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EXECUTIVE FIRE OFFICERS' STRATEGIC THINKING CAPABILITIES AND THE RELATIONSHIP WITH INFORMATION AND COMMUNICATION TECHNOLOGY

by

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A Dissertation Submitted to the Faculty of

The College of Education

in Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

Florida Atlantic University

Boca Raton, Florida

August 2010

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This dissertation was prepared under the direction of the candidate's dissertation advisor, Dr. Valerie C. Bryan, Department of Educational Leadership, and has been approved by the members of her supervisory committee. It was submitted to the faculty of the College of Education and was accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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ACKNOWLEDGMENTS

"Man's mind, once stretched by a new idea, never regains its original dimensions"

Oliver Wendell Holmes

My thanks go out to the collegial learning community of faculty, students and alumni that has stretched my mind and helped me achieve my academic success at Florida Atlantic University. First and foremost, I would like to thank my advisor and dissertation chair, Dr. Valerie C. Bryan, for her guidance, support, encouragement and friendship. Dr. Bryan's commitment to excellence in the best of times, and her faith in me in the worst of times helped me most to persevere and grow in my learning. My sincere thanks go to committee members, Dr. John R. Pisapia, who inspired me in strategic leadership and global change; Dr. J. Dan Morris, whose patience and questions stretched me statistically; and Dr. Burton A. Clark, who set the bar for my research excellence, as an Executive Fire Officer. All gave selflessly of their time and energy, believed in me and encouraged me in my learning process.

Special thanks go to my doctoral cohort at FAU, particularly Dr. Brian W. Findley, Dr. Darwin E. Asper, and Dr. Pete Zsiga who helped me immensely. I have been blessed by support from my colleagues at Palm Beach County Fire Rescue, and my great friends Kathy Owens, Royanne Nilson, and Debbie Greenberg. My sister, Janet Penney was my greatest cheerleader. Most of all, I am thankful for God in my life and my work.

ABSTRACT

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Title:	Executive Fire Officers' Strategic Thinking Capabilities and the Relationship With Information and Communication Technology
Institution:	Florida Atlantic University
Dissertation Advisor:	Dr. Valerie C. Bryan
Degree:	Doctor of Philosophy
Year:	2010

This study investigates the relationship of executive fire officers' use of strategic thinking skills and their proficiency using information and communication technology. A non-experimental quantitative study design was employed. The study consisted of 400 graduates of the National Fire Academy's Executive Fire Officer Program. The use of strategic thinking skills was measured by the Strategic Thinking Questionnaire (STQ_{v6}) (Pisapia & Reyes-Guerra, 2007). The use of information and communication technology tools was measured by the Information and Communication Technology (ICT) Fluency Questionnaire (Hilberg, 2007).

The EFOs' strategic thinking capabilities of systems thinking ($3.58 \pm .447$) and reflecting ($3.82 \pm .445$) compared to previously reported samples from the literature, both empirically and theoretically. Depending upon the sample, some means were significantly higher and others were significantly lower. The strategic thinking

questionnaire and the ICT fluency questionnaire were not directly correlated to one another; however, there were some strong correlations within their subscales. ICT fluency and ICT comfort were highly correlated (r = .516), as well as systems thinking and reflecting (r = .688) at the 0.05 level. There was a significant correlation between age and ICT comfort (r = -.235), as well as between years of experience and ICT comfort (r = -.203) at the 0.05 level. Age moderated the relationship between systems thinking*reflection, and ICT comfort. Race moderated the relationship between systems thinking*reflection, and ICT education/training. This research was significant because it was the first time that Executive Fire Officers have been studied regarding their strategic thinking capabilities and their information and communications technology fluency.

EXECUTIVE FIRE OFFICERS' STRATEGIC THINKING CAPABILITIES

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CHAPTER 1

INTRODUCTION

The study of leadership has been a topic of research as far back as 1920 when Cowley defined leadership as: "succeeding in getting others to follow" (cited in Pisapia, 2005, p. 3). The concept of leadership has evolved through the years with as many as 65 different classification systems defining the dimensions of leadership (Fleishman et al., 1991). Leadership has been defined by personality or character traits, that is, leaders are born not made. Other theories of leadership include theory X and theory Y, Path- Goal, situational leadership, Leader Member Exchange (LME), transactional leadership, transformational leadership, and servant leadership, just to name a few. Three of the fundamental attributes of leadership regardless of the supporting theory are: (a) setting personal and organizational goals, (b) setting high expectations for everyone in the organization, and (c) mentoring to subordinates (Dobbins & Pettman, 1997).

Leadership has not gone unnoticed by the American Fire Service. The National Fire Academy (NFA) created the elite Executive Fire Officer Program (EFOP) to provide professional development programs for senior fire executives in 1983. EFOP certification is often required for advancement to fire chief positions. The EFOP promotes the leadership traits described in the course goals and objectives, but little research exists on whether Executive Fire Officer (EFO) graduates perceive that they have improved their

abilities in these areas as compared to their perceived level of ability before they started the program.

The available research showed that participation in the EFOP was a positive factor in the reported increase of goal setting, setting high expectations, mentoring, transformational leadership, lifelong learning, and organizational commitment (Wolf, 2004). Shields (1993) measured the ability of fire service middle managers to adapt their leadership style effectively based on their understanding of Situational Leadership Theory (Blanchard, 1985). He found that leader flexibility improved the relationship between managers and subordinates by reducing friction with their subordinates. He also reported that the friction level was associated with age and education level of the manager. The younger the manager, the higher the good relations level was with the subordinate. The older the manager, the higher the friction level was with the subordinates. The higher the education level of the manager; the better the relationships and teamwork with his subordinates. Graphical results of Shields' study can be found in appendix A.

What is missing from these research efforts is a focus on the key role visioning plays in leadership. As Bryan (2001, p. 168) says, "The vision process is an opportunity for you and your stakeholders to identify who you are, who you actually serve, what you are known for, and...find out from your constituents what they want of you." The ability to find the future, a key leadership skill for all fire chiefs, has gone largely unnoticed in the research available although it is taught in academy programs.

Executive Fire Officers have a tremendous responsibility. In the field, they must be able to assess a situation quickly and accurately and make decisions that could affect

the lives of their personnel and/or the people they serve. In these life-and-death situations, it is critical for the EFO to be a strategic thinker. Within the organization, the EFO, with his or her management team, develops and helps to implement the vision and mission of the department. To accomplish these requirements for assessing a situation and developing direction for the organization, the EFOs must be able to think strategically. This study addresses their ability to think strategically.

A second area that is untouched by the research is that fire chiefs need to be exceptional communicators. Leaders can be assigned to their position of power, or they can emerge over time through the support of other people in the organization. In either case, positive communication behaviors for successful leaders include being verbally involved, being informed, seeking others' opinions, initiating new ideas, and being firm, but not rigid (Fisher, 1997).

Leaders in today's world rely heavily on communication tools. This is especially true in the emergency services field. In a major incident, there will be more than one fire department responding to the call. Radio frequencies can vary from one department to another, making communication between responders nonexistent or at best, difficult. As Bolman and Deal (2003) point out this was a problem during the September 11 terrorist strikes on the World Trade Center,

> Extraordinary individual efforts were hindered or thwarted by breakdowns in communication, command, and control... there was no link between fire and police radios, and the commanders in the two departments could not communicate because their command posts were three blocks apart. (p. 44)

This lack of cohesiveness between the technical aspects of communication and the human side of communication can be life-threatening in the emergency services field. Interoperability, the ability of diverse systems and organizations to communicate and work together, is essential in times of emergency. In the aftermath of 9/11, this gap between lack of communication and the human beings has been noticed and responded to by fire departments nationwide. Many departments switched to 800 megahertz radios to provide seamless communication. They trained ham operators also to get the department's message out when breakdowns in normal communication systems occurred during emergencies such as floods, hurricanes, and earthquakes until cellular towers could be restored.

The speed of information resulting in instant communication and the creation of new technological devices for communications and field operations has had a profound impact on the fire service and its leaders and how they respond to crises situations. Over the past 20 years, the way people access information and communicate with one another has become more and more dependent on technology. Use of the internet and mobile communications technology has grown at an amazing rate. With the advent of the personal computer (PC) and the World Wide Web, the way people bank, pay bills, shop, and work has changed dramatically. Social networking sites such as Facebook, MySpace and Twitter tie citizens into a global society with lightning-quick information, often crafted in 140 characters or less. Today's fire officers are required to work with technology where information and communication are nearly instantaneous. Information can be delivered at the click of a mouse or by e-mail to a smart phone or personal digital assistant (PDA).

EFOs have a tremendous need to communicate quickly and act in a timely and accurate manner. Many new tools have been developed to aid them in meeting this need (i.e., global positioning satellites, automatic vehicle locators, thermal imaging cameras, and handheld devices recording patient assessment sent wirelessly to the emergency room while en route). What is unknown is the level of skill possessed by fire officers to use these tools. This study illuminates this lack of information.

Problem Statement

The events of September 11, 2001, reinforced the need to address the role of the fire service in a new world order. Then Division Director of the U.S. Fire Administration's (USFA) National Fire Programs and EFOP graduate, Dr. Cortez Lawrence, said that "developing critical strategic thinking on the part of the EFO is necessary when confronted with complex incident operations that may involve a myriad of local, regional, state and even federal assets" (Burkell, 2004, p. 2).

The EFOP curriculum was designed to focus on leadership development; risk reduction; integrated incident preparedness; response and mitigation; and applied research to facilitate change at the community level. The 4-year program is anchored by an initial executive development class and then by an executive leadership capstone course. Both courses are continually revised to guarantee that they are current. The primary focus of the initial executive development class is to address the fire officer's role in organizational effectiveness, whereas in the executive leadership capstone course, the main focus is on personal effectiveness. After each course, the EFO must complete a rigorous applied research project within six months in order to continue through the

program. Since 1990, there have been more than 4,000 exceptional applied research projects related to these two courses.

As Dr. Lawrence stated, the development of critical strategic thinking is necessary for the EFO. Herein lies the current problem. No research study has been completed with EFO graduates to ascertain if they are, in fact, strategic thinkers who are prepared to address this new world order with all of its complex technological advancements. With regard to the ever expanding use of new technology, the same population of EFOs has never been studied regarding their Information and Communication Technology (ICT) fluency. To date no information has been codified that addresses:

1. The types of information and communication technology that EFOs use,
2. Whether or not they have had training in the use of ICT,
3. How fluent or proficient they are in using ICT, and
4. How comfortable they feel using ICT.

Purpose

The purpose of this study was to examine the relationships, if any, that exist between and among EFOs' strategic thinking capabilities and the EFOs' use of information and communication technology.

Research Questions

The study was guided by the following questions:

1. How do EFOs' strategic thinking capabilities compare to previously reported samples from the literature?

2. What relationships, if any, exist between the EFOs' training in ICT, their ICT fluency, and their ICT comfort level?

3. Is there a correlation between the EFOs' strategic thinking capabilities and the results of the ICT Fluency Questionnaire?

4. Are the scores on the STQ and the ICT fluency questionnaire influenced by the demographics of age, department size, education, gender, race, and years of experience?

5. Is the relationship between the STQ and the ICT Fluency Questionnaire moderated by the demographics of age, department size, education, gender, race, and years of experience?

The null hypotheses examined included the following:

H_{o1}. EFOs' strategic thinking scores do not differ from previously reported samples from the literature.

H_{o2} There is no relationship between the EFOs' training in ICT, their ICT fluency, and their ICT comfort level.

H_{o3} No significant correlations exist between the STQ and the ICT Fluency Questionnaire.

H_{o4} The scores on the STQ and the ICT Fluency Questionnaire are not influenced by the demographics of: age, race, years of education, years of experience, and department size.

H_{o5} The relationship between the STQ and the ICT Fluency Questionnaire is not moderated by the demographics of age, department size, education, gender, race, and years of experience.

Significance of the Problem

Examination of the relationships between and among strategic thinking capabilities and information and communication technology adds to the body of knowledge with regard to EFOs and their leadership skills. The completion of this study provides new insights into curriculum development and preparation for new fire officers in the ever changing technological environments they are required to react in and respond to in order to protect those they serve.

Many fire departments have some type of leadership institute, which incorporates a training program specifically designed for new fire officers. Often new fire officers have taken many programs, which hone their on-the-job technical skills; however, there has been a dearth of training in the human relations field and how that aspect of training may impact their strategic mindset which could impact how they make decisions and respond in critical leadership situations.

The correlation between strategic thinking and information and communication technology could also have an impact on the future of professional development in the fire service. The *Strategic Thinking Questionnaire (STQv6)* and the *Information and Communication Technology (ICT) Fluency questionnaire* could be administered to new fire officers or could be used as part of an assessment center during competitions for district, battalion, and division chief promotions.

The examination of information and communication technology with this population could contribute to the expansion of alternate platforms of program delivery in the realm of leadership courses. With the present expansion of the NFA's Degrees at a Distance program, the EFOP could consider piloting a hybrid or online course.

In the past year, the NFA has developed a new online site where students can go for the Degrees at a Distance Program and take online courses. To date, no online course exists that has been designed specifically for and by the NFA to address strategic thinking and the use of the diverse information and communication technology currently in use by those attending the EFOP. Although the concepts of strategic thinking are addressed in the EFOP courses, all of these courses are 2-week classes that are taught face-to-face. The only portion of the program that is completed online is the Applied Research Project (ARP) submitted after each course.

Delimitations

The sample was confined to EFOs who have completed all requirements of the EFOP and have graduated from the NFA's EFOP within the past 4 years.

Limitations

All participation in the study was voluntary; therefore, the study was subject to self-selection bias. All data was gathered through self-reporting surveys via an online format. There are several limitations when administering surveys online. Since this survey was sent using SNAP software, some recipients may not be technologically inclined and may choose not to complete the survey. Since one of the instruments being used focuses on ICT fluency, this may attenuate the variance in ICT scores, which could present a possible problem. Although the STQ survey was sent online to the sample, the results were compared to an STQ survey that was delivered face-to-face. This may be a possible limitation. Since the sample spans a 4-year timeframe, some of the email addresses may no longer be accurate; however, this could also be a factor with a mail-in survey. With any type of returned surveys, the researcher cannot be sure that the person

responding to the survey is the actual person to whom the survey was sent. This would result in a situation where only the responses from those in the sample that are returned will be analyzed. Inaccuracies could be a factor from discrepancies in data between the responses from the sample and the unobtained responses from the nonrespondents.

Researcher bias might also be a possible confounding factor, since the researcher teaches some courses for the NFA; however, the researcher does not teach any courses in the EFOP. These limitations and delimitations could affect the ability to generalize the results of the study.

