

HOW WILL DIRECT INTERFACE BETWEEN HUMANS AND MACHINES
IMPACT LAW ENFORCEMENT BY THE YEAR 2010?

A project presented to
California Commission on
Peace Officer Standards and Training

Stephen R. Thomas
Santa Rosa Police Department

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This Command College Independent Study Project is a FUTURES study of a particular emerging issue in law enforcement. Its purpose is NOT to predict the future but rather to project a number of possible scenarios for strategic planning consideration.

Defining the future differs from analyzing the past because the future has not yet happened. In this project, useful alternatives have been formulated systematically so that the planner can respond to a range of possible future environments.

Managing the future means influencing the future--creating it, constraining it, adapting to it. A futures study points the way.

The views and conclusions expressed in the Command College project are those of the author and are not necessarily those of the Commission on Peace Officer Standards and Training (POST).

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CHAPTER ONE

Introduction

You'll never discover new oceans unless you're willing to lose sight of the shore.
-Author Unknown

This project on the future of man and machine direct interface was completed for the State of California Commission on Peace Officer Standards and Training (POST) Command College. It is an exploration of the opportunities and applications likely to be available to law enforcement agencies in the near future. It is offered for the purpose of raising awareness and promoting exploration and discovery of practices and capabilities that were once dreamed about, but are now within our grasp. The project is divided into four sections.

The introduction provides a brief overview of current capabilities linking man and machine. It will set the stage, describing the current landscape and providing a contextual background necessary to a discussion of future potentials and applications.

The second chapter articulates the process used to identify trends and events likely to shape the future and influence the use and development of man/machine interfaces. These identified trends and events, coupled with current capabilities connecting human biological and neurological systems to electronics systems is used to develop likely scenarios for the future, especially as they relate to law enforcement applications.

The third chapter identifies strategies for the development and implementation of man/machine interfaces, especially as relates to change management and coordination of the various Socio-Technological systems. A

strategic plan to identify key stakeholders, resources, obstacles and the driving/restraining forces most likely to impact this future is offered and discussed.

The fourth chapter concludes with a review of the implications around man and machine direct interfaces as they relate to application by law enforcement, and the strategies for building the most desirable future.

Setting the Stage

If the world is a stage, it is a much smaller stage than that which played to the world of yesterday. Communication systems have dramatically increased the ability of people to interact with others in quick and convenient ways. Cellular telephones, compact portable two-way radios, video conferencing and the Internet have provided connectivity and methods for sharing information in greater scope and in ways faster than ever before in the history of the world. Decisions are enhanced as information that would previously have taken weeks, days, or hours to receive, is now provided in the blink of an eye. Our ability to influence others and be influenced by them is made easier, and the impact this can have on our lives is dramatic.

Information systems that capture, store, manipulate and communicate data have become central to our society. The breadth and scope of information systems and their applications, together with the degree of connectivity and interdependence that developed over the course of the last two decades, has radically changed how we conduct business. Advances in miniaturization make it possible to package and transport applications unobtrusively, and often in a way that frees the operator's hands for other tasks.

People communicate with others via a telephone connected to a boom microphone and earpiece, thereby leaving their hands free to write or operate keyboards. We see these devices used by receptionists, tele-marketers, secretaries, and even the commuter on the freeway. The original device, developed by the military to facilitate communication between pilots while keeping their hands free to control their aircraft, has continued to evolve. The military has added a night vision component, allowing pilots to see in low-level light conditions, and in wavebands of light, such as infrared, which are not visible to the naked eye. Another modification includes a helmet-mounted ocular eyepiece, which directs aircraft weapons at potential targets through the synchronization of the pilot's head movements.

Video-conferencing, satellite transmission, voice-activated recording, and laptop computers with cell phone modems are just a few examples of external devices we routinely use to connect people, share thoughts, ideas and information, and store data for use at a later time, all from remote locations. It is this ability to remotely connect and communicate with others, and access data banks of information, that has so significantly impacted our capabilities in today's society.

It has often been proposed that some day man and machine may be connected more directly. References in science fiction literature, movies and television abound, postulating that sometime in the future, man and machine will be joined. The Borg from the popular television show Star Trek: The Next Generation, and the Terminator movie series are just two examples of the

marriage of biological, electronic, and mechanical systems. Recent developments have made this science fiction a likely reality.

Cochlear implants are auditory devices that provide hearing impaired people with the sensation of sound. It combines a surgically implanted device, located behind the ear, with an external speech processor. A tiny microphone captures sound, transmits it to the speech processor which then sends a signal to the implant to stimulate the auditory nerve. The individual then hears loud and soft sounds and a variety of pitches.¹

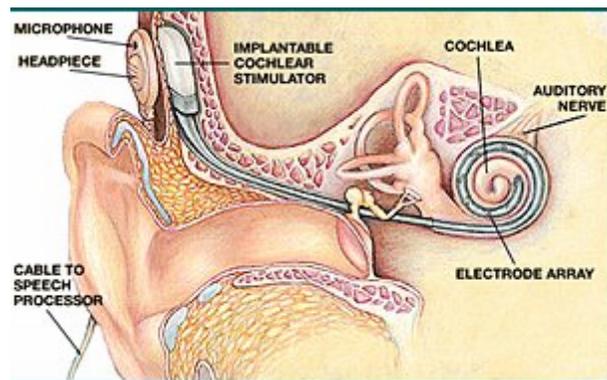


Fig 1

The cochlear implant bypasses a defect or damage to the tiny hairs of the inner ear, which are responsible for generating the electrical current sent to the brain by the auditory nerve. The implant stimulates the nerve directly and must be tuned to each individual's capacity. Currently, 28,000 people have received cochlear implants.²

A Bionic Eye uses similar technology to restore the loss of vision due to damaged eye tissue. A microchip is implanted into the back of the eye, and as light strikes the solar cells of the microchip, an electric signal is transmitted to the brain via the optic nerve. Visual sensations have been restored in tested animals, and human testing will begin in the next two years.³

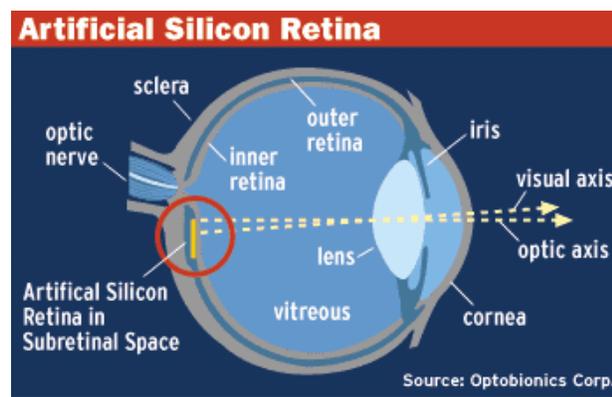
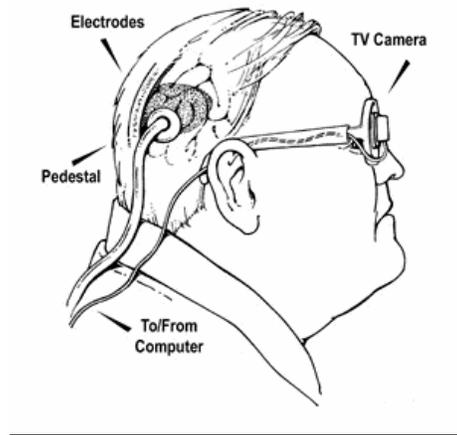


Fig 2

Another system developed by William H. Dobelle, a Columbia University researcher, connects a video camera to a computer, which then generates electrical signals via surgically implanted electrodes directly to the brain. In a recent demonstration, a blind man who had been working with scientists since 1978 was able to maneuver through a crowded room of randomly placed mannequins, locate a hat, and place it on top of a mannequin. The subject was also able to recognize a two-inch tall letter of the alphabet from five feet away.⁴

Fig 3



Neurosurgeon Ron Bakay and his research team at Emory University in Atlanta Georgia were able to implant a tiny hollow glass cone containing a microscopic gold wire and nerve tissue from a stroke victim's leg, directly into his brain. After several months the nerve tissue in the cone fused with that of the patient's brain tissue. A sensor worn in the headband of a baseball cap detected motor neuron activity generated by the brain. The sensor was connected to a computer nearby. The patient, paralyzed from the neck down and unable to speak or move, was trained to move the cursor on a computer screen to highlight specific icons simply by thinking in a particular way.⁵

These are just a few examples of current capabilities of direct interfaces between man and machine; with a little bit of visioning, the potential is staggering. What if it were possible to apply a skin patch sensor that allowed an officer to see in infra-red or other light spectrums, or have a discriminating sense of smell, or a heightened hearing sensitivity in ranges found only in animals? What if an officer could access a remote data storage site and run records checks or compare photos simply by thinking it?

