HOW WILL VIRTUAL REALITY TECHNOLOGY IMPACT CRITICAL INCIDENT TRAINING IN A MID-SIZE URBAN LAW ENFORCEMENT AGENCY BY 2010?

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Peace Officer Standards and Training

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This Command College 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.

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CHAPTER ONE

ISSUE IDENTIFICATION

Introduction

A speeding vehicle runs a stop sign in front of a rookie police officer. A late night pursuit begins to wind through abandoned city streets. The short vehicle chase ends in a downtown business district when the suspect abandons his vehicle and continues his flight on foot. There is no time to wait for backup. The rookie officer exits his patrol vehicle and gives chase, shouting at the suspect to stop. The suspect ignores the demands to stop and quickly ducks into the doorway of a closed business. The officer hears a loud crashing noise and the sound of breaking glass. As he approaches, he sees that the suspect has broken into the business through the front door. The suspect pulls out a gun and fires a shot in the officer's direction before disappearing inside the business. The officer, shaken but uninjured, calls in his location and follows the suspect into the building.

Did the officer make a sound tactical decision by not waiting for backup and following the suspect into the business? According to conventional wisdom and most police agency training standards, probably not. In playing out this scenario, whether the officer made the correct decision or not, the value of the training experience and the impact it will have upon future tactical decisions made by this officer is immeasurable. That is, of course, providing the officer lives through the experience.

Fortunately for this officer, the scenario occurred in a realistic high-tech world called virtual reality. This is a world where training can have real-life impact without the associated risks, namely being killed when you make the wrong decision.

It has often been said that "experience is the best teacher." However, in the law enforcement arena, officers may not get a chance to learn from their experience. They might go

through an entire twenty-year career and never be exposed to certain critical situations. In order to survive, the training they receive must prepare them for most situations they will encounter on the street.

The more realistic the training, the greater the lessons learned. Virtual reality can provide the type of realistic training that today's peace officers need. By completely immersing the senses in a computer-generated environment, the artificial world becomes reality to the users and greatly enhances their training experience.[1]

Virtual reality is one of the newest trends sweeping the world today and has developed at an astonishing rate. It is the next level in interactive computer simulation where the computer will captivate the senses and imagination.[2]

At the present time, many people equate virtual reality with video games and science fiction. Yet, with the military, numerous commercial businesses and non-profit organizations dedicated to its development, virtual reality will soon become an important part of life, especially for law enforcement personnel.[3]

This research project asks the question: "How will virtual reality technology impact critical incident training in a mid-sized urban law enforcement agency by 2010?" This project will provide possible future scenarios that will aid in answering this question. If an organization is aware of future possibilities, based upon projected trends and events, then action can be taken to mitigate or facilitate those trends and events where necessary.

It is clear that training for critical incidents is and will continue to be a major area of challenge for law enforcement managers. They will need to utilize developing technology and the best strategies to impact this challenge.

This project examines the role that virtual reality technology will play in preparing police officers to handle critical incidents. A critical incident is defined as any incident that is out of

the ordinary and causes an extreme emotional reaction that interferes with an officer's ability to function properly.

The information provided by this research is designed to be utilized by any mid-size urban law enforcement agency for developing organizational policy or in strategic planning for training in critical incidents.

Chapter I, Issue Identification, provides background information, terminology and a historical perspective of virtual reality training. There is also information regarding current training applications that are utilized by the military and law enforcement. Chapter II, Futures Forecasting, is an approach that will assist in forecasting a probable future. An important element of this chapter is the Nominal Group Technique exercise. This exercise provides information concerning trends and events that may have an impact on the issue. Chapter III, Strategic Plan, is designed to create a plan that will transition the current state of virtual reality training for critical incidents into a desired future state of training in law enforcement agencies. Chapter IV, Transition Management, discusses the implementation of the strategic plan and how to overcome resistance to change in the organization. Chapter V, Conclusion, includes a summary, recommendations for the future and implications for leadership.

Historical Perspective

The idea behind virtual reality has been around for over 25 years, but suddenly the term is being widely utilized. The term can be found in trendy magazines, on cable news and in movies such as "Virtuosity" and "Minority Report."[4] It might be difficult to understand the concept if you have never been immersed in a virtual reality environment. It is highly interactive, unlike just watching TV, because the whole body becomes part of the program and objects can be manipulated or altered.

Jaron Lanier, founder of VPL (Visual Programming Language) Research originally coined the term "Virtual Reality" in 1989. Other terms that have been utilized interchangeably include, "Artificial Reality" (Myron Krueger, 1970), "Cyberspace" (William Gibson, 1984) and "Virtual Worlds" in the 1990s.[5] Originally the term referred to "Immersive Virtual Reality" where the user becomes fully immersed in an artificial, three-dimensional world that is completely computer generated.[6]

The three concepts that describe true virtual reality technology are immersion, interactivity and information intensity. Immersion deals with the ability of the technology to isolate the senses and give the illusion of being transported to a new location or environment. Interaction is the technology's ability to change the scene from the point of view of the participant and the ability to alter their physical position and manipulate objects. Informational intensity means that the virtual world includes artificial entities that demonstrate a certain degree of intelligent behavior.[7]

One of the first areas where virtual reality found practical application was in military training and operations. Ten years ago virtual reality was a science-fiction fantasy. Today it is a developing technology. Tomorrow it may be as common as television. Virtual reality is a medium whose only limiting factor is the imagination of the user.

Terminology
Virtual Reality Devices

Head-Mounted Display (HMD)

This was the first device providing its wearer with an immersive experience. A typical HMD houses two miniature display screens and an optical system that presents a stereo view of a virtual world.

Binocular Omni-Orientation Monitor (BOOM)

The BOOM was developed in order to overcome the awkwardness of the head mounted display. This is a head-coupled stereoscopic display device. Screens and an optical system are housed in a box that is attached to a multi-link arm. The user looks into a box and sees the virtual world.

Cave Automatic Virtual Environment (CAVE)

This device provides the illusion of immersion by projecting stereo images on the walls and floor of a room-sized cube. Several persons wearing lightweight stereo glasses can enter and walk freely inside the CAVE.

Input Devices and other Sensual Technologies

A variety of input devices like data gloves, joysticks, and hand-held wands allow the user to navigate through a virtual environment and interact with virtual objects. Directional sound, tactile and force feedback devices, voice recognition and other technologies are utilized to enrich the immersive experience.[8]

Applications

As the technologies of virtual reality evolve, the applications become literally unlimited. A virtual environment can represent any three-dimensional world and can be either real or abstract. Useful applications of virtual reality include training in a variety of areas. The military, the medical industry, the airline industry, the education system, the space program, architecture, ergonomic studies, assistance for the handicapped, and the study and treatment of phobias are all fields currently utilizing virtual reality technology training.[9]

Although considerable research and development have been conducted in this field, only a limited amount has applied directly to law enforcement. The apparent reason is simply that for the most part, law enforcement has not asked for it.[10] Because virtual reality technology in

training applications is relatively new, most law enforcement administrators know very little about it. They know even less about what it can do for their agencies. By understanding what virtual reality is, how it works and how it can benefit them, law enforcement administrators can and should become more involved in the development of this important new technology.

Military Training

The Pentagon and the Department of Defense lead both the public and private sectors in the development of virtual reality training. Since the early 1980s, the military has actively researched, developed and implemented virtual reality to train members of the armed forces to fight effectively in combat.

A recent study conducted by the Defense Science Board found that "The superb performance of our military in the 1990s was not just the result of technological superiority but equally of training superiority."[11] To make training more realistic, the military has reached out to the business world, academia, think tanks, and non-traditional sources such as the entertainment industry for out-of the-box thinking, support and technology.[12]

Groups of military personnel from around the world can engage in combat safely on a virtual battlefield. The combatants never actually come together physically. Simulators that are located in various sites around the world transmit data to a central location where the virtual battle is controlled. This form of training has proven very cost effective because it is less expensive to move information than people.[13]

The military is so convinced that virtual reality technology will enhance its training methods that more than $45 million may be spent on simulation projects between 2000 and 2005.[14] This also reflects a larger Pentagon mandate to use technology to train the video-game generation now entering the service.

Virtual reality can also be used to recreate actual battles. The Institute for Defense Analyses recreated an offensive conducted by the 2nd Armored Cavalry Regiment during Operation Desert Storm based upon information from actual participants. Upon viewing the simulation, the soldiers who fought in the battle reported the extreme accuracy of the events and the feeling of actually reliving the battle.[15] Clearly, virtual reality simulation of past incidents holds great potential for accurate review and analysis that would be difficult to accomplish by any other method.

Even though virtual reality environments are only simulations, complete immersion overwhelms the senses and totally engrosses the users in the action. This perceived realism plays a major role in the effectiveness of the training. Research shows that the more similar a training situation is to the real event, the more transfer of expertise.[16]

The military has been so successful in training multiple participants in group combat situations that it plans to train infantry personnel individually with virtual reality fighting skill simulators.[17]

Law Enforcement Training

To varying degrees, military uses such as firearms training, tactics and assault skills, can transfer to law enforcement. In the past, very few research companies have been interested in developing virtual reality training simulation for law enforcement.

After the terrorist attacks on the World Trade Center and the Pentagon on 9/11/01, the creation of the United States Department of Homeland Security generated new interest in training the nation's first responders for terrorist incidents. In the area of preparedness for emergencies and disasters, the U.S. Department of Homeland Security has made more than $ 4.4 billon in funding available for grants since March 1, 2003. Funds totaling $566 million have been made available to states and cities for equipment, training, planning and exercises.[18] Law

enforcement managers should use this interest, momentum, and available funding to expand virtual reality training capabilities as they become available.

Virtual reality technology offers law enforcement benefits in a number of areas including pursuit driving, firearms training, high-risk incident management, incident recreation and crime scene processing.

Pursuit driving is one area where a virtual reality application has been widely accepted and utilized. Driving simulators have been developed and are being used by a large number of police departments around the country. Virtual reality simulators provide invaluable training at a fraction of the cost and none of the risks of using actual vehicles. The simulators help officers develop judgment and decision-making skills that are carried over to actual driving conditions.