Definition of Terms

Executive Fire Officer Graduate (EFOG): This person has successfully completed all four years of the EFOP including four rigorous applied research projects, due within six months of the completion of each course. The traditional target audience is the senior fire executive, which includes the chief of the department, those individuals who report directly to the chief, and other senior officers who have sole responsibility for major functional areas. Battalion-level chief officers in metropolitan fire service organizations, as defined by the International Association of Fire Chiefs (IAFC), also are considered within this audience, as well as State Fire Marshals and State Directors of Training and other individuals serving in "key leadership" positions. As of July 1, 2008, candidates must have a minimum of a baccalaureate degree in order to enter the competitive application process.

Executive Fire Officer Program (EFOP): A competitive 4-year program with one 2-week (80-hour) course per year. An applied research project (ARP) must be completed

within six months from the final class date of every course, prior to returning the following year. The research project allows students to investigate a problem or key issue within their department, reach a conclusion and offer recommendations that contribute to the improvement of their organization. The ARP uses the American Psychological Association (APA) format and must contain the following elements: (a) title page, (b) certification statement, (c) abstract, (d) table of contents, (e) main body of the paper, including: introduction, background and significance, literature review, procedures, results, discussion, recommendations, and (f) reference list. ARPs usually range from 30 to 40 typed pages, excluding references and appendixes. Each project is evaluated and a passing grade of C is needed to progress in the program.

Incident Command System (ICS): The ICS is the combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure, designed to aid in domestic incident management activities. It is used for a broad spectrum of emergencies from small to complex incidents, both natural and manmade, including acts of catastrophic terrorism. ICS is used by all levels of government—federal, state, local, and tribal, as well as by many private-sector and nongovernmental organizations. ICS is usually organized around five major functional areas: command, operations, planning, logistics, and finance and administration.

Information Literacy: Information literacy is the ability to access, organize, evaluate and effectively use information. It is a process that supports lifelong learning.

Information and communication Technology (ICT): ICT is the convergence of computers and digital communication to enable access to information and other resources and to facilitate communication and collaboration.

ICT Fluency: ICT fluency is a high level of proficiency with information and communication technology. In addition to contemporary ICT skills, it requires a broad understanding of foundational concepts and ICT capabilities.

Information and Communication Technology (ICT) Fluency Questionnaire: The ICT Fluency Questionnaire was developed by Dr. Scott Hilberg (2007). It is an online, web-based survey containing 56 questions and divided into the following five sections: (a) demographics, (b) usage, (c) education/training, (d) fluency, and (e) comfort. It was designed as a self reporting survey used to measure a person's fluency or proficiency in ICT.

National Incident Management System (NIMS): On February 28, 2003, President Bush issued Homeland Security Presidential Directive-5 (HSPD-5). The Secretary of Homeland Security was directed to develop and administer a National Incident Management System (NIMS). NIMS is the first-ever, standardized approach to incident management enabling all government, private-sector, and nongovernmental organizations to work together. NIMS is a comprehensive, national approach to incident management that is applicable at all jurisdictional levels and across functional disciplines. It is intended to: (a) be applicable across a full spectrum of potential incidents, hazards, and impacts, regardless of size, location or complexity, (b) improve coordination and cooperation between public

and private entities in a variety of incident management activities, and (c) provide a common standard for overall incident management.

Strategic Leadership: For purposes of this study, leaders are grounded in three preconditions: attributes, skills, and strategic thinking. Leaders must possess a majority of the eight leadership attributes associated with successful leaders: aspiration, adaptation, attraction, assertiveness, character, confidence, connection, and competence. Strategic leadership also necessitates that the leader effectively apply the core skills of decision making, communicating, motivating, and conflict management (Pisapia, 2005).

Strategic Thinking: Successful leaders develop a strategic mindset by engaging in the cognitive processes of reflection, reframing, and systems thinking. Reflection is defined as "the ability to weave logical and rational thinking through the use of perceptions, experience and information to make judgments as to what has happened and then create intuitive principles that guide future actions" (Pisapia, Reyes-Guerra, & Coukos-Semmel, 2005, p. 56). Reframing is defined as "the ability to switch attention across multiple perspectives, frames, mental models, and paradigms in order to generate new insights and options for actions" (Pisapia et al., 2005, p. 52). Systems thinking is defined as "the ability to see systems holistically by understanding the properties, forces, patterns and interrelationships that shaped the behaviors of the systems, which provides options for actions" (Pisapia et al., 2005, p. 48).

Strategic Thinking Questionnaire (STQ): a reliable and validated instrument designed to provide an assessment of three cognitive skills: systems thinking, reframing and

reflection, important to strategic thinking. These dimensions reveal the test takers ability to think flexibly, conceptually and strategically.

Table 1

Acronyms in Fire and Emergency Services Terminology

Acronym	Terminology
DHS	Department of Homeland Security
EFO	Executive Fire Officer
EFOG	Executive Fire Officer Graduate
EFOP	Executive Fire Officer Program
EMI	Emergency Management Institute
FESHE	Fire and Emergency Services Higher Education
HSPD	Homeland Security Presidential Directives
IC	Incident Commander
ICS	Incident Command System
ICT	Information and Communication Technology
LODD	Line of Duty Deaths
NETC	National Emergency Training Center
NFA	National Fire Academy
NIMS	National Incident Management System
USFA	United States Fire Administration

Chapter Summary

As a leader in times of crisis, the EFO needs to respond quickly and to accurately assess the situation in order to mitigate the problem. The EFO is a leader who must think strategically and must also be familiar with today's technology. Chapter 1 reviews some of the leadership qualities that are essential for all EFOs highlighting communication skills, relationships with subordinates, and leadership styles. Various types of technology being used today in the emergency services field are discussed, as well as the impact they have on the EFO's job and his or her need to apply effective and efficient leadership practices.

Based on a review of the literature, there appeared to be support for the study of the strategic thinking capabilities of the EFO. Since technology is ever prevalent and continuously growing in the field, a study of the EFO's ICT fluency was also necessary. Through the use of two separate instruments designed to measure these constructs, the researcher identified linkages that existed between strategic thinking capabilities and information and communication technology. This study examined the relationships between and among strategic thinking and ICT, using graduates of the NFA's EFOG as the sample population.

Chapter 2 examines the literature for previous studies that have relevance to these areas. Leadership theories and concepts were explored, specifically as they related to fire and emergency services and functions within a paramilitary organization. Adult learning theories including self-directed learning and how it affects the EFOP are discussed.

The increasing role of technology in today's fire service was explored. An analysis of the instrumentation for gauging strategic thinking processes and ICT fluency is included.

Chapter 3 is an outline of the research methods to be used in this study. The nature of the population was examined, including the rationale for the selection process. The research design is presented as well as the protocol for collecting, handling, recording, and analyzing the data.

CHAPTER 2

LITERATURE REVIEW

Dramatic changes and events in society and technology in this young century require changes in emergency response leadership knowledge and skills. Military style training and organization offered a suitable model for training of adults in emergency services (police, fire, medical) throughout the past century, because of the nature of the roles and the limited technology. However, the lessons learned from the emergency response to the critical events of September 11, 2001 in various locations in the country as well as from a wide variety of natural disasters since the turn of this century have yielded demands for rethinking the approaches to the training and preparation of leaders in fire service as well as the needed characteristics of leadership among Executive Fire Officers (EFO).

This review examines the literature that supports a framework of theories, concepts, and research evidence of this inquiry into adult learning, strategic leadership, and the applications to the profession of Executive Fire Officer. Areas examined include concepts of adult learning (andragogy, self-directed learning, and learning styles); leadership and strategic thinking; the leadership characteristics of EFOs; and emerging technology. It fosters the discovery of the interrelationships that exist, if any, for EFO's strategic thinking capabilities and their use of ICT

Adult Learning and Emergency Responders

While traditional job training utilized an approach of lecture (tell), demonstration (show), and practice (do), modern leadership training for emergency responders and technological capabilities require consideration of several current theories of adult learning. Training and education in executive and management leadership in today's emergency services requires attention to what is known about adult learning, self-directed learning, and learning styles as well as how these ideas of adult learning apply specifically to EFOs. Technology has had a great impact on the nature of operations and learning to rely on continually evolving technology provides an ongoing challenge to the effective executive and adult learner. Not only is continuous adult learning a necessary leadership trait, but self-directed learning is a demonstrated trait of high achieving professionals, executives, and leaders (Byrd, 1987; Clark, 1989; Oddi, 1986; Preziosi, 1986; and Reio, 2004.

Andragogy

Knowles (1968) introduced the European concept of andragogy, "the art and science of helping adults learn" (p. 350) as a contrast to pedagogy, which focused on the way that children and young people learn. His model postulated five assumptions about the adult learner (a) with maturity, a person's self-concept moves from being dependent toward being self-directed; (b) through their growing experiences, adults accumulate a rich resource for learning; (c) an adult's learning readiness is closely related to the developmental tasks of their social role; (d) as people mature, there is a change in their time perspective, from future application of knowledge to immediacy of application

becoming more problem-centered than subject-centered; and (e) internal factors, rather than external ones motivate adults to learn.

Knowles noted that experiential techniques were the most effective ways for adults to learn. Rather than lectures and reading didactic texts, the use of discussion groups, problem solving, case studies, and role-playing better served the adult learner. Knowles's concluded that pedagogy and andragogy represented a continuum in learning, from teacher-directed to student-directed depending on the situation. Merriam and Caffarella (1999) suggest that teachers of adult learners have used the five assumptions for many years to better understand their students. The design of the training program for EFOs utilizes what is known about adult learners.

Self-Directed Learning

Knowles's first assumption of andragogy centers on self directed learning and he later elaborated on that notion of self-directed learning. Knowles (1975) defined self-directed learning as "a process in which an individual takes the initiative, with or without the help of others," (p. 18) to diagnose their learning needs, formulate learning goals, identify resources for learning, select and implement learning strategies, and evaluate learning outcomes. Brockett and Hiemstra (1991) add that:

> Self direction in learning refers to two distinct but related dimensions. The first ...is a process in which a learner assumes primary responsibility for planning, implementing, and evaluating the learning process. An education agent or resource often plays a facilitating role in this process. The second dimension, which we refer to as learner self-direction, centers

on a learner's desire or preference for assuming responsibility for learning. (p. 13)

Students who apply to the NFA for the EFOP display both dimensions of self-directed learning. They know up front that they will be taking on a 4-year commitment of coursework and applied research projects, so they must plan for that in their schedule. They exhibit the desire to take on this particular learning project, by continuing to apply, year after year, until they get accepted into the program. Because this is a one-of-a-kind program, and only offered in one location, competition for available slots can be very heavy.

Clark (1989) studied EFOs to see how they compared with other self-directed learners. This seminal work compared the self-directed learning readiness scores of 30 NFA EFOs with the theoretical norm and also with 76 public managers. This was groundbreaking work for the NFA for a number of reasons. There had been consideration of expanding the EFO curriculum to include self-directed learning methodology; however, the amount of student preparation needed was unknown. The comparison of NFA students to other populations with regard to self-directed learning readiness had never been done before. This was the first study undertaken that would compare NFA students to the norm and also to public managers. The NFA students were enrolled in the first EFO class—executive development. These students were EFOs from around the country who, in their own jurisdictions, played a similar role to that of the public managers.

The 30 male students, ages 35-55, were tested using Guglielmino's (1978) instrument, the Self-Directed Learning Readiness Scale (SDLRS). An individual's score

on the instrument produces a rating of low, below average, average, above average, and high. The distribution of the EFOs' scores was then compared to the theoretical norm, as well as to the scores of the 76 public managers. This comparison was made statistically with the chi-square goodness of fit calculation. Clark (1989) found that the majority of the EFO SDLRS scores were distributed at the upper-end of the scale with 53.3% above average and 7% high. Although the EFO scores were significantly higher than both the theoretical norm and the public managers, as evidenced by the distribution table below, the remaining 30% of the scores fell in the average range. This was judged to be unacceptable, because the literature had indicated that professionals need a high degree of self-directed learning to be successful (Oddi, 1986).

Table 2

Distribution of SDLRS Scores between Groups by Percentage

Group	Low	Below Average	Average	Above Average	High
Fire Executives [a, b]	0.0	0.0	30.0	53.3	16.7
Theoretical Norm	7.0	24.0	38.0	24.0	7.0
Public Managers	0.0	10.5	22.4	34.2	32.9

Note. The distribution of scores between fire executives and theoretical norm (a) and public managers (b) were compared using a chi square goodness of fit calculation.

a $x^2 = 81.896$, df=4 $p \leq .001$

b $x^2 = 31.722$, df=3 $p \leq .001$

Preziosi (1986) and Byrd (1987), in their research on executives and managers, identified self-learning as an effective characteristic. A study done by Johnson, Sample, and Jones (1987) found that the primary task in professional development is to create

opportunities that foster self-directedness in learning. One of the methods they recommended to accomplish this was the use of learning contracts, which have been shown to increase the degree of self directed learning readiness. As result of this study, Clark (1989) recommended that the NFA include learning contracts in the curriculum, to assist students in increasing their levels of self-directed learning.

These earlier studies were corroborated more than a decade later, by a review of the literature on self-directed learning (Reio, 2004). Individuals who were self-starters, responsible for their learning decisions, creative, independent, and successful in learning, also rated higher on the self-directed learning readiness scale.

Zsiga (2007) used the self-directed learning readiness scale, as well as the strategic thinking questionnaire in his study of 543 YMCA directors. He found that individuals who exhibited self-directed learning tendencies can be expected to use strategic thinking strategies; those who are strategic thinkers reflect self-directed learning behavior.

Barriers to Self-Directed Learning

Sometimes a self-directed adult learner will start a learning project and meet with barriers or interrupters that cause a delay in the project. In some cases they will be able to restart the project and follow it through to completion; however, some barriers may cause them to abandon the project altogether. Guglielmino, et.al. (2005) looked at some of the common barriers faced by self-directed learners. Their study examined the learning projects of 14 subjects selected by the researchers, who were described as high self-directed learners. The subjects were given the *Self-Directed Learning Readiness Scale* (Guglielmino, 1978, SDLRS) and subsequently interviewed using a modification of

Tough's (1971) interview protocol. The subjects placed well above the mean and averaged 13.8 learning projects in the year prior that met the criterion of a minimum 7 hours each. The average time spent on each learning project was 56.1 hours. Researchers found that seven themes emerged as barriers to continuation of the learning projects: time, lack of accessibility or adequacy of resources, interactions with other people, personal limitations, issues with formal learning activities, technical difficulties, and loss of intensity with the top barrier cited reported as lack of time.

Time can also be a barrier to continuing to progress through the EFO program. After each course, an applied research project must be submitted within six months. A one-month extension may be granted in extreme circumstances, such as a death in the family or a severe illness befalling the EFO student. According to Burkell (2004),

> The USFA and NFA annually accept 200 applicants to begin the program. Because the EFOP is four years, the total course population in rotation usually exceeds 800. Participants must maintain their eligibility throughout the four-year process and are required to notify...if any changes in position or employment occur. (p. 3)

Cost was sited by some learners with comments such as, "You had to be able to afford to go. You had to be able to get yourself there" (Guglielmino et al., 2005, p. 81). The distance in driving to a learning location was also cited as a barrier.