If we can use electronic devices to stimulate the optic and auditory nerves, mightn't it be possible to record everything an officer sees, hears or smells during his or her workday? Might it be possible to tap the electrical signals going to the brain from these nerves and divert it to a recording device located on the officer's uniform or even download it to a remote site?

CHAPTER TWO
Possible Futures

Trend/Event Analysis

On January 12, 2000, a diverse group of professionals met at the Santa Rosa Police Department for the purpose of identifying future trends and events, and their impact on the question "How will direct interface between humans and machines impact policing by the year 2010?" Nine participants were scheduled:

Psychology Department Head/Systems Consultant - Sonoma State University

Director of Secondary Education - Santa Rosa City Schools

Chaplain and Episcopalian Minister

Assistant City Attorney - City of Santa Rosa

Prevention Division Department Head - Sonoma County Health

Chief of Police - Petaluma Police Department

Research and Development Division Head - Hewlett Packard

Past President of Police Labor Organization - Santa Rosa Police Officer's Association

Psychologist - Private practice

Two people were unable to attend due to last minute schedule conflicts and one person mis-calendared the session and did not discover their mistake until the next day. A police commander, who was familiar with the process as a command college graduate, stepped in to assist at the last minute.

Trends

A Nominal Group Technique was used to facilitate this process. Participants identified trends in a round robin format, and briefly discussed why they felt it significant to the topic. Trends were defined as a course of movement or tendency for society to move in a particular direction over time. Forty-seven trends were identified. Through discussion and dialogue, these forty-seven trends were collapsed and consolidated into the following categories:

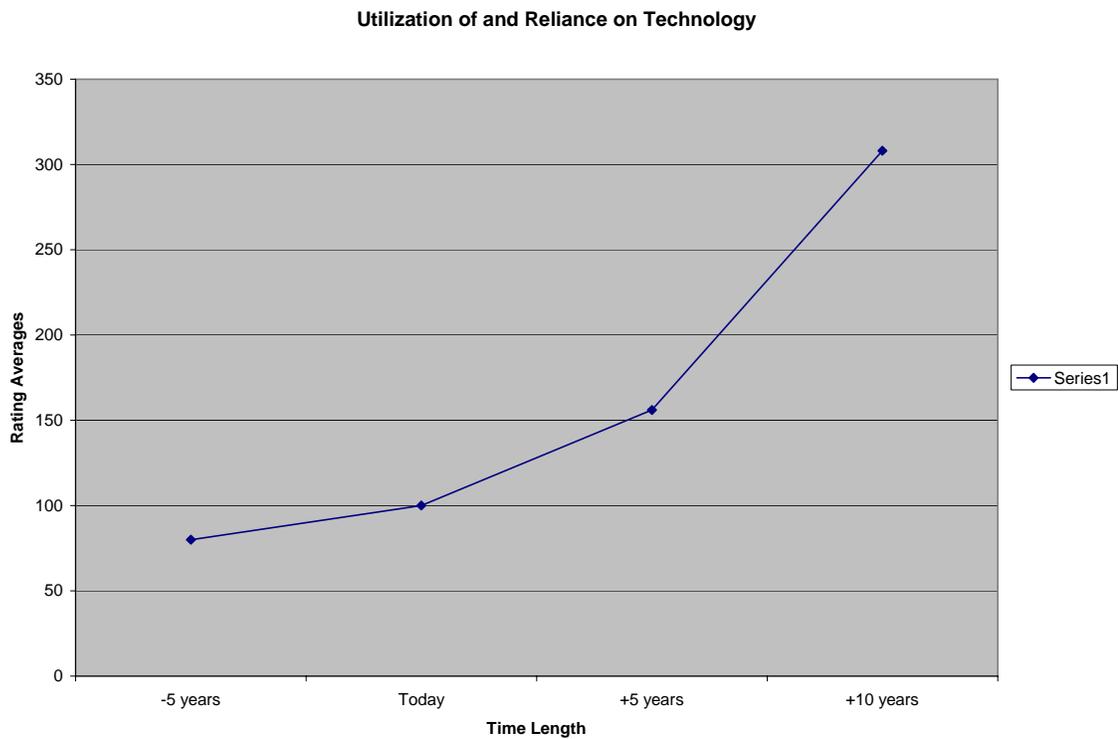
- Reactions to the pace of technology and information overload
- Advancements in the field of medicine
- Changing character of crime
- Legalization of human affairs
- Reliance on Technology
- Balkanization (cocooning) of America
- Globalization
- Gap in educational, social, economic opportunities
- Consolidation of major industries
- Valuation of public service efforts
- Diversity
- Definition of family
- Urbanization
- Media and marketing
- Degradation of environment
- Civil disobedience

- Health Care accessibility

Participants discussed and clarified each trend, developing a common definition. They then used a multi-dot voting technique and selected the top five trends, which would have the most significant impact on the topic question. Participants were then asked to chart these trends relative to five years in the past, currently, and at five and ten year intervals in the future. An arbitrary figure of 100 was used as a starting point snapshot of that trend relative to current society, which allowed for a charting of decreasing/increasing values. The five most significant trends are identified below, and contain a brief description of the trend, followed by a chart depicting the trend over time.

Trend 1 - Utilization of and Reliance on Technology.

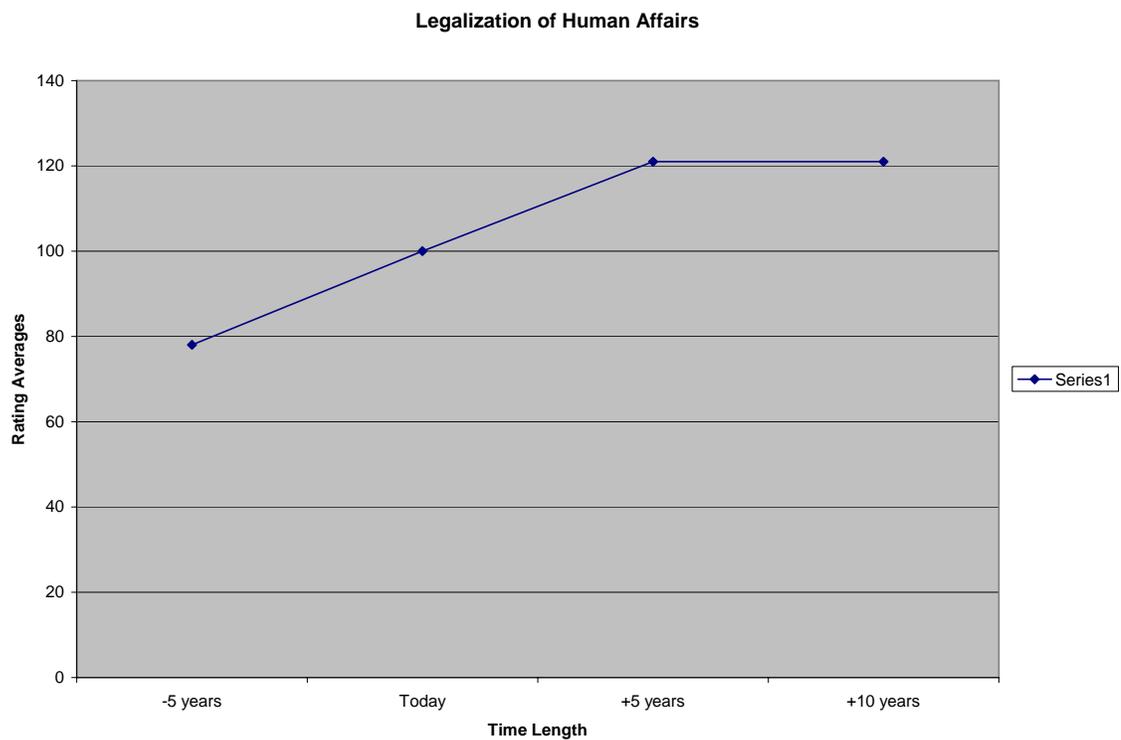
Technology was seen as a critical component of our society, something that for many of us goes unseen, but which we rely on tremendously in every facet of our lives. All of the participants save one, felt that as a society, our reliance on technology would continue to increase.