Virtual reality firearms simulators could greatly enhance the two-dimensional, limited interactive shooting simulators currently in use. A virtual reality system would allow officers to enter a virtual three-dimensional environment alone or as a team and confront computer generated foes or other virtual reality users. The training could be observed and accessed by evaluators from any perspective including that of the officers or the foes. The scenarios could involve actual buildings, local city streets and be adjusted to other criteria such as lighting, weather, the number of participants and types of weapons.

This type of virtual reality weapons training could also prove invaluable for SWAT team members prior to high-risk tactical assaults. Floor plans and other known facts about a location or structure could be entered into a computer to create a virtual environment that could be analyzed prior to taking actual action.

Virtual reality technology could also be utilized in the area of incident recreation. Data could be collected from victims, witnesses, suspects and crime scenes to reconstruct traffic

accidents, shootings and other crimes. Virtual environments could be created that would refresh the memories of victims and witnesses for testifying in court.

In a virtual world, officers could be trained to analyze crime scenes and collect evidence without ever having to leave the station. Actual crime scenes could be recreated to add realism to training or evaluate prior police actions.

Virtual reality by no means represents a panacea for all aspects of police work. It is, however, a new and intriguing technology that holds great potential for training applications.

There are two compelling reasons why virtual reality will become a prominent technology in the future of law enforcement critical incident training. One reason is that, each crisis situation is unique, so it is very difficult to train for all possible scenarios. Officers generally perform well after training even though they cannot always accurately report their decision-making process. Repeated and varied training builds self-confidence and allows an officer to function well under stress. Refinements in virtual reality training will provide officers with the experience needed to handle critical events without having to wait for an actual event. The second reason is that there is a public expectation that law enforcement will automatically know how to deal with and resolve any given critical incident. Training in a virtual reality environment significantly enhances officer awareness, decision making, and command and control skills.

Interactive Training Applications using Responsive Virtual Human Technology

Responsive virtual human technology (RVHT) is a relatively new advancement in training technology. This technology combines virtual reality with an emotion engine. This engine portrays emotions in a virtual human being. These virtual humans stare, gesture and present body language as well as verbal feedback during the training interaction.[19]

Interactive skills such as interviewing, negotiating, presenting and eliciting information are essential in all endeavors, especially in law enforcement.

A research firm called the Research Triangle Institute in North Carolina has created several effective applications using RVHT. One such application for the National Institute of Justice in called JUST-TALK Police Training.[20] The simulation program provides a virtual human that interacts with the student in a way that mimics the role-playing approach to training. It is designed to train peace officers to handle mentally disturbed persons. In this training, the students use visual cues as well as react to verbal responses to complete the scenario. The emphasis of this program is upon applying the technology to support law enforcement training and determining the best way to deliver it to small and mid-sized police departments around the country.

Current State of Virtual Reality and Critical Incident Training

Currently, most law enforcement agencies conduct critical incident training through live scenario exercises. This type of training can be very time-consuming and costly. As a result, critical incident training is not conducted very often.[21] It becomes very difficult to maintain acceptable levels of skill, judgment and preparedness to deal with these situations without creating live scenarios.

There is an alarming trend of increasing terrorist events in the United States and throughout the world. There is an expectation by the public that law enforcement personnel will respond correctly to these critical incidents. Advancements in virtual reality training will provide an opportunity to train for such events in a controlled and safe environment.

Virtual reality has been utilized in a very limited capacity by law enforcement for training purposes. The first driving simulators and shooting simulators utilized limited two-dimensional video technology. The simulators did provide an interactive and somewhat realistic training

experience, however this was not true virtual reality technology. The cost of virtual reality technology has always been a limiting factor in utilizing it for law enforcement related training.

There are hundreds of companies, universities and research organizations who are actively involved in the development of virtual reality simulation training. There are only a few who currently offer law enforcement related training products. The reason for this is simply a matter of demand. Law enforcement agencies have not been in the market for such technology. Most of the research organizations and universities express a lack of contact and involvement by law enforcement agencies that would provide them with the incentive to create such training projects. In other words, currently there is a very limited market.

The purpose of this project is to answer the question: How will virtual reality technology impact critical incident training in a mid-sized urban law enforcement agency by 2010? The following chapters will forecast future trends and events, identify obstacles to implementation, explore the development of a strategic plan and describe managing the transition to virtual reality critical incident training.

CHAPTER TWO

FUTURES STUDY

Introduction

How will virtual reality technology impact critical incident training in a mid-sized urban law enforcement agency by 2010? The future cannot be known. The correct word to use when studying the future is "futures" in the plural. There is no one preordained future that is fated to occur. Rather, there are many different possible alternative futures. Instead of predicting what the future will be, this research project uses a wide range of scientific methodologies to engage in structured and thoughtful speculation about future possibilities.

This chapter will present possible future scenarios that were derived utilizing environmental scanning and futures forecasting. Scanning is the process of looking for social, technological, economic, environmental and political change.[22] It is the acquisition and use of information about events, trends and relationships in an organization's external environment. Gaining this knowledge will assist in planning the organization's future course of action. Creating alternative future scenarios will allow transition into the strategic planning process and ultimately assist in creating the desired future of utilizing virtual reality technology for critical incident training.

Nominal Group Technique

The Nominal Group Technique (NGT) was used to develop and identify trends and events that might impact the use of virtual reality technology for critical incident training by law enforcement agencies. The NGT exercise is recognized as an effective means of arriving at conclusions concerning issues of future importance.[23] It is a process that uses generation and discussion of ideas, analysis of ideas for purposes of clarification and understanding, and

prediction as to their probability of realization. The purpose of the exercise was to identify trends and events that could impact the issue, and bring together a wide range of experience and knowledge enhancing the opportunity for exposure to different perspectives.

A diverse group of individuals with different educational and career backgrounds was formulated to examine the feasibility of virtual reality technology being utilized to train law enforcement personnel for critical incidents. The NGT members were (Appendix A):

Major, Helicopter Pilot, United States Marine Corps

Professor of Social Work, California State University, Fresno

Ph.D. Candidate in Psychology, Dissertation on Critical Incidents

Police Captain, Training Division, Clovis Police Department

Administrator of Technology Services, Clovis Unified School District

Information Services Director, City of Clovis

Technical Support Manager, Pelco International

Professor of Computer Science, California State University, Fresno

Participants were selected in hopes of achieving a representative sampling of public and private sector professions. They were also selected with the intent to achieve a breadth of experience relating to the issue question.

The NGT occurred in March of 2004. Approximately one week prior to the scheduled process, each of the participants received a packet containing materials clarifying the issue. The packet included research information and definition of terms relevant to the NGT process. An introductory presentation was given regarding the NGT process and its value to the project, as well as the project's role in the Command College experience. The group focused upon development of trends and events. The following definitions were given to the NGT panel:

Definitions

Trends:
A series of events strung together. They may be internal or external to the organization and should represent major areas of relevance to the issue. They should be clearly stated in terms defined and understood. They are non-directional and are quantifiable or qualitative.

Events:
A single incident that could have a significant impact on the issue. Events do or do not ultimately take place and they have probabilities of occurrence. They may be internal or external to the organization and have not occurred in the past.

Definitions presented to the NGT panel[24]
Table 2.1

The following steps were used to identify possible trends and events relating to the project question:

- Silent generation of possible trends and events
- Clarification of trends and events
- A vote to establish top trends and events
- Two private votes establishing values for the status of each trend, five years in the past, five and ten years in the future, and establishing a level of concern for each trend
- Two private votes establishing percentage values for the probability of occurrence of each event five and ten years in the future, establishing the first year probability exceeds zero, establishing an impact scale and a positive or negative impact
- Establishing the medians for all trend and event values

TRENDS	-5 years	Today	+5 years	+10 years	Level of Concern 1-10
T1: Budget funds available for training purposes	75	100	150	125	6
T2: The number of critical incidents occurring in law enforcement agencies	50	100	200	200	7
T3: The amount of state funds allocated to social service agencies	50	100	50	50	9
T4: Cost of virtual reality technology	150	100	75	50	7
T5: Public expectations of law enforcement's ability to respond to critical incidents	50	100	150	150	8
T6: Average years of experience of new officers dealing with critical incidents	100	100	75	50	10
T7: The amount of training on proper law enforcement actions and decisions at critical events	50	100	125	150	6
T8: Amount of legislation for mandated training	80	100	125	150	5
T9: Development of virtual reality technology to meet training needs	75	100	125	130	7

Trend Analysis
Table 2.2

Trends and events were developed in the context of their having a social, technological, economic, environmental or political (STEEP) impact on the question.[25]

Panel members began the NGT process by identifying trends that they believed would impact the issue. Members were given turns to contribute several trends, which were recorded on a flip chart for all to view. Twenty three trends were identified (Appendix B).

The group then discussed whether or not any of the identified trends could be modified or combined. After all members understood the identified trends, they were asked to select the

trends that they believed would have the greatest impact upon the question. For comparison purposes, the value in column two in Table 2.2 represents an arbitrary level of 100 today. The level five years ago and five and ten years into the future are reflected in columns two, four, and five. The value in column five represents the group's level of concern about the trend. The following nine trends received the most votes from panel members. The data represents the median of the panel's assessment of the trend levels.

The nominal group panel discussed the following trends and identified them as being the most likely to impact the development and implementation of virtual reality as a training tool for law enforcement in critical incidents.

T1- Budget funds available for training purposes

The initial cost of virtual reality technology could be significant. The panel felt there would be a steady increase in available funding for training as law enforcement agencies are mandated to become better prepared at handling critical incidents. They also felt that this trend would diminish as law enforcement agencies obtained the necessary technology to provide the required training. Government assistance in the form of grant funding could be used to supplement local budget funding. Partnerships should be developed with other agencies, both countywide and statewide, to pool resources and funds. Partnerships should also be developed with military services that currently use virtual reality training. These suggestions should help mitigate concerns over the cost of the technology. The panel's concern about this trend was minimal.

T2- The number of critical incidents occurring in law enforcement agencies

Most panel members believed that the number of critical incidents is increasing at an alarming level. This increase will drive the need to train and prepare law enforcement to respond. The panel felt that virtual reality will offer a versatile proving ground for first-

responders to train for incidents such as biological weapons and weapons of mass destruction. The panel expressed apprehension about possible future terrorist attacks. They did see a direct relationship between the threat of a terrorist attack and preparing law enforcement personnel to respond to such incidents by using virtual reality training methods.