When an applicant is accepted into the EFOP, they take on a 4-year commitment. Each year they travel to the NFA in Emmitsburg, Maryland, for a 2-week course. Although there is travel reimbursement and dormitory lodging provided, each individual,

or their fire department, is responsible to cover the cost of their meals while at the Academy so funding for travel may be a slight barrier.

Learning Styles

Each person is an individual with their own personality, and their own way of conceptualizing ideas. Different people have different ways of learning things and these ways are not good or bad, just different. Learning styles go back to the time of the Greeks, 400 BCE, when Hippocrates created the model of personality which included: the sanguine, the phlegmatic, the choleric, and the melancholic. Historically, more than 100 different theories of learning styles and instruments designed to evaluate different types of learning styles have been created. An individual's learning style tends to be consistent in their interactions with new and/or difficult information, including how they select, make sense of, recall and use input from all that is available to them. Although they do change as people mature, learning styles are stable, characteristic behaviors. How an individual prefers to learn has implications not only in the educational environment, but also in the home, social, and workplace environments (Given, 2000). In addition to the learning environment, a learner's motivation to learn, their beliefs, interests, goals and personality also influence their learning style. An individual's preferred approach to learning may be considered as the baseline definition of learning styles. Merriam and Caffarella (1999) suggest that researchers have identified characteristics of learning styles such as: cognitive, affective and physiological behaviors that are stable indicators of how learners perceives, interact with and respond to the environment.

Jung (1912), in his study of personality types, introduced the concepts of extroversion and introversion. He went on to differentiate these types into four areas:

thinking, feeling, sensing, and intuition. Eventually this system became the basis for the Myers Briggs Type Indicators (MBTI). Although personality traits may be reflected in the individual's choice of learning styles, they are not the same thing. For instance, a person who is classified as an extrovert on the MBTI might work well with other students on a group project or interactive activities. On the other hand, one who is classified as an introvert may feel much more comfortable processing the information internally. If we were to look into the four areas of thinking, feeling, sensing, and intuition, we would find that thinkers prefer to use objective conclusions based on concrete evidence. Feelers are more likely to use subjective factors in coming to conclusions. Sensors like to work with concrete ideas and processes, while intuitors tend to understand things conceptually.

This MBTI is part of the course work that Executive Fire Officers take during their final EFO class: Executive Leadership (Myers, McCauley, Quenk, & Hammer, A., 1998).

Mitchell and Everly (1996), in a 2-year study, found that emergency service responders have similar personality traits that differ significantly from the personality profiles of non-emergency personnel. They are action oriented. They like to be in control. They are risk takers. They tend to enjoy public attention. They are dedicated and loyal. They are less family oriented than the norm. They have a strong desire to be needed and want to help others. Casey and Leger (2000) reported the findings of the 2-year study done by Mitchell and Everly to be valid.

Just because a group of people who choose the same career have similar personality styles that does not mean that they all learn the same way. The problem encountered by Klingensmith (2006), was that no study had ever been done on

emergency service responders and the way that they learn. Because emergency responders often have to make critical decisions immediately which impact the public, their training and education must prepare them for these situations. It is essential that their instructors and trainers know how emergency responders learn so that they can prepare them adequately for any situation they might face in the field. Klingensmith (2006) studied 100 emergency responders to determine their learning style preferences and patterns. After considering various types of learning style inventories such as the MBTI, The Learning and Study Strategies Inventory (LSSI), and the Kolb Learning Style Inventory, the V.A.R.K. Preferences Instrument was chosen. The V.A.R.K. Preferences was developed at Lincoln University, New Zealand (Fleming, 1998), as a way to help students identify how they prefer to learn.

The acronym V.A.R.K. stands for visual, aural, read/write and kinesthetic. A fifth category, multimodal, was added when it was found that approximately 60% of respondents had more than one preference. The study identified learning style patterns, based on years of service, rank, and educational levels for 100 emergency services responders who answered the questionnaire. The pattern showed that multimodal - visual, aural, read/write, and kinesthetic was the learning style most preferred followed by kinesthetic. Merriam and Caffarella (1999) suggest that using learning style inventories is a useful step that helps both the student and the instructor become aware of their strengths and weaknesses both as learners and as teachers.

Roles of emergency responders have changed dramatically in the last 20 years from structural firefighting to an increased emphasis on emergency medical services. More than 80% of fire department calls are now rescue calls that are medically related

requiring firefighters to be dually certified as Emergency Medical Technicians (EMTs) or paramedics. Special operations and hazardous materials calls are on the rise, as well as response to terrorism and natural disasters. Learning for emergency responders needs to be cutting-edge. The student needs to be engaged and the instructor needs to be capable of delivering the material in ways that each and every student can learn. "Simple paper based manuals and guides don't work. Even classroom-based lectures lack the efficiency of some other training methods" (Hendrix, 2003, p. 2). Understanding the learning styles of emergency responders goes a long way to help professionalize the fire service.

Adult Learning and Professional Development

Over the past 11 years, the NFA has taken a proactive step in professionalizing the fire service by creating the Fire and Emergency Services Higher Education (FESHE) program. The mission of FESHE is to establish an organization of post-secondary institutions to promote higher education and to enhance the recognition of the fire and emergency services as a profession to reduce loss of life and property from fire and other hazards. Establishing a model core curriculum for undergraduate and graduate degrees, which crosswalks educational competencies with job performance requirements allows fire service personnel to obtain training, education and certification simultaneously, as they progress on their professional development path. For fire service personnel who progress up through the ranks, their professional development path follows a pyramid shape, starting at firefighter 1, 2, EFO, and culminating in chief fire officer designation.

The NFA's EFO program is often the culminating curriculum for chief fire officers. In both the beginning EFO class, Executive Development and the capstone course, Executive Leadership, professional development plays a key role. Putting

together a professional development plan, including a professional portfolio helps the individual target their needs and track their results toward their goals and objectives. Bryan (2001) suggests that an important learner strategy is to conduct a self-assessment and identify areas for improvement. In answer to the question of how to cultivate leadership within the firefighters' organization, Waite's (2008) first recommendation is to create a Professional Development Program. He adds that "This type of program is to train a firefighter not only to become better at his or her current job, but also to become completely trained to assume the next one " (p. 49).

Leadership

This study focuses on Executive Fire Officials, so it is important to understand the foundations of executive leadership development. Specifically, the study explores the strategic thinking and strategic leadership of EFOs. This section of the literature review explores the notions of strategic thinking, cognitive complexity, and the general evolution of thinking about leadership providing a foundation for the development of leadership studies and training.

Strategic Thinking

Today we live in a global society, with instant information and the knowledge that what we do impacts more than our small circle, but rather the world. One example of this is the recent downturn in our country's economy and its impact on the world market. The shift towards globalization, the impact of the information explosion, and the increase in communication resulting in the diminishment of time, space, and distance was recognized by Pisapia et al. (2005).

Because of today's technological advances in the information age, leaders are challenged by a chaotic and complex environment that no longer responds to linear thinking. This can result in the failure of leaders who use a limited set of leadership actions and find it difficult to react when surrounded by paradoxes. Oftentimes there needs to be a shift from command-and-control toward coordination and collaboration. This may require a strategic mindset. The elements as proposed by Pisapia et al. in 2005 include three interrelated cognitive processes: systems thinking, reframing, and reflecting.

Pisapia and his colleagues (2005) define systems thinking as "the ability to see systems holistically by understanding the properties, forces, patterns and interrelationships that shaped the behaviors of the systems, which provides options for actions" (p. 48). A leader who practices systems thinking will recognize patterns, interrelationships, archetypes, integration, and be able to think holistically.

Reframing is defined as "the ability to switch attention across multiple perspectives, frames, mental models, and paradigms in order to generate new insights and options for actions" (Pisapia et al., 2005, p. 52). A leader who practices reframing is able to use different paradigms and frameworks; suspends judgment; gathers appropriate information; and reviews and reforms mental models.

Reflection is defined as "the ability to weave logical and rational thinking through the use of perceptions, experience and information to make judgments as to what has happened and then create intuitive principles that guide future actions" (Pisapia et al., 2005, p. 56). A leader, who practices reflection uses double loop learning, recognizes why some choices work and others don't, uses past experiences to understand the present

and future, uses experience and knowledge to think through situations and blends knowledge and analysis as they take action.

Wallace (2001) states that "strategic management occurs when implementation of the strategic plan is the norm and is integrated into all facets of the organization at each of its levels... strategic management focuses on results" (p. 193). Strategic planning has long been a part of fire department operations.

In order to be an accredited fire department by the Center for Public Safety Excellence, the first step is to devise a strategic plan. Many fire departments have used the strategic planning method developed by Humphrey, a Stanford based management consultant, in the 1960s. The SWOT analysis (strengths, weaknesses, opportunities and threats) is used as part of the 12-step strategic planning process, but it does not stop there. Wallace (2001) recommends constantly conducting a gap analysis of strategic thought versus action in daily operations; thinking and acting strategically. Wallace suggests that it is not just the department leaders practicing strategic management, but also the firefighters, company officers, and battalion chiefs making the dream a reality through their creativity and innovativeness. Pisapia, Reyes-Guerra, and Yasin (2006) also state that strategic thinking can no longer be seen as a once-a-year task performed as part of the annual strategic planning process; it must be the essence of every leader's daily work.

Because there was no instrument available to measure the strategic thinking capabilities of leaders, Pisapia et al. (2005) developed the *Strategic Thinking Questionnaire*. After literature review, definition of cognitive components or processes of strategic thinking, expert review, pilot testing, and further refinement and revision, reliability was established.

Pisapia et al. (2005) examined the development of leadership philosophies and began to classify skills and practices they determined to be most suitable for dealing with the rapid pace of external change through internal adaptations in the organization. They assert that, as a precondition to success, strategic leaders develop a schema which enables them to conceptualize and understand a myriad of organizational challenges and move non-linearly to adapt by connecting apparently separate and unrelated items and composing alternative responses. Their research identifies systems thinking, reframing and reflection as the three critical cognitive processes necessary to lead strategically. Pisapia and Reyes-Guerra (2007) developed the *Strategic Thinking Questionnaire (STQv6)* to study the connections of strategic thinking and leadership.

Since that first study, there have been more than 3,000 test takers of the *STQ*. It has been translated into four languages, and both managers and executives of for-profit and nonprofit corporations have been tested. Other populations who have taken the *STQ* include 543 school leaders in Hong Kong, 328 students preparing for educational management roles, and 543 YMCA directors in the U.S. The STQ has shown acceptable reliability scores demonstrating content, face, predictive and discriminate validity in statistical evaluations (Pisapia, 2009). A more detailed description of the instrument can be found in Chapter 3.

Strategic thinking is one of the cornerstones of the EFOP. From the time, a firefighter starts their career to their retirement; they have to constantly make decisions that can have life-and-death consequences. The ability to conceptualize the entire system, look at the total picture and maybe make a split-second decision on how to proceed requires strategic thinking. It may also require the ability to reframe the situation and go

in a different direction. Whether you are the leader on the fire ground, in a natural disaster or in the midst of contract negotiations with the union, the Executive Fire Officer must be a strategic thinker.

Cognitive Complexity

Strategic thinking requires a level of cognitive complexity in order to operate in an environment of increasing, intensifying and accelerated demands. Leadership in critical situations, whether they are in medical settings, military encounters, or police or fire incidents require a great capacity for cognitive complexity. Hock (1999), Senge (1990), Snyder, Acker-Hocevar, and Snyder (2000), and Wheatley (1992) advise modern leaders to get comfortable with the chaos (and sometimes confusion) that accompanies ambiguity and paradox in the environment.

Operating during a major critical incident or in a conference room working on contract negotiations between labor and management, the EFO has to exhibit leadership skills. The EFO needs to exhibit the capacity for cognitive complexity which is related to the ability to think strategically and to make good decisions even under extreme pressure.

Psychologists (Heslin & Streutfert, 1968; Kelly, 1955) studied the decision-making process, often looking at the frame and perceptual skill of the person to determine how complex or simple it is. Kelly (1955) developed the idea of "personal constructs" extending complexity theory to encompass decision-making. Cognitively complex individuals have a greater capacity to effectively handle emergencies (Heslin & Streutfert, 1968). In the 1980s, research and training to improve decision-making had been shown to be effective components in complexity theory. Contemporary environmental stressors such as war, terrorist attacks and nuclear disasters provide

excessive stressor levels. This brings us into an era of meta-complexity which requires additional testing of decision-making under these severe conditions. Even in some medical settings, stress upon personnel can be severe (Streufert, 1997). Simulation training has been an effective tool in education for EFO's who are often making decisions under stressful situations.

Myers (2007) studied cognitive complexity among senior military officers enrolled in the US Army War College (USAWC) Distance Education Program. The AWC has both a resident program and a distance education program, accepting 300 and 400 students, respectively per year. They completed the Modified Career Path Appreciation (MCPA) survey at the beginning and end of the first year of the program. The instrument was based on Elliot Jaques' Stratified Systems Theory (SST) which assesses strategic leader cognitive capacity and the ability to contend with increasing complexity and long term planning capabilities at least ten years in the future. The survey measured respondent preference for differing levels of cognitive complexity both qualitatively and quantitatively. Quantitative data also included the Strategic Leadership Course Survey Report. Data indicated there was a significant increase in leader cognitive development for respondents that completed the first year of the distance education program. Findings from this study support the development of strategic cognitive leadership skills through distance education which is ever expanding due to the new developments in technology.

Evolution of Leadership Theory

The study of leadership has been ongoing since the early 1900s. The thinking about leadership has evolved through many stages. From identifying traits, to scientific

management methods, through motivation studies, and distinguishing transactional and transformational leadership, theorists and researchers have explored many facets of leadership and leadership development.

Humanitarians and great leaders in political, social, cultural and military arenas were studied to identify common characteristics and/or personality traits. It was believed that people having these "traits" were born to be leaders. Research concentrated on the difference between leaders and followers according to their characteristics and personality traits (Bass & Stogdill, 1990). Since this was a rather limiting view of leadership, Stogdill went on to study the interaction between leaders and followers in various situations.

Situation and style became the focus of several key theorists. Stogdill (1948, 1974) found that leadership was determined by situational factors, as well as personality traits. The thinking on situational leadership was further developed by Hersey and Blanchard (1969). There are times when a leader will need to use a different leadership style depending upon the situation and the needs of his or her subordinates. Hersey and Blanchard identified four common leadership styles (directing, coaching, supporting, and delegating). The style approach to leadership was further refined by Blake and Mouton's Leadership Grid (1985) which outlines the interaction between concern for people and concern for production and categorizes leadership into five styles (authority-compliance, country club management, impoverished management, middle-of-the-road management, and team management). The interaction between the leader and followers was described in the Leader Member Exchange (LMX) theory (Northouse, 2001) leading to thinking about *transactional* leadership.