As can be seen, a strong majority of participants felt that the utilization of technology and society's reliance on it in day to day living would grow exponentially. The lone dissenter was the Minister, who felt that people in general were frustrated by an over reliance on technology, and were attempting to simplify their lives, eschewing a reliance on technology in order to facilitate spiritual growth and development.

Trend 2 - Legalization of Human Affairs.

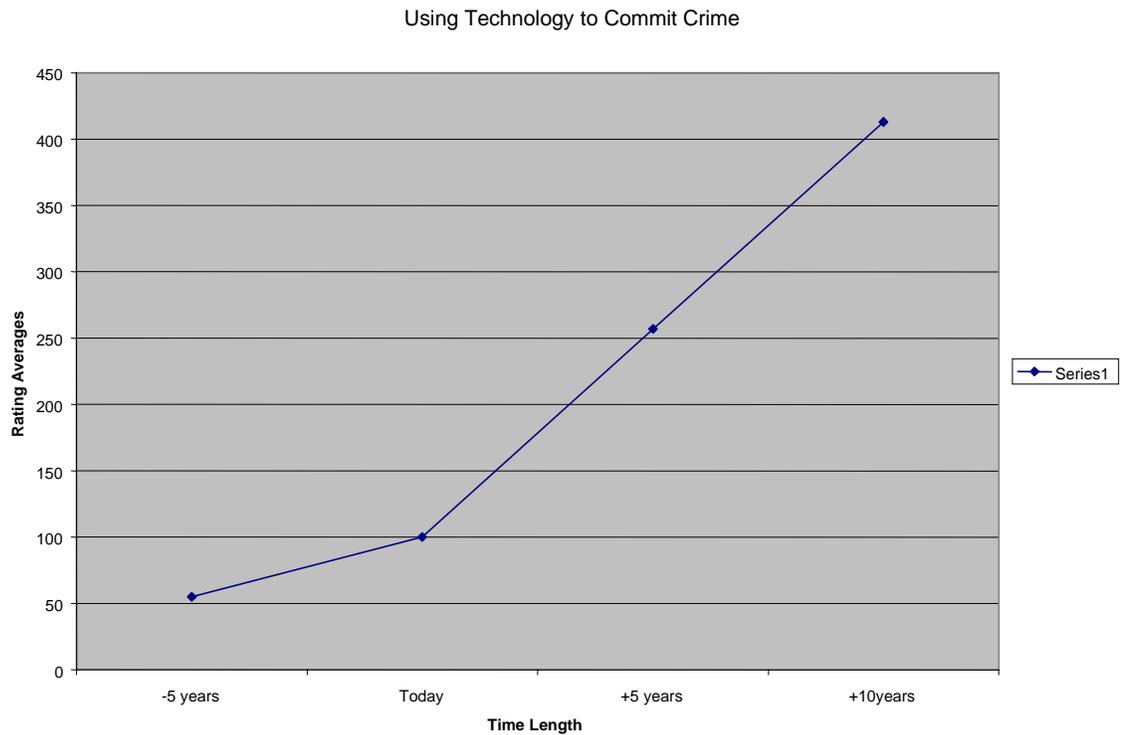
Laws and the systems for monitoring, enforcing, and controlling human behavior, which while integral to our society as a means of establishing and maintaining order, was seen as overly restrictive and bureaucratic. The belief of the participants was that we see more and more examples of legal interventions to remedy inequities in business, education and government, using the court system to right the wrongs and problem solve solutions.



As can be seen in the chart above, participants believed this trend would continue for another five years, before stabilizing.

Trend 3 - Use of Technology in Crime.

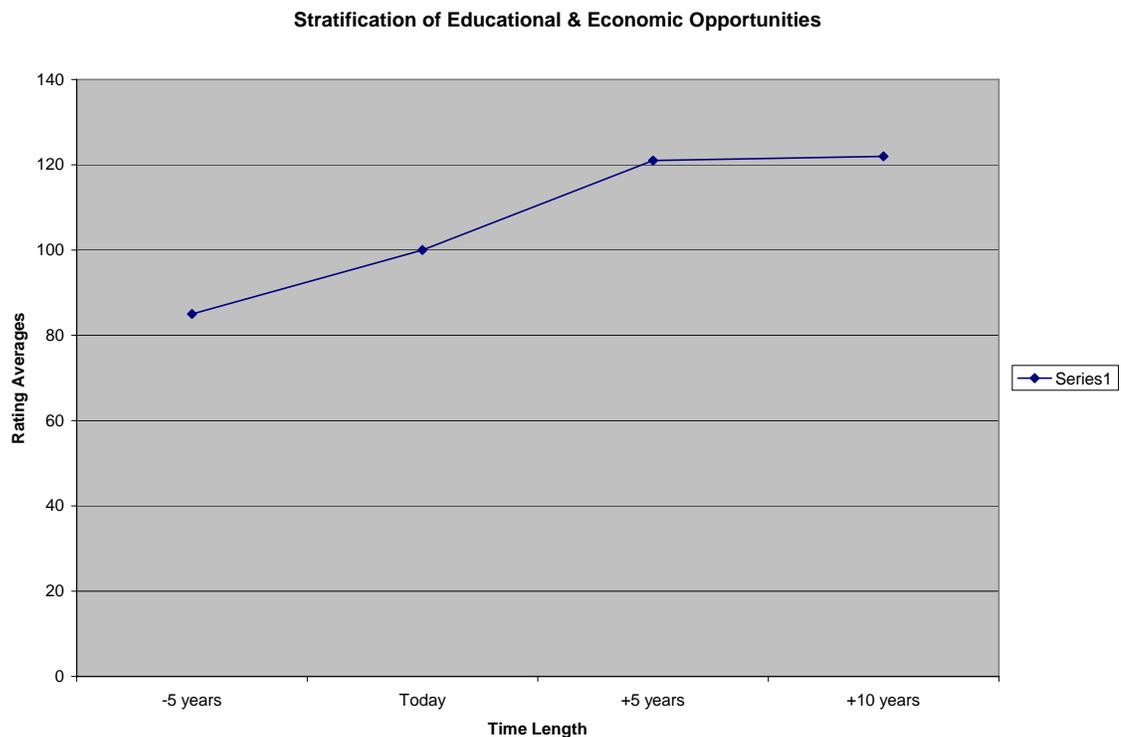
Information extortion, financial hacking/enhanced forgery and fraud capabilities, were all examples of how the face of crime was changing. Participants believed that not only would traditional crimes continue, but that new and diabolic ways of victimizing people would develop using new technologies.



Participants believed that there would be an exponential increase of the use of technology to commit crime in the near future, stabilizing in a linear increase in the long term.

Trend 4 - Stratification of Economic and Educational Opportunities.

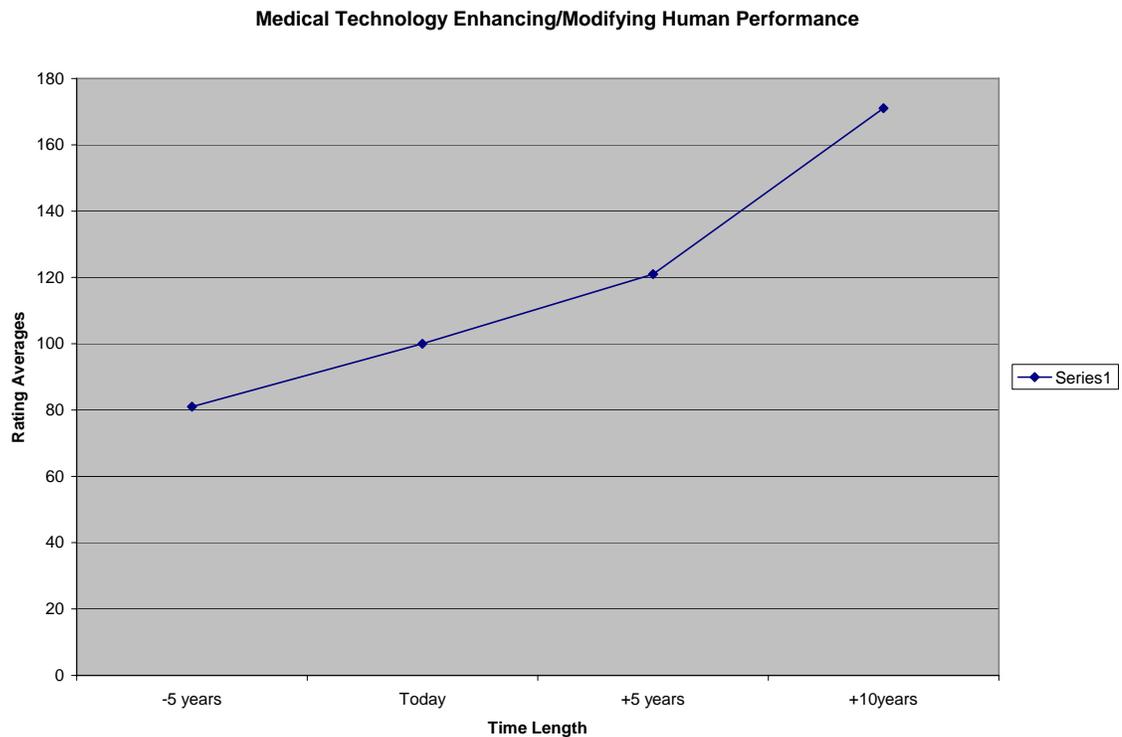
Gaps in skills and competencies, as well as opportunities for growth and development based on race and ethnicity would continue to grow. Issues of class, the haves and the have nots would lead to more divisiveness and conflict.



