environmental protection (SHEP) are applied to individual technical projects. Second, costs increase by addressing the hazards problem. If preventing hazards, causes the cost to exceed benefits, the technology is not feasible. Third, social acceptance can stop the technology. Decades ago, technology might pass all three criteria, but today fails the last test of social acceptance. The social acceptance criterion really becomes an ethical value judgment. Moreover, the ethical value judgment may be difficult to foresee. Ethics can vary and rely on perception by citizens, who are not directly involved in the technology and generally not

educated in the technology. The prime example is nuclear power technology. Citizens of several countries have perceived a risk greater than the benefit to society.[74]

How Leaders Must Handle the SHEP Problem and "Acceptable Risk" or "Ethical Risk"

Safety, health, and environmental protection (SHEP) problems are ethical value judgments and must be recognized as such. Actual trust must be established. If trust is not established there is "ethical risk." A careful SHEP risk analysis must be done at the conceptual design stage, continue through implementation stage, and follow through continually in the production stage. Public trust must be established from toys to airplanes to nuclear plants.[75] For example, think back to the tainted dog food and toothpaste made in China. Public trust is now lacking on numerous products from China.

Public trust demands ethical leaders and organizations. Ultimately, technology decisions will be determined by the free market. Unfortunately, the free market by itself is not fully capable of assessing the SHEP problem, especially long-term.[76] Moreover, society can not assume organizations will police themselves. Enron, Arthur Anderson, Tyco, WorldCom, and others have provided ample evidence to the fact that some organizations will not police themselves nor act ethically. As we saw with SOX and its fallout around the globe, restrictions to *liberty/individual* will be mandated by law for unacceptable ethical behavior.

Further, the study of science and technology, investigations, data gathering, statistics over large time frames and large geographical areas, requires organizations of substantial size and means. The scope and interface presents a difficult organizational problem between the private, Liberty/Individual, and government regulators, Society. As the complexity grows, more and more governmental regulatory duties must grow to handle the SHEP problems.[77]

Simon Ramo asserts the results of governmental regulation have not been very good. Regulation of SHEP has been costly, delayed benefits, and all too often failed to provide needed protection. For example, Viox and other drugs have come to market, killed, and then been re-assessed. Leadership in the technological society must appreciate the SHEP risk/benefit analysis coupled with requirement for governmental regulation.

Analyzing risk/benefit and "ethical risk" is a difficult and inexact task. SHEP can be measured for most technology. However, a level of "acceptable risk" changes and presents a difficult issue.[78] For example, in August of 2005, a Category 3 hurricane levee system for New Orleans was an acceptable risk. Today, the "acceptable risk" and "ethical risk" will be higher.

How "acceptable risk" and "ethical risk" is defined depends upon how much risk society is willing to accept. Most often, the risk does not directly affect the persons determining the "acceptable risk" or "ethical risk." "Acceptable risk" becomes an ethical value judgment or "ethical risk." Assessment of economic worth on health improvement and prevention of accidents is difficult. For example, the free market does not set a price for an extra year of your life or one month's supply of fresh air.[79] Moreover, the free market is particularly harsh to those outside the norm, such as persons with asthma, when clean air is vital.

Comparing Alternatives---Risk and Regulation

Without question, technology requires regulation. New technology creates new regulation. Most regulation involves some sort of societal risk. Unfortunately, there is no such thing as zero risk. The closer society tries to achieve zero risk, the more expensive the regulatory bureaucracy becomes. Technology decision making must examine alternatives. The alternatives must be compared. Oftentimes alternatives are not good. Thus, a balance of risks versus benefits, must take place when developing rules and regulations for technology.

Society must realize that an overly severe regulation is not necessarily safer. Overly severe regulations may have a negative impact on productivity, employment, and investment as well as reduce competitiveness in the world market. Examples are plentiful, aviation, nuclear, pharmaceutical, and environmental regulations have affected productivity, employment, and investment. Unfortunately, society has been forced to protect itself from technology. Often, the result has been that society has overcompensated.[80]

Leaders must realize that over regulated and poorly managed technology by a government presents a severe handicap to beneficial technological advancement. Regulation involves a complex mix of science, technology, economics, politics, and personal value judgments or ethics. Ideally, business leadership should contribute substantially to sound regulation of technology.[81]

Achieving the "ideal" is unrealistic. The bottom line for regulation becomes a question of how safe is safe? How safe is safe will always be a value judgment or ethical consideration. The inescapable ethical dilemma is risks versus costs, and lower risks invariably mean greater costs. "The best industry can do in working out risk-safety-price relationships is to anticipate and meet market requirements where they are applicable and government-imposed regulations where they exist."[82] Trust and ethics are critical, especially for technology.

FUTURE ETHICAL PROBLEMS OF TECHNOLOGY

The near future will bring ethical problems with new and advanced technology. Some of the new technology ethical dilemmas, a forced choice between bad alternatives, will be included in: **Bioethics, Neuroethics, and Roboethics.** Each of the underlying technologies involves science and engineering, but each also requires a philosophy of life and ethics.

The Baby Business

In her book, *The Baby Business-How Money, Science, and Politics Drive the Commerce of Conception,* Harvard Professor Debra Spar, describes a scene of children on a playground. Two girls are swinging and two boys are playing on monkey bars. However, the two girls are twins with one half Vietnamese and the other Caucasian. One of the boys on the monkey bars was saved by his brother's bone marrow transplant. He was conceived specifically to save his brother. Others on the playground have no genetic traits of their parents and have come from, Russia, Guatemala, Vietnam, China, and other countries allowing adoption. You might also see children who were cured from cystic fibrosis or a replica of a lost child.[83]

The children just described are not future children. In the U.S. 41,000 children in 2001 were created as test tube babies (in vitro fertilization). Some 6,000 of those children came from donated eggs and about 600 had surrogate mothers. Americans adopted 21,616 children in 2003 from countries abroad.[84]

All of the described children were purchased and part of the baby business. The question becomes, where does the baby business go from this point forward? What type of baby are you willing to buy? There are high-tech services that will select a child's sex for you to buy. Sperm can be obtained with the donor's SAT scores, size, and characteristics. Eggs can be gathered from a woman with the

desired genetic makeup for a price between $2,500 to $50,000, although the price is going up. Right now surrogate mothers can be hired for something on the order of $60,000. (I recently saw an article indicating surrogate mothers in India receive $4000.) Or, children can be adopted from different countries for a range in price depending on the country.[85]

In the free market everything has a price. Our children, our most precious pieces of humanity, can be bought and made. As Professor Spar warns, "because *no* one wants to define baby-making as a business, and because the endeavor touches deeply on the toughest of moral dilemmas, many governments around the world have either ignored the trade in children or simply prohibited it…the demand for children is so deep, so intense, that many people will do literally anything to fulfill it."[86]

As the baby business emerges, difficult ethical and moral issues will be thrust upon us in the global society of the 21st Century. Truly, these societal issues are global and require global solutions.

BIOETHICS

Bioethics is an offshoot of medical ethics to be used as further scientific findings become more advanced. Bioethics helps determine what is acceptable, distinguishing right from wrong, in areas of genetic engineering, reproductive science, defining what constitutes brain death, "designer babies," cloning, and other technological areas past traditional medical areas.[87]

A starting point in bioethics begins with life and ends with death, but in between there are large ethical debates.

Starting with when life begins, the ethical question becomes when should society confer moral and/or legal status on an embryo? In other words, should we call an embryo or a fetus one of us? Prior to an egg and sperm uniting, there is no life as an individual. Once the egg is fertilized we have the beginning of life in a separate individual. However, is it right to attribute the same moral and/or legal status to that human embryo as to a new born baby, or for that matter, you or me?[88]

The implications of these relatively simple questions are enormous. The beginning of moral and/or legal status of an embryo affects abortion policy, in vitro fertilization, biomedical cloning, stem cell research, "designer babies," and other

ethical dilemmas faced by society. Moreover, there are global consequences as societies decide bioethical dilemmas.[89] For example, Mexico recently approved some form of abortion. Abortions could have an affect on Mexico's replacement population, causing their population to become older. This shift toward an older population could have economic consequences as the older population requires care and there are less younger workers to offset that care.

Moreover, by allowing an abortion policy, has a society placed a lesser value on human life? Will that value carry over psychologically and philosophically to that society? If abortion is an ethical and/or legal policy; how about euthanasia? Logically, if a society accepts abortion at the beginning of life; voluntary or, perhaps, involuntary euthanasia, might conclude life. That society could very well shift the beginning and end of life of its society justifying its behavior on cost of care.

Ethical dilemmas, such as these, can have far reaching implications.

Designer Babies

The *Oxford English Dictionary* defines "designer baby" as "a baby whose genetic makeup has been artificially selected by genetic engineering combined with in vitro fertilization to ensure the presence or absence of particular genes or characteristics."