T3- The amount of state funding allocated to social service agencies

The panel felt that due to the current state budget crisis, adjustments will be made and funding will be taken away from social service agencies and programs that provide assistance to persons at risk. This will result in a kind of social upheaval and cause an increase in critical incidents that will have to be handled by law enforcement. The panel felt that cutting social service programs would directly impact law enforcement agencies and their critical incident experience. They expressed a high level of concern about this trend.

T4- Cost of virtual reality technology

There is concern over the cost of new virtual reality technology. The panel felt that the cost would decline in the next five to ten years. The major concern is with the initial expense of a training system. The panel believes that technological advances in the area of computer hardware and software will actually drive down the costs of VR in the future. Expending a large amount of money for state of the art technology that will probably be obsolete in a few years is a risk.

T5- Public expectations of law enforcement's ability to respond to critical incidents

The panel felt that law enforcement is being called upon by the public to perform more than just the traditional duties of fighting crime. In this post-September 11 world, communities are turning to law enforcement agencies for protection from terrorism. The public expects law enforcement to be prepared to handle any crisis that occurs. This is another trend that will drive the need to provide virtual reality training to prepare for critical incidents. The panel felt that

this trend will increase steadily as more critical incidents occur and the public becomes more concerned about terrorist events.

T6- Average years of experience of new officers dealing with critical incidents

The panel felt that the impending retirement of a large population of baby boomer generation officers will have an impact upon the experience levels in law enforcement organizations. A lot of these veteran officers have vast experience in dealing with critical incidents over their twenty-year-plus careers. The panel projected that the average level of experience will decline over five years and be half of what it is today by ten years out. They expressed concern over how critical skills will be passed on to the new hires. They see virtual reality training as a way to impart experience and expose new officers to critical incidents. There is a high level of concern about losing the vast amount of experience of older officers, and how this experience will be passed on to younger, inexperienced officers.

T7- The amount of training on proper law enforcement actions and decisions at critical events

The panel felt that it is important to teach the proper decision-making process to officers who are charged with handling a critical incident. There was a concern expressed by panel members about how law enforcement officials would monitor trends so that the training would reflect accurate training environments. The panel suggested that more could be done in this area by developing a curriculum that specifically examines the decision-making process. The panel felt that the trend to provide more decision-based training will continue to increase due to liability issues caused by inadequate training in this area.

T8- Amount of legislation for mandated training

The panel expects that federal and state legislators will continue to mandate training related to domestic terrorism and response to mass casualty events. This has been the pattern in all areas of public concern and should continue into the foreseeable future. The level of concern

for this trend is minimal because the panel felt that the justification to obtain VR technology to train for critical incidents will be provided by mandated training.

T9- Development of virtual reality technology to meet training needs

The panel projected that virtual reality technology will continue to develop and be utilized for critical incident training at a steady pace in the next ten years. The panel suggested that it will be critical for law enforcement to continually monitor software and hardware advancements to ensure that the training programs utilize the best tools possible. The panel sees the opportunity to form partnerships with universities and private research firms to aid in the development of virtual reality simulation training programs. There has been little input from law enforcement regarding the type of virtual reality training that would be useful. The concern level for this trend is high because it is essential for law enforcement to provide input as to the type of VR training that is needed.

The NGT panel repeated the same process to identify potential events. The panel identified twenty-three events that could possibly impact the issue (Appendix C). Nine of these events were chosen because the panel felt they had the greatest significance on the issue. Values were assigned to each event. The value in column two represents the first year the event could occur. The value in columns three and four represents the probability of the event occurring within five and ten years. The value in column five represents the impact of the event on the issue and whether that impact will be positive or negative. The identified events and the median values assigned by the group are reflected in Table 2.3.

EVENTS	Yr. > 0	5 Years	10 Years	Impact (-10 to +10)
E1: Unexpected side effect on humans exposed to VR	6	0	50	-5
E2: Bio-terrorism attack occurs	3	50	100	+5
E3: A law requiring critical incident training for homeland security	2	50	80	+10
E4: 50 percent increase in officer involved shootings	3	25	50	+7
E5: Federal government develops VR training program for critical incidents	2	75	100	+9
E6: Economic depression	8	0	20	-7
E7: A critical incident exposes law enforcement lack of training	4	20	50	+9
E8: Private donor contributes $100 million for VR research	2	20	50	+10
E9: Several officers killed in live training scenario	6	0	10	+8

Event Summary
Table 2.3

E1) Unexpected side effect found on humans exposed to virtual reality

Panel members expressed concern about the psychological and physical impact that virtual reality may have upon some users. Some individuals have experienced negative reactions such as motion sickness to VR and this could potentially have a negative impact on its use as a training tool. Some panel members anticipated worker compensation claims might result due to use of VR technology. Lawsuits filed claiming negative effects from VR training could potentially include both physical injury and psychological issues. The panel suggested that as more individuals and organizations use VR technology, researchers can study its potentially negative effects. In the meantime, law enforcement agencies should be aware that VR users may experience some ill effects. The panel felt that the probability of this event occurring would increase as VR technology was more widely utilized. They predicted the probability of this event

occurring within 10 years is 50%. The impact upon the issue would be negative because it might influence law enforcement to avoid using the technology if the side effects were severe enough.

E2) Bio-terrorism attack occurs

The panel discussed the possibility of a chemical or biological attack occurring locally. With intelligence sources indicating that Al-Quida is planning another attack in the United States, the San Joaquin Valley is a target rich area. The release of a chemical or biological agent would cause scores of citizens to become sick or die. This type of attack would be very problematic for first responders and would overwhelm public safety resources and hospitals. Virtual reality training for an event of this nature would certainly aid law enforcement with the ability to prepare and respond. By simulating a training program in VR rather than using a live exercise, law enforcement officers could practice in a controlled environment that would allow them to run through a variety of situations in a shorter time period. The panel felt the probability of this event occurring in the next 3 to 5 years was 50 percent. In the next 5 to 10 years the probability would increase to 100 percent. The impact would be positive in the context that it would encourage the development of VR training to prepare first responders.

E3) A law requiring critical incident training for homeland security

If a law was passed that mandated critical incident training concerning homeland security issues, the panel felt that this would likely result in more VR technology being developed and created as a training tool for critical incidents. Federal and state money would surely become available that would speed the development of VR technology and its availability for use by law enforcement. The panel felt the event might occur between the next 2 to 10 years, with the probability increasing with each passing year. The impact on the issue would be very positive and create a critical incident training market for the developers of VR training.

E4) 50 percent increase in officer involved shootings

There was discussion that if there was a dramatic statistical increase in officer involved shootings, this could possibly drive the development of more sophisticated shooting simulators. The panel felt the public, of course, would be outraged at an increase in police shootings and demand better training. They felt that VR technology could provide realistic and interactive training for law enforcement officers. Scenarios that would test decision-making skills could be applied and shoot, no shoot situations practiced in a safe, controlled environment. The panel felt that the probability of this event occurring between the next 3 to 10 years would be 25 to 50 percent. They felt this would be another event that would have a positive impact upon the issue, because it would cause new, and better training methods to be developed.

E5) Federal government develops VR training program for law enforcement critical incidents

The panel felt that the federal government would have control over the training exercises and curriculum if they developed a VR training program for law enforcement critical incidents. This could minimize the potential of anti-police groups reviewing law enforcement training techniques. The panel felt that the federal government could also combine current VR training and technology now utilized by the military and apply it to law enforcement use. This would certainly help reduce the cost of the training for law enforcement. The panel sees a strong probability that this event will occur sometime in the next 2 to 10 years. They cited continuing government efforts to improve homeland security and disaster preparedness as indicators that this event will occur. The event would have a very positive impact upon the issue.

E6) Economic depression

The panel felt that if the United States suffered a major economic disaster such as the stock have a very negative impact upon law enforcement training. If law enforcement lost its ability to train effectively, liability issues would develop. It would be very difficult to continue

the high training standards that the public demands and the legislature mandates. The panel felt that there is only a slight possibility of this event occurring, 20 percent, in 10 years.

E7) A critical incident exposes law enforcement lack of training

The panel felt that if a highly publicized critical incident event occurred, and a lack of training was found to contribute to an undesirable outcome, this event would create more mandated training. Panel members felt that negative events that get much media and public attention sometimes cause positive things to happen in the area of training. A positive result in this instance would be better training in the form of VR technology. The data from the panel discussion indicates that the probability of this type of event occurring increases to 50% in 10 years. The panel felt an event of this nature would benefit the issue in terms of increased pressure upon law enforcement to provide better training for critical incidents.

E8) Private donor contributes $100 million for VR research

Panel members felt that the probability of the donation of a large sum for VR research to aid law enforcement training might not be that far-fetched. Funding in the area of VR research and development would speed up the implementation of VR training for law enforcement. The panel felt that a private donation from companies and individuals is an area that has not been exploited by law enforcement agencies. They projected a 20 to 50 percent probability that this event would occur between the next 2 to 10 years.

E9) Several officers killed in live training scenario

The panel felt this event is similar in nature to event number seven. It is a very negative event that would have a positive impact upon the issue. They pointed out that one advantage that VR training provides is a safe and controlled environment. There was discussion regarding the fact that mistakes can be made in virtual reality, and the participants do not have to suffer real

consequences. However, the panel felt the probability of this event occurring between the next 6 to 10 years was only 10 percent.

Cross-Impact Analysis

The panel was asked to assess the impact the events would have upon the trends. Events were assessed to have either a positive or negative impact on trends. A rating value of 1 to 5 was assigned, with 5 indicating the highest degree of impact. By analyzing the relationship between an event and a trend, a determination can be made whether to encourage or discourage an event from occurring in order to achieve a desirable future.[26] The cross-impact values were converted to median scores.

The cross-impact analysis indicated that Event 1 (Unexpected side effect on humans exposed to VR) would have a negative impact upon any funding that would be allocated for VR training. If the adverse effects were found to be severe, VR training would probably not be used at all by law enforcement.