Transactional leadership does not focus on the needs or personal development of subordinates. Rather, transactional leadership focuses on the exchanges that take place between the leader and he followers. Factors of transactional leadership include: *Contingent reward* which is an exchange process, where followers receive rewards in exchange for effort supplied and *management by exception* which can be active or passive but both use more negative reinforcement in the process of the exchange.

Burns (1978) distinguished between transactional and transformational leadership defining transactional leadership as focusing. On the other hand, Northouse (2001) defines transformational leadership as

> The process whereby an individual engages with others and creates a connection that raises the level of motivation and morality in both the leader and follower. This type of leader is attentive to the needs and motives of followers and tries to help followers reach their fullest potential. (p. 132)

Northouse (2001) states that several components can be identified as central to the phenomenon of leadership, no matter what way leadership is conceptualized. Northouse, views leadership as a process that involves influence, occurs within the group context, and involves goal attainment. Bass and Avolio (1994) further define transformational leadership as incorporating many factors including charisma, inspirational motivation, intellectual stimulation, and individualized consideration.

Pisapia (2005) summarizes approaches to leader's actions in a historical framework with four distinct categories: Psychological, Behavioral, Sociological, and Cognitive. He outlines a description of the type of leadership as well as the approaches in the literature.

Bolman and Deal (2003) look at leadership from four different frames. A frame is explained as a "coherent set of ideas that enable you to see and understand more clearly what goes on day to day" (p. 41). The structural frame looks at how the social architecture works (the roles and functions of groups, the goals, authority, rules and policies of the organization). The human resource frame looks at human needs and the bond between the individual and the organization. The political frame focuses on decision-making as it relates to allocating resources in scarcity and divergent interests. The symbolic frame looks at the culture, rituals, vision, story, and symbology used by humans to make sense of their environment. One of the most important contributions made by Bolman and Deal is the concept of reframing leadership. This concept looks at leadership from an "and" instead of an "either/or" framework.

> Reframing offers a way to get beyond narrow and oversimplified views of leadership. Each of the frames offers a distinctive image of the leadership process. Depending on leader and circumstance, each view can lead to compelling and constructive leadership images, but none is right for all times and seasons. (Bolman & Deal, 2003, p. 348)

One of the reasons leaders fail in chaotic complex environments is because they rely upon linear thinking mindsets in the midst of ambiguity and complexity. "A new leader framework is recommended that shifts the balance from command-and-control toward coordination and collaboration... these are features of a strategic mindset for executive and managerial leaders" (Pisapia, Reyes-Guerra, & Coukos-Semmel, 2005, p. 42).

The ability to shift the balance from one style of leadership to another is essential during times of chaos or shifting priorities. Such is the case for the EFO, who needs to

assume command and control on the fire ground; however, the EFO may need more of a coordination and collaborative approach when dealing with budgeting and the allocation of resources, as well as creatively envisioning the use of new communications structures and technologies.

Leadership Characteristics of EFOs

EFOs work within a paramilitary structure with a clearly defined chain of command (see Fire Rescue Organizational Chart in Appendix B). For many years EFOs have relied upon an autocratic style of leadership and will continue to do so, on the scene of an incident. Hersey and Blanchard note that for the fire service, "the autocratic style of leadership has traditionally been the dominant style" (1988, p. 191). This practice has served the fire service well in response to an emergency incident. On the fire ground or at the scene of a mass casualty incident (MCI), the first officer responding has to assume command of the incident.

The Incident Command System (ICS) defines the operating characteristics, management components, and structure of incident management throughout the life cycle of an incident. When lives hang in the balance and decisions have to be made instantly, only one person can be in charge. The Incident Commander (IC) is responsible for incident activities, including the development and implementation of strategic decisions and for approving the ordering and releasing of resources. The higher ranking person from the first arriving unit assumes command of the incident. Depending on the type, size and complexity of the incident, that IC may maintain command as is or transfer command to a more senior officer or someone more qualified to handle that type of incident.

Management of the emergency scene requires the autocratic style, especially in the early, rapidly moving stages of the incident. There is seldom time in these situations for group participation, controversy or shared decision making (Shields, 1993). Emergency services personnel have been trained and tested on the incident command system. After 9/11 it became evident that government, private sector, and nongovernmental organizations needed to be able to work together during a domestic incident. The Homeland Security Presidential Directive 5 (HSPD5) issued on February 28, 2003, was designed to develop and administer the National Incident Management System (NIMS). NIMS is a comprehensive national approach to incident management that is applicable at all jurisdictional levels and across functional disciplines. Until the events of 9/11, there had been no national standards for incident operations and communications; personnel qualifications; resource management; information management; and/or supporting technology.

Because there had been no national standards prior to 9/11, emergency responders with good intentions and eager to help in a disaster situation have dispatched themselves to the site of the MCI without regards to the needs or the impact that their presence may have on the current situation. These well-meaning, emergency responders have in some cases added additional burden to the already stressed and overtaxed infrastructure by requiring additional resources to meet their basic needs such as food, shelter, and other essential items.

Not all communication systems between departments are the same, so one group may not be able to talk to another group. In addition, the self-dispatched emergency

response teams' equipment may not be interoperable. In 2001, there was no national standard to specify the tools and equipment for all special operations vehicles.

NIMS provided for interoperability and compatibility standards among all emergency responders, local, regional, and federal. NIMS also included a national system of competency credentialing, called *red card.* The red card is similar to a driver's license. The credentials specify levels of competency, including firefighting and incident command, achieved by successfully completing training and testing to national standards (Smeby, 2006, p. 6). To encourage acceptance of these standards, all state and local governments had to be NIMS-compliant by fiscal year 2005 in order to apply for federal preparedness assistance such as grants and contracts.

In December, 2008 the Department of Homeland Security released a revised NIMS document. The original document was expanded to include planning and preparedness; differentiate between NIMS (a national action template) and the National Response Framework (a national policy structure); and to improve readability.

Fire departments have been using the ICS for years, beginning back in the 1970s, as a response to out-of-control wild fires. Chief Waite (2008) recalled the need to urge fire service leadership to incorporate law enforcement, hospitals, and non-fire-based EMS into the fold, thus making fire rescue's job much easier at a large-scale incident.

Not unlike the wide range of leadership styles that individuals exercise in non-emergency scenarios, incident commanders range in leadership styles from dictatorial to laissez-faire styles under stressful conditions. Regardless of their leadership style, the IC is responsible for everything that happens under their jurisdiction. Along with that responsibility comes a high degree of accountability. Seasoned and competent incident

commanders are very much aware of the fact that if it happens on their watch, it is their problem and nobody else's (Coleman, 2006).

In Recruit school, firefighters take courses on strategy and tactics so that when they arrive on scene, they can size up the situation and strategize on how to proceed. A story is told about a new fire captain arriving on the scene of a working fire. The crew gets to work and the captain, as IC, realizes he needs back up and calls dispatch for a second alarm. The Battalion Chief (BC) arrives and assumes command. He asks the captain to do a "walk around" or "360" of the house and let him or her know if there is fire on the C side of the building. Within minutes, the BC's cell phone rings, and on the screen is a picture of fire showing in the windows on the C Side of the building. With traditional technology, the captain would respond using his or her radio to describe what was seen. Modern technology allows instant transmission of the picture (worth 1000 words). Although there are many ICT devices available that can be used on emergency scenes, all too often, fire departments continue to use the tried and true old technology.

Strategic thinking is an essential leadership skill that has been incorporated throughout the courses in the EFOP, from its inception in 1985 to the present time. Courses such as Strategic Analysis of Fire Prevention Programs; Strategic Analysis of Fire Department Operation; and Strategic Management of Change all incorporate strategic thinking and strategic planning.

One of the USFA's 5-year objectives is to reduce the loss of life from fire by 15%. In line with this objective, the primary goal of the newly revised Executive Analysis of Community Risk Reduction (EACRR) course is to empower the EFO with the ability to lead community risk reduction in a strategic manner. This requires the

ability to think strategically in creating a plan to reduce the risk of fires starting in a community.

EFOs that practice systems thinking will look at the community holistically. They will see how the fire department interacts with the school system, home owners' groups, and business organizations, to educate and encourage these groups to eliminate fire hazards in the home, school and business environment.

In the Executive Analysis of Fire Service Operations in Emergency Management (EAFSOEM) course, risk assessment is mission oriented. The fire department uses the context of its mission statement to develop a risk reduction strategic plan for the benefit of the whole community. By examining the three phases of an event (pre-event, event and post event) a strategic plan can be conceptualized, resulting in reducing risk in the community. For instance, a pre-event would be the strategic location of fire stations with appropriate apparatus. The event activity would be rapid entry into a burning building to rescue citizens. The post event can be treating them for smoke inhalation or burn care (Executive Analysis of Fire Service Operations in Emergency Management (EAFSOEM) Student Manual, 2007, p. 52-55)

The Executive Leadership EFO course addresses why and how successful executives derail. Research suggests that one cause for derailed executives was the inability to think strategically (Executive Leadership Student Manual, 2005, p. 94).

Information and Communication Technology (ICT)

The world today is totally different with instant messaging, texting, podcasts, social networking such as LinkedIn, MySpace and Facebook, blogging, gaming, smart phones, YouTube, interactive websites, video conferencing, and so forth. The information age offers instantaneous satisfaction. No longer do people need to wait to receive letters by mail, when they can email or text message. The earlier stall tactic of *the check is in the mail* no longer works when checks are automatically deposited into a bank account, electronic banking transactions process the check, and a person can pay all of his or her bills online. There is a new generation of Millennials in the workforce who grew up as gamers accustomed to technology and the internet. They are smart, driven, and used to working in teams, as well as being incredible multitaskers.

The importance of effective communication for emergency services leaders is stressed by James Lee Witt (2002), a former director of the Federal Emergency Management Agency (FEMA). He emphasizes six important points about communication: (a) begins at home, self to self, (b) is more than just talking - it's the honest and open exchange of personal views (c) is built on rock solid infrastructure (c) initiates communication without waiting, (d) includes early warning alerts within the communication and (e) encourages the media as a marketing ally. His strong emphasis on communication has provided a foundation for many advances in ICT on a federal level, from the way courses are delivered to the way people are contacted in emergencies. Many communities now use reverse 911, where emergency operating centers send messages out to alert citizens about evacuations during natural disasters. Often fire department websites will display real-time dispatching, where citizens can logon and see

what calls are in progress, or the news media may be automatically alerted through a paging system or text messaging.

The fire service has used technology for many years, including a geographic information system or GIS. The system integrates hardware, software, and data so that information is displayed in pictures or maps with layers of information aligned to the national grid system. Fire chiefs can use the system to look for water sources, traffic flow, location of units, and the staging of emergency supplies during natural disasters. At the Vision 20/20 conference in Washington DC, the Chief Executive Officer of the Country Fire Authority, Victoria, Australia, reported that the progress of bushfires was broadcast live on their website with GIS and they were gearing up to be able to text message evacuation notices to citizens in critical areas (Bibby, 2008).

Technology has also been used for instructional purposes. Gabrielle (2003) studied the effects of technology-mediated instructional strategies (TMIS) with 784 students at an undergraduate military academy. Students were randomly divided into control and experimental groups, given identical syllabi, and classroom-based content. The researcher used email to communicate with both groups and to direct the experimental group to the TMIS delivered via personal digital assistant (PDA), Web, CD-ROM, and other technologies. Students who accessed the TMIS had significantly higher levels of academic performance than the control group, as well as higher motivation and proclivity to be self-directed learners.

By 2005, 71% of all adults used a computer at home, work or school, and 69% used the Internet (U.S. Census, 2007). ICT is evolving at such an astounding rate that the number of transistors on a silicon chip affecting the processing quality of computers

doubles about every 18 months (National Research Council, 2006). ICT supports distance learning and provides access to educational resources that have not been readily available to students. Being fluent with ICT is necessary to be information literate in today's digital world.

Hilberg (2007) studied the ICT fluency level of 198 undergraduate students enrolled in computer and information sciences general education courses. Using Educational Testing Services' ICT literacy assessment, as well as the ICT fluency questionnaire, the study indicated that ICT educational experience did not significantly improve student ICT fluency. This suggests that ICT education doesn't adequately address ICT fluency in support of ICT literacy as outlined by the National Research Council and others.

Technology and Generational Learning

For the first time in history, four separate and distinct generations have evolved who work shoulder-to-shoulder and face-to-face in a stressful, competitive workplace (Lancaster & Stillman, 2002). The four generations are Traditionalists (1900-1945), Baby Boomers (1946-1964), Generation Xers (1965-1980), and Millennials (1981-1999). The Millennial generation has never known a time without computers and the internet. They experience technology in their communications, education and entertainment, functioning in a digital world. For example, today's kids are always "multiprocessing"-they do several things simultaneously-listen to music, talk on the cell phone, and use the computer, all at the same time (Brown, 2000). Millennials carry many technological devices, which they use to keep them connected to friends, information, and events. Millennials have grown up as part of the gamer generation and "grew up with a finger on

the keyboard and an ear to the cell phone and in a world where the forces of globalization have broken down national barriers like no time in history" (Beck & Wade, 2004, p. 1). For Baby Boomers, cutting-edge technology was telephone, television, and transistor radios (Lancaster & Stillman, 2002). Some Baby Boomers use traditional methods of receiving information, while others have adopted the new technology. Generation Xers are technologically savvy, good multitaskers, were latch-key kids, and tend to focus on friends more than family.

Traditionally the fire service has marketed its message through trifold brochures, VHS videos, PSA's, flyers and hand-out fact sheets. Some modern marketing options are now needed to reach these above described populations: blogging, podcasting, social networking on Facebook and MySpace, videos uploaded to YouTube, and texting. Some fire service instructors are now using blogs to show class progress on their websites. Firehouse.com now offers training through podcasts on many hot topics (Hyde, 2008). The National Fire Protection Association currently has a library of podcasts and many of its fire safety videos are on YouTube. The Home Safety Council regularly schedules webinars for the fire and life safety industry. Currently the Home Safety Council is in the development phase of the Expert Network Academy, an online learning management system that will assist fire and life safety educators with training modules at an introductory and advanced level. The fire service is embracing the new technology, but one question still remains, which will be answered in this study: What type of ICT users are EFOs?

Chapter Summary

The literature on adult learning and leadership provides a framework to improve understanding of how the EFO may learn the skills and competencies needed to function in their ever changing environment and how they may best function. The literature also shares some of the changes in the nature of the EFO based on the impact of the technology to which they have been exposed.

This chapter examined the following areas that related to this study: leadership, including the leadership characteristics of EFOs, strategic thinking, adult learning and emergency responders, self-directed learning, barriers to self-directed learning, leadership styles (specifically as they address the emergency services personnel), adult learning and professional development (specifically as it addresses the FESHE program), technology, and its interaction with generational learning (especially new learners in the fire service). This chapter included major theorists in each area, as well as information specific to fire and emergency services.