Recent advances in genetics make "designer babies" possible. Society must ask itself what moral or ethical limits should apply to the selection of our children's genes and characteristics.

We, individually, and society must ask ourselves: (1) How will "designer babies" be made? (2) The moral or ethical difference distinguishing between using genetic technology to prevent disease or simply to enhance human capabilities, i.e., bigger, smarter, faster? (3) Should we protect society from genetic enhancement with ethical boundaries? (4) What is the longer term effect on society with "designer babies"?[90]

Already, mouse brains have been enhanced by introducing an additional NR2B gene into mouse genomes that allows the mouse to learn faster than contemporary mice and retain information longer. The NR2B gene exists in humans and, thus, could allow humans to be enhanced, similar to enhanced mice. More study is

required to examine safety concerns in humans, but the ethical concerns remain unresolved.[91]

In 2007, the U.S. Food and Drug Administration (FDA) investigated the Abraham Center of Life embryo bank located in a house in San Antonio, Texas. The center sells customized embryos for $5,000 a pair. Customers choose embryos after reviewing the donors' characteristics, educational background, and in some cases, photographs. A spokesperson for the center claimed, "anyone off the street can walk into a clinic and do exactly what I am doing. They can hire an egg donor, they can hire a sperm donor, and they can create embryos." It is unclear exactly what laws and regulations were triggering the FDA investigation.[92] Unregulated embryo sales portend a dangerous warning both ethically and legally.

Clones

Cloning is another method of selecting a child's characteristics. Cloning consists of a somatic or body cell from the person to be cloned. The nucleus of this cell is introduced into an egg cell whose own nucleus has been removed and the reconstructed embryo is introduced into a womb.[93]

At present, there are major concerns about the health of clones. Animal clones suffer from an incomplete reprogramming of somatic cell DNA or other damage that can lead to a lessened life span.[94]

Again, assuming a safe cloning process, there is an ethical question distinguishing between therapeutic and life savings as opposed to cloning for enhancement or competitive advantage. Moreover, it is difficult to draw a bright line between therapy and enhancement.

Perhaps the greatest concern is that genetically modified, designer babies or clones, could lead to a superior or superhuman race.

Nazi Racial Hygiene or Nazi Eugenics

The Nuremberg, Buchenwald, and other Nazi war crime trials provide evidence of the involvement of doctors and scientists in a massive extermination of "lives not worth living," (*Lebensunwertes Leben)* including infants with heritable defects, handicapped children and patients of psychiatric institutions, and, ultimately, populations of "unwanted races."[95]

The Nazi eugenics programs included euthanasia and the passage of the 1933 Sterilization Law. Interestingly, the Nazi Sterilization Law of 1933 was modeled after similar laws in the United States.

The Nazi eugenics programs became social policies that espoused relative ethics and utilitarian (greatest good for the largest number) ethics to justify their position. Biology and science were used as tools on behalf of the Nazi social programs. Professor Joachim Mrugousky, an editor of a popular book on medical ethics, was sentenced to death for his orders regarding terminal typhus experiments on prisoners at Buchenwald.[96] Obviously, Professor Mrugousky was not practicing the medical ethics he wrote about in his books.

"Designer Babies" and cloning have the same potential to select humans and their traits with the same end goal that the Nazi doctors were trying to achieve. The horrors of the Holocaust, and human experimental facilities like Auschwitz, where "selected" people were subject to experimentation and/or eliminated, may take place in "test tubes" with similar intended results.[97]

Technology must be humanized and the ***Technology Triangle*** carefully applied to balance technology with individual/liberty versus society and integrated technology. "Designer Babies" and cloning are but two examples of bioethics that we, as a global society, must confront immediately.

NEUROETHICS

Neuroethics is a relatively new area of ethics. It examines the ethics, right and wrong, of the treatment of or enhancement of, the human brain. Neuroethics examines the social issues of disease, normality, mortality, and lifestyle relating to brain mechanisms. Neuroethics places personal responsibility in the social and biological context in a effort to achieve a brain based philosophy of life. A goal of neuroethics is to use what humans know about how our brains work and better define what it is to be human and how we can and should interact socially.[98] The human brain is one of the last frontiers we face in understanding ourselves.

Global neuroethics is required because of the advancement of neuro or brain technology by researchers around the world. Neurotechnology describes the tools used in the rush to develop the neurosciences. This new neurotechnology is abbreviated NBIC for *Nano-Bio-Info-Cogno.*

Zack Lynch has a vision for neurotechnology. He is executive director of Neurotechnology Industrial Organization (NIO), managing director of NeuroInsights, and serves on the advisory boards of the McGovern Institute of Brain Research at MIT, the Center for Neuroeconomic Studies, and SocialText, a social software company. Lynch is a social forecaster concerning the impact of neurotechnology on business, government, and society.

Zack Lynch's NBIC 2003 Conference paper describes that the industrial revolution has had a consistent pattern of 50 year waves of techno-economic change. He contends we are nearing the end of the fifth wave of "information technology diffusion." Lynch opines we are emerging into the sixth wave across the NBIC (nano-bio-info-cogno) technology. This sixth wave of neruotechnology seeks to enhance human performance of the brain.[99]

Zack Lynch recognizes, "Society shapes and is shaped by advancing technology."[100] Most assuredly, the ***Technology Triangle*** previously discussed is appropriate for the discussion because the NBIC technology must achieve a balance between the technology, society, and most importantly, individual/liberty. As we shall conclude, the NBIC technology starts with individual/liberty and crosses that gray area into society and its implications. Unfortunately, our ethical decisions will be pushed faster by the rapid progress of the NBIC techno-economic wave.

According to Lynch, biochips and brain imaging techniques are accelerating the neurotechnology wave. Biochips will perform basic bio-analysis and functions similar to microprocessors for data and function (like microprocessors in today's cars). Combining biochips and brain neuro-imaging will advance neurotech with tools that will influence the brain. Thus, neurotech can be used to enhance human emotional, cognitive, and sensory system performance.[101]

As Lynch points out, the techno-economic waves can have widespread effects on the economy and society. Low cost biochips and neuroimaging will produce new product sectors in the economy. Low cost product sectors drive economies and societies. As we have seen in the past, economics and society have progressed from using canals and boats, to coal and steam engines, to electricity, oil, and, now, microchips to biochips. These progressions have combined with other technologies to open up other sectors in economics and society. Following the progression came railroads, electric products of all sorts, automobiles, now computers, and ahead, bio-education.[102]

Technology waves increase productivity and create investment and profit opportunities. We have just witnessed the "dot com" investment and profit cycle which has stabilized to some extent. The neurotech wave will restructure major portions of the global economies. For example, biochips and neuroimaging will provide genetic and neural organizational information allowing neuroceuticals (pharmaceuticals for the brain) and/or electrical stimuli to influence and enhance human emotional, cognitive, and sensory capabilities. Engineers could be stimulated to think like lawyers and visa-versa.[103]

Since personal innovation is a complex mental process with a combination of cognitive assessment and emotional states combining to create new knowledge, neuroceuticals and/or brain stimulation will allow more productivity and creativity providing a biocompetitive advantage. New infrastructure, both tangible and intangible will take place from capital investment. Tangible infrastructure comes from the manufacture and distribution of neurotechnology. Intangible infrastructure will come in the form of education and training, management, and legal and political standards regionally, nationally, and globally.[104]

Zach Lynch predicts neurotech will lead to "substantial economic, political, and social change," as well as "create new industries, reinvigorate others, develop new forms of social and political organization, and make possible different modes of artistic expression." Lynch claims neurotechnology will create a whole new type of human society, "a neurosociety."[105]

Ethical Implications of Neurotechnology and Neurosociety

Society will certainly be faced with ethical issues arising out of the new neurotechnology and neurosociety in the very near future. Issues we, as individuals, and as a global society must resolve are:

1. What are the implications of people using neuroceuticals ("smart drugs" or "brain steroids") or electrical stimuli to pass competitive exams?
2. What affect should the neurosciences have on our sense of individual responsibility? What is legal? What is ethical?
3. If criminal predisposition if identified by brain imaging, should preventative steps be taken in advance of anyone actually committing a crime? If so, who should decide? Or, what should society do to protect itself from those with criminal tendencies?
4. What are the boundaries between brain therapy, which most would agree is good for society, and brain enhancement, which would add a competitive advantage in society?

5. Should neuroscience aid in the individual pursuit of happiness?
6. Should governments, nationally and globally, impose laws and regulations on areas of neurotechnology and the neurosociety or should the free market determine the outcome?

These ethical and legal issues are general questions individuals and societies must answer. And, as shown below, these ethical and legal issues must be answered rather quickly.