Event 2 (Bio-terrorism attack occurs) is a negative event in the context of its effect on law enforcement and the public's safety. It would ironically have a positive impact upon all trends. An event of this nature would cause legislation for mandated training and encourage the development of VR technology. The panel felt the reaction would be similar to government reaction following September 11, 2001, with an outpouring of money coming in the wake of such an attack.

	Trends								
Events	**T1** Training Funding	**T2** Number of Incidents	**T3** State Funds	**T4** Cost of Technology	**T5** Public Expectations	**T6** Average Experience	**T7** Amount of Training	**T8** Mandated Training Legislation	**T9** Technology Development
E1 Side Effects	-5	0	-4	-3	0	-5	-3	-4	-5
E2 Biological Attack	+2	+3	+3	+1	+2	0	+2	+5	+3
E3 Law Requires Training	+5	0	+2	+1	+5	+5	+4	+5	+5
E4 Increase in officer involved shootings	+4	+3	+2	+1	+5	+3	+4	+4	+5
E5 Federal Training Program	+4	0	+3	+5	+5	+5	+3	+5	+5
E6 Economic depression	-5	0	-5	-3	0	-5	-4	-4	-5
E7 Incident exposes lack of training	+4	0	0	0	-5	0	-3	+4	+4
E8 Private donation for training	+5	0	+1	+4	+2	+3	+2	+1	+5
E9 Officers killed in live scenario	+4	0	0	0	-1	0	+1	+2	+4

Table 2.4
Cross Impact Analysis

Event 3 (A law requiring critical incident training for homeland security) would positively impact Trend 1 (Budget funds available for training). More money would be provided by the federal government to cities and counties to provide mandated training. This event would also positively impact all of the other trends and cause VR training to be brought to the forefront for preparation to respond to critical incidents.

Event 4 (50 percent increase in officer involved shootings) was viewed as an event that would have a significant positive impact upon government funding and support due to increased public and political pressure to improve training.

Event 5 (Federal government develops VR training program for critical incidents) would have a very positive impact on most of the trends. The federal government would be funding the expenses surrounding technological development and advances in virtual reality. This would greatly increase the likelihood of new technological advances. Law enforcement agencies would be more likely to benefit from the VR training that already exists in military applications.

Event 6 (Economic depression) would significantly affect federal, state and local budgets. If Event 6 occurs, it would have a negative impact on Trend 4 (The cost of virtual reality technology) and funding for technological advances would not be available, causing advances to stop.

Event 7 (A critical incident exposes law enforcement lack of training) would have a mixed impact upon the trends. The panel felt it would positively impact Trend 1 (Budget funds available for training purposes) because more training would be necessary. It would have a negative effect on Trend 5 (Public expectations of law enforcements ability to respond to critical incidents) as it would serve as an example of law enforcement not being properly training and prepared. This event would have a positive effect upon Trend 8 (Amount of legislation for mandated training) and Trend 9 (Development of virtual reality technology to meet training needs). The panel discussed how a major mishandling of a situation by law enforcement brings about mandated training and new funding to provide the training.

Event 8 (Private donor contributes $100 million for VR research) would positively impact all trends. More funding in the area of VR research and development would certainly speed up the time table for VR to be applied to critical incident training.

Event 9 (Several officers killed in live training scenario) would positively impact Trend 1 (Budget funds available for training purposes) and Trend 9 (Development of virtual reality technology to meet training needs). The panel felt that tragedies usually cause law enforcement organizations to reexamine how they conduct business. A by-product of this reexamination process is that more attention is given to training needs.

Alternative Future Scenarios

The purpose of scenario planning is not to pinpoint future events but to focus upon the forces that push the future in different directions.[27] Scenarios help to prepare for the future by causing an exploration of uncertainties and what they might mean so the responses to these possible futures can be planned.

The examination of virtual reality technology and its feasibility for training in critical incidents generated a wide range of possibilities. Three alternative future scenarios were created based upon information gained from the scanning process and the nominal group technique process. The pessimistic scenario describes a law enforcement agency where training for critical incidents with VR technology is non-existent. The normative scenario describes the existence of an advanced form of VR training for critical incidents, one in which its presence is solidified, yet not utilized to full potential. The optimistic scenario describes a law enforcement agency where VR training for critical incidents is very sophisticated and utilized to its fullest potential.

SCENARIO 1 (Pessimistic)

It is March 25, 2010, and Sergeant Presley, a twenty-five-year veteran is conducting the graveyard shift briefing. He surveys the room and begins to wonder where everyone has gone and, more importantly, why is he still here. All of the experienced officers that he worked with for so many years have now retired. The police union had recently bargained for a new

retirement package called 4% at 45. Yes, police work is a young man's game, but this new retirement system has virtually wiped out several hundred years of experience. The average age of the fifteen officers in the room with him is twenty-three. Sergeant Presley often comments that he has socks and underwear older than most of the officers who work for him. The average time on the job is a scant two years. He is very worried about how the young, inexperienced officers will respond to the critical incidents. It is not that they are not dedicated and enthusiastic; it's just that they do not have the experience and now there is no one around to pass it on. He wonders how he can possibly prepare these young officers for what they will encounter. After the stock market collapse of 2009, training funding has been almost non-existent. He has tried to get the department to conduct live training scenarios for different types of critical incidents, but the chief and command staff are hesitant. "This town doesn't have enough critical incidents to worry about preparing officers," they tell him. Sergeant Presley knows better: "All it takes is one," he thinks to himself. The last live critical incident training that was conducted ended in disaster with an accidental shooting. There are lawsuits still pending and, besides, there is no money in the overtime budget. He knows about virtual reality training and wishes that law enforcement would have put more effort into lobbying for its use in critical incident training. Then at least these rookie officers could experience and train for these unusual situations that always eventually happen. But, recently, scientists have discovered that exposure to virtual reality environments cause adverse psychological reactions in some people. Besides, there is no money available to purchase the necessary hardware or software, so it's a moot issue. The telephone in the briefing room rings. It is dispatch reporting that a critical incident has just occurred in the downtown area. A large tractor-trailer truck has exploded and it contained a possible nerve-agent gas. An anonymous tip was received that the militant group "Anarchy" was claiming responsibility. There are over 20 people dead and scores seriously

injured. Downwind of the event, people are becoming ill. No need to worry about experience or training now, there are too many other things to worry about.

SCENARIO 2 (Normative)

It is March 25, 2010, and Sergeant Presley is watching his officers train in a virtual environment. He sees one of his officers make a rookie mistake. The officer dies a virtual death. "Hit the restart button and try it again," he shouts. He knows that when the real situation happens, there will be no second chances. Even though he has seen many of his more experienced officers retire due to the newly acquired 4% at 45 retirement system, he feels confident that this training will prepare his rookie officers to respond properly to a critical incident. He has witnessed many technological changes throughout his twenty-five-year career, but virtual reality training has certainly been the highlight. In this virtual scenario, there has been a biological warfare agent dispersed following a terrorist bombing. With virtual reality, his officers are exposed to critical incidents and are able to practice over and over again, like in a video game. "You make mistakes and you learn," he says. An officer who dies a quick cyber death is not likely to forget the importance of wearing the proper protective equipment in the future. He knows that experience is the best teacher and not only prepares officers mentally to encounter critical incidents, but also helps them make better decisions when they are called upon to respond. A few years ago he attended a virtual reality workshop, a result of being appointed to a technology review committee by the Chief. He remembers seeing the virtual reality firearm training system for the first time and he was very impressed. Due to his involvement and lobbying, the training system was purchased with the aid of a federal grant. The system immersed officers in an environment that enabled them to significantly enhance their awareness, shooting and decision-making skills. "This type of training can be applied and will benefit law

enforcement in other areas," he thought. He didn't realize it at the time, but technological advancements and demand for more virtual reality training by law enforcement agencies would help bridge the experience gap left by so many baby-boomer retirements. He had a sense of well-being as he contemplated pulling the plug himself. He still felt that more could be done in the area of virtual reality training but who would carry on the advocacy if he retired? After all, he had been responsible for getting the virtual reality driver's training system and the virtual terrorist attack system that his officers were now training on. The telephone rings in the training room. Its dispatch... could this be the real thing? "Bring it on, we are ready," he thinks to himself. It's not a terrorist attack, just a run-of-the-mill hostage situation. "We trained in virtual reality for those two weeks ago," he says with a grin. "Maybe I will virtually retire tomorrow."

SCENARIO 3 (Optimistic)

It is March 25, 2010, and Sergeant Presley and his patrol shift have just finished a training session with the newest form of virtual reality training called Responsive Virtual Human Technology. This VR technology has been adopted by law enforcement agencies around the country to prepare and train for critical incidents. It had come to fruition when the federal government decided to develop their own VR training system as part of the homeland security bill. It was funded through a federal grant. This is truly an immersive, interactive training experience that uses natural language processing and virtual reality to provide a computer-based role- playing realistic encounter with a mentally ill subject. Through observations of the virtual environment and a dialog with the virtual subject, the officer must stabilize the situation and adapt their responses appropriately. Sergeant Presley watched as one of his rookie officers became impatient with the virtual subject. The virtual subject reacted by becoming more aggressive. "Don't forget; your job is to calm him down. Getting people upset doesn't take a lot

of effort; it's calming them down that takes real skill," he said with a smile. The virtual subject maintains an emotional state that is driven by the verbal inputs of the officer. Sergeant Presley knew that this virtual interaction would provide valuable experience for the rookie officer in dealing with mentally ill subjects. Virtual reality training was now an integral part of the department's strategy to expose officers to critical incidents that did not occur on a regular basis. An officer might go through an entire career without exposure to certain critical incidents. On the other hand, a new officer might be involved in a critical incident on the first day on the job. It didn't really matter to the public either way. They expected law enforcement to be prepared to handle any situation that might arise. He thought of the old days, before virtual reality training and how unprepared he was for certain situations. If you were involved in a real critical incident, you learned a lot about what to expect, what types of actions to take and what actions not to take. If you were never exposed to certain situations, you didn't have a clue. Today, you can experience these critical events in a safe virtual world, where you can make mistakes and learn proper procedures and tactics. There are no real consequences such as lawsuits and injuries and even death. The virtual consequences are memorable enough and training scenarios can change with only a few keystrokes. "We have truly come a long way from merely reacting instinctively to a critical incident to actually practicing them before they happen and planning a proper response," he told his officers. "How fortunate you are to have this capability." Sergeant Presley knew that his officers were prepared to handle any situation. He could now retire and pursue his life-long ambition of moving to Las Vegas and becoming a "virtual Elvis" impersonator. He would only have to change his first name.