CHAPTER 3

METHODOLOGY

This quantitative study analyzed the relationships between and among strategic thinking and the use of information and communication technologies in a diverse group of EFOs with similar leadership roles. Although the EFOP has been in existence for 24 years, there has never been a formalized study of the strategic thinking capabilities of its graduates, nor of the relationship, if any, with the use of ICT. The resulting findings add to the body of knowledge in these areas and contribute to curriculum development in the leadership arena with the possibility of more online and hybrid courses. In addition, the findings from this study may assist in the recruiting, selecting and training of tomorrow's leaders in fire and emergency services.

Setting

A critical part of the Department of Homeland Security (DHS), the National Emergency Training Center (NETC) is located in Emmitsburg Maryland, 10 miles from Camp David. Today, the 107-acre campus houses the United States Fire Administration (USFA), including the National Fire Academy (NFA), the Emergency Management Institute (EMI), the Field Personnel Office, Satellite Procurement Office, and the Fallen Firefighter's Memorial. In January 1980, the NFA opened its doors for residential programs. In 1983, the superintendent, Joe Donovan, proposed to the Federal Emergency Management Agency (FEMA) a sweeping plan of fundamental consolidation that reorganized the NFA's varied curricula into the EFOP. At that time, a number of

important legislative and review documents, including Public Law 093-498, *America Burning* and the Wingspread Reports, fortified the creation of the EFOP. The plan received unprecedented bipartisan approval. Fire-related organizations from across the country offered overwhelming support. Donavan's vision became reality with the first EFOP graduates in July 1987. Since that time, over 3,000 EFOs have graduated from the program.

The NFA's EFOP is the most elite fire leadership program in the U.S. The program has evolved since its inception in 1985 to become the preeminent professional development program for senior fire executives. Advertisements for fire chief positions almost always require certification as an EFO.

In an NFA EFOP Participation Student Profile for the past 4 fiscal years, FY 05 through FY 08, 1,235 students were enrolled in EFO classes. These students were at various stages of their 4-year program, some beginning and others getting ready to graduate. Table 3 below shows basic demographics of this population.

Table 3

Demographics of Executive Fire Officer Students FY 2005- 2008

Demographic	Type	n	%
Gender			
	Male	1,159	93.85
	Female	76	6.15
Total		1,235	100.0
Race/National Origin			
	American Indian	16	1.30
	Asian	10	0.80
	Black	62	5.02
	White	1,115	90.28
	Hispanic	17	1.40
	No Response	15	1.20
Total		1,235	100.0
Type of Organization	Career	757	61.30
	Volunteer	30	2.43
	Combination	434	35.14
	No Response	14	1.13
Total		1,235	100.0
Students' Current Status	Paid Full-Time	1,151	93.20
	Paid Part-Time	24	1.94
	Volunteer	31	2.51
	No Response	29	2.35
Total		1,235	100.0

Sample

A deliberate sample of the last four years of EFO graduates was selected and invited to respond to this study. The total number in the sample was 415 EFOP graduates. Since this is a 4-year program, the survey group from 2001 to 2008 is actually the latest 4 years of EFO graduates who completed the program in 2005-2008.

Similar to the demographic data already shown in the preceding section on the EFO student population, the NFA in its registration process actually captures fifteen demographic areas including: completion date, age, gender, race, position, years in position, jurisdiction, organization type, department size, population, status, responsibility, area of experience, and years of experience in business type.

Based on the registration information provided, it was determined that the typical EFO graduate was a white male, 48 years of age with an average of 18.3 years of experience in the field, of which 5.8 years were in their current EFO position. Of the 400 EFO students, only 30 were female showing that women are still underrepresented in fire and emergency services, and specifically in chief officer ranks. Department size for these officers varied from 20 to 6,000 personnel with the average department size having 289 positions.

Using the population described, the purpose of this study was to examine the relationships, if any, that existed between and among EFOs' strategic thinking capabilities (utilizing the STQ_{v6}, [Pisapia & Reyes-Guerra, 2007]) and information and communication technology (utilizing the ICT *Fluency Questionnaire* [Hilberg, 2007]).

Research Questions

1. How do executive fire officers' strategic thinking capabilities, including the subscales of systems thinking, reframing and reflecting compare to previously reported samples from the literature?

2. What relationships, if any, exist between the EFOs' training in ICT, their ICT fluency, and their ICT comfort level?

3. Is there a correlation between the level of STQ and the results of the ICT Fluency Questionnaire?

4. Are the scores on the STQ and the ICT fluency questionnaire influenced by the demographics of age, department size, education, gender, race, and years of experience?

5. Is the relationship between the STQ and the ICT Fluency Questionnaire moderated by the demographics of age, department size, education, gender, race, and years of experience?

The null hypotheses examined included the following:

H_{o1} EFOs' strategic thinking scores do not differ from previously reported samples from the literature.

H_{o2} There is no relationship between the EFO's training in ICT, their ICT fluency, and their ICT comfort level.

H_{o3} No significant correlations exist between the STQ and the ICT Fluency Questionnaire.

H_{o4} The scores on the STQ and the ICT Fluency Questionnaire are not influenced by the demographics of age, department size, education, gender, race, and years of experience.

H_{o5} The relationship between the STQ and the ICT Fluency Questionnaire is not moderated by the demographics of age, department size, education, gender, race, and years of experience.

Instrumentation

Strategic Thinking Questionnaire (STQ_{v6})

The STQ_{v6} was designed to provide an assessment of three cognitive skills important to strategic thinking: systems thinking, reframing and reflection. Interpreting these cognitive skills helps test takers understand their own mental processing, and whether they think flexibly, conceptually and strategically. Depending on the version of the test, the STQ is six pages with 48 to 53 items. These questions are cast on a 5-point Likert scale ranging from "Almost never" (1) to Almost Always (5). The higher the number, the greater the use of the cognitive skill. The instrument takes approximately 15 to 20 minutes to complete and can be scored manually or electronically. The STQ measures three cognitive skills: Systems thinking, Reflection, and Reframing.

Systems thinking. The instrument was helpful to executives involved in leading organizations, leadership development programs, and coaching and counseling (Pisapia & Reyes-Guerra, 2007). Systems thinking refers to leaders' ability to see systems holistically by understanding the properties, forces, patterns, and interrelationships that shape the behaviors of the systems that provide options for actions.

Reframing. Reframing is a conscious effort by leaders to switch attention across multiple perspectives in order to generate new insights and options for actions. The goal is to produce usable knowledge by rotating through appropriate conceptual models for the activities and events observed.

Reflection. Reflection, in this study, refers to leaders' ability to weave logical and rational thinking together with experiential thinking through perceptions, experience, and information to make judgments as to what has happened and then create intuitive

principles that guide future actions. In reflection, one uses perceptions, experience, and information to make judgments as to what has happened in the past and is happening in the present to help guide their future actions.

Psychometric properties. The STQ has produced acceptable reliabilities and has demonstrated content, face, predictive and discriminate validity. In a study using the STQ_{v3}, reliabilities ranged from .77 and .83 on subscales and .91 for the scale (Pisapia et al., 2005). The range of the STQ_{v4} reliabilities is between .74 and .87 for the subscales and .93 for the scale meeting the .70 standard. Additionally, the rank order of the means on the subscales reveals that systems thinking is the cognitive skill most frequently used as expected from v3 and earlier editions. However, the reflecting skills (3.66) surpassed reframing (3.43) as the second most used skill. Thus, the rank ordering of means among the v4 sub scales is exactly the same as v3 subscales except that they were used more often by this sample. Furthermore, STQ_{v4} was subjected to a principle axis factoring method with iterative communality estimation and Oblimin with Kaiser Normalization rotation. Two factors (systems thinking and reflection) with eigenvalues greater than 1.0 accounting for 53% of the variance were extracted. This result is inconsistent with the hypothesized three subscales of the STQ but is consistent with the literature on the subject (Pisapia, Pang, Hee, Lin, & Morris, 2009). The items are subjected to empirical analysis after every administration to continue to refine the instrument. To date there have been over 3,000 respondents. A table comparing the Strategic Leadership Questionnaire, V3 and V4 can be found in Appendix D. *Note:* Results of this study have also been added to this table as V6.

Information and Communication Technology (ICT) Fluency Questionnaire

This instrument is a self-reporting survey developed by Hilberg (2007) in association with a panel that included a Ph.D. in computer education and an Ed.D. in instructional technology. The instrument was crafted from a review of the literature and the expertise of the panel. A small group of undergraduate computer and information science students (CIS) were pilot-tested with the instrument. The students did not participate in the final study; however, they did assist in the debriefing session. Any confusing or ambiguous questions were identified in this session and appropriate modifications were made by the survey review panel.

The ICT Fluency Questionnaire is an online web-based survey containing 56 questions and divided into the following five sections: (1) demographics, (2) usage, (3) education/training, (4) fluency and (5) comfort. The demographics section of the Hilberg instrument, as well as that of the STQ, was modified in this study to address the demographics of the EFO population. The modifications were made with approval of the author and the instrument was reformatted for pilot testing with participants similar to those in the upcoming study. The modifications included:

1. In section (2) usage, Questions 1 through 14 were used as provided. Question 15 was modified by years. Questions 16 through 18 were not used.

2. In section (3) education/training, all seven areas of ICT training were incorporated; however, the answer selections were changed to years instead of grade levels to accommodate the EFO population.

3. In section (4) fluency, one additional area was added: Smart phones or PDAs, like Blackberry or iPhone.

4. In section (5) comfort remained the same as the original instrument.

5. Under hours spent per week, the fourth category was changed to 11 to 20 (not 21) hours.

6. In section 4, Comfort: Questions 37, 38 and 44 were excluded from scoring and in Question 43, reverse scoring was used. Although these questions are part of the original instrument, the scores in the comfort section were not used.

7. In the larger study, two open-ended qualitative questions were added to capture the three excluded questions. These questions read:

If you were designing the best learning experience or course for you to acquire ICT skills, what would that experience or course look like? Please identify elements that you would prefer to see or have.

If you were designing the best learning experience or course for you to acquire ICT skills, please identify elements that would be less desirable.

Pilot Test of ICT Fluency Questionnaire

In order to establish reliability on a new instrument that measures ICT fluency, it was agreed that a pilot test of the instrument with a minimum of 30 respondents was necessary. IRB approval was sought and obtained for this pilot test. All questions in the ICT fluency questionnaire were captured in the SNAP survey software. In reviewing the pilot instrument, it was agreed that in Section 2, education/training, questions 12-18 would have more weight given to courses taken most recently. It was also agreed that there was too much gradation in the time categories. The committee suggested the following categories: 5 years or less, 6-10 years, more than 10 years, and none at all. This was changed for the larger study; however, the pilot study remained as written. The pilot

test of the ICT fluency questionnaire took place after the amendment/modification was approved.

Data Collection

The NFA was approached regarding this study, and they agreed to assist by providing the researcher with email addresses for former EFO graduates. All online survey materials including instruments, demographic information and two qualitative questions were transferred into the SNAP software program. A request for participation with the website link to the survey was sent to 415 EFO graduates. The request was sent by intranet email with a letter explaining the research and encouraging participation. A reminder letter was also sent out one week and two weeks after the first request.

Instructions were given to the sample to open the link to the survey website. An electronic version of the Consent Form for the study appeared with the option to agree and continue on to the survey, or decline and close the survey website.

Participants who give their consent to participate were ensured confidentiality of data. The STQ and the ICT survey forms, demographic information and two qualitative questions were completed by each participant. The total time for each participant was less than one hour. Levels of strategic thinking and information and communication technology in EFO graduates were obtained from the sample of EFO graduates who responded to the online survey (n= 122). The resulting data were analyzed to determine if correlations exist between strategic thinking and information communications technology fluency.

Data Analysis

Data from the website were downloaded into SPSS format using the SNAP software. All data were analyzed employing SPSS software. Descriptive statistics were used to describe the population. The relationships between and among strategic thinking and information and communication technology fluency were explored. Data analyses for each question are listed in Table 4:

Table 4

Statistical Analysis Tools Used

Research Questions and Null Hypotheses	Statistical Analysis
1. How do EFOs' strategic thinking capabilities, including the subscales of systems thinking, reframing and reflecting compare to previously reported samples from the literature? H_{o1} EFOs' strategic thinking scores do not differ from previously reported samples from the literature.	Descriptive Statistics SPSS Independent samples *t* test
2. What relationships, if any, exist between the EFOs' training in ICT, their ICT fluency, and their ICT comfort level? H_{o2}: There is no relationship between the EFOs' training in ICT, their ICT fluency, and their ICT comfort level.	Correlation analysis - *Pearson r's*

(table continues)

Table 4 *(continued)*

Research Questions and Null Hypotheses	Statistical Analysis
3. Is there a correlation between the level of STQ and the results of the ICT Fluency Questionnaire? H_{o3} No significant correlations exist between the STQ and the ICT Fluency Questionnaire.	Correlation analysis - *Pearson r's*
4. Are the scores on the STQ and the ICT fluency questionnaire influenced by the demographics of age, department size, education, gender, race, and years of experience? H_{o4} The scores on the STQ and the ICT Fluency Questionnaire are not influenced by the demographics of age, department size, education, gender, race, and years of experience.	ANOVA and Correlation analysis - *Pearson r's*
5. Is the relationship between the STQ and the ICT Fluency Questionnaire moderated by the demographics of age, department size, education, gender, race, and years of experience? H_{o5} The relationship between the STQ and the ICT Fluency Questionnaire is not moderated by the demographics of age, department size, education, gender, race, and years of experience.	Moderator Analysis Regression

Chapter Summary

This chapter discussed the methodology used in the research study. After a brief introduction, the setting as well as the sample for the study was described. The software program and instrumentation used to collect data (*SNAP*, *STQv6*, and *ICT Fluency Questionnaire*) were discussed. The procedures of the study were described including how the data were collected and analyzed. Chapter 4 presents the findings of the study. This has been accomplished through statistical analyses of mean score comparisons, correlation analyses, and moderator analyses. Finally, the results of the hypothesis testing are explored.

CHAPTER 4

FINDINGS

This study investigated the strategic thinking capabilities of EFO graduates in comparison to previously reported samples from the literature and examined the relationships between and among EFOs' strategic thinking and their ICT fluency. This purposeful sample consisted of EFO graduates from the last four EFO classes, who consented and provided responses to the survey. Strategic thinking was measured by the STQ version 6 and ICT fluency was measured by an approved modification of the ICT fluency questionnaire. The data that resulted were analyzed to discover if correlations between the measured items existed and whether they were moderated by department size, education, years of experience or demographic variables. Prior to administering this study, a pilot test of the ICT fluency questionnaire was conducted with a similar sample of currently enrolled EFO students. The purpose of the pilot test was to obtain reliability measures on the instrument, observe correlations in the subscales, and further refine the instrument for the study.