Electrical Brain Stimulation and Neuroceuticals

Significant progress in electrical brain stimulation has been made since Michael Crichton wrote his thriller, *The Terminal Man*, in the 1970's and later made into a movie. In *The Terminal Man,* electrical stimulation was used to help control seizures caused by epilepsy and was based on actual research at the time.

Today, one of the companies involved in electrical stimulation is NeuroPace, Inc. NeuroPace's product, the Responsive Neurostimulator or RNS system detects abnormal electrical activity in the brain and delivers small amounts of electrical stimulation to suppress epileptic seizures before the seizure symptoms appear. The NeuroPace RNS system is still an investigational device under U.S. law.[106]

Typically, the RNS would be placed inside the skull and underneath the scalp. Electrodes would be placed in the brain where the seizure activity develops. A monitor in the RNS senses the activity from the electrodes, identifies the signature activity at the start of a seizure, and provides a mild electrical stimulation to suppress the seizure. Clinical research has shown electrical stimulation can stop seizure activity.[107] An implanted RNS is shown in Figure 2 below.

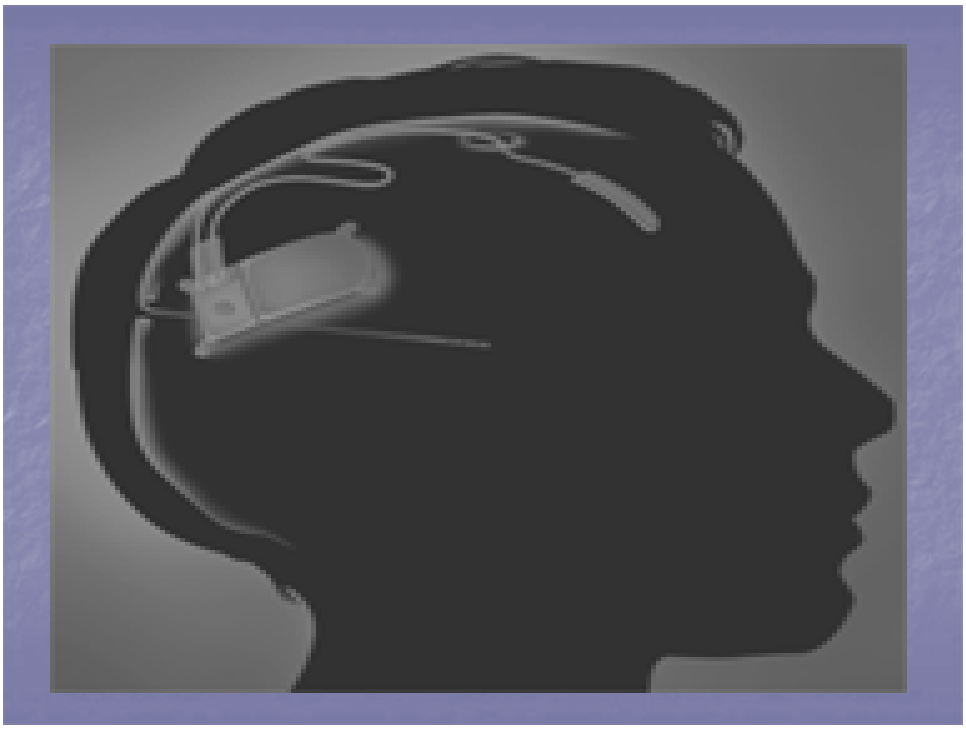

Figure 2 Implanted RNS

Aside from electrical stimulation for seizure prevention, neuroscientists have found that laughter can be induced by electrical stimulation. There appears to be a humor processing circuit or a pleasure pathway in the brain. Laughter can be induced by electrical stimulation to the deep center of the brain, the subthalamic nucleus. Laughter can also be invoked from the cortical areas closer to the brain surface by electrical stimulation.[108]

Behavioral research shows that laughter disarms people, creates a bridge between them, and facilitates amicable behavior.[109] There is an old lawyer saying, "laughing juries, don't convict."

As the field progresses, electrical stimulation of the brain will expand to other brain functions and control other aspects of the brain.

Neuroceuticals

Neuroceuticals can be thought of as tools and will expand the psychopharmacy we have today. Psychopharmacy started becoming prominent in the 1990s when Prozac and similar drugs were introduced. This class of drugs is used to relieve depression by raising the level of serotonin in the synapse between the neurons in

the brain. These drugs affect the neurotransmitters or chemical messengers of the brain. Prozac and its group of drugs are accepted and widely used today. The drugs used today are largely therapeutic and used to correct defects or disease.[110,111]

However, on the near horizon are enhancement neuroceuticals. Enhancement neuroceuticals would improve normal functioning brains. Enhancement by itself is not inherently bad. Brain enhancement is achieved today by education, training, and improvement of mental skills in concentration, memory, and critical thinking. Coffee and caffeine are used to improve alertness routinely. This type of brain enhancement is taken for granted and does not present individual or societal ethical problems for the most part.[112]

The future generation of neuroceuticals may be scary; and, ethically challenge society, because these drugs will have the capacity to influence our moods and behavior. By modifying behavior, these neuroceuticals create a potential for increased human productivity, political stability, and ecological balance. Unfortunately, we must realize this new technology has the potential to be used for mind control, coercive truth detection, or to erase memories rather than enhance memories. In other words, instead of being free thinkers, the future generations of neuroceuticals could cause us to be controlled thinkers and doers.[113]

How close are we coming to these new neuroceuticals? An example of how far we have come is Modafinil. Modafinil is sold as Provigil and was originally developed to treat narcolepsy, an irresistible urge to fall asleep. Modafinil used with healthy people can keep them awake for 54 hours without any significant drop off in performance. In some occupations, Modafinil could be used for a competitive advantage.[114]

The point relating to neuroceuticals becomes, if we allow ourselves to be doped up machines, altered by drugs, where do our traditional concepts and values, such as free will and responsibility, belong? When “personality pills” become the norm, will we be interpreting our experiences and lives in chemical terms instead of human interpersonal experiences and lives? Will we become slaves or masters of the neuroceutical technology?[115]

What Are You Thinking?

What are you thinking? Would you like to share it with us? Maybe, Maybe not! In the neuroscience and neurosociety of the 21st Century, your thoughts may

become shared with others. The question may be whether or not you have a choice to share your thoughts with others?

Brain Imaging

Our brains are involved in everything we do. Our brains function on an instant to instant basis relating to how we think, how we feel, how we act, and how we get along with other people, things, and animals. Initially, brain imaging was used to investigate mental disorders and difficult behaviors related to structural problems of the brain. Now, we are investigating structural and functional problems; and, we are not only brain imaging abnormalities, but also normal brains for other purposes. In the last decade, studies show that many neurological and psychiatric disorders do not relate to the brain's anatomy or structure, but to problems with how the brain functions or processes.[116]

Right now there are a host of brain imaging devices, some of which have been used for decades and some just for the last several years. The localization of function by imaging is based on the idea that the brain has distinct regions that support a particular process or function. Several of these available brain imaging techniques are identified and described below:

1. MEG-Magnetoencephalography is a noninvasive functional neuroimaging technology that measures minute changes in the magnetic fields caused by the electrical activities of neurons in the brain, with potentially high spatial and temporal resolutions. Neurons can be thought of as brain cells that are differently shaped and have different patterns of conductivity making them functionally distinct. Neurons are connected to other neurons, some close and some distant, by their dendrites and axons.
2. EEG-Electroencephography is the measurement of electrical potential of the brain. It has been long known that consciousness depends on certain frequencies of oscillation in an EEG. Flat lines indicated brain death.
3. TMS-Transcranial Magnetic Stimulation is a technology that temporarily stimulates a brain region to disrupt its function and generates a magnetic field in nearby brain tissue that produces localized electrical current.
4. PET-Positron Emission Tomography is a functional neuroimaging technique that creates images based upon the movement of radioactive material (tracer) injected into the patient. PET scans can identify parts of the brain metabolically associated with a given perceptual, motor, or cognitive function, such as, seeing faces, hand movement, or mentally reciting sentences.