Chapter 2 has been an exploration of the trends and events that were identified by the nominal group technique as having a significant impact upon the issue. Three alternative

scenarios were offered to assist in the development of a vision for the desired future of virtual reality training and its role in preparing law enforcement officers to respond to critical incidents. Chapter 3 will engage in the development of a strategic plan, the purpose of which is to assist in the achievement of the optimistic scenario presented in this chapter.

CHAPTER 3

STRATEGIC PLANNING

Introduction

A strategic plan is developed for the purpose of achieving a future that will resemble the one described in the optimistic future scenario.[28] The plan is this chapter will define strategies that will be important to developing, managing and implementing virtual reality (VR) training for critical incidents. It is presented as a tool to provide a mid-sized urban law enforcement agency with a blueprint of what to do, why to do it and how to do it. The purpose of this chapter is to focus upon the ongoing process of decisions and actions that will shape the future of virtual reality in critical incident training.

Strategic planning is a disciplined process that involves preparing the best way to achieve a desired result.[29] Being strategic means being clear about goals, aware of available resources and incorporating both to be responsive in a dynamic environment. Planning involves intentionally selecting a desired future and developing an approach to achieve that future. The process herein includes an organizational analysis, stakeholder analysis and strategy development with three alternative strategies.

The plan will be used to prepare an organization for change and to minimize the negative impacts of that change. The desired changes include: increasing the availability and type of virtual reality training, forming partnerships with other law enforcement agencies and obtaining funding to purchase VR simulators for critical incident training.

Vision and Goals

The primary objective of this plan is the development and implementation of virtual reality technology to train law enforcement personnel for critical incident response. The second objective is to prepare an organization for the challenges born in the pursuit of new technology

for training. VR training promises to greatly increase law enforcement's ability to prepare and respond effectively to critical incidents. An effective VR training program will result in better management of critical incidents and a safer, more adaptable training experience for peace officers.

Organizational Description

The model agency for this project is the Clovis Police Department. It was chosen because it typifies a mid-size, urban law enforcement agency. The issue of virtual reality training for critical incidents was previously examined through scanning, literature review, nominal group technique and alternate future scenario planning. Prior to developing a strategy, an examination of the current state of the Clovis Police Department is in order.

The city of Clovis is a general law city providing services to a population of 80,000 residents living within a 19-square-mile area.[30] The city shares a common border with the city of Fresno and is surrounded by a metropolitan population approaching 500,000. Clovis is located in the central valley and is adjacent to California State University, Fresno. The city is governed by a five member city council and city departments are administered by a City Manager.

The police department has 91 sworn officers, 48 civilian employees and an annual budget of 16 million dollars.[31] Policing of the city is divided into north and south sectors. Five captains command divisions and answer directly to the Chief of Police.

Approximately $100,000 is budgeted annually for training purposes.[32] The police department budget is funded almost entirely through the general fund.

The following population projection was based on a city of Clovis baseline projection of population within the Clovis General Plan project area. The projection of sworn personnel is based upon a preferred ratio of 1.25 officers per 1,000 population. The civilian employee

projection is based on a .5 civilian employees per 1,000 population. Budget projections are based upon an extrapolation of annual budget growth. These projections are from the Planning Department.

The Clovis Police Department

	Now	**2010**
Population	80,000	118,000
Sworn Officers	91	147
Civilian employees	48	59
Department Budget	$16,000,000	$21,000,000
Training Budget	$100,000	$150,000

Table 3.1[33]

The Clovis Police Department seeks to build enthusiasm around issues that are of priority to the mission of the department.

Department Mission

> To provide superior protection and service in a manner that builds public confidence and improves the quality of life in our community. To those we serve, we want to be the best![34]

Mission Statement of the Clovis Police Department

> Every member of the department is also expected to seek out better ways of doing their job as well as better ways for the department to accomplish its mission. New ideas and initiative are encouraged. We also strive to be alert for new methods and procedures that might assist us in accomplishing our objectives.[35]

The department is selective about the degree to which organizational energies and resources are expended on issues. Any plan undertaken must be worth the effort. Several questions are posed at the onset: What will be the impact of the plan? Will it provide customer

satisfaction, meet organizational needs, improve community safety or improve quality of life in the community? Can enthusiasm be fostered both inside and outside of the organization that will bring about the success of the plan? Virtual reality training for critical incidents is exciting, possible and realistic. Department personnel as well as the community can get excited about the pursuit of such training capabilities.

The training function of the Clovis Police Department falls under the responsibility of the Support Services Division. This division plans training on an annual basis and schedules both in-house and off-site classes that enhance the professional skills of police department personnel.

The department has done a limited amount of live scenario training on certain critical incidents. Periodically, there has been multi-agency training for disaster preparedness. County-wide disaster training has taken the form of a mock plane crash and hazardous material spill. The department has also conducted live scenario training with the Clovis Unified School District for a school shooting situation and a bomb detonation on the school grounds.

The SWAT team trains on a monthly basis. The members practice tactical training such as building searches, dynamic entries, and hostage situations. Currently, the only video simulation training that is done is driver training. The driving simulator consists of a steering wheel interface device that plugs into a computer. It is low-end technology and not virtual reality. The department has also utilized the FATS (Firearm Training System) in the past. The system was designed as a training tool to address judgmental use of force issues and marksmanship for peace officers. However, it is outdated technology that is no longer utilized by any agencies in the area.

There are two main reasons why the department does not utilize virtual reality training at the current time. One is that there has been no interest generated by anyone in the organization to pursue such technology. The other has to do with budget considerations. Losses in general

government revenue have been the direct result of efforts by the state to reallocate property taxes that finance local government. This situation was prompted by a fiscal crisis in the state in past years. One significant source of revenue to cities is the motor vehicle license fees (VLF). For the City of Clovis, VLF represents $4.2 million, or about 10% of general operations.[36] If these funds are repealed or seriously reduced, it will most certainly result in service cutbacks and employee layoffs for public safety. The problem is that this amount of lost revenue would cripple the city's ability to maintain services, let alone provide funds to improve department training.

Organizational Analysis

One method of analyzing the current state of an organization and its potential to change to a desired state is by an objective appraisal of the organization and environment, generating a list of weaknesses, opportunities, threats and strengths. This analysis will provide an understanding of the organization's internal process and matches internal strengths and weaknesses with environmental opportunities and threats as they relate to the issue of developing VR training. This process, known as a WOTS UP analysis, is a systematic means to identify how to use the strengths, take advantage of the opportunities, avoid the threats and minimize the impact of weaknesses.[37]

Internal Weaknesses

- There is currently no virtual reality training utilized by the department and officers may be skeptical of VR training.
- There is uncertainty about the budget situation.
- There is a lack of networking with allied agencies concerning critical incident training.
- The department needs to depend on consistent funding sources.
- Older officers have a tendency to be more skeptical of this type of training.

- There are no resources devoted to exploring the possible uses of VR technology.

- There is no ongoing critical incident training program.

Internal Strengths

- There is a good climate for change. A brand new, state of the art police facility that incorporates the latest technology into day to day operations is conducive to new training programs.

- Administration, supervisors and line staff are all supportive of advancements made in the area of training.

- The agency is known as a progressive, responsive, well trained department and has strong external relationships in both the public and private sectors.

- There is a strong grant writing program already in place.

- Training and preparedness is already a major focus of effort and resources within the department.

- There is an established history of technological advancement and progressive use of new technology by the agency.

- The agency is in close proximity to a major university that has an excellent VR research program.

External Opportunities

- City leaders may support the police department obtaining VR training due to the promotion of a progressive, new technology image.

- There is an opportunity to create positive media attention with the implementation of new VR training methods.

- Other law enforcement agencies in the same region may be willing to pool funds to purchase VR technology.

- Federal funding for anti-terrorism training may become available for critical incident training.

- Universities with VR development programs might be amenable to forming partnerships with law enforcement agencies to develop critical incident training scenarios.

- The new generations going the workforce have had much more exposure to video games and might respond better to VR training.

- Ongoing research and advancements in VR technology are occurring at a rapid pace.
- With increased public interest in homeland security, it is politically correct to call for better and increased first responder training.

External Threats

- There are budget deficits at federal, state and local government levels.
- Aggressive training measures by law enforcement may be seen by the public as militarization of the police.
- There may be difficulty in obtaining the necessary funding to ensure that VR technology will be developed for law enforcement critical incident training.
- There is a possibility that the media could distort of the value and purpose of VR training if they do not view it as cost effective.
- Changes in technology occur so rapidly that it is often difficult to select the proper medium and make large capital investments with certainty.
- The current cost of the technology is somewhat prohibitive to law enforcement agencies.
- VR training programs for law enforcement currently do not exist.

Stakeholder Identification and Analysis

The identification of key stakeholders and the analysis of their roles and expectations pertaining to the issue is a critical part of the strategic planning process. Stakeholders are defined as individuals or groups who are impacted, or have an impact on, what the organization is attempting to accomplish.[38] The influence that stakeholders have on an issue may be positive or negative. It is very important to identify all stakeholders and to be vigilant in conducting a search for "snail darters."[39] A snail darter is a small fish that has no economic or recreational value which was proclaimed to be an endangered species. It was discovered that its habitat would be destroyed if the Tellico Dam in Tennessee was completed and a reservoir was created. The dam was nearly completed when the United States Supreme Court decided to protect the snail

darter and not allow the dam to be completed. Needless to say, the snail darter was an unidentified stakeholder that created huge problems.

Once all of the stakeholders are identified, it must be determined how they can potentially impact the strategic planning process. It can be said that the state of an organization at any given time is a direct result of the interactions with and among stakeholders.

The following table lists potential stakeholders in the issue of how virtual reality technology will impact critical incident training in a mid-size urban law enforcement agency.