As indicated in the above chart, participants felt that society would continue to experience a growing gap between the haves and have nots, more or less in a linear fashion, for the next five years, before eventually stabilizing.

Trend 5 - Medical Technology: Ability to enhance or modify human performance.

This trend spoke most directly to the topic of this paper. Participants believed that the ability to clone humans, re-engineer genes, transplant body parts, connect biological systems to artificial ones, and medically eradicate some of societies most debilitating and insidious diseases would continue to be a societal priority in the future.



Again, participants believed that this trend would continue growing, more or less in a linear fashion, for the next decade, as an aging population and interest in improving the quality of one's life continue to be a priority.

Events

Using the same process as described above, participants identified events likely to occur within the next ten years. Events were defined as an occurrence having a significant impact and were identified as:

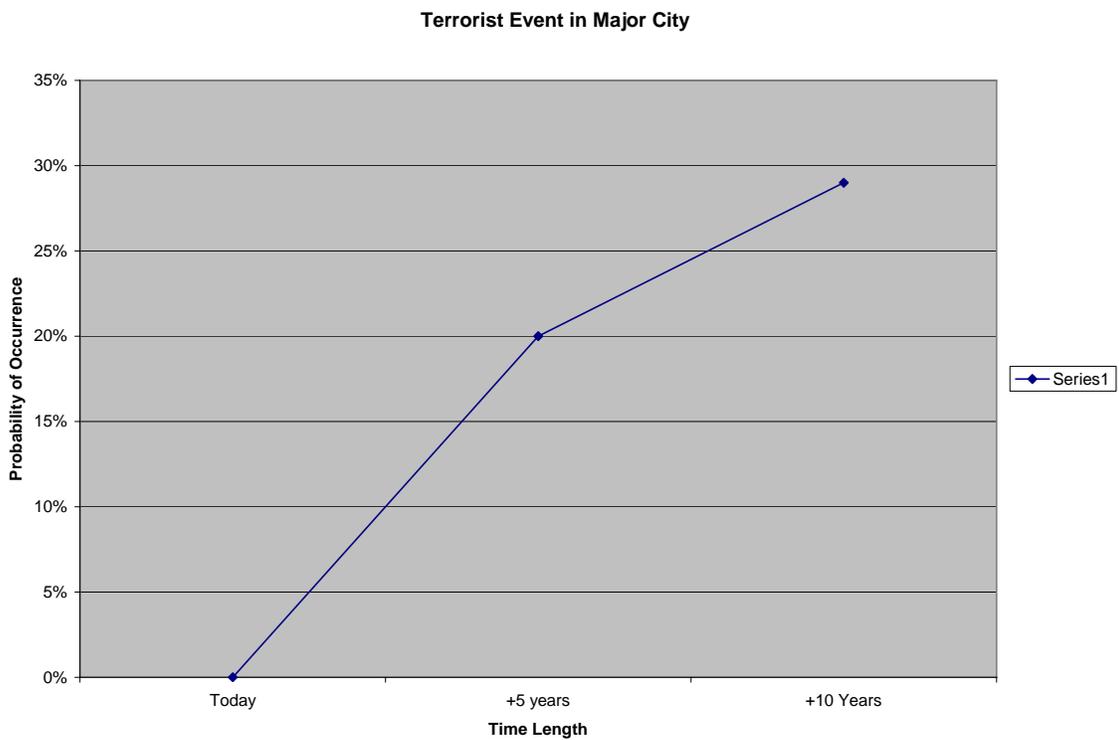
- Terrorist event in a major city claiming more than 1,000 lives
- New AIDS type communicable disease
- Dow Jones hits 2000
- 8.0 Richter scale earthquake
- Interest rates hit 17%
- Flat tax
- Same sex marriages legalized
- Significant war
- Mandatory decree re; Gender balance in the workplace
- Relaxation of Immigration laws
- Cloning of humans
- Legalization of Drug laws
- Legalization of Euthanasia
- Cure for cancer
- Elimination of Social Security
- Imposition of General price control
- Fully mechanical heart
- Medical cure for addiction
- Regionalization of Law Enforcement

- Individual handgun ownership outlawed
- Portable Metal detector/video equipment for the detection of handguns
- Transportation grid lock
- Elimination of Fossil fuels as common source of energy
- Development of non-lethal technology eliminating need for handguns
- Abortion outlawed
- Major catastrophe of Eco-system

Participants discussed and clarified each event, developing a common definition. They then used a multi-dot voting technique and selected the top five events, which would have the most significant impact on the topic question. Participants were then asked to chart these events relative to the probability of their occurrence, forecasting in what year the probability of the event occurring was greater than zero and then the probability of the event having occurred within five years and again in ten years. The five most significant events are identified below, and contain a brief description of the event, followed by a chart depicting the event over time.

Event 1- Terrorist Event in a Major American City Resulting in the Death of at Least 1,000 People.

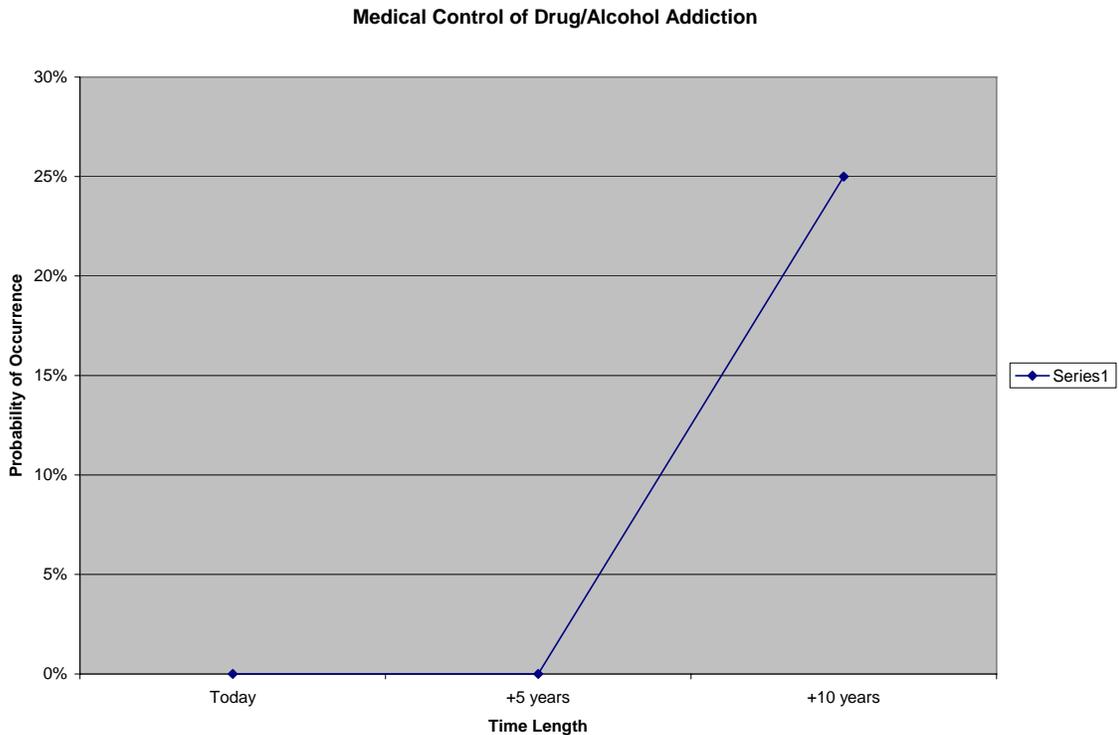
The Sarin gas attack in Tokyo, the bombing of the World Trade Center in New York and the bombing of the Federal Building in Oklahoma City, lead participants to the conclusion a major city in the U.S. would experience an incident wherein at least 1,000 people would perish as a result of a terrorist act. The ease of delivery of highly potent biological or chemical agents in a concentrated space such as a sports arena, made this a likely scenario from the participants perspective.