5. SPECT-Single Photon Emission Computerized Tomography uses a radioactive isotope gamma emitter to study cerebral blood flow and indirectly brain activity or metabolism. A computer reconstructs 3D images of activity levels and generates a sophisticated blood flow and metabolism brain map with brain function.
6. fMRI-Functional Magnetic Resonance Imaging is a neuroimaging technique that uses standard MRI scanners to investigate changes in brain function over small increments of time. The fMRI can localize different mental processes to different parts of the brain, mapping which areas are responsible for which processes that are ongoing in the brain.
7. CAT and MRI-Computerized Axial Tomography and Magnetic Resonance Imaging, respectively, are detailed imaging techniques that capture an image of the brain's structure, principally showing damage, but not function over small time intervals.[117]

Functional brain imaging, as opposed to structural brain imaging, shows what the brain is doing over a certain time frame of seconds to minutes. All of the most common functional imaging techniques, fMRI, PET, and SPECT, are based upon the principle that brain activity causes a change in blood flow, electrical discharges (ion exchanges), and magnetic fields.[118]

I believe it is instructive to actually see some examples of brain scans, as we discuss these neuroimaging techniques Dr. David G. Amen, a psychiatrist and imaging specialist, has provided a SPECT image gallery that includes brain scan examples of a murderer, toxic work exposure, temporal lobe cyst, head trauma and drug abuse, encephalitis, cerebellar tumor, alcohol abuse, worried brain, as well as a healthy brain example. The Amen Clinic Brain SPECT Gallery is on the BrainPlace website http://amenclinics.com/bp/spect_rotations/ .

Another brain scan example is of Functional Magnetic Resonance Imaging associated with research by Professor Scott Huettel, Ph.D. at Duke University. Dr. Huettel focuses on brain mechanisms underlying executive control, with emphasis on areas responsible for economic and social decision making. He uses fMRI to probe changes in brain activation associated with decision making, integrating fMRI activation measures with behavioral and psychometric data. His research seeks to understand the functions supported by the prefrontal cortex and the ways prefrontal regions contribute to individual decision making. Ongoing studies evaluate whether there are distinct forms of uncertainty whose resolution is mediated by different brain systems. These studies look at how certainty, risk, and

ambiguity differentially influence decision processes and how changes in probability of events influence brain systems for decision making.[119]

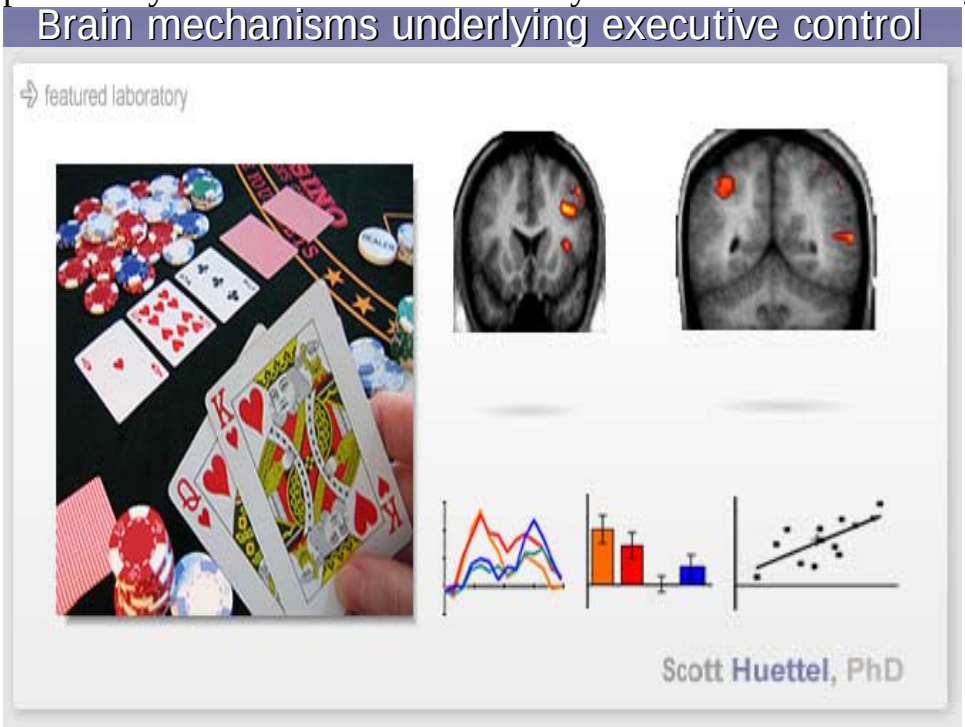

Figure 3 Executive Control

Dr. Huettel's fMRI scan correlates executive control decision making with brain processes in Figure 3.

Brain Scans to Read Your Mind

At Berlin's Berstein Center for Computational Neuroscience an interesting experiment took place. Volunteers were placed in an MRI machine and asked to decide whether to add or subtract two numbers then choosing which of two buttons to press. The volunteers were not aware that in the next room researchers were trying to read their minds by using fMRI scans to predict what their intentions were *before* the volunteers acted on their decisions. Researchers claim this was the first time neuroscientists were able to identify people's decisions about how they would later do a high-level mental activity, such as adding versus subtracting.[120]

In another experiment, volunteers were instructed to add or subtract two numbers a few seconds before the numbers were flashed on a screen. Prior to the person's decision, a computer scanned images and predicted their decision. One brain scan image predicted addition and another image predicted subtraction.[121]

These experiments were lead by Dr. John-Dylan Haynes at the German Bernstein Center. Dr. Haynes asserts that his research has already progressed from identifying the regions of the brain where certain thoughts occur, to identifying the very content of those thoughts. These new technologies claim that for the first time, neuroscientists have a real possibility of going straight to the source to determine what someone is thinking or feeling without that person having an ability to prevent that determination.[122]

John-Dylan Haynes, recognized as a top researcher, is decoding mental states from human brain activity and predicting a person's thoughts based on functional magnetic resonance imaging data. This "brain reading" can reveal how information is neurally encoded in the brain. The underlying theory contends it is only possible to decode a thought if one knows the correct code. Potential applications for Haynes' research included deception detection, thought control of computers and artificial prostheses, or market research.[123]

Another Haynes mind project, determines attention, awareness, and functional brain connectivity where the relationship between consciousness, attention, and dynamic changes in brain connectivity are investigated. He has demonstrated an increased connectivity between early and late visual areas when subjects become aware of stimuli. These studies of connectivity reveal how remote brain areas cooperate in mediating awareness and attention.[124]

Brain Fingerprinting

Although no court has as yet allowed Brain Fingerprinting (BF) into evidence in criminal cases, at least two courts have consider it.[125]

Brain Fingerprinting uses Electroencephography (EEG) to record event related potentials induced by stimuli. An EEG is recording a subject's brain wave activity when the subject is introduced to words, phrases, or pictures. An investigator uses information only the subject would know. The brain wave pattern is uneventful if the subject lacks knowledge of the information. However, if the subject does have knowledge of the information and tries to deceive or lie, a specific brain wave, identified as P300, is active.[126]

Brain Fingerprinting still has several issues as to its accuracy, including a requirement of sufficient information from an investigation. Unquestionably, BF will be researched further and will likely be combined with other neuroscience techniques. Sensory input from memory centers of the brain will be developed

with fMRI scans. Although requiring radioactive isotope injections, SPECT and PET scans could be helpful to enhance lie detection techniques. Theoretically, the day will come when chemical and electrical properties in specific areas of the brain allow downloading to a computer of information stored in the brain.[127]

Neuroscience research is providing information about our personality, intelligence, emotional capacity and has the potential to influence every dimension of our society, and the global societies of the 21st Century.

Potential Neuroethical Abuses

Our major social institutions, globally, from schools and courts to the workplace and healthcare systems, are targets for tests derived from the neurosciences. Tests provide an assessment of the costs associated with the inclusion or exclusion of people into a particular system. A classic example is the SAT exam to get into the college of your choice.

Aside from other biological tests, such as DNA, neuroscience has the possibility to have the greatest influence on society. Neuroscience uses diagnostic methods that are determining what is actually happening in the brain with greater and greater accuracy. SPECT, fMRI, and PET scans are seen as direct reflections of brain activities and deficits. Previously, tests such as IQ tests were only crude approximations of intelligence, but the new neuroscience tests provide direct examination into the inner reaches of the brain. Importantly, this new science will have greater credibility than what preceded it.[128]

Currently, brain scans may reveal, without our consent or knowledge, hidden things about who we are and what we think or do. The logical, and key question, is ***who*** should be allowed to scan our brains? Should we allow schools to assess our brains? How about employers? State and Federal governments would love to know what each of us is thinking, should government be allowed into our minds?

When our thoughts, feelings, desires, values, emotions and other individual human characteristics are available for review to schools, employers, and governments, what individual privacy rights do we possess? Should governments, for example, allow brain enhancement for its citizens? Where do we draw the line for society creating a superior workforce through brain enhancement without our effective consent? As we have seen with Nazi eugenics, should successful brain enhancement create a superior group within society that could politically and financially dominate the remaining groups (almost a caste system)?[129]

Obviously, the **Technology Triangle**, technology, society, and individual/liberty must be balanced for neuroscience in the 21st Century. However, we need to act now before it is too late. William Saleton authored an article in *Slate,* "Today, the Neurotechnology Industry Organization is lobbying for a federal initiative to study ethics as well as the mechanics of brain science. 'Right now, we're discovering the seat of morality,' warns NIO President Zack Lynch. 'In 10 to 15 years, we'll have the technologies to manipulate it.'…But there's the other catch: Once technology manipulates ethics, ethics can no longer judge technology. Nor can human nature discredit the mentality that shapes human nature. In a utilitarian world (greatest good for greatest number), what's neurologically fit is utilitarianism. It'll become the norm, the standard of right and wrong."[130] Possibly, the manipulated ethics could be as bad as the Nazi's utilitarian ethics.