Stakeholders and their Expected Role in the Strategic Planning Process

Stakeholder	**Inclusion**	**Recognition**	**Information**	**Leadership**
City Council		X	X	
City Manager		X	X	
Chief of Police	X	X	X	X
City Attorney Risk Manager	X		X	
Trainers Supervisors	X	X	X	X
Police Officers	X	X	X	
Developers of VR technology	X	X	X	

Table 3.2

<u>City Council</u>

- The leadership and general philosophy may change after elections.
- The council will be concerned about the costs associated with virtual reality training.
- Mitigating city liability may be an important factor in a decision to support the technology for critical incident training.

<u>City Manager</u>

- Will be concerned about the city council and community reactions.
- Will want to be assured of no hidden costs.
- Will be interested in the possibility of reducing city liability for mishandling of critical incidents.

Chief of Police

- Will want personnel to train for critical incidents so they will respond with proper tactics.
- Will want written policy and procedures for virtual reality training.
- Will want to protect officers and the city from unnecessary exposure to liability.
- Will want to know what impact the technology will have upon the budget.
- Will want to know what value the officers' place upon the training.

City Attorney/Risk Manager

- Will support if virtual reality training helps to better train and prepare officers for handling critical incidents.
- Will support if this type of training will reduce claims against the city for mishandling of critical incidents.
- Might be concerned with possible adverse side effects from prolonged exposure to virtual reality training.

Police Management

- Will want realistic and verifiable training.
- Want to increase the level of preparedness to respond to critical incidents.
- Will want to know the cost to benefit ratio of virtual reality training.

Trainers/Supervisors

- Want the best possible training methods.
- Are concerned with liability issues regarding critical incidents.
- Want to develop competent people.

Police Officers

- Will support the training if they view it as valuable.
- Will want regularly scheduled training.
- Will want the technology to be realistic and not arcade-like.
- Will be concerned with possible adverse physical or psychological effects.
- Will gain exposure to critical incidents they have not encountered in their careers.

Developers of Virtual Reality Technology

- Will need to know what type of critical incidents to develop for VR training.
- Will want assurance from government agencies that they will be financially committed to obtaining VR technology.
- Will need to know the extent of the market for their products.

- Will need to work closely with law enforcement agencies in the development of proper scenarios.

A plan needs to be developed that will meet the expectations of the various stakeholders. Some stakeholders will have common expectations while others may have expectations that are solely their own.

In this issue, the City Council, City Manager and the Chief of Police would share the common expectation that the plan would be cost-effective and reduce city liability. A method to measure the effectiveness of the training must be developed that would correspond to the liability experience of the city. The plan needs to show the overall benefits of acquiring virtual reality technology training for critical incidents. These benefits include more flexibility than live scenario training. In virtual reality, peace officers can experience situations and effective responses which they otherwise would not have an opportunity to practice.

Police management, supervisors and trainers expectations would be that other training methods would not be sacrificed in order to fund virtual reality training technology. These stakeholders would need to see the connection between the strategic plan to obtain virtual reality training, and the direct and/or indirect benefits to the agency.

Police officers would expect the transition to VR technology to enhance their training experience and provide more exposure and practice for critical incident response. They would also expect that a VR training environment would be safer for them than live training scenarios.

Research and development organizations of VR technology have been identified as a possible “snail darter.” The major contributors in this area should be identified, contacted and included early in the strategic planning process. Law enforcement’s need for critical incident training must be related to the developers of the technology. If these organizations do not

develop the type of VR training that is needed, the process will be delayed or even thwarted. Another possible “snail darter” could be the military. It is not known what type of military regulations or restrictions currently exist that might prevent the sharing of already available VR technology.

Development of a Strategic Plan

In pursuit of the goal to obtain virtual reality training for critical incidents, the following benchmark activities are recommended. These issues can be addressed as task force assignments, small groups or in workshops. Recommended stakeholder involvement is indicated with each benchmark.

Research

Determine the need, practicality and depth of utilization. Determine what is out there now in terms of technology and what will be out there in the future. Determine what is most essential by prioritizing resources and effort.

Suggested stakeholder involvement: Police management, supervisors and trainers, developers of VR technology.

Financing

Determine what funding sources and mechanisms are available.

Suggested stakeholder involvement: Police management, Chief of Police, City Manager, finance department, developers of VR technology.

Training

Perform a training needs assessment. Contact potential vendors and determine suitability of available products. Determine if partnerships with research organizations can be developed. Preparation of Requests for Proposal (RFP) to be provided by training vendors.

Suggested stakeholder involvement: Police management, supervisors and trainers, line staff, and developers of VR technology.

Infrastructure

Appraise existing technology. Coordination of inter-agency efforts. Identification of common protocols, hardware, and software.

Suggested stakeholder involvement: Police management, POST, supervisors and trainers, city information services, developers of VR technology.

Development of Alternative Strategies

The following discusses three alternative strategies which could assist in the development and implementation of virtual reality technology for critical incident training. The strategy that offers the most promising opportunity to create the desired future state is the strategy that should be pursued.

Strategy 1

Develop partnerships with other law enforcement agencies to educate and communicate the value of utilizing VR technology for critical incident training. This strategy also involves working with such entities as the California Police Chiefs Association, POST, the League of California Cities, California Association of Police Training Officers, legal advisors, risk managers, and the state Attorney General's Office. A consortium with these entities could be developed for the purpose of promoting the value of investing in VR as a tool for critical incident training.

Strategy 2

Develop an in-depth educational process to present to all stakeholders. This strategy can be utilized to create a sense of urgency. Stakeholders can be presented with information on

future opportunities and rewards for capitalizing on those opportunities. This strategy allows law enforcement leadership to develop the most effective type of image that will promote the vision of utilizing VR technology to train and prepare peace officers for critical incidents. This can also help stakeholders see the value in VR technology and how it will impact training in the future.

Strategy 3

Law enforcement leaders work directly with the developers of VR technology to address critical incident training needs. Specific training applications should be identified and support offered for research in these areas. This strategy is crucial to the future development of VR training for law enforcement. Currently, only a limited amount of research and development is applied directly to law enforcement. The apparent reason is simply that law enforcement has not asked for it. The model agency will need to become active in research and development and request that applications be developed to meet their special needs.

Chapter 3 has explored the development of a strategic plan for the purpose of utilizing VR technology in a way that enhances officer preparedness to handle critical incidents. The current state of the model organization was presented and weaknesses, strengths, opportunities and threats were discussed. Stakeholders were analyzed for their expected role in the strategic planning process, and alternative strategies were developed. The purpose of this area of research is to assist in developing a strategy that will propel the organization toward implementation of VR training for critical incidents.

Chapter 4 will examine successful transition management through commitment planning, dealing with the critical mass of stakeholders, and effective change implementation.

CHAPTER FOUR

TRANSITION MANAGEMENT

Introduction

How will the model organization transform from its current state to a desired future state? The strategic plans developed in Chapter 3 will be of little value unless a successful transition management plan is also developed and implemented. In order to bring virtual reality technology to critical incident training, the transition plan must encourage innovative ideas, creative problem solving, and must be flexible. The purpose of this chapter is to lay a foundation for critical elements of a more specific and detailed transition plan to be developed by the agency. Elements of a successful transition management plan include commitment planning, implementation of changes, and transition evaluation.[40] The plan must educate staff and all stakeholders about the benefits of VR technology for training purposes. Task groups must be formed to work through potential issues and problems. Accomplishments must be recognized and touted as the transition process is worked through. Timelines should be created and monitored keeping in mind that flexibility is also important.

Organizational and Operational Change

It is important to remember that an organization cannot institute change if its employees will not accept the change. Change can be managed by those who decide it is necessary and a plan developed on how it is to be implemented; however, it will actually occur only when it is accepted by employees. It is paramount that the reasons for the change be identified and understood by the employees. If they do not understand why the change is important to the future of the organization, the change will not be supported.

Commitment Planning

The leadership in an organization, by itself, cannot cause large-scale change to occur. The change must have broad-based support throughout the organization and with the stakeholders. The stakeholders have been defined as individuals or groups whose commitment is needed to implement the change. In Chapter 3 the following stakeholders were identified as having key roles in the transition process:

- City Council
- City Manager
- Chief of Police
- City Attorney/Risk Manager
- Police Management
- Trainers and Supervisors
- Peace Officers
- Developers of VR technology

Commitment Charting

Commitment charting is a tool used to show where a stakeholder currently is in the transition process.[41] It shows their current degree of commitment as compared to where they should be in order to maximize the chance of the desired change occurring. This chart shows the work that is necessary to receive a firm commitment from the various stakeholders.

Critical Mass

It is not necessary that all stakeholders have the same degree of commitment. For instance, it might be desirable to move a particular stakeholder from blocking the change to

simply allowing the change to occur. Webster's Dictionary defines "critical" as being a turning point or especially important juncture, and "mass" as being a large number of people viewed as a whole. The concept is taken from nuclear physics, and when applied to organizational change identifies the minimum number of stakeholders necessary to bring the change to fruition.[42] The following table illustrates who the stakeholders are and where they need to be to make the change happen:

Critical Mass Commitment Chart

X= Current position

O= Desired position

Critical Mass Stakeholder	Block Change	Let Change Happen	Help Change Happen	Make Change Happen
City Manager		X	O	
Chief of Police			X	O
Police Management		X		O
Police Officers		X	O	
Developers of VR technology		X		O

Table 4.1

Intervention Strategies

The Critical Mass Commitment Chart shows that every identified stakeholder will need to be moved from their current position to a more desirable position in order to best facilitate the change. When creating a plan and developing strategies to gain more commitment to change, there is one basic premise to remember. Most people become committed to a course of action only when they have had a chance to personally engage in dialog and debate and discover the rational for the action. This engagement process is crucial to the overall success of the transition. The intent behind approaching and involving each stakeholder is to provide the opportunity to

actively participate in the change. The stakeholders who comprise the critical mass will be much more likely to support what they help create.

Resistance from Stakeholders

It is anticipated that there will be resistance from some of the critical mass stakeholders who are not currently committed to the degree required by the change effort. For example, some stakeholders may have an issue with the initial costs of VR technology for critical incident training. One way to intervene and address concerns is through a method called "Problem Finding."[43] By using this neutral process, stakeholders who are concerned about the change can get together and discuss and clarify certain issues. This strategy assumes that the process of discussing and clarifying the issue as opposed to "Problem Solving" will be less threatening and thereby encourage commitment.