This study was guided by the following questions:

1. How do EFOs' strategic thinking capabilities compare to previously reported samples from the literature?

2. What relationships, if any, exist between the EFOs' training in ICT, their ICT fluency, and their ICT comfort level?

3. Is there a correlation between the EFOs' strategic thinking capabilities and the results of the ICT Fluency Questionnaire?

4. Are the scores on the STQ and the ICT fluency questionnaire influenced by the demographics of age, department size, education, gender, race, and years of experience?

5. Is the relationship between the STQ and the ICT Fluency Questionnaire moderated by the demographics of age, department size, education, gender, race, and years of experience?

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) computer software, Version 17.0. An alpha level of 0.05 was set for all statistical tests. The first section of the findings presents the ICT fluency questionnaire pilot test data for the sample of currently enrolled EFO students. The next section presents descriptive statistics on the *STQv6* instrument. Included are the *STQ* mean scores for the subscales of systems thinking and reflecting (empirical coding), with comparisons made to samples from the literature (Research Question 1). This is followed by the results of correlation analyses of *ICT Fluency* and *STQv6* subscale scores (Research Questions 2 and 3) as well as the influence of demographic variables on these scores (Research Question 4). The last section shows the results of moderator analysis on the relationship between the two instruments and the demographic variables (Research Question 5). The chapter concludes with a summary of the findings.

ICT Fluency Questionnaire Pilot Test Results

The revised ICT fluency questionnaire pilot was electronically distributed to 215 students currently enrolled in the EFO program. This sample was similar to the EFO

graduates who were surveyed in the larger study. Before the survey window closed, 67 surveys were returned. Of these, 50 completed cases comprised the pilot test sample. The data from the pilot were used to obtain reliability on the instrument, correlation data between the subscales of the instrument and to further refine the instrument for the EFO graduates.

Demographics of the Pilot Test Sample

Of the 50 respondents, 45 were male, 4 were female and 1 did not respond. The overwhelming majority (94%) identified themselves as white (Caucasian), the minority comprised 4% black and 2% Hispanic respondents. Only 10% were between 25-35 years of age, while 38% were between 36- 45, and the majority (50%) were between 46- 55, leaving only 2% in the 56+ category. While 24% had associate's degrees, 46% had bachelor's degrees, and the remaining 30% had graduate degrees with 4% having doctorate degrees. In terms of years of experience, only 4% had 10 years or less while 12% had between 11 and 15 years. The next three categories were fairly evenly distributed with 22%, 26%, and 20% of subjects having up to 20, 25, and 30 years respectively, leaving 16% with more than 36 years of experience. Fire department size measured by numbers of staff showed a majority (86%) fairly equally distributed in departments with up to the 50, 100, and 250 staff. Only 4% of departments had between 251-500 staff with the remaining 10% in fire departments with 501+ personnel. Table 5 provides greater detail of the demographics and diversity of the sample.

Table 5

Demographic Description of the Pilot

Demographic	Type	n	%
Gender			
	Male	45	90.00
	Female	4	8.00
	Missing	1	2.00
Total		50	100.00
Race/National Origin			
	Black	2	4.00
	White	47	90.00
	Hispanic	1	1.00
Total		50	100.00
Age	25-35	5	10.00
	36-45	19	38.00
	46-55	25	50.00
	56-65	1	2.00
Total		50	100.00
Education: Highest Level Achieved	Associate Degree	12	24.00
	Bachelor Degree	23	46.00
	Masters Degree	13	26.00
	Doctorate Degree	2	4.00
Total		50	100.00
Years of Experience	6-10	2	4.00
	11-15	6	12.00
	16-20	11	22.00
	21-25	13	26.00
	26-30	10	20.00
	31-35	7	14.00
	36+	1	2.00
Total		50	100.00

(table continues)

Table 5 (*continued*)

Demographic	Type	n	%
Type of Fire Department			
	Career	35	70.00
	Volunteer	1	2.00
	Combination	13	26.00
	Missing	1	2.00
Total		50	100.00
Department Size: Number of Staff	0-50	14	28.00
	51-100	15	30.00
	101-250	14	28.00
	251-500	2	4.00
	501-1000	4	8.00
	4000 & Above	1	2.00
Total		50	100.00
Department Classification			
	Rural	3	6.00
	Suburban	20	40.00
	Urban	18	36.00
	Metro	9	18.00
Total		50	100.00

Eighteen (18) cases responded to all questions in the Education/Training subscale, whereas 46 and 45 respectively, responded to all questions in the Fluency and Comfort subscales. Missing data were the result of the omission of appropriate response choices in two of the subscales. This was remedied by a change of design in the larger study, to include choices for *no training at all* and *not applicable* in the education/training and comfort subscales of the instrument.

In the ICT Education/Training subscale, the mean sample score was 41.38 ± 7.40. The range was 20.00 with a minimum of 29.00 and a maximum of 49.00. The median was 42.50 and the mode was 49.00. The skewness was -.345 and the kurtosis was -1.52, the median was 42.50 and the mode was 49.00.

In the ICT Education/Training subscale, the mean sample score was 41.38 ± 7.40. The range was 20.00 with a minimum of 29.00 and a maximum of 49.00. The median was 42.50 and the mode was 49.00. The skewness was -.345 and the kurtosis was -1.5.

In the ICT Fluency subscale, the mean sample score was 51.15 ± 9.72. The range was 37.00 with a minimum of 34.00 and a maximum of 71.00. The median was 50.50 and the mode was 48.00. The skewness was .350 and the kurtosis was .688.

In the ICT Comfort subscale, the mean sample score was 49.27 ± 7.50. The range was 33.00 with a minimum of 32.00 and a maximum of 65.00. The median was 49.00 and the mode was 48.00.

Internal reliability, estimated using Cronbach's alpha, was very strong with .89 or higher for scores on all three subscales. Valid number of cases fluctuated within subscales. In ICT Education/Training there were 18 cases with 36 excluded due to missing data. In ICT Fluency there were 46 cases with 4 excluded due to missing data. In ICT Comfort there were 45 cases with 5 excluded due to missing data. These analyses are presented in Table 6.

Table 6

ICT Fluency Subscale Internal Reliability

ICT Subscale	Cronbach's Alpha	n	%
ICT Education/ Training	.904	18	36
ICT Fluency	.892	46	92
ICT Comfort	.888	45	90

The two-tailed correlations among the three subscales yielded the following results: between education/training and fluency, $r = -.634$, $p < .01$; between education/training and comfort, $r = -.715$, $p < .01$; and between fluency and comfort, $r = -.632$, $p < .01$. All three correlations were statistically significant and of practical significance. The correlation analysis is presented in Table 7. Discussion of these findings can be found in Chapter 5.

Table 7

ICT Fluency Pilot Subscale Correlations

ICT Fluency Subscales		Ed/Trn Summative	Fluency Summative	Comfort Summative
Education/		1	-.634**	-.715**
Training	*p* (2-tailed)		.006	.002
Summative	N	18	17	16

(table continues)

Table 7 (*continued*)

ICT Fluency Subscales		Ed/Trn Summative	Fluency Summative	Comfort Summative
Fluency Summative	Pearson Correlation	-.634**	1	.632**
	p (2-tailed)	.006		<.05
	N	1	46	41
Comfort Summative	Pearson Correlation	-.715**	.632**	1
	p (2-tailed)	.002	<.05	
	N	16	41	45

Note. ** Correlation is significant at the 0.01 level (2-tailed).

STQv6 and ICT Fluency Questionnaire Results

The survey was sent to 400 EFO graduates with 130 responding. The sample (n = 122), a 30% return rate consisted of EFO graduates from the last four EFO classes, who consented and provided responses to the online survey. Females accounted for only 5.7% of the sample which shows they continue to be underrepresented in chief officer ranks. In highest level of education achieved, 41.8% had a bachelor's degree; however, 40.2% had graduate degrees, while just 18% had an associate's degree. Typically the EFO is a white male between the ages of 46-55 working in a career fire department and is paid full-time with 21-25 years of experience. Greater detail of the demographics and diversity of the sample is provided in Table 8.

Table 8

Demographic Description of the Study

Demographic	Type	n	%
Gender			
	Male	115	94.30
	Female	7	5.70
Total		122	100.00
Race/National Origin			
	American Indian	1	.80
	White	116	95.10
	Hispanic	4	3.30
	Missing	1	.80
Total		122	100.00
Age			
	36-45	37	30.30
	46-55	68	55.70
	56-65	17	13.90
Total		122	100.00
Education: Highest Level Achieved	Associate Degree	22	18.00
	Bachelor Degree	51	41.80
	Masters Degree	42	34.40
	Specialist Degree	4	3.30
	Doctorate Degree	3	2.50
Total		122	100.00
Years of Experience			
	11-15	5	4.10
	16-20	17	13.90
	21-25	42	34.40
	26-30	35	28.70
	31-35	19	15.60
	36+	4	3.30
Total		122	100.0

(table continues)

Table 8 (*continued*)

Demographic	Type	n	%
Type of Fire Department			
	Career	84	68.90
	Volunteer	5	4.10
	Combination	31	25.40
	Missing	2	1.60
Total		122	100.00
Department Size: Number of Staff	0-50	28	23.00
	51-100	30	24.60
	101-250	28	23.00
	251-500	19	15.60
	501-1000	10	8.20
	1001-2000	4	3.30
	4000 & Above	3	2.50
Total		122	100.00
Department Classification			
	Rural	4	3.30
	Suburban	37	30.30
	Urban	49	40.20
	Metro	31	25.40
	Missing	1	.80
Total		122	100.00

Strategic Thinking Mean Scores

The mean sample score of the *STQv6 Systems Thinking subscale,* using the empirical coding was 3.58 $\pm$ .447 (n = 122). The range was 2.71 with a minimum of 2.00 and a maximum of 4.71. The median was 3.57 and the mode was 3.43. The skewness was -.440 and the kurtosis was 1.105. Figure 1 shows the frequency distribution of scores.

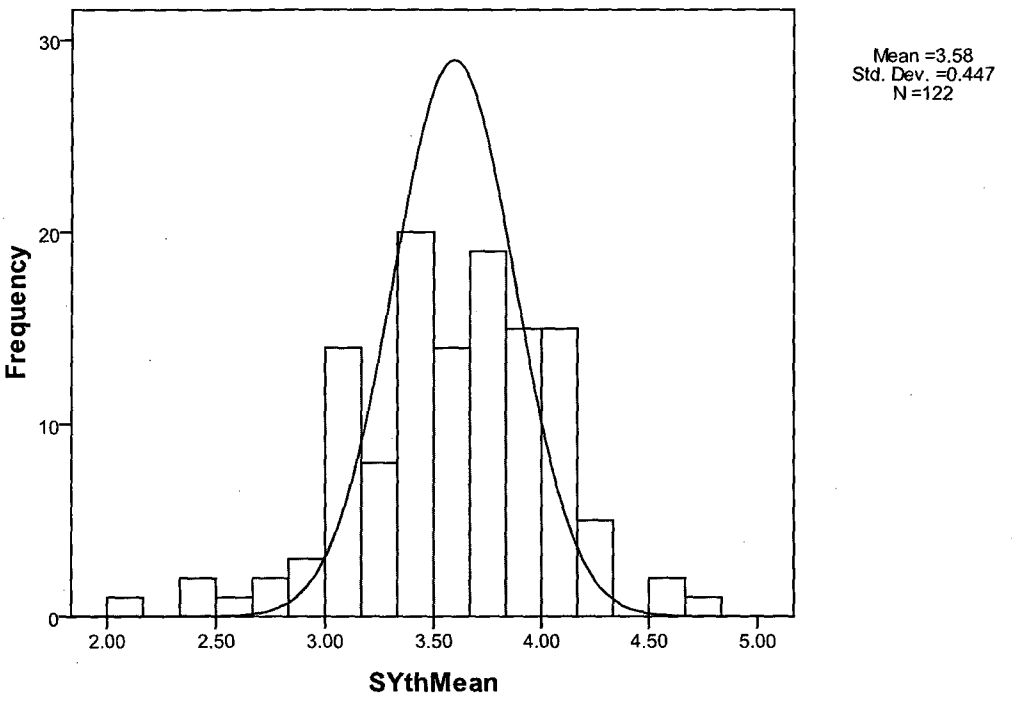


Figure 1. Mean *Strategic Thinking Questionnaire version 6 (STQv6)* Systems Thinking subscale frequency.

Internal reliability, estimated using Cronbach's alpha, was .590 for the empirical coding scale on 7 items. For the theoretical coding scale, internal reliability was .773 on 18 items using Cronbach's alpha.

The mean sample score of the *STQv6 Reflecting subscale,* using the empirical coding was $3.82 \pm .445$ ($n = 122$). The range was 2.50 with a minimum of 2.50 and a maximum of 5.00. The median was 3.83 and the mode was 4.00. The skewness was -.359 and the kurtosis was .474. Figure 2 shows the frequency distribution of scores.

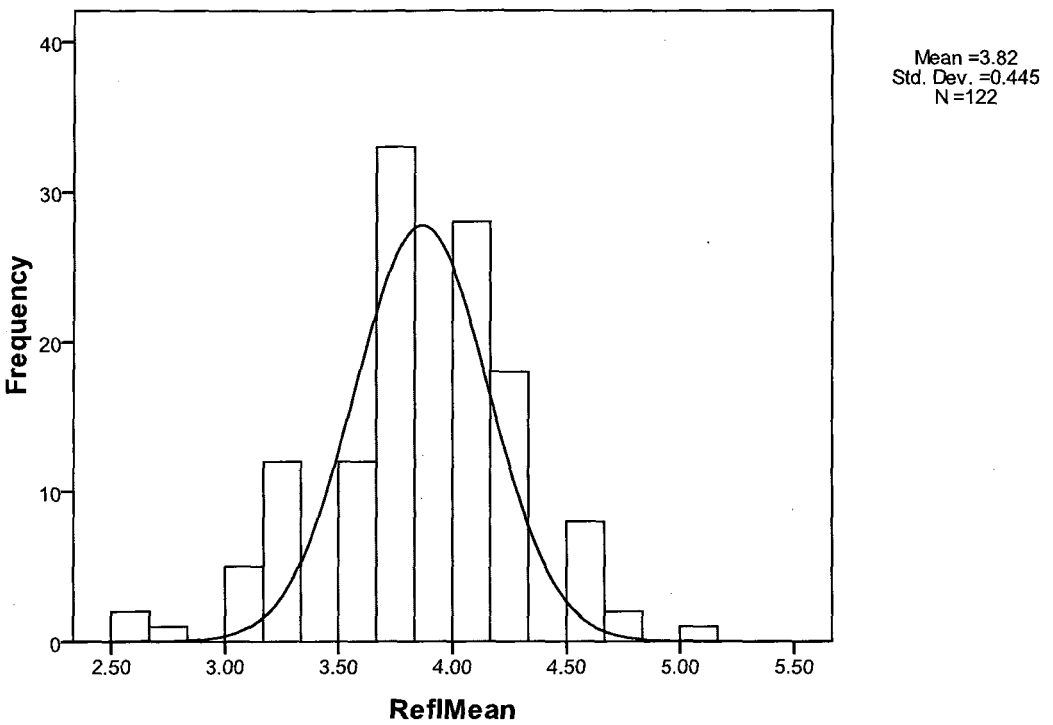


Figure 2. Mean *Strategic Thinking Questionnaire version 6 (STQv6)* Reflection subscale frequency.