Dr. Richard Restak is a noted neurologist, neuropsychiatrist, and author. Dr Restak argues our best chance for resisting manipulation is to learn as much as possible about the emerging social applications of brain science. He challenges us to employ new neuroscience to advance human freedom within the neurosociety and not to allow irresponsible people to use neuroscience that is not in ours and society's best interests. Dr. Restak implores us to learn "as much as we can" about the social applications of emerging brain science, and "be in a position to resist manipulation by ads, pop culture, political spin, movies, and television."[131]

Today, the choice is ours. If we wait to become engaged, we may have waived our chance to think.

ROBOETHICS

Isaac Asimov's 1950 classic science fiction thriller, *I,Robot,* portends, "We had a long discussion at the time we bought Robbie (the robot) about the First Law of Robotics. You *know* that it is impossible for a robot to harm a human being; that long before enough can go wrong to alter that First Law, a robot would be completely inoperable. It's a mathematical impossibility…"[132]

Isaac Asimov developed an ethics code for his fictional robots in *I, Robot:*

I, Robot
By Isaac Asimov (1950)
Ethics Code

1. A robot may not injure a human being, or, through inaction, allow a human being to come to harm.
2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

Almost prophetically, the synopsis for *I, Robot*, describes, "the scientists who invented the earliest robots weren't content that their creations should remain programmed helpers, companions, and semisentient worker-machines. And soon the robots themselves, aware of their own intelligence, power, and *humanity*, aren't either….Here human men and women confront robots gone mad, telepathic robots, robot politicians, and vast robotic intelligences that may already secretly control the world. And both are asking the same questions: What is human? And is humanity obsolete?"

Does *I, Robot* sound far fetched? Maybe not.

Roboethics determines what is acceptable, right versus wrong, in areas of robotic engineering and man-machine interfaces.

RoboCup

As I write this course, my Alma Mater, Georgia Tech, is hosting **RoboCup 2007** in Atlanta. There are 197 senior teams from 26 countries and 124 junior teams from 19 countries registered at the event. RoboCup is an international joint project to promote artificial intelligence, robotics, and related fields. RoboCup chose three major themes: (1) the soccer game as a central topic for research; (2) rescue robots, RoboCupRescue; and, (3) robotic applications to assist humans in everyday life, RoboCup@Home. (This is the first year for nanotechnology robot demonstration teams.)[133]

RoboCup@Home focuses on real world applications for human-machine interfaced autonomous robots. These robots are designed to assist humans in everyday life. RoboCupRescue includes competitions for real and simulated events pertaining to disasters. These robots explore a simulated disaster site with mannequins located in rubble and other situations and provide sufficient information for human rescuers to safely perform a rescue. RoboCup, centered on soccer, uses robot teams that actually play in a soccer game. The soccer teams are divided into leagues based on robot characteristics such as size, simulation, and shapes. The goal for the humanoid robots is to be able to win against a **human world soccer championship team** by 2050.[134] Place your bets now!!

Deep Blue—Man versus Machine

In 1997, Garry Kasparov was the greatest chess player in the world. Most people regard chess as an intellectual game requiring an intelligent person with skill. IBM had been developing a computer for chess for several years. In 1997, the world's greatest chess player, the man, met the IBM computer named "Deep Blue" for a series of chess matches. Man has challenged machine on numerous occasions before, but this match required "thinking." Could this machine, Deep Blue, outsmart a human, much less than the greatest chess player in the world?[135]

Deep Blue was capable of processing 200 million chess positions per second. Garry Kasparov was excellent at three or four hundred positions per second. Kasparov was subject to physical stress and emotion during a match, Deep Blue was not. At the end of the match, in 1997, Deep Blue had beaten the human chess master. The machine had beaten the greatest human chess player in the world.[136]

If we regard Kasparov as a skilled and intelligent being, how do we regard Deep Blue? Can machines become smarter and faster than humans? Can machines think for themselves?

Brain-Computer Interfaces

Researchers at the University of Washington's Laboratory for Neural Systems have developed a two foot tall humanoid robot named Morpheus, shown in Figure 4.

Figure 4 Morpheus from University of Washington

The interesting thing about Morpheus is that the robot is controlled with brain waves. Morpheus can be controlled by thought alone. To control Morpheus, a person puts on a cap containing 32 electrodes and watches a tv screen displaying images from Morpheus' two camera eyes. The cap collects EEG data and transmits the data through a machine learning algorithm. The algorithm interfaces between the person's thought patterns and commands in about a five to ten minute training process to coordinate the EEG with Morpheus' movements. Morpheus can walk to a certain location or pick up Styrofoam blocks.[137]

Noninvasive brain-computer interface (BCI) has been developing since the 1970s. Right now the time lag between human concentration and robot action is five to ten seconds. Researchers are trying to shrink the lag time to instantaneous thought, something like just straightening out your arm.

The interesting development in brain-computer interface is the almost seamless combination of the brain to machine interface. It does not take too much imagination to think of brain controlled fighter jets, tanks, or other military equipment.

Computer Brain Simulation

From the IBM Almaden Research Laboratory and University of Nevada, scientists ran a "cortical simulator" as large and complex as half a mouse brain. The "half a mouse brain" was run on the BlueGene L supercomputer with 4,096 processors and 256 MB memory each.[138]

"Half a mouse brain" has roughly eight million neurons and 8,000 synapses or connections with other nerve fibers. Using the BlueGene L, researchers were able to create half a virtual mouse brain with eight million neurons and up to 6,300 synapses. The complexity of the simulation required run speeds of ten seconds as opposed to a real mouse brain equivalent of one second. In other words, the simulation was ten times slower than an actual "half mouse brain."[139]

Researchers claim that on smaller simulations they observed "biologically consistent dynamic properties" emerge as the nerve impulses traveled through the virtual brain cortex. Importantly, researchers assert they have observed characteristics of thought patterns seen in real mouse brains.[140]

From BlueGene L to BlueGene P Supercomputer

The BlueGene L supercomputer sustained a world record speed of 280.6 teraFLOPS with a peak speed of 360 teraFLOPS making it the fastest computer in the world. Floating Point Operations Per Second or FLOPS measures a computer's performance in floating point calculations, similar to instructions per second. One teraflops equals 1×10^{12} FLOPS and 1 petraFLOPS equals 1×10^{15} FLOPS or 1 quadrillion operations per second. BlueGene is an IBM project supercomputer used in applications such as understanding biological processes and the Stockpile Stewardship Program. The Stockpile Stewardship Program is part of the U.S. Department of Energy's National Nuclear Security Administration. BlueGene L is used to run molecular dynamics programs at extreme speeds to solve material aging issues confronting the Stockpile Stewardship Program.[141]

BlueGene L starts with two commercial IBM Power PC 440 processors on a chip and scales up to a supercomputer system that was the fastest in the world, as shown in Figure 5.[142]

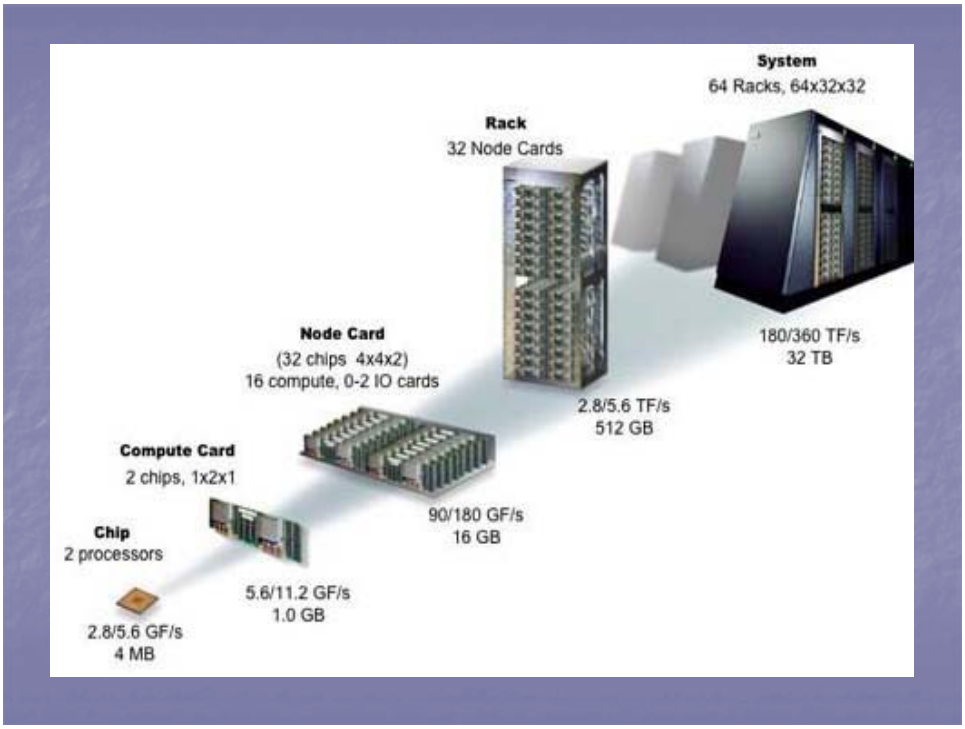

Figure 5 BlueGene L scale up to supercomputer

BlueGene L uses a three-dimensional torus network in which the red ball, nodes, are connected to their six neighbors. The ends of the mesh loop back eliminating a mesh with edges problems, as shown in Figure 6[143].