Another method to overcome resistance is "Educational Intervention."[44] Virtual reality is a term that is often misused and can be very confusing to people. Stakeholders need to be educated and supplied with the proper context and meaning of the term. Virtual reality is indeed a technology, not simply a nebulous idea. It is not synonymous with illusion, mirage or hallucination. It is an emerging field of applied science that has very useful training application potential for law enforcement.

Moving the critical mass to the desired positions of commitment requires gathering data and presenting a cost-benefit analysis. It must be demonstrated that VR training is a cost effective method to better prepare law enforcement officers to respond to critical incidents. The stakeholders will need to see the value to the agency in terms of better use of training time, increased public safety, and decreased liability.

Certain facts regarding the nature of change in an organization are constant, regardless of the purpose or scope of the proposed change. Successful transitions require that leaders

communicate a clear image of the future. Successful transition management requires systems that support the desired changes, such as rewarding people for the right behaviors. Some resistance to the change is inevitable. Any change will require that employees develop new knowledge and skills.

Implementation Plan

The following is a brief proposal of an implementation plan designed to facilitate the incorporation of VR technology for critical incident training:

- Oversight Committee

  It is recommended that the Chief of Police appoint, empower and support an oversight committee for the purpose of implementing the strategic plan. This committee would recommend any changes or departures from the original plan and make sure that the necessary resources are procured. It is suggested that the committee be comprised of at least one of the following stakeholders: police manager, police supervisor, police trainer, police officer, member from risk management, member from computer services and member from finance department.

- Team Building Workshop

  It is recommended that the agency dedicate at least two full days to a workshop in which participants can frame the question, define issues, plan strategies, set goals, discuss the future, develop decision-making protocols and commit to success.

- Conduct Technology Assessment

  Some of the technology related to virtual reality is still in the development stage, existing only on drawing boards or as prototypes. It is recommended that a team of stakeholders be charged with researching the following: determine what technology is available currently, in the near future and the distant future; what is the cost of the

technology and what financial preparations are necessary; what current VR applications are available; what are other possible critical incident applications for VR technology; what are future training issues or needs.

Responsibility Charting

In order to facilitate the implementation of important tasks, actions and decisions, it is helpful to develop a responsibility chart. A responsibility chart clarifies the behavior that is required by the individual stakeholders.[45] The required level of involvement in decisions and actions that must exist for change to occur can be classified into four categories. They are responsibility (R), approval (A), support (S), and inform (I). For the purposes of charting, the identified stakeholders are referred to as "actors" and listed on the horizontal axis. The tasks, actions and decisions are listed on the vertical axis. The required behavior of each actor is then charted in relationship to the particular task, action or decision. The making of a responsibility chart helps reduce ambiguity, wasted time and energy, and identifies possible adverse emotional reactions between individuals and groups who may be affected by the change. The usefulness of responsibility charting lies not only in the end product of agreements between actors, but also in providing clarity and understanding of the roles of others in the change process.

A responsibility chart should be developed according to the work to be done and not according to the status or authority of the actors listed on the chart. The ground rules are that no box may contain more than one letter and not more than one R can exist for an activity. The chart is useful to check the expected behavior of the actors and to call attention to actual behavior that falls out of line with what is expected. The following responsibility chart reflects that responsibility for each action lies with police management, with approval required by the chief of police. The other actors must either support the action or be kept informed.

Responsibility Chart

R = Responsibility (not necessarily authority)
A = Approval (right to veto)
S = Support (put resources toward)
I = Inform (to be consulted before action)
~ = Irrelevant to this item

Actors Tasks or Decisions	City Council	City Manager	Chief of Police	City Attorney Risk Manager	Police Manager	Trainers Super-visors	Allied Agencies	Developers of VR Technology
Develop oversight committee	I	I	A	S	R	S	I	~
Technology Assessment	I	I	A	I	R	S	I	I
Decisions on equipment purchase	I	I	A	I	R	S	S	S
Design of training scenarios	I	I	A	I	R	S	I	S

Table 4.2

Evaluation

The demands of keeping an organization on track during the transition to a new technology require skilled, adaptive and informed managers. Measurement tools can help monitor the progress and effects of the change on the organization. Developing a set of measurement tools can also act as a type of early warning device that will indicate likely problems. In this way, problems that require attention can be addressed and quickly remedied.

The following is a brief proposal of monitoring methods to access the progress and outcome of the transitional process:

- Formal surveys

  Structured questionnaires are often efficient tools for quickly gathering information at multiple levels in the organization. Surveys can be used to gather data on issues from officer attitudes about training needs to perceptions of the effectiveness of the technology.

- Interviews

  One-on-one discussions with stakeholders about predetermined issues are often beneficial for obtaining insight into progress of the transition.

- Informal conversations and observations

  Keeping an "ear to the ground" provides a rich source of information about the state of the organization during the transition. Information from the rumor mill, water cooler conversations, and informal chats can yield useful insights.

- Statistics

  Keeping statistics regarding the number of critical incidents and the number of officer injuries before and after training will provide valuable insight into the effectiveness of VR training.

The purpose of Chapter 4 has been to identify potential obstacles that would hinder or prevent the implementation of virtual reality technology as a tool for critical incident training. Strategies and methods have been proposed for overcoming those obstacles. Insight has been provided into how to transition from the old training methods into the new developing technology of virtual reality. Chapter 5 will provide a summary of the key findings discovered

during the research, along with conclusions and recommended actions that will assist in creation of the desired future.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

Summary

Virtual reality technology is a tool that can provide the type of training that today's and tomorrow's law enforcement officers need. In its present form, VR allows officers to enter a virtual training environment and react to real-world situations without the accompanying dangers of injury and liability. Virtual environments are extremely flexible and can be created and re-created to test and evaluate strategies and decision-making abilities.

The Pentagon and the Department of Defense have been the main proponents of using VR technology for the training of military personnel. They lead both the public and private sectors in the development of new VR technology for training purposes.[46] Studies conducted by the Defense Science Board indicate that the outstanding performance of the military in the 1990s was not only a result of superior weapons, but also of superior training methods.[47]

Currently, no actual VR training is utilized by law enforcement. The major reason for this seems to be that law enforcement has simply not asked for it.

There are two compelling reasons why VR technology will play a major role in the future of law enforcement critical incident training. First, each critical incident is so unique that it is very difficult to train for all possible scenarios that could occur. The logistics of presenting live scenario training are often difficult, time-consuming, costly and sometimes dangerous. Secondly, there is a public expectation that law enforcement will automatically know how to deal with and successfully resolve any given critical incident. The consequences of mishandling

a critical incident are possible injury or loss of life, exposure to great liability, and loss of public confidence and support.

There is currently a new advancement in VR training technology that is under development. It is called Interactive Training Applications using Responsive Virtual Human Technology (RVHT). This VR technology provides a virtual human that displays emotions and gives verbal feedback during the training experience. It mimics the role-playing approach to training and is designed to train police officers to better handle mentally disturbed persons. This is an indication that VR technology for training is now a developing market for law enforcement.

The cost of VR technology has traditionally been a limiting factor that has prevented use by law enforcement agencies. The creation of the U.S. Department of Homeland Security has certainly generated new interest in training the nation's law enforcement agencies to respond to terrorism incidents. More and more government funding is being made available to states, counties and cities for training purposes. Law enforcement should use this interest, funding, and momentum to expand the use of VR technology in critical incident training.

The Nominal Group Technique (NGT) was used to identify trends and events that would most likely have an impact upon VR technology for critical incident training. The following is a summary of the key trends and events that were identified:

- T1: Budget funding available for training

  The NGT panel felt there would be a steady increase of funding available from the state and federal government as law enforcement agencies are mandated to become better at handling critical incidents.

- T4: Cost of virtual reality technology

Although there was concern over the initial costs of new VR technology, the panel felt that technological advances in the area of computer hardware and software would drive down the costs in the future.

- T6: Average years of experience of new officers dealing with critical incidents
  The panel felt that the looming retirement of baby boomer generation officers would have a profound impact upon the experience levels in law enforcement organizations. They see virtual reality training as a way to mitigate the loss of experienced officers by better training new officers to prepare for critical incidents.
- E3: A law passes requiring critical incident training for homeland security
  The panel felt that if a law of this nature passed, the likely result would be increased funding and development of VR training for critical incidents. They projected a 50% probability that this event would occur within 5 years. Law enforcement should participate in an active lobbying effort that would influence this event to occur.
- E5: Federal government develops VR training program for critical incidents
  The panel felt that it would be very beneficial if this event occurred and projected a 75% probability that it would occur within 5 years. It was suggested that the government could develop current VR technology now utilized by the military and apply it to law enforcement critical incident scenarios. They cited continuing government efforts in the area of homeland security and disaster preparedness as indicators that this will eventually occur. This is an event that could be influenced by a strong lobby effort.

A strategic plan was developed and alternatives offered for the purpose of focusing upon the ongoing process of decisions and actions that will shape the future of virtual reality in critical

incident training. The process involved selecting a desired future, as was presented in Chapter 2 under Scenario 3 (Optimistic). An analysis was conducted to appraise the current state of the organization and its potential to change. The WOTS UP analysis was used to identify the organization's strengths and weaknesses, and environmental opportunities and threats. It is also recommended that an organizational capability assessment be conducted first. This will aid in determining whether or not the agency has the capacity and stakeholder willingness to accept the challenges of the strategic plan.

Key stakeholders in the process were identified and an analysis of their expected roles and required level of commitment was presented. The developers of VR technology were identified as a possible snail darter in the process. It is essential that law enforcement include this stakeholder in the process and make known the type of training that needs to be developed.

Benchmark activities were identified that are recommended as part of the strategic plan development. In the area of research, the need, practicality and depth of utilization must be determined. With regard to financing, there must be a determination of what funding sources and mechanisms are available. Regarding the area of actual training, a needs assessment should be conducted along with exploration of possible partnerships with universities and other research organizations. In the area of infrastructure, there must be an appraisal of existing technology, coordination of inter-agency efforts, and identification of common protocols along with computer hardware and software.