Participants believed there was a 30% probability of this event occurring within the next decade, and believed society would be looking to law enforcement to prevent such an attack from occurring.

Event 2 - Medical Control of Drug and Alcohol Addiction.

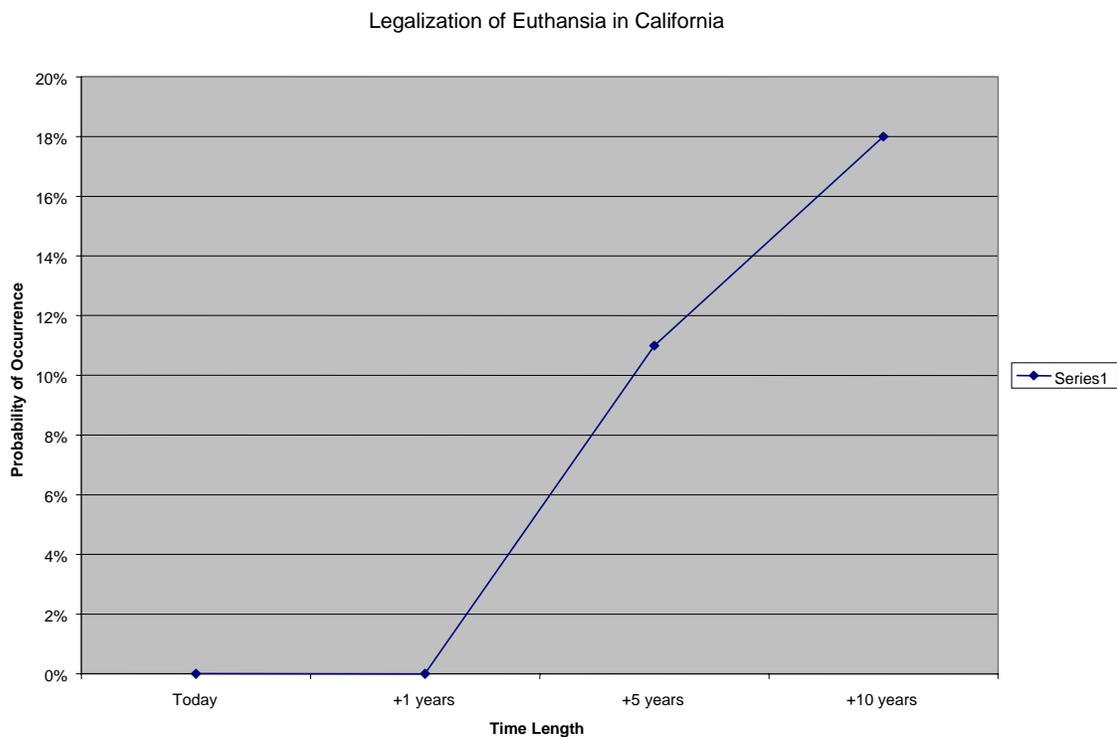
This event was postulated by the Director of Prevention services for the county, as likely to happen in the next several decades. Recent advances in understanding biological systems, the pursuit of gene mapping, cloning and other research convinced her that drug and alcohol addictions would no longer be an issue in the near future.



Participants did not believe a medical solution to addiction would be found before five years, but did believe it would be forthcoming relatively quickly after that time.

Event 3 - Legalization of Euthanasia in California.

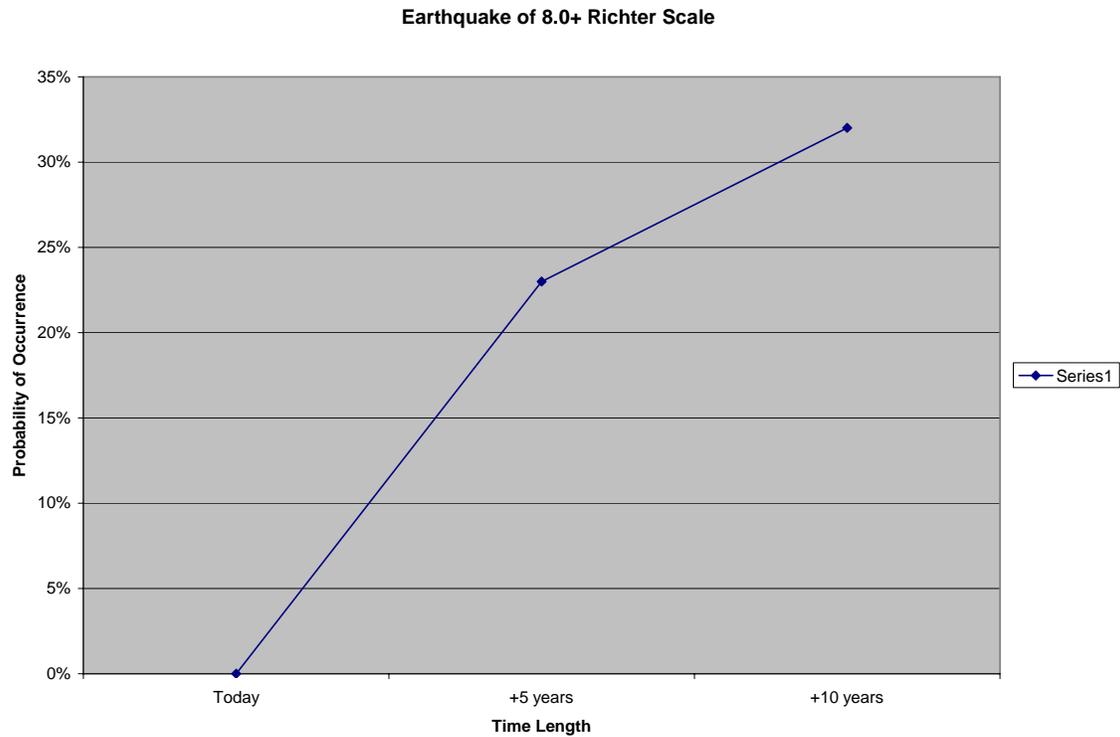
Participants believed that euthanasia was becoming more socially acceptable, as society confronts the issue of death and dying. It was the overall consensus of the group that by simply acknowledging the cycle of life, restoring dignity to the death experience, and providing for individual freedom to choose as life quality indicators deteriorated, was an outcome most of society would support.



Participants believed there was an 18% probability California residents would legalize some form of euthanasia within the next decade.

Event 4 - Earthquake of 8.0+ Richter scale in California. This event is self-explanatory.