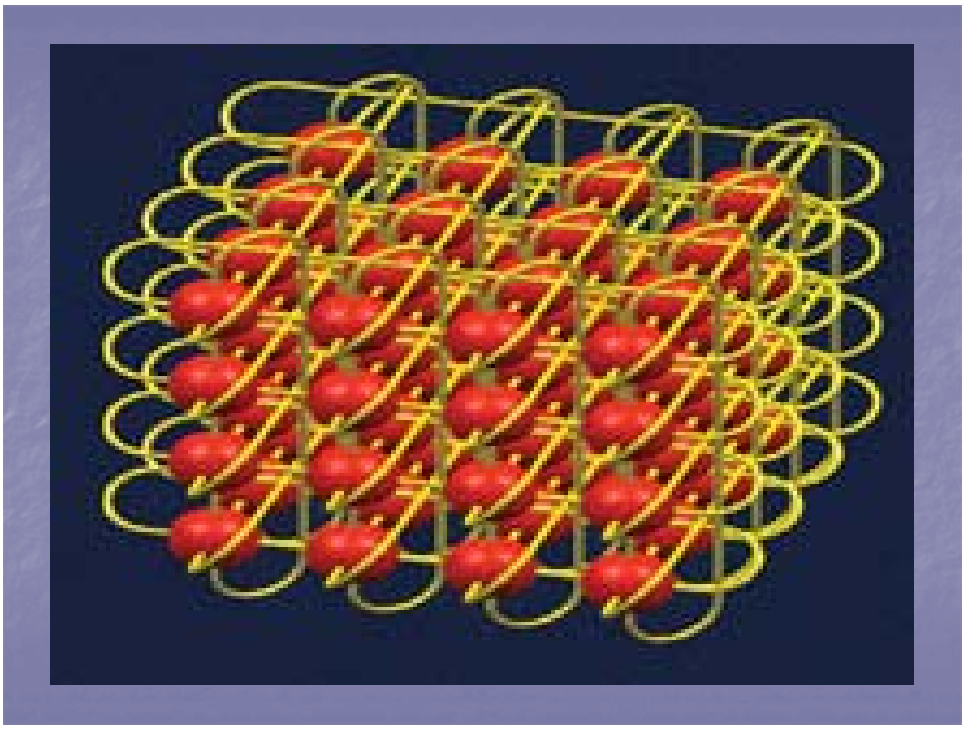

Figure 6 BlueGene L 3-D network

As if all records were meant to fall, BlueGene L's world's fastest computer, at 360 teraFLOPS, record has fallen. In June 2007, IBM announced a next generation of BlueGene, called BlueGene P, designed to operate continuously at speeds of one petraFLOPS with obtainable speeds in excess of three petraFLOPS or three quadrillion operations per second.

With these phenomenal speeds, it won't be long before researchers are simulating full mouse brains on a quest to simulate the human brain.

Robots for Good

Ever since man first discovered machines to do his work, there has been a search for better machines to do more work. From simple machines, lever and wedge, man progressed to better and better machines. Now, machines are made to make life easier; and, machines are made to kill, robots included.

Bomb Detecting Robots

As the Iraq war enters its fifth year, the U.S. government has stepped up spending on military robots. Now there are about 5,000 robots in Iraq and Afghanistan, which is up from 150 in 2004. Seventy percent of U.S. casualties in Iraq are caused by roadside bombs. The military has started using bomb or explosive sniffing robots to detect bombs and protect soldiers.[144]

Protecting soldiers' lives is what these robots are all about. One type of bomb sniffing robots uses an iRobot Corp. Packbot platform with ICx Technologies explosive detection technology. It has a seven foot arm that allows the robot to place the explosive sensor close to suspicious objects, under vehicles, and through vehicle windows. The robot has the ability to destroy explosives while soldiers remain at a safe distance. Figure 7 shows the iRobot being checked.[145]

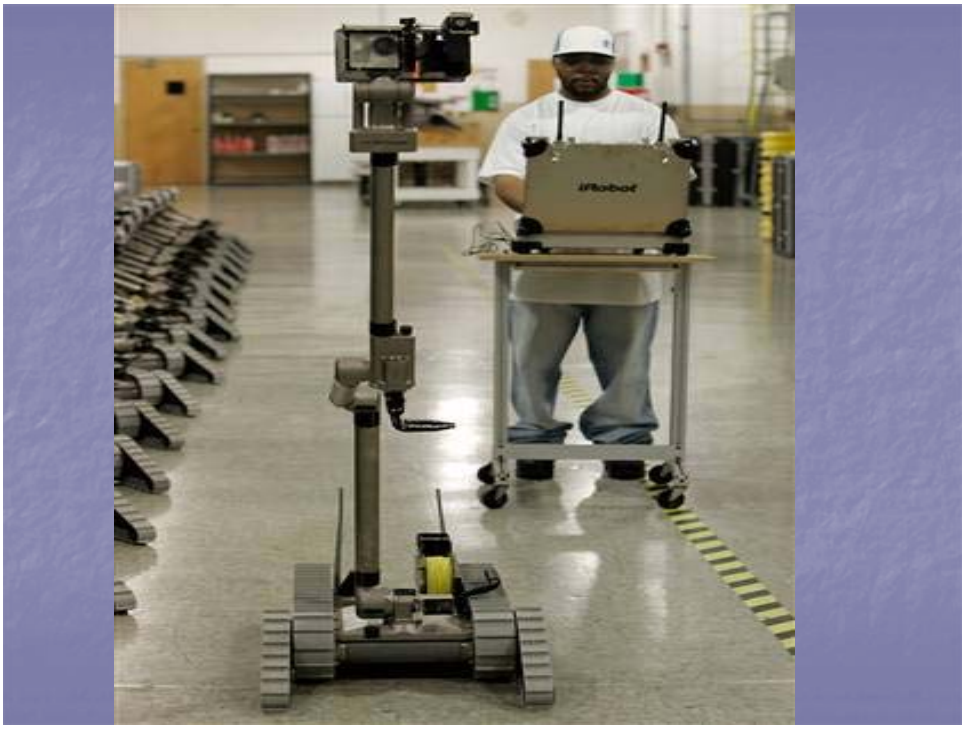

Figure 7 Bomb Sniffing iRobot

Obviously, protecting lives is a good use for this robot.

Dr. Robot

More and more robots are being used by and for doctors. One interesting use doctors discovered is a videoconferencing robot. These videoconferencing robots check the doctor's patients when the doctor is miles away from the hospital. One such robot is used at Baltimore's Sinai Hospital. The robot has cameras, screen, and microphone where the doctor talks to the patient just as if s/he were present. The robot has a joystick control and allows the robot to be controlled from anywhere in the world allowing communication between the doctor and patient.[146]

Moreover, across town at Johns Hopkins, a similar robot can teleconference and translate languages so doctor and patient are communicating in the same language. Further, studies are showing patients with robotic doctor visits have shorter hospital stays. A "doctor robot" is shown in Figure 8.

Figure 8 Dr. Robot

Needless to say, the good use of these "doctor robots" is on the increase.

Hospital Robots

The BBC News reports that a fleet of robots to transport linen, waste and equipment in a new hospital at Larbert in Stirlingshire will be the first in the United Kingdom. The robots will be separated from patients by a separate network of corridors and use magnetic strips or infra red to find their way. The robot technology already exists in car plants and hospitals in France and Japan. The architect claims material in a hospital have to get to the right place at the right time and dirty materials, linens and equipment present logistical problems in large hospitals. Robots can do certain tasks more efficiently than humans can manually.[147]

Many other uses for good are being served and will be served in the future as the robotics field progresses into the future. Unfortunately, not all uses of robots are for good.