In order to bring virtual reality technology to critical incident training, the transition plan must encourage creative problem solving, innovative ideas and must be flexible. A commitment chart was presented in Chapter 4 to show where the critical mass stakeholders are in the transition process regarding their commitment. To maximize VR training being successfully implemented, efforts must be made to obtain the necessary degree of commitment from these

essential stakeholders. It is important to note that all identified stakeholders need to be moved from their current positions to more desirable positions. This becomes an important factor in developing the necessary critical mass that will allow the change to occur.

It is anticipated that there will be resistance from some of the stakeholders who are not currently committed to the degree required to develop critical mass. The use of two intervention strategies has been suggested to deal with this resistance. Problem finding and educational intervention are methods that will assist in mitigating the resistance.

An implementation plan was proposed to facilitate the incorporation of VR technology for critical incident training. It is recommended that an oversight committee be appointed for the purpose of implementing the strategic plan. This committee would oversee the plan and be responsible for procuring the necessary resources. A team building workshop should be utilized to develop strategies, set goals and develop decision-making protocols. A technology assessment must be conducted to determine what technology is currently available, the cost of the technology, and what financial preparations are necessary.

A responsibility chart was presented to facilitate the implementation of important tasks, actions and decisions that need to be made. This chart helps clarify the behavior that is required from the individual stakeholders.

A brief proposal of monitoring methods was presented in Chapter 4 for the purpose of checking on the progress of the transition. Potential obstacles were identified that could possibly hinder the implementation process and some strategies were suggested to aid in overcoming these possible developments.

Advantages of Virtual Reality Training

The major advantage with VR training is that the officer is able to experience real life scenarios in a controlled environment. This type of virtual environment reduces the possibility

of injury and is much more flexible than other training methods. An officer can practice tactics and methods over and over again, just like in a video game. Mistakes can be made and the officer can learn from these mistakes. An officer who dies a quick death in VR training will not likely forget the importance of the lesson. If the officer does die a virtual death, hitting the reset button is all that is required. Through such VR training experiences, law enforcement officers may acquire decision-making skills that, until now, could be learned only in the heat of an actual crisis.

Another advantage of using VR technology for training is that the officers are mentally and physically stressed in these environments, just as they would be in a real situation. The goal of VR technology is to provide a virtual training experience that is as real as possible.

An agency that has well trained officers and is on the cutting edge of technology has an advantage in recruiting top quality people. The public perception of better trained peace officers often leads to more confidence and support from the community.

VR System Availability and Cost

There are currently no commercial VR training systems that cover the topic of critical incidents. A VR system that does address critical incident training for law enforcement will be very expensive because it will be one of a kind. Even if low cost personal computers are used, the main expense will be on the development of scenarios and the artificial intelligence system that controls the interaction with the characters. According to leading research and development professionals, the cost would be anywhere from $50,000 to $80,000 for the projection system.[48] A projection system of this nature is needed to provide a 1:1 scale in the simulation. Additional cost would be from $300,000 to $500,000 for the development of the scenarios.[49] A VR training system costing over $500,000 might seem a bit extravagant for most mid-size law enforcement agencies. However, when the time, cost, and risks of live scenario training are determined, the

price tag may seem more reasonable. Add in the liability factor of improper or inadequate training for critical incidents and $500,000 may just be a bargain.

Training Costs

Most mid-sized urban law enforcement agencies face budget restraints and must plan well in advance for equipment purchases. Pooling of budget funds is a potential method of getting more benefit out of allotted training dollars. Law enforcement agencies can join together in the creation of regional training centers. Creating such partnerships would make VR training available and more affordable for all agencies, regardless of their size.

Research indicates that VR simulators can reduce implementation of training time by as much as 30 percent.[50] Other cost-saving considerations include: negative publicity due to a mishandled critical incident, and the impact of officers or citizens injured or killed because of poor decisions due to perceived inadequate training.

Potential Funding Sources

There are several possible sources of funding available to purchase VR technology for training purposes. Federal and state grants are a promising source of revenue, especially with the current interest in homeland security and disaster preparedness. Sponsorships from interested private sector companies are another potential source. Forming partnerships with research organizations and universities to act as beta sites for testing VR technology is another possible means of acquiring funding. Military services that currently use VR training methods might also form partnerships with law enforcement.

Possible Side Effects

At this early stage of VR development, there has been little research into the possible side effects of the technology. A phenomenon known as “simulator sickness” has been

documented.[51] It is similar to motion sickness and can occur when viewing a video display depicting a representation of motion in the absence of actual physical motion. It is not known how much the side effects are due to the VR technology itself or the physical makeup of an individual. Additional research should be conducted in this area.

Conclusions

All indications are that computer generated technology, such as virtual reality, will continue to become a much greater part of organizational operations and training methods in the future. The optimistic scenario presented in Chapter 2 represents a vision of the future that integrates sophisticated virtual reality technology into the training function of a mid-sized urban law enforcement agency. The groundwork for the transition into this desired future state has been presented in the preceding chapters of this project. The key to unlocking the potential future of virtual reality training for critical incidents is establishing working relationships with the developers of the technology. Law enforcement must become involved with this most critical stakeholder and work toward creating VR training exercises that are specific to their needs.

Research in this area has shown that interactive multimedia and virtual reality technology are currently being used to address many training issues in both the military services and the private sector. The next generation, the "Net Generation" of officers that are now being hired have been immersed in digital computer technology and surfing the Internet since they were children. This generation will lend itself well to virtual reality training methods for critical incidents. They are a part of the VR technology revolution that is creating the training medium of the future.

The National Research Council (NRC), in a report entitled "Virtual Reality: Scientific and Technological Challenges," pointed out that if the federal government pursued research in

this area, the results could lead to many cost-effective applications that would go well beyond anything that is now available.[52]

How will virtual reality technology impact critical incident training in a mid-sized urban law enforcement agency by 2010?

The benefits of using VR technology for critical incident training in the future are many and its impact will be great. VR simulation training will help officers develop judgment and decision-making skills that will carry over to real critical incident situations.

Currently, peace officers receive only a limited amount of critical incident training conducted through live scenario exercises. The process of setting up this type of training is time-consuming and the overtime costs for personnel can rapidly deplete a training budget. VR technology offers the potential of a much more flexible, cost-effective, realistic and safer method to provide training for critical incidents. Instead of looking at pictures of enforcement scenarios or watching videotape, officers can become immersed in compelling situations where they must take actions just as they would in real world situations.

Virtual reality-based law enforcement training will allow officers to experience and develop effective responses for situations they would otherwise have no opportunity to practice until encountered in real life. This training can even surpass real life as a training tool when intangibles such as risk and danger can be seen visually for the first time.

Virtual reality is the most effective way to teach such skills because any task, procedure, or process can be recreated in the virtual world, allowing trainees to practice over and over, risk free.

Virtual reality is uniquely suited for law enforcement training. The U.S. military has long used it to train military personnel and has found that as a training tool, it is second only to real life experience.

The quality of training is vitally important to all law enforcement agencies in the state. The ability of an agency to respond to new training challenges is directly related to the training methods that it uses. VR technology will provide the preferred method for delivering quality training in the twenty-first century.

The ultimate answer to the question of virtual reality's impact lies dormant and rests with law enforcement leadership. It will depend upon the efforts of visionary leaders. Leaders who must have the determination to embrace new technology, find untraditional funding sources, and realize the benefits of incorporating VR technology into their training programs. It is a virtual certainty that the future belongs to those who will take the initiative to create it.

APPENDIX A

Nominal Group Technique Panel Members

Professor Tarek Alameldin - Computer Graphics - California State University, Fresno

Jesse Valez - Information Services - City of Clovis

Chuck Philips - Administrator, Technology Services - Clovis Unified School District

Major Dan Lierly - Helicopter Pilot - United States Marine Corps

Sergeant Rudy Polak - President, Cal Association of Police Training Officers - Tulare County Sheriff's Department

Bill Savage – Manager of Technology Support – Pelco International

Kerri Chase – Doctorial Candidate – California School of Professional Psychology

Dr. Fred Childers – Professor of Social Work – Licensed Clinical Social Worker

Captain Robert Keyes – Training Function – Clovis Police Department

APPENDIX B

List of Potential Trends Identified by the NGT Panel

1. Budget funds available for training purposes
2. The number of critical incidents occurring in law enforcement agencies
3. The amount of state funds allocated to social service agencies
4. Cost of virtual reality technology
5. Public expectations of law enforcement's ability to respond to critical incidents
6. Average years of experience of new officers dealing with critical incidents
7. The amount of training on proper law enforcement actions and decisions at critical events
8. Amount of legislation for mandated training
9. Development of virtual reality technology to meet training needs
10. Percentage of Crime Rate changes
11. Level of Public Support for law enforcement agencies
12. Amount of new training mandates
13. Amount of state budget deficit
14. The number of Regional Training Centers
15. The number of new technological developments in VR
16. The number of lawsuits filed citing inadequate training
17. The number of law enforcement VR developer partnerships
18. The level of government support to develop VR technology
19. The amount of funding made available from the Department of Homeland Security
20. The number of terrorist events in the U.S.
21. Shift from service to information based economy
22. The number of worker compensation claims related to training
23. The number of methods used for training purposes

APPENDIX C
List of Potential Events Identified by the NGT Panel

1. Unexpected side effect on humans exposed to VR
2. Bio-terrorism attack occurs
3. Law passes requiring critical incident training for homeland security
4. 50 percent increase in officer involved shootings
5. Federal government develops VR training program for critical incidents
6. Economic depression
7. Critical incident exposes law enforcement lack of training
8. Private donor contributes $100 million for VR research
9. Several officers killed in live training scenario
10. Governor signs bill offering VR training
11. VR display breakthrough occurs
12. Development of on-line VR training
13. Cost of VR technology skyrockets
14. Game company creates new VR software
15. Consolidation of county law enforcement agencies
16. Commercial applications for VR are developed
17. VR is displayed on TV shows
18. Adverse court ruling forces VR training
19. Act of terrorism occurs on Washington D.C.
20. Public outcry for better law enforcement training
21. Law enforcement staffing reduced by 10 percent
22. Change of Chief of Police
23. Movie industry generates interest in VR technology

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