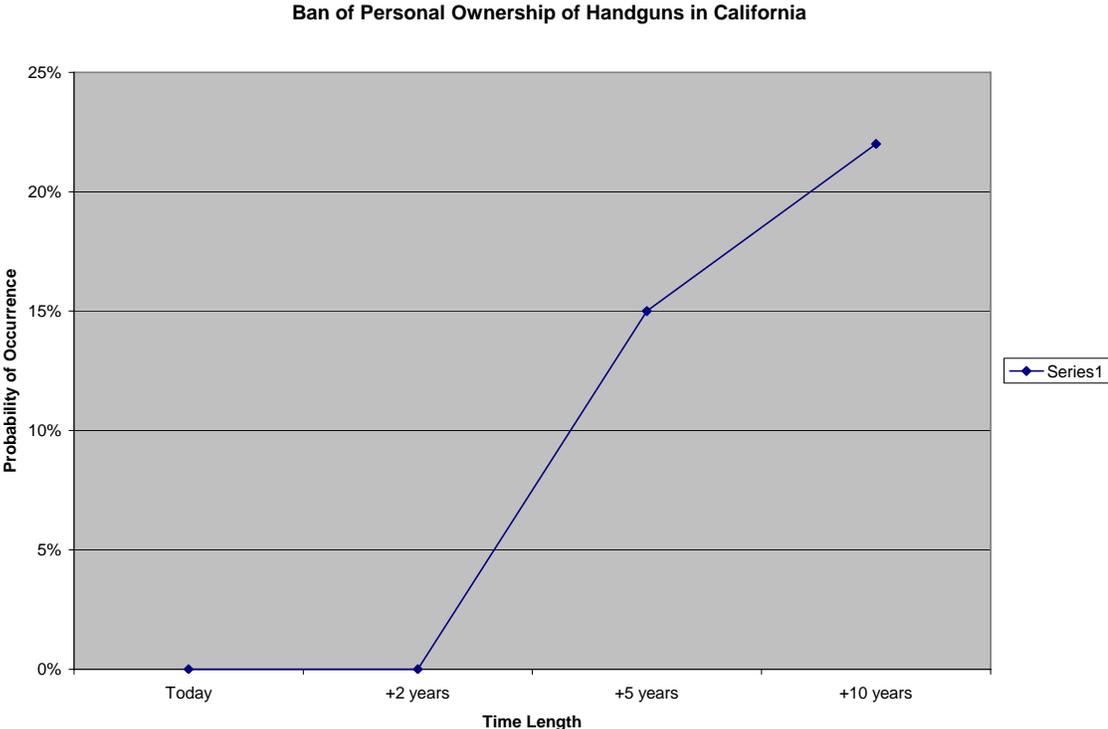
Participants believed that a major earthquake laying waste to significant parts of California was a reality.



As can be seen, participants believed there was a 33% probability that California would experience an 8+ earthquake within the next decade.

Event 5 - Ban of Personal Ownership of Handguns in California.

Participants believed that societal norms around owning and using handguns was changing and would eventually lead to legislation banning ownership by the majority of citizens.



The probability of this event occurring within the next decade was believed to be about 20%.

Cross Impact Analysis

The NGT panel then did a cross impact analysis of both trends and events. Using a Likert scale of 0-5, zero being no impact and five being major impact, participants were asked to assign a number indicating the combined impact an event and trend would have on the development of human/machine direct interfaces. A positive impact indicated the event and trend would promote such development, while a negative number indicated the event and trend would impede such development. The information was charted and is captured below.

CROSS IMPACT ANALYSIS TABLE

		EVENTS				
		Terrorist Act	Alcohol/Drug Solution	Earthquake	Euthanasia	Handgun Control
T R E N D S	Reliance on & Use of Technology	+2.8	+1.8	+.5	+1.8	+.7
	Legalization of Human Affairs	+2.6	+1	+2.5	+2.3	+2.3
	Use of Technology in Commission of Crime	+3.2	+.7	+1.3	-3.2	+1.8
	Stratification of Economic Educational Opportunity	+.2	+2.3	+.8	-4.2	+1
	Medically Enhanced Human Performance	+2	+1	-.2	+1.7	-1

Of the twenty-five combinations of trend and event pairings, twenty-one of them were deemed to have a positive influence on the development of man/machine interfaces. Interestingly enough, the one combination with the most significant negative influence on the development of man/machine interfaces was the legalization of euthanasia event, coupled with the continued trend of stratification of economic and educational opportunities. Participants clearly had a concern that should the gulf continue to grow between those who are well placed to take advantage of economic and educational opportunities and those that are not, and should society legalize euthanasia, an indirect consequence would be a growing distrust of the police. Participants came to that conclusion based on the belief that the haves would be able to provide for sick elderly family members while the have nots would be forced to resort to euthanasia as a solution for a sick elder. Resentment of the have nots would restrict the ability of police to garner resources to implement technology, the fear being it would maintain the gulf between the two disparate groups.

The pairing of a terrorist act resulting in the death in excess of a 1,000 people and the growing trend of using technology in the commission of crimes was seen as having the most significant positive impact on the development of man/machine interfaces. Participants believed that as criminals begin using more sophisticated technology, society's response would be to support law enforcement's use of the same or enhanced technology to combat very real threats to public safety.

In addition, two trends were identified as having a positive impact on the development of man/machine interface, no matter what event took place, and

two events were identified as having a positive impact no matter what trend. The two trends were Reliance On and Use of Technology and Legalization of Human Affairs. Across the board participants believed that as society became more comfortable with new technologies, uses to assist police would be well supported. The two events identified were a terrorist act where in excess of 1,000 people perish, and a medical solution to alcohol and drug Use. Again, participants believed that any technology assisting in the prevention of a terrorist act or the apprehension of responsables after the fact would be well supported. As to the medical solution for substance abuse, participants felt that once the issue of substance abuse was addressed in a more humane fashion, police would be left to concentrate on serious habitual offenders who presented a significant risk to public safety, and technological solutions would be well supported.

Learning from the NGT Process

Two of the three people absent were from key disciplines; psychology and work systems, and the hi-tech research and design manager. It was unfortunate, as their perspectives certainly would have added value to the discussion. The interaction between the members of the panel present was full and healthy, and lead to lively conversations around social issues. The health and education representatives, the Episcopalian priest, the city attorney and police reps all had their assumptions challenged at some point during the activity, so there was indirect learning by all that attended.

Ensuring clarity when defining trends was difficult. What one person thought was being said in the trend statement, was not what another understood. We tried to catch these as they came up, and still they surfaced during the cross impact analysis phase.

Lastly, the group missed the mark somewhat on the development of events likely to impact the question as posed. The facilitator was overly sensitive to directing them in any particular direction, yet the quality of the content would have been improved had they done so, at least as it related to the development of events likely to impact the topic question.

The NGT process is an established and reliable tool in scenario development. The amount of time spent is minimal however, and participants often find it difficult to consider other perspectives. The final product is therefore somewhat compromised. A Dialogic model has been used very successfully in the private sector, academia, and in research and development

projects and may provide a better product. Assumptions are identified and questioned at the outset and participants suspend judgement as they attempt to gain a deeper understanding of the issues. While it takes more time overall, the quality of the product is substantially improved. Future projects of this sort may want to consider this approach as opposed to reliance on the NGT model.

Trend and event information, research data, and literature review were considered to develop possible future scenarios. These scenarios were developed to illustrate the potential for creating a desired future, and follow below.

Scenarios

Scenario 1 - Optimal

Associated press - August 1st, 2010

Santa Rosa Police believe they have arrested the serial rapists who have preyed on park goers, having committed three rapes in the last three weeks. Responding officers were able to sneak up behind the suspects who were hiding in wait for officer's arrival. Using enhanced sight, hearing and olfactory technology, responding officers were able to detect the suspect's presence as they hid in a heavily vegetated area. One of the suspects had armed himself with a 2'x4' board. Responding officers were able to videotape the suspects as they lay in wait, and obtained audio evidence of their crime as they whispered to each other their intentions.

Veteran officer Bill Berg was highly complimentary of the new technology, stating that just ten years ago this event may well have resulted in an officer's

serious injury or death. Berg, the president of The Santa Rosa Police Department Peace Officers Association, related that when first approached with the concept of implementing this technology at Santa Rosa Police, he was adamantly opposed. He expressed gratitude to Police Chief Phil Sanchez for allowing the POA to work with management to design a system that met the needs of the community, as well as department employees.

Associated Press – August 1st, 2010

A protest turned violent at last night's school board meeting as members of the community, incensed about changes in curriculum and standards, reacted to a decision by the school board to decrease funding of vocational, special education, arts and sports programs in order to subsidize college bound student needs. Supporters of the college track program insist any student can take advantage of the increased subsidies to secure placement in the UC system. Minority community members argue however that reduced economic opportunities for minority families force their children into work at an earlier age, compromising their ability to reap full educational benefits. In addition, 80% of all students who enter college are typically Anglo-American, while they represent only 45% of the total population.

Officers who arrived on scene were quickly able to restore order as combatants, cognizant of police capabilities to automatically record and capture video, quickly disengaged. Officers did take into custody two white men who witnesses allege made derogatory and racist comments.

Scenario 2 - Least Preferred

Associated Press – August 1st, 2010

Another Santa Rosa Police officer was critically injured in an ambush yesterday evening while responding to a reported rape in progress at Howarth Park. Investigating officers believe the suspects concealed themselves in a brushy area and waited for the officer to pass before physically assaulting him with a 4' 2x4. Back-up officers were unable to locate the suspects who fled the area on foot. A 24-year-old woman was located at the scene and has provided investigators with a description of her assailants.