Internal reliability, estimated using Cronbach's alpha, was .697 for the empirical coding scale on 6 items. For the theoretical coding scale, internal reliability was .819 based on 18 items using Cronbach's alpha.

Research Question 1

How do EFOs' strategic thinking capabilities compare to previously reported samples from the literature? The most recent sample from the literature using the empirical coding scale was an exploratory study of aspiring school leaders in multiple locations in Hong Kong, Malaysia, Shanghai, and the United States (Pisapia, Pang, Hee,

Lin & Morris, 2009). In that study, the total *Systems Thinking* mean score for all locations was 3.60 ± .551, while the total *Reflecting* mean score for all locations was 3.70 ± .616. This places the EFO sample slightly below (3.58 ± .447) the total mean score for *Systems Thinking* and significantly higher (3.82 ± .445) than the total mean score for *Reflecting*. Table 9 shows the means in relationship to all locations reported in that study.

Table 9

Mean Systems Thinking and Reflecting Scores for EFOs and Previously Reported Samples (Empirical Coding)

Groups Tested: Aspiring school leaders	Primary Researcher and Year of Study	Systems Thinking Mean ± SD	Reflecting Mean ± SD	N
Borneo	Pisapia/2009	3.90 ± .500	4.00 ± .648	50
USA	Pisapia/2009	3.85 ± .463	3.85 ± .584	64
Kuala Lumpur	Pisapia/2009	3.66 ± .504	3.78 ± .540	52
Hong Kong	Pisapia/2009	3.53 ± .467	3.70 ± .507	102
Shanghai	Pisapia/2009	3.01 ± .406	3.09 ± .488	51
Total	Pisapia/2009	3.60 ± .551	3.70 ± .616	328
Executive Fire Officers	Penney/2010	3.58 ± .447	3.82 ± .445	122

H_{o1} EFOs' strategic thinking scores do not differ from previously reported samples from the literature.

The first hypothesis was tested by comparing the *Systems Thinking* mean (3.58 ± .447) and the *Reflecting* mean (3.82 ± .445) in the current study, to the previously reported means for aspiring school leaders in all locations tested, as reported by Pisapia et

al. in 2009. The appropriate type of t-test, unequal variances or equal variances, were used depending on whether the homogeneity of variance test was significant or not, respectively. Independent t-test results showed that the EFOs' *Systems Thinking* scores were significantly lower ($p<.05$) than the USA and Borneo and significantly higher ($p<.05$) than the Shanghai study; however, non significant when compared to Kuala Lumpur, Hong Kong and the total score. Independent t-test results show that the EFO's *Reflecting* scores were significantly higher ($p<.05$) than the Shanghai and total studies; however, non-significant when compared to the USA, Borneo, Kuala Lumpur, and Hong Kong studies. Table 10 provides more detail on the comparison of means.

Cohen's d was used to assess practical significance. Defining a small effect as $d = .20$, a medium effect as $d = .50$, and a large effect as $d = .80$, the effect sizes were small to medium, except for Shanghai R, which had a large effect.

Null Hypothesis 1 stated: EFOs' strategic thinking scores do not differ from previously reported samples from the literature. The null hypothesis was rejected on the EFOs' *Systems Thinking* scores when compared with the USA, Borneo, and Shanghai studies and also on the *Reflecting* scores when compared with the Shanghai and total scores studies. The null hypotheses failed to be rejected when the EFOs' *Systems Thinking* scores were compared with the Kuala Lumpur, Hong Kong, and total score studies, and also when the reflecting scores were compared with the USA, Borneo, Kuala Lumpur, and Hong Kong studies.

Table 10

Comparison of Means for EFOs and Previously Reported Samples (Empirical Coding)

Systems Thinking						
	H of Variance		t-test (two-tailed)			Cohen's
Reported Samples	Fmax	p	t	df	p	d
USA	1.07	0.366	3.87	184	<.05	0.58
Borneo	1.25	0.152	4.34	179	<.05	0.64
Kuala Lumpur	1.25	0.158	1.04	172	0.302	0.16
Hong Kong	1.08	0.347	0.81	222	0.417	0.11
Shanghai	1.23	0.207	7.81	171	<.05	1.40
Total	1.50	0.005	0.39	263	0.694	0.04
Reflecting						
	H of Variance		t-test (two-tailed)			Cohen's
Reported Samples	Fmax	*p*	t	df	*p*	d
USA	1.71	0.006	0.36	103	0.720	0.05
Borneo	2.10	<.05	1.92	86	0.058	0.28
Kuala Lumpur	1.44	0.054	0.47	83	0.640	0.07
Hong Kong	1.27	0.104	1.88	222	0.062	0.24
Shanghai	1.87	0.003	7.65	73	<.05	1.19
Total	1.87	<.05	2.26	295	0.024	0.19

Research Question 2

What relationships, if any, exist between the EFOs' training in ICT, their ICT fluency, and their ICT comfort level?

ICT Mean Scores

The mean sample score of the *ICT Education/Training subscale* was 2.19 ± .607 (n = 122). The range was 2.71 with a minimum of 1.00 and a maximum of 3.71. The median was 2.14 and the mode was 2.00. The skewness was .073 and the kurtosis was -.363. Figure 3 shows the frequency distribution of scores.

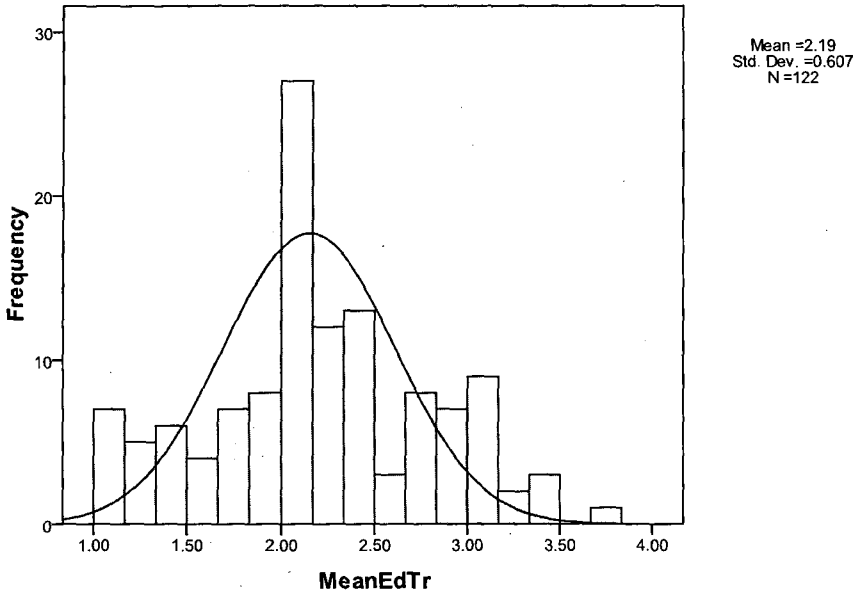


Figure 3. Mean *ICT Education/Training* subscale frequency.

The mean sample score of the *ICT Fluency subscale* was 3.21 ± .667 (n = 121). The range was 2.93 with a minimum of 2.07 and a maximum of 5.00. The median was

3.07 and the mode was 2.67. The skewness was .449 and the kurtosis was -.566. Figure 4 shows the frequency distribution of scores.

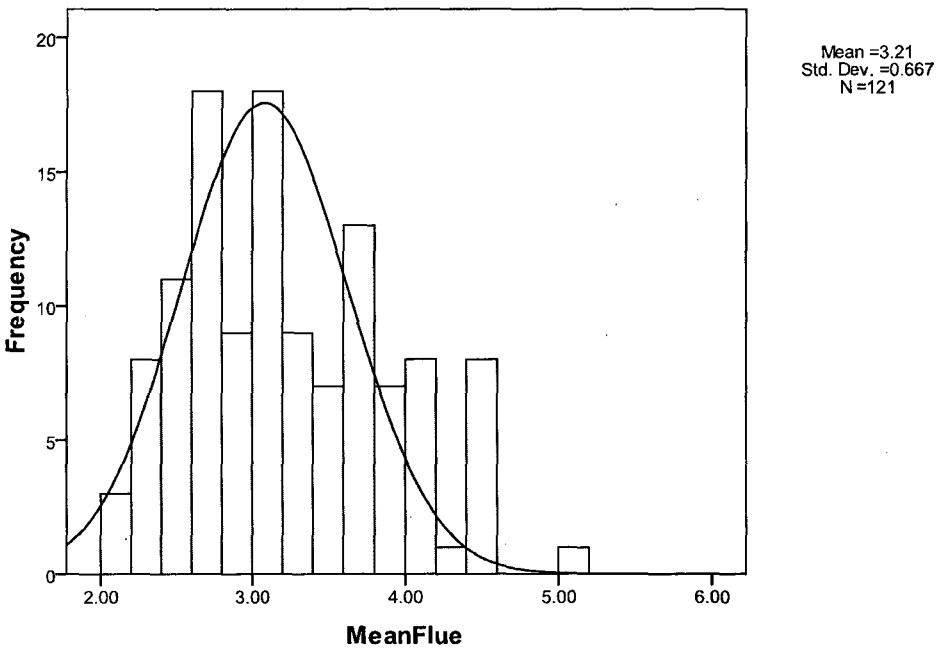


Figure 4. Mean *ICT Fluency* subscale frequency.

The mean sample score of the *ICT Comfort subscale* was 3.59 $\pm$.577 (n = 121). The range was 2.99 with a minimum of 1.70 and a maximum of 4.69. The median was 3.62 and the mode was 3.38. The skewness was -.505 and the kurtosis was .384. Figure 5 shows the frequency distribution of scores. Multiple modes exist. The smallest value is shown.

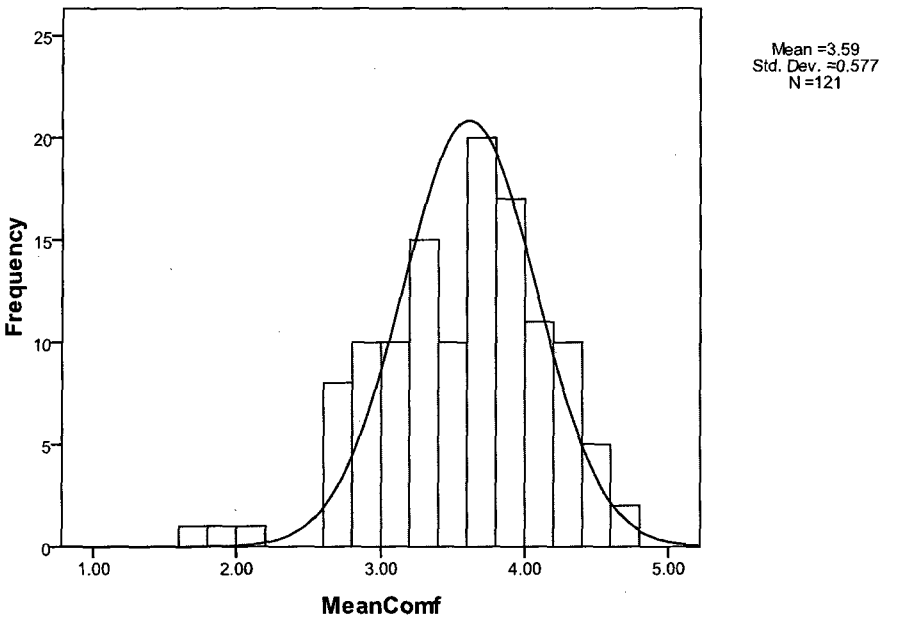


Figure 5. Mean *ICT Comfort* subscale frequency.

The second hypothesis was tested by computing Pearson *r* correlations, which showed a significant ($p < 0.01$) relationship between *ICT Fluency* scores and *ICT Comfort scores* ($r = .516$). This is demonstrated in Table 11.

Table 11

Correlations for Hypothesis 2

		ICT Ed/Trn	ICT Fluency	ICT Comfort
ICT Ed/Trn	Pearson r	1	.019	.094
	N	122	121	121
ICT Fluency	Pearson r	.019	1	.516**
	N	122	121	120
ICT Comfort	Pearson r	.094	.516**	1
	N	121	120	121

Note. ** Correlation is significant at the .01 level (2-tailed).

Null Hypothesis 2 was rejected due to the significant relationship ($p < 0.01$) between ICT fluency and ICT comfort (r = .516). The null hypotheses failed to be rejected when no relationship was found between any other ICT subscales.

Research Question 3

Is there a correlation between the level of STQ and the results of the ICT fluency questionnaire?

The third hypothesis was tested by computing Pearson *r* correlations for each variable when compared to the other variables, specifically: *Systems Thinking* and *Reflecting* with *ICT Education/Training*, *ICT Fluency*, and *ICT Comfort*. A regression analysis was also performed to determine if *Systems Thinking* and *Reflecting* could predict *ICT Education/Training*, *ICT Fluency*, and *ICT Comfort*.

The first test computing Pearson Correlations resulted in two correlations that were significant at the 0.01 level (two-tailed): *Systems Thinking* and *Reflecting* and *ICT Fluency* and *ICT Comfort*. There were no significant correlations with any of the subscales between the two instruments.

The second test, regression analysis was performed using *Systems Thinking* and *Reflecting* as predictor variables for *ICT Education/Training*, *ICT Fluency*, and *ICT Comfort*. Results of the regression analysis to predict *ICT Education/Training* found that the Pearson r of .688 between the two predictors indicated multicollinearity. Since the p value of .758 was > .05 (alpha), the linear model did not account for a significant portion of the variance in *ICT Ed/Trn*. Similarly, the predictors' p values of .756 (Systems Thinking) and .782 (Reflecting) > .05 (alpha), also did not account for a significant portion of the variance in *ICT Ed/Trn*. Neither predictor made a significant contribution to the model, beyond what the other predictor provided. Similar results were also found for ICT Fluency and ICT Comfort.

Null Hypothesis 3 stated: No direct correlations exist between the STQ and the ICT Fluency Questionnaire. There were no direct correlations between any subscale in the STQ and any subscale in the ICT. The null hypothesis was not rejected. These results are consistent with the null hypothesis that there was no relationship between the STQ and ICT.

Research Question 4

Are the scores on the STQ and the ICT fluency questionnaire influenced by the demographics of age, department size, education, gender, race, and years of experience?

The fourth hypothesis was tested by computing Pearson *r* correlations for strategic thinking and ICT subscales with the demographic variables. Race was treated as dichotomous with minorities collapsed, which represented less than 5% of the sample.