Robots for Not-So-Good

Isaac Asimov's *I,Robot's* first law, "A robot may not injure a human being…," seems to be broken by Samsung Techwin Co.'s Sentry Robot.

Guard Robot

South Korea has a draft army of 650,000 against North Korea's 1.2 million person military. A falling birth rate in South Korea means it will be difficult in the future to maintain a military at half the strength of North Korea. Ergo, South Korea's need to replace soldiers with technology, i.e. robots.[148]

Samsung Techwin Co. and Korea University developed the "Intelligent Surveillance and Security Guard Robot" for the South Korean government. These robots have surveillance, tracking, firing, and voice recognition capabilities. The robots also have the capability to track and distinguish humans from other objects at distances of two kilometers during the day and one kilometer at night. Once a human is tracked and distinguished the robot provides deadly suppressive fire with a machine gun. Figure 9 shows the weapon carrying robot.[149]

Figure 9 Samsung Guard Robot

The ideal use for South Korea is to use the robots along the 155 mile demilitarized zone dividing North and South Korea, along the coastline, military airfields, and possibly oil pipelines and power plants. A sobering video of these guard robots in action is linked at http://robots.pandemonium.de/2006/11/15/ (accessed 7/16/07).

Unfortunately, without too much imagination, North Korea will test the robots with decoys and then later with armed robots of their own. A robot standoff or fight could easily be predicted for the DMZ between the Koreas.

Bionic Hornet Robots

The Summer 2006 Israeli war against Hezbollah in Lebanon did not go well for Israel. Israeli soldiers found themselves fighting in towns with narrow streets and alleyways. Tanks were ineffective in tight places and fighting became hand to hand, building by building, with civilians interspersed.

What is a solution to this military problem? It became apparent that small flying robots could fly down narrow streets and alleyways. To solve this problem Israel will invest $230 million in nanotechnology to develop the "Bionic Hornet." The "Bionic Hornet will be the size of a wasp used to chase, photograph, and kill hiding terrorists in civilian neighborhoods. This "Bionic Hornet" robot will rely on pilotless drone aircraft already in use in Iraq and Afghanistan. Prototypes for the "Bionic Hornet" should be ready in the next three years.[150]

For those of us who think the "Bionic Hornet" may be a little too science fiction, Figure 10 illustrates Harvard University's life size fly that has actually flown. The tiny "Robofly" weighs 60 milligrams and has a wing span of three centimeters. Its movements are modeled after a real fly.[151] Moreover, researchers of the Kawamaro Laboratory at Fukuoka Institute of Technology, Japan, have developed a flying robot with the characteristics of a Hawk Moth. The Hawk Moth robot has a wing span of 10 cm and a total weight of 2.3 grams. The Hawk Moth Robot actually flies. Further, Cal Tech and Cal-Berkeley have been researching "Robofly" for a number of years. The "Roboflies" could join the University of Pennsylvania, which is researching large networked robot swarm behavior.[152]

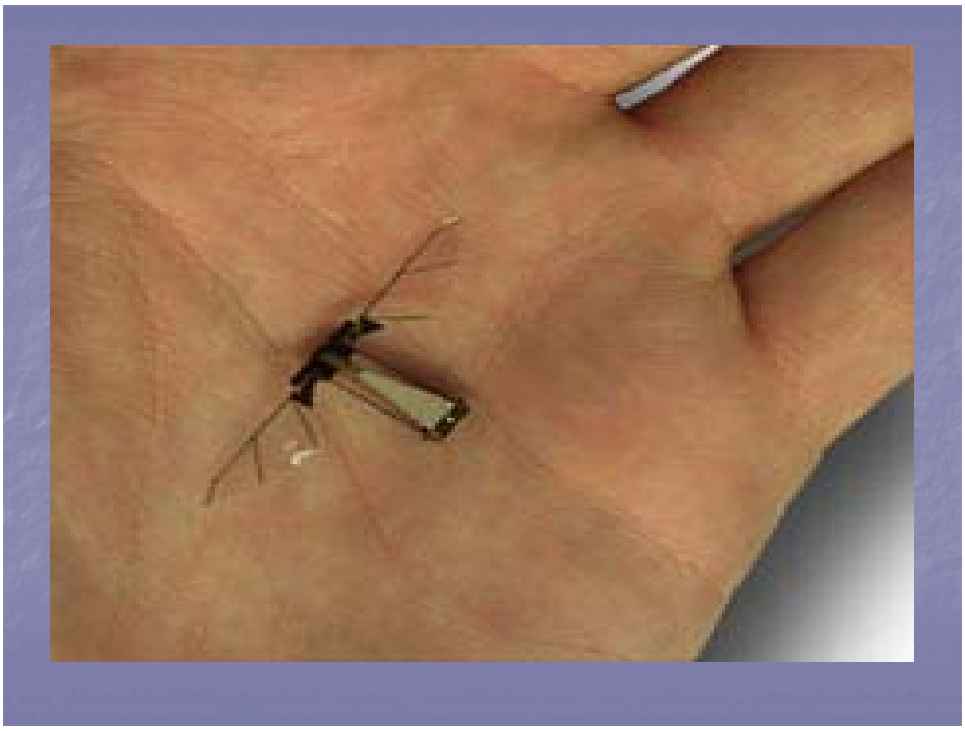

Figure 10 Harvard University's Fly Robot

Unfortunately, as the German Spiegel Online points out, insurgents and terrorists can use high technology also. Hezbollah flew a drone, pilotless aircraft, over Israeli territory in 2005. Terrorist groups are buying ultra-light aircraft and powered paragliders to escape radar detection. Thus, the escalation of high tech warfare goes on for both sides in a never ending spiral.[153]

Sobots

Sobots are software robots with personality. South Korean Professor Kim Jong-Hwan has developed a software robot in a virtual world named "Rity." Rity is a software puppy dog programmed with artificial chromosomes to create human personality traits. Rity is programmed with 14 artificial chromosomes in 1800 bytes that control 77 behaviors to come alive on a computer screen with its own emotions. At the sight of its master, Rity will lap up affection or retreat when scolded.[154]

These sobots have the ability to transfer themselves into desktop computers, PDAs, servers and robotic avatars, adapt and evolve like genetic organisms. Sobots can transfer to other robots and multiply. Sobots will become more sophisticated in the future.[155]

Professor Kim contends, "If we design the chromosomes safely, the self-producing robot will not post a threat back to us."[156] It would seem that Professor Kim's "**If**" Points squarely at the Technology Triangle required of all the robots and computers we have considered above, as well as those not considered here.

Rapidly Changing Definition of Humanity

Singularity is a future period during which the pace of technology change will be so rapid, and the impact so great, **human life** as we now know it, **will be irreversibly transformed.**[157] Our humanity will change by our technology.

In his book, *The Singularity Is Near-When Humans Transcend Biology*, Ray Kurzweil predicts by 2045 the Singularity, this profound disruption to human capability will happen.[158] Ray Kurzweil is an MIT graduate in Computer Science and Literature, but he is most famous as the principal developer of the optical character recognition (OCR) system, print to reading machine for the blind, speech recognition software, and electronic musical instrument duplication. Moreover, he is engaged in Artificial Intelligence (AI) and nanotechnology. Ray continues to be on the "cutting edge" of technology, particularly computers, brain modeling, and nanotechnology.

Kurzweil has developed a predictive outlook of what he calls "the law of accelerating returns." "The law of accelerating returns" predicts advances in technology with an exponential increase rather than a linear or arithmetical increase. The prime support for Kurzweil's technology advancements is the solidification of "Moore's Law" governing transistors per computer chip. "Moore's Law' was a prediction by Gordon Moore, co-founder of Intel, that states the number of transistors on a chip doubles approximately every two years. Moore's prediction in 1965 has held true for over 40 years and seems secure into the foreseeable future.[159]

Kurzweil takes Moore's Law further in different computer areas, such as cost per chip, and to other technologies, including nanotechnology, neurosciences, and biological sciences.[160]

In essence, Kurzweil predicts within several decades information based technologies will **exceed all human knowledge and proficiency.** This exceeded human knowledge and proficiency will include the pattern-recognition powers, problem solving skills, and emotional and moral intelligence of the human brain. Remember, Kurzweil has tremendous knowledge and insight into pattern-recognition and computer solving skills by virtue of his speech recognition software and his synthesis of musical instruments. Emotional and moral intelligence of the human brain may be a stretch for Kurzweil.[161]

I have tried to provide examples in the areas of genetic engineering, neurosciences, and robotics that are "cutting edge" technology. These examples are where society is today. It does not take too much imagination to foresee where society and business are going. How fast society and business get there, may be open to debate. However, even if Kurzweil is off by a factor of 10 or 100, there are serious personal and societal problems facing each of us. Each of the technologies is driven by money, power, or a military advantage. The basic issue of right or wrong, ethics, does not appear to be addressed in view of the rush forward.