This is the fourth alleged rape incident at a city park within three weeks. All of the rapes have taken place in the early evening, and in each instance the victim is forced to an area of the park that is heavily vegetated and poorly lit. Officers have been making extra patrols at the parks and used the media to make announcements to the public warning of the risk and asking people to avoid being in the parks after dark.

This is the sixth officer to be injured in an ambush in as many months, and has fueled calls by the Santa Rosa Police Officer's Association for the loosening of city funds for increased staffing. POA members are pushing for two officer units and the purchase of technology to assist in the location and detention of violent suspects, and the protection of individual officers.

Associated Press – August 1st, 2010

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any student can take advantage of the increased subsidies to secure placement in the UC system. Minority community members argue however that reduced economic opportunities for minority families force their children into work at an earlier age, compromising their ability to reap full educational benefits. In addition, 80% of all students who enter college are typically Anglo-American, while they represent only 45% of the total population.

Officers who arrived on scene were quickly overwhelmed with the number of combatants, claims of assault and battery, and resistance to police intervention. Officers took two men into custody, but acknowledged they did not have the resources to identify who did what to whom, even after officers arrived on scene. NAACP activists were quick to complain about police brutality.

Scenario 3 - Most Likely

Associated Press – August 1st 2010

Santa Rosa Police today began testing new technology making possible the enhancement of individual officer's capabilities in three of the five senses. The pioneering process was initiated a decade ago when a video camera was first hardwired to the optic nerve of a sight-deprived individual's eyes, allowing him to see. This second generation process links electronic technology with biological systems providing officers with enhanced sight capabilities in low-light conditions such as infra red or starlight, helpful in the detection of hidden objects; enhanced hearing in high and low ranges, and enhanced smell. In addition, everything the officer sees, smells and hears is monitored, collected and stored.

A skin patch is used to monitor the body's neural systems, allowing for the transfer of data between artificial systems and the officers' eyes, ears and nose; a small recording device attached to the officers' utility belts captures and stores the information for use at a later time. At the end of an officer's shift, data is transferred to the department's information system and made available to both prosecuting and defense attorneys in preparation for possible criminal proceedings.

The skin patch is much less invasive than the hardwire interfaces used in the original design, being very small and yet able to take advantage of recent technological advancements in detecting biochemical electrical activity. The patch is worn on the temple and is easily attached and removed. While the importance of enhancing vision during night-time hours has long been desirable in police work, the need for increased ability to detect chemicals used

in the construction of explosive devices became clear as terrorist acts continued to rise, culminating in the bombing of the 3COM Stadium during the 2007 World Series. The new device eliminates the need for officers to grasp night goggles, listening, or smelling devices, leaving their hands free. It also provides direct evidence of what officers hear, see and smell, a critical application necessary to support reform initiatives in the criminal justice system. "Recent overhaul efforts have centered on ways to streamline court processes" said Commander Coyote of the Santa Rosa Police Department and this new technology is viewed as one way to impact the time and money spent on capturing witness/suspect/victim statements for court testimony.

The scenarios depicted above represent three possible futures described as optimal, least desired, and probable. As can be seen, more effective and efficient policing through the development of direct interfaces between man and machine can be realized. It has, however, significant implications on how man views himself and the world around him, and societal norms and attitudes will need to be challenged before supporters for any application can see it through to fruition. Exploring what the future may hold relative to technological advancements and their potential applications, anticipating trends and events likely to impact the development of those technologies, and formulating future scenarios similar to those described above, assists the law enforcement leader in pursuing courses of action likely to lead to an optimum future. The next chapter will speak to the issue of strategic planning and transition management as we endeavor to move toward this desirable future.

CHAPTER THREE Strategic Planning and Change Management

Strategic Planning

Forewarned is forearmed. If we take the time to consider what the future may hold for us, we can begin to strategically plan our response. If we do not plan for the future, and anticipate ways the environment will change, we limit our capabilities. The choices we make now define our strategy for the future, whether it is reactive, proactive or a combination of both.

Time, energy, and resources may be put into developing highly sensitive feedback systems that allow us to react quickly to changing conditions, or a more active approach may be taken by consciously initiating change to create the future environment. Compelling arguments can be made for each option. Scanning the environment and monitoring performance to ensure congruity can be effective, especially if the environment is turbulent and the system is flexible.⁶ The downside however, is that marshalling resources to respond to societal level change involves intervention in a complex interdependent system, one comprised primarily of bureaucracies, the least effective organizational structure when it comes to flexibility and adaptability.⁷

Initiating system change to transform the external environment can also be a very effective strategy. Creating a market for your services or product, especially as it relates to law enforcement agencies which typically do not have to compete for their service, is as close a guarantee to congruence as one could expect. On the other hand, decisions made expediently at a very local level, without a full understanding of the ramifications, have brought about

unintended consequences, occasionally having tremendous adverse impact on a global scale.

The decision to use Chloro-flouorocarbons as a propellant for aerosol dispensers is one example, and can be used to illustrate the worst possible scenario, that of initiating change to affect the environment in a system having poor feedback and response mechanisms.⁸ Thus, a seemingly innocuous decision to use an inert chemical compound in a personal toiletry item back in the mid seventies resulted in an unintended degradation of the ozone layer; it has taken a quarter of a century for our society to realize the impact and then respond to the threat. Clearly, the initial decision did not consider long range impacts when shaping the future, and government was ill prepared to assess the hazard and mobilize quickly to mitigate continued depletion of the ozone layer.

The decision in the early eighties to define annual dates in computer code as a two-digit construct is another example. Who knew at the time that our reliance on computers and the operating systems that drive them would grow so quickly and be so pervasive in our society, yet the original decision developing that software code made any remedy a complex and Herculean task. Once again the interdependencies of a system involving a multitude of institutions frustrated any easy response and remedy.

The challenge then is to identify preferred futures, and build a multi-level strategy which provides for the early recognition of changing conditions, an ability to respond and adapt quickly, and the capability to divert resources to

building and shaping a future which eliminates, as best as possible, unintended adverse consequences.

An STP model can be useful in clarifying what takes place in the strategic planning process. The current Situation is assessed, a desired future scenario is Targeted, and the Process whereby the organization will from move S to T becomes the Strategic Plan.

Developing the first phase of the Strategic Plan requires an assessment of the external environment including driving and restraining forces, trends, key resource controllers and collaborators. Also required is a review of legislative mandates, a review of the current mission and values by key stakeholders and the internal environment including resources, strategy and performance.

The second phase requires an analysis of SWOT; Strengths, Weaknesses, Opportunities and Threats; and helps identify strategic issues. This provides the planning team with a clear picture of system abilities and challenges and helps focus energy and resources in identifying approaches having the highest probability for success.

The third phase is the actual formulation of strategies, based on all previous work, and usually takes the form of goal identification; the desired outcomes which meet the SMART test; Specific, Measurable, Attainable, Results-oriented, Time-based; and represent the benchmarks by which progress toward realization of the vision will measured.

Lastly, implementation plans and action steps are developed to assist in meeting goals, and include periodic evaluation and assessment that the strategies are in fact still appropriate. This is the course correction component

ensuring flexibility in response to changing conditions in the environment and unintended consequences.

Stakeholders

Stakeholder involvement in this planning process is critical at every juncture. The kind of changes necessary to realize a future where direct interfacing of man and machine is a reality, will challenge core beliefs and values of not only members of law enforcement, but the greater community they serve. Initially, we can anticipate individuals aligning themselves with one of two fundamentally diverse groups. The first group would focus on the benefits of the man/machine interface and reconcile any conflict relative to their personal beliefs of man deliberately altering and enhancing his performance capabilities through the use of artificial devices. The second group will oppose man/machine interface based on a view that man does not have the divine guidance necessary to re-engineer himself, similar to the arguments we hear about gene engineering and cloning. Certainly, how we resolve moral and ethical issues will be a determining factor in moving forward with this technology.

A key stakeholder group will be police officer associations. The concern might include the notion that constituents have to be model communicators and perfect employees in every situation and with every member of the community, since everything they do and see will be recorded and available to management, the courts and the public.

Civil libertarians may embrace this position as well, and add a few more concerns of their own, since heightened ability to see, smell and hear would have a direct impact on right to privacy statutes.

Members of minority communities, whether ethnic, racial or alternative lifestyle, would surely be interested in the ability to monitor officer performance to ensure non-biased behaviors are modeled and practiced. The ability to provide performance feedback and accountability is a strong argument for pursuing direct interface technology.