The Future May Not Need Us

There are others who are concerned about the ethics of technology. Bill Joy, one of the founders of Sun Microsystems, has concerns about technology and ethics.

Bill Joy grew up fascinated with computers and spent most of his adult life developing computer networking systems. He was fortunate to land a job programming the early supercomputers. Attending graduate school at Cal-Berkeley, he would stay up all night "inventing new worlds inside the machines." At Sun Microsystems, Bill Joy has been instrumental in the creation of advanced microprocessor technologies and internet technologies including Java and Jini. Like Kurzweil, Bill Joy had a fascination and love of computers.[162]

Bill Joy became concerned about technology and ethics almost by accident. He and Ray Kurzweil were both speakers at a conference and met at the hotel. Kurzweil came over to him and started talking, "the subject of which haunts me to this day." Kurzweil enlightened Joy with the fact that the rate of improvement of technology was going to accelerate and we (humans) would fuse with robots. Joy was shocked by the statements. The shock was magnified because of Kurzweil's proven ability to imagine and create the future. Following their chance meeting, Kurzweil gave Joy an early preprint of his upcoming book, *The Age of Spiritual Machines*, regarding immortality and robotic technology. Kurzweil's book caused Joy further angst. Joy "felt sure he (Kurzweil) had to be understating the dangers" of accelerating technologies.[163]

Joy provides a thoughtful analysis of Kurzweil's "Singularity." He assumes Kurzweil is correct; and, intelligent machines can do things better than humans. If so, then, work will be done by organized machine systems, and no human effort is necessary. In this scenario, either of two circumstances will occur. One, machines will make their own decisions without human oversight; or, two, human control over machines will be retained.[164]

If machines make their own decisions, it will be nigh well impossible to predict how these "free thinking" machines will behave. Moreover, the complexities of life with the intelligent machines will become exceedingly complex such that no human beings will be capable of effectively controlling the situation. It will be like "revenge of the nerds" except the nerds will be machines. There will become a dependence on these "intelligent" machines, such that they can not be turned off.[165]

The other option is for humans to retain control over machines. Bill Joy sees the average man with control over private machines, like PC's today. So far, so good. Unfortunately, the control over really large capability machines will belong to a small elite group, like today, except for two distinctions. The truly elite will have ever greater control over the masses. Since machines will be doing the work humans used to do in the economy, humans could become a burden on society. If the elite is ruthless, masses or classes of humans would be eliminated, some what like the *Lebensunwertes Leben*, that the Nazis pursued. If the elite are humane, they may skip the *Lebensunwertes Leben* (lives not worth living) and use psychological or biological techniques to reduce the birth rates of the "undesireables." Perhaps, if the elite have a heart, they may act as "good shepards" for the masses and satisfy their physical and psychological needs. Regardless, life could become purposeless and not free.[166]

Bill Joy's analysis presents a bleak outlook for future technology; two choices, neither of which is good. His fear is, why aren't "people more concerned about these nightmarish scenarios?" Joy's answer, he believes, is society's attitude toward the new and a bias toward familiarity and unquestioning acceptance. We have grown accustom to scientific breakthroughs, what is one more? However, what we haven't become accustom to, is the coming together at a mature stage all, at once, of genetic engineering, neurosciences, replication and improvement of our brains, nanotechnology, and superior intelligent robots.[167]

As Bill Joy argues, the 20th Century was a century with weapons of mass destruction (WMD) consisting of nuclear, biological, and chemical weapons that required extensive raw materials, difficult techniques for fabrication and delivery, and large funding. The 21st Century has the real possibility of WMD, but also knowledge-enabled mass destruction (KMD). KMD is magnified by its ability to self-replicate or reproduce itself. Joy believes we are at the edge of evil. Technology could pass beyond nation-states to individuals of extreme evil.[168]

Bill Joy asserts, "failing to understand the consequences of our inventions while we are in the rapture of discovery and innovation seems to be a common fault of scientists and technologists; we have long been driven by the overarching desire to know that is the nature of science's quest, not stopping to notice that the progress to newer and more powerful technologies can take on a life of its own."[169]

Bill Joy argues that nanotechnology, genetics, and the tremendous power of future computers has the "opportunity to completely redesign the world, for better or worse…," but is greatly concerned it may not be for better. His concern is magnified by the fact that WMD technology required development in controlled government laboratories, whereas the future technologies have commercial uses and are being developed by corporate entities who's sole purpose is to make profits for their shareholders (with large salaries to CEOs, of course). The commercialism of these future technologies will cause future technologies to become mere corporate tools or pawns. These future technologies are being pursued with unchallenged global capitalism with its financial incentives and competitive pressures. Some of the capital, of course, comes from military spending as it advances its weaponry.[170]

Societies are being propelled into the 21st Century with "no plan, no control, and no brakes." These next few years may be the last chance to control these future technologies. Joy believes there is a basis for hope, exemplified by the biological weapons convention, chemical weapons convention, and nuclear arms agreements. These examples provided relinquishments and recognition of the threats posed. These conventions and treaties could be a basis for risks posed by our future technologies. Verifying relinquishments and compliance is always a problem, but can be dealt with. Verifying compliance requires a strong code of ethics for those in the future technology fields. Joy contends the ethics code should resemble the Hippocratic Oath that doctors take and encouragement of whistleblowers.[171]

Joy finds his new ethical basis from the Dalai Lama's book, *Ethics for the New Millennium*." The Dalai Lama asserts we should conduct our lives with love and compassion for others, with societies developing a universal responsibility and interdependency. Of course, the one universal rule for all religions and ethics is the golden rule, do to others as you would have them do to you.[172]

Beyond ethics, we need a deepened sense of personal responsibility. Many other people know about the dangers of future technology and stay silent. Lastly, Bill Joy hopes people participate in larger discussions of the issues raised and in settings not predisposed to fear or favor technology for its own sake. Our future depends on it.[173]

Ethics, Leadership, Technology: Man and Machine

Every new technology creates questions that society and individuals must address. The **Technology Triangle** requires a careful balance. Personal questions arise, will this new technology help me become the person I want to be, both personally and professionally? How will this new technology affect other members of our society and other societies? Am I my brother's keeper, and him mine? Does this new technology help our societies advance our and my ethical values?

Unfortunately, these questions exist whether we think about them or not. By not addressing these questions we will have already waived our right to vote on this new technology. I call it voting with your feet. Walking away from the problem and not becoming involved. You can not complain, when you did not vote or become involved. Moreover, politicians may duck these important questions and leave them to us to bring them out to the public. As engineers and scientists, we have a duty to protect the public.

Kurzweil and Joy have contrasting views. In the end, it is not their views that dictate our new technology, but your view and your vote. Collectively, we have votes. Leadership is influence and influence can vote. It is up to each of us to vote and to vote ethically. Voting ethically is not easy. Voting ethically requires involvement. Voting ethically requires thorough knowledge. Voting ethically requires informed decision making.

Each of us has four gigantic questions to answer for ourselves, and the time to answer is now:

1. What makes a human being a human being and a robot a robot when machines have the ability to think, have feelings, and become aware of themselves?
2. How would you act as a person if you had a robot slave and that robot slave developed feelings and awareness?
3. Where should society draw the line on the ability of robots to think, have feelings, and/or become aware of themselves?
4. What are the personal and societal implications with robots, whether bionic or mechanical?

I have my choices and you have yours. Hopefully, you will think, act, and be ethical personally and professionally. The ethical revolution is upon us, whether we are there or not.

Perhaps the best guidance comes for the Old Testament Book of ***Proverbs 3:6-7*:**

Trust in the LORD with all your heart
and lean not on your own
Understanding;
in all your ways acknowledge him,
and he will make your path
Straight.
Do not be wise in your own eyes;
Fear the LORD and shun evil. (NIV)

Conclusion

In sum, it is inescapable that ethics must play an important role in everyone's life, personally, professionally, and on a global scale. Ethics is particularly vital with technology. Moreover, strong ethical leadership will be required in the "knowledge worker" future. We must think, be, and act ethically, personally and professionally; and, demand it from ourselves and our leaders.

Ethical leaders must realize the *Technology Triangle* requires balance. Ethical leaders must realize technology promises benefits to society, but also threatens harm. Ethical leaders must realize liberty/individual provides freedom to innovate, but is held in check by society that insists on rules, as SOX clearly illustrates.

The *Technology Triangle* must be understood as constantly interconnected with each aspect influencing the other. Balance is the key, fortified by the two way street of ethics and leadership. Societies are on the cusp of emerging technologies that require a specialized set of ethics: bioethics, neuroethics, and roboethics.

Societies and companies of the twenty-first century will not survive with twentieth century ethics. Social change in the global society of the 21st Century must include ethics, leadership, and technology.

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