Certainly policy would have to be developed to answer the concerns of stakeholders. For that reason, it is imperative these stakeholders participate in the development of these policies. The greater their involvement in the design process, the clearer the understanding of how behaviors are linked to desired rewards and the more flexible the organizations they serve and represent.⁹

Law enforcement can wait for this discussion to unfold, no doubt sparked by the innovations and applications that will develop from continued research, or we can put in place mechanisms to facilitate this discussion. Employing methods used for a large system intervention, referred to by French and Bell in their 1995 book as a Trans-organizational Development, can be useful in affecting change where a number of systems are involved.¹⁰ Key stakeholder organizations, institutions, or disciplines are identified and provide representatives to serve on a steering committee that establishes criteria for membership and facilitates introduction of potential partners and collaborators. A search conference similar to those described by Marvin Weisbord, in his 1992 book Discovering Common Ground can be convened,

including members from all levels of key stakeholder organizations in an effort to get the whole system in the room.¹¹ Search conference attendees could begin a strategic planning process that acknowledges how current practices and policies came to be, identifies trends, and then builds desirable future scenarios. The last phase is the development of strategies and action plans meant to achieve the desired future.

Given the scope of the issue, that being whether society is ready to move toward a new epoch where man and machine become physically connected, a Future Search Conference involving representatives from key stakeholder groups is the preferred approach. Expected outcomes are increased understanding by participants as they are exposed to different perspectives on the issues to be addressed, an identification of driving and restraining forces affecting any potential change, and the development of critical mass leading to policy statements and action plans.

Change Process

Action research Scientist Kurt Lewin suggested there were three phases of a change process; Unfreezing, Moving, and Re-Freezing. Edgar H. Schein added the psychological mechanisms involved in each stage and numerous others have built on their work and written extensively on the change process.¹² The most critical determinant factor in a successful change effort however is the process. William A. Pasmore, Ph.D. in his book Designing Effective Organizations writes, "the success of group-based designs for work varies directly with the amount of attention given to making group processes

effective."¹³ This requires particular attention be paid to the process used to engage key stakeholders in the design of the work.

Whether the change is made in response to external forces, or initiated from within, as discussed earlier, it is people who make it happen. It requires attention to building safe environments, where assumptions may be challenged, and diverse points of view expressed. It requires authentic interaction and dialogue, first as a state of appreciative inquiry, moving then into a state of advocacy. And it requires patience, as each individual deals with change in different ways, at different times.

Claes Janssen describes how each person, group, department, company, and perhaps culture, lives in a four room apartment, moving from room to room depending on how the individual is feeling, what they want, and in response to external forces. The rooms represent cyclical phases, and in moving from room to room people are re-born as they embrace a new perspective or actualize their future. In the first room, Contentment, individuals are satisfied, and everything is status quo. Equilibrium reigns and they are comfortable; there is continuity. When this is challenged by change, people often move into the room called Denial; they are either unaware of the impacts the change will have, afraid of it, or simply insensitive about how they feel about it. Once an individual recognizes they will be impacted and owns up to their fear and anxiety, they move into the third room called Confusion. Here we recognize things are different; people feel out of touch, scattered, unsure, apprehensive, and anxious. When an individual makes a conscious choice to

sincerely consider the degree of the impact, takes a risk and moves toward constructive action, they enter the fourth room called Renewal.

Change and anxiety go hand and hand. Anxiety is the energy stored while waiting to invest it in an action. Letting go of the past is a pre-condition for moving into the future, and it is the transformation of this anxiety energy to constructive action that is necessary for any change to occur.¹⁴ Recognizing that individuals move from one room to the other, at disparate speeds and levels of understanding, it is easier to see why change can be so problematic. When considering the question of designing a future where man and machine share direct interfaces, allowances have to be made for each person, group, department, company, and perhaps culture, to struggle through the four rooms at their own pace. It will be law enforcement's challenge to ensure that no one is left behind as we create this future.

In summary, a multi-pronged strategy employing highly sensitive feedback systems to ensure congruent response to external environment needs coupled with an action plan designed to shape external environment expectations will greatly assist in realizing an optimal future. Law enforcement agencies individually, and as collective representatives of the profession at large, will need to begin planning for the inevitable application of man and machine direct interface. Clearly, the benefits of enhanced performance and efficiencies made possible through man/machine interfaces will be explored by a future society. Illegal applications of this technology are a foregone conclusion, as it does not appear that we will be a crime free society within the next decade. This requires a concomitant response by law enforcement to

mitigate criminal activity and prevent crimes committed through the use of this technology. It is incumbent that law enforcement take a leadership role by initiating processes involving key stakeholder participation in identifying issues around this application, and developing policies and practices leading to a planned and appropriate response.

CHAPTER FOUR

Conclusion

Leadership Implications

As discussed previously, a planning process involving key stakeholders is necessary in order to realize a future in which man/machine interfaces are utilized. Any one of several credible organizations that exist to promote the professionalism of law enforcement can begin the process of transorganizational development by pulling key stakeholders together in a future search conference. The International Association of Chief's of Police, The California Police Officer's Association, and any number of state organizations such as the California Commission on Peace Officer Standards and Training are well positioned to initiate the process. Staying abreast of technological advances and applying them in a manner that is consistent, effective, and well supported by the larger community is within the purview of each of these organizations. Pursuing the capability of a direct interface between man and machine certainly qualifies as a viable technological application.

As is the case with any new technology, there are budget implications. Costs associated with the initial purchase, training, maintenance, and any upgrades, can be quite substantial, and perhaps cost prohibitive given the limited resources of local agencies. When we consider the possible savings associated with reduced criminal court costs for testimony and evidence collection, improved detection and identification capabilities, and protection from civil suit litigation due to real time audio/visual recording, one can

imagine direct interface between man and machine systems could pay for themselves. Certainly disputes over the facts of what an officer saw or heard will be greatly minimized, leaving only the examination of their specific intentions and motivations to be conducted. Having a complete record of everything an officer sees, hears and smells, could go a long way toward enhancing credibility and guaranteeing optimum performance.

Summary

The concept of man and machine direct interface touches on the highly sensitive topic of individual core beliefs and worldview. As can be seen we are already at the cusp of a new age, where man and machine can be connected, enhancing man's capabilities to collect, understand and communicate data from the world around him. We can anticipate that not everyone is going to embrace this new reality, and many will undoubtedly work hard to keep it from happening. Who will move forward, and who will be left behind? Is this the dawning of a new epoch in which man's next evolutionary step is from homo sapiens to homo cybernetic? You can bet that people have very strong ideas and beliefs about that possibility, and it will require much debate and interaction to cross over that line.

Until we enter an era in which police officers are no longer required to keep the peace, maintain order, and improve the quality of life, law enforcement professionals will seek practices and technologies that will best serve their communities. The interfacing of man and machine has benefits and provides opportunities for more efficient and effective policing. It is incumbent

upon us as leaders to ensure that the dialogue necessary for this application takes place at every level of society.

ENDNOTES

¹ Powell, Dawn. "What is a Cochlear Implant and how does it work?"

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² "Cochlear Implant Club International, 1998"

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³ Smith, Jack. "Creating a Bionic Eye"

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⁴ San Francisco Chronicle, 17 January 2000.

⁵ Howard, Toby. "Controlling computers by thought."

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⁶ William Pasmore, Designing Effective Organizations, (New York: John Wiley & Sons, 1988), p 10.

⁷ Lee G. Bolman and Terrence E. Deal, Reframing Organizations, (San Francisco: Jossey-Bass Publishers, 1997), p 57.

⁸ Richard Slaughter, The Foresight Principle, (Westport: Praeger, 1995), p

⁹ William Pasmore, Designing Effective Organizations, (New York: John Wiley & Sons, 1988), p 29.

¹⁰ Wendell French and Cecil Bell Jr., Organizational Development, (Englewood Cliffs: Prentice-Hall, 1995), p 231

¹¹ Marvin Weisbord, Discovering Common Ground, (San Francisco: Berrett-Koehler, 1992), p 73

¹² Wendell French and Cecil Bell Jr., Organizational Development, (Englewood Cliffs: Prentice-Hall, 1995), p 81

¹³ William Pasmore, Designing Effective Organizations, (New York: John Wiley & Sons, 1988), p 29.

¹⁴ Marvin Weisbord, Discovering Common Ground, (San Francisco: Berrett-Koehler, 1992), p 73

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