Null hypothesis 4 stated: The scores on the STQ and the ICT Fluency Questionnaire were not influenced by the demographics of age, department size, education, gender, race, and years of experience, race, years of education, years of experience, and department size. Table 12 *Correlations for STQ and ICT Subscales with Demographic Variables* provides detail for all correlations. The test results show that correlation between age and *ICT Comfort* is statistically significant. The null hypothesis is rejected. These results support the alternative hypothesis that there is a relationship between age and *ICT Comfort.* Results show that the correlation between years of experience and *ICT comfort* is also statistically significant. The null hypothesis is rejected. These results support the alternative hypothesis that there is a relationship between years of experience and *ICT comfort.*

There were no statistically significant correlations between *Systems Thinking*, *Reflecting*, *ICT Education/Training*, and *ICT Fluency* and any of the demographic variables. The null hypothesis is not rejected. These results are consistent with the null hypothesis that the scores on the STQ and the ICT Fluency Questionnaire are not influenced by the demographics of age, department size, education, gender, race, and years of experience.

Table 12

Correlations for STQ and ICT Subscales With Demographic Variables

Demographic Variables		Systems Thinking	Reflect	ICT Ed/Trn	ICT Fluency	ICT Comfort
	Pearson r	.110	.060	-.019	.062	-.064
Gender	*p* (2- tailed)	.228	.513	.835	.497	.488
	N	122	122	122	121	121
	Pearson r	-.111	-.050	-.048	-.169	-.235**
Age	*p* (2- tailed)	.221	.586	.597	.063	.010
	N	122	122	122	121	121
	Pearson r	.085	-.036	.145	.122	.116
Education	*p* (2- tailed)	.351	.694	.110	.184	.206
	N	122	122	122	121	121
Years of	Pearson r	-.026	-.018	.109	-.171	-.203*
Experience	*p* (2- tailed)	.779	.841	.232	.060	.026
	N	122	122	122	121	121
Department	Pearson r	.048	-.099	-.153	-.029	.044
Size	*p* (2- tailed)	.600	.278	.092	.752	.629
	N	122	122	122	121	121
Department	Pearson r	.071	.015	-.096	-.073	.025
Classification	*p* (2- tailed)	.439	.873	.295	.430	.787
	N	121	121	121	120	120
Race with	Pearson r	.038	.022	.024	-.094	-.082
Minor. Clps.	*p* (2- tailed)	.676	.808	.793	.307	373
	N	121	121	121	120	120

Note. **Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the *alpha* 0.05 level (2-tailed).

Research Question 5

Is the relationship between the STQ and the ICT Fluency Questionnaire moderated by the demographics of age, department size, education, gender, race, and years of experience?

The fifth hypothesis was tested with a moderator analysis to determine if a demographic variable moderated the relationship between STQ and ICT. ICT scores were the dependent variable and were measured against demographic variables and STQ scores as predictors, as well as a third predictor representing the product of the demographic variable and STQ. The *t* value comes from the Beta of the product term. The demographic variables tested were: age, department size (DS), education (E), gender (G), race (R), and years of experience (YE). Table 13 reports the results of the moderator analysis.

Age was the first demographic variable to be tested and was not a moderator of the relationship between the STQ and ICT. The null hypothesis for age was not rejected. These results support the null hypothesis that the relationship between the STQ and ICT was not moderated by age.

Department size was not a moderator of the relationship between the STQ and ICT. The null hypothesis for age was not rejected. These results support the null hypothesis that the relationship between the STQ and ICT was not moderated by department size.

Education is not a moderator of the relationship between the STQ and ICT. The null hypothesis for age was not rejected. These results support the null hypothesis that the relationship between the STQ and ICT was not moderated by education.

Gender was not a moderator of the relationship between the STQ and ICT. The null hypothesis for gender was not rejected. These results support the null hypothesis that the relationship between the STQ and ICT was not moderated by gender.

Race was not a moderator of the relationship between the STQ and ICT. The null hypothesis for age was not rejected. These results support the null hypothesis that the relationship between the STQ and ICT was not moderated by race.

Years of experience were not a moderator of the relationship between the STQ and ICT. The null hypothesis for years of experience was not rejected. These results support the null hypothesis that the relationship between the STQ and ICT was not moderated by years of education.

Table 13 provides details on the *t* values and *p* values for demographic variables as single moderators of the relationship between each STQ and ICT subscale. The findings were not significant. These results were consistent with the null hypothesis that the scores on the STQ and the ICT Fluency Questionnaire were not influenced by the demographics of age, department size, education, gender, race, and years of experience. Table 14 provides details on the *t* values and *p* values for second order moderations between STQ and ICT.

There were two significant findings. The degree to which age moderated the relationship between systems thinking and ICT comfort was dependent on the reflecting score. The degree to which race moderated the relationship between systems thinking and ICT education/training was dependent on the reflecting score. In these cases, the null hypothesis was rejected. The results are consistent with the alternative hypothesis that there is a relationship between the three predictors and the criterion.

Table 13

Demographic Variables as Moderators between STQ and ICT

Predictor Variables	Dependent Variables	*t*	*p*
Age*systems thinking	ICT	.269	.788
Age*reflecting	Education/Training	.985	.327
Age*systems thinking	ICT	-.147	.883
Age*reflecting	Fluency	.486	.628
Age*systems thinking	ICT	.118	.906
Age*reflecting	Comfort	1.328	.187
DS*systems thinking	ICT	.185	.854
DS*reflecting	Education/Training	.998	.320
DS*systems thinking	ICT	-1.410	.161
DS*reflecting	Fluency	.169	.866
DS*systems thinking	ICT	.895	.372
DS*reflecting	Comfort	.189	.851
E*systems thinking	ICT	.363	.717
E*reflecting	Education/Training	-.140	.889
E*systems thinking	ICT	-.380	.704
E*reflecting	Fluency	-1.164	.247
E*systems thinking	ICT	-.223	.824
E*reflecting	Comfort	.001	.999
G*systems thinking	ICT	.693	.490
G*reflecting	Education/Training	.469	.860
G*systems thinking	ICT	1.748	.083
G*reflecting	Fluency	1.932	.056
G*systems thinking	ICT	.454	.651
G*reflecting	Comfort	.291	.772
R*systems thinking	ICT	-.011	.991
R*reflecting	Education/Training	1.331	.186
R*systems thinking	ICT	.546	.586
R*reflecting	Fluency	.796	.428
R*systems thinking	ICT	.323	.747
R*reflecting	Comfort	.510	.611
YE* systems thinking	ICT	.686	.494
YE* reflecting	Education/Training	1.113	.268

(table continues)

Table 13 *(continued)*

Predictor Variables	Dependent Variables	*t*	*p*
YE* systems thinking	ICT	-.657	.512
YE* reflecting	Fluency	.163	.871
YE* systems thinking	ICT	.190	.849
YE* reflecting	Comfort	1.031	.305

Note. *t* values come from the Beta of the product term; alpha= .05

With the exception of these two moderator analysis, all other findings were nonsignificant. All other demographic variables were not moderators on the relationship with ICT comfort. These results are consistent with the null hypothesis that the scores on the STQ and the ICT Fluency Questionnaire were not moderated by the demographics of department size, education, gender, and years of experience.

Table 14 provides details on the *t* values and *p* values for second order moderations between STQ and ICT.

There were two significant findings. The degree to which age moderated the relationship between systems thinking and ICT comfort was dependent on the reflecting score. The degree to which race moderated the relationship between systems thinking and ICT education/training was dependent on the reflecting score. In these cases, the null hypothesis was rejected. The results are consistent with the alternative hypothesis that there is a relationship between the three predictors and the criterion.

With the exception of these two moderator analysis, all other findings were nonsignificant. All other demographic variables were not moderators on the relationship with ICT comfort. These results are consistent with the null hypothesis that the scores on the STQ and the ICT Fluency Questionnaire were not moderated by the demographics of department size, education, gender, and years of experience.

Table 14

Demographic Variables as Second Order Moderations between STQ and ICT

Predictor Variables	Dependent Variables	*t*	*p*
Age*systems thinking* reflecting	ICT Education/Training	.073	.942
Age*systems thinking* reflecting	ICT Fluency	.163	.871
Age*systems thinking* reflecting	ICT Comfort	-2.359	.020
Age*systems thinking* reflecting	ICT EdTrn*Fluen*Comf	.301	.764
DS*systems thinking* reflecting	ICT Education/Training	.160	.873
DS*systems thinking* reflecting	ICT Fluency	.979	.330
DS*systems thinking* reflecting	ICT Comfort	-.104	.917
DS*systems thinking* reflecting	ICT EdTrn*Fluen*Comf	.323	.748
E*systems thinking* reflecting	ICT Education/Training	.252	.801
E*systems thinking* reflecting	ICT Fluency	.302	.763
E*systems thinking* reflecting	ICT Comfort	-.549	.584
E*systems thinking* reflecting	ICT EdTrn*Fluen*Comf	-.207	.836

(*table continues*)

Table 14 (*continued*)

Predictor Variables	Dependent Variables	*t*	*p*
G* systems thinking* reflecting	ICT Education/Training	.441	.660
G* systems thinking* reflecting	ICT Fluency	1.167	.245
G* systems thinking* reflecting	ICT Comfort	-.562	.596
G* systems thinking* reflecting	ICT EdTrn*Fluen*Comf	.690	.492
R* systems thinking* reflecting	ICT Education/Training	2.258	.026
R* systems thinking* reflecting	ICT Fluency	-.479	.633
R* systems thinking* reflecting	ICT Comfort	-.299	.766
R* systems thinking* reflecting	ICT EdTrn*Fluen*Comf	.938	.350
YE* systems thinking* reflecting	ICT Education/Training	.613	.541
YE* systems thinking* reflecting	ICT Fluency	-.301	.764
YE* systems thinking* reflecting	ICT Comfort	-.285	.776
YE* systems thinking* reflecting	ICT EdTrn*Fluen*Comf	.497	.620

Note. t values come from the Beta of the product term; alpha= .05

Qualitative Questions

The administration of the empirical *STQ* and the ICT combined with two open-ended questions allowed for a mixed quantitative and qualitative analysis of responses to produce a combined study. The qualitative questions asked EFOs to determine which elements they would prefer (or find less desirable) in the best learning experience or

course to acquire ICT skills. The resulting findings add to the body of knowledge with regard to the strategic thinking practices of EFOs, as well as establish a baseline of information on how they would prefer to learn ICT skills.

Participants were asked to answer two open-ended questions (53.53 and 53.54) on the survey, which are included as Appendix I. Responses were evaluated for the presence of any consistently repeated themes. Examinations of the responses were conducted until no additional repetitive elements could be identified. Frequency counts for the identified themes were collected and recorded. Table 15 reflects the consistently emerging themes and the number and percentage of those who answered the questions with responses that contained connections to repeatedly emergent themes. The totals may exceed 100% due to multiple choices within responses. Sample comments illustrating each theme are also included.

Question 53.53, stated: If you were designing the best learning experience or course for you to acquire ICT skills, what would that experience or course look like? Please identify elements that you would prefer to see or have. There were 87 respondents to this question.

By far the most frequent theme to emerge was the preference to have "hands-on" training (34.5%); examples of this theme were comments such as: *Lots of hands on with help for problem areas... Hands on usage and lots of visuals or graphics... Lots of hands on with a specific product (project, goal) in mind... Some classroom with hands on guidance by the instructor.*

The second most frequent theme to emerge was the importance of an "instructor" (13.8%). Comments such as: *Instructor lead; Knowledgeable, accomplished and*

credentialed instructor with practical experience in subject matter... an instructor available on line... time for individual attention from instructor... formal class room instructor to follow up with in class instruction were typical examples of this theme.

The related responses of "computers" (11.5%) and "class" (10.3%) were the next most frequent and often combined in responses such as: . . . *an adequate computer lab with one person per computer. The ability for adequate instruction manuals and books that relate to the topic being taught for in class and out of class learning. . . . Classroom learning and working on the computer while in class and then doing homework or use Blackboard for more experience.*

A learning experience that was "practical" (8.1%) and "skills" (8.1%) based was another emergent theme, often combined in responses such as: *Use of technology (visual and work stations) to show ICT skills being taught. Break up presentations with frequent practical exercises.*

Focus on the "student" (6.9%) themes were sometimes combined with the type of "program" "online" and "interactive" (all 5.8%). Examples of these themes were: . . . *provide opportunities to use the program in class (eg. computer lab) - small student/teacher ratios...small class size... an interactive format works best... online pre-course resources, discussion boards ... Hybrid classroom and online.*

Question 53.54, stated: If you were designing the best learning experience or course for you to acquire ICT skills, what would that experience or course look like? Please identify elements that would be less desirable. There were 50 respondents to this question.

Many of the themes which have already emerged were also found in the responses to this question. As expected the "instructor" led the most frequent responses (20%), and was often paired with "online" (16.0%) methodology. Examples of these themes were comments such as: . . . *little or no instruction - as in entirely online... online video or instruction without an instructor available.*

Other themes, such as "lecture", "student" and "class" (all 14.0%) often related to each other, for example: *Lecture without demonstration and practice.... lecture with no practical application... Large students to instructor ratios... Strictly classroom lecture with no follow up by the instructor.*

"Practical" and "reading" (both 6.0%) were the next most frequent themes with examples such as: . . . *classes that do not provide enough practical experience....Lots of book reading... Reading a textbook and learning on my own.*

"Computer" and "skills" (both 4.0%) were next followed by "technology" (2.0%). Examples of these themes were: . . . *a facility not adequately designed for computer learning... Wide spectrum of knowledge, skills, and abilities in ICT skills in a single class... a course outline that does not take advantage of technology and leaves the student to hunt and peck his/her way through the information.* Table 15 reflects the consistently emerging themes and the number and percentage of those who answered the questions.

Table 15

Qualitative Questions: Designing a Course to Acquire ICT Skills

Theme Keywords Preferred	N	%	Theme Keywords Less Desirable	N	%
Hands-On	30	34.5	Instructor	10	20.0
Instructor	12	13.8	Online	8	16.0
Computer	10	11.5	Lecture	7	14.0
Class	9	10.3	Student	7	14.0
Practical	7	8.0	Class	7	14.0
Skills	7	8.0	Practical	3	6.0
Student	6	6.9	Reading	3	6.0
Program	5	5.7	Computer	2	4.0
Online	5	5.7	Skills	2	4.0
Interactive	5	5.7	Technology	1	2.0
Total	96	110.3%	Total	50	100.0

Chapter Summary

This chapter began with an analysis of 50 currently enrolled EFO students who responded to the pilot survey of the ICT questionnaire. All three ICT subscales had statistically significant correlations that were of practical significance. Slight modifications were made to the larger study, as a result of lessons learned from the pilot test.

The larger study consisted of 122 cases, representing a 30% return rate. The study was guided by five research questions which explored the relationships between the STQ and ICT questionnaires. This chapter presented the findings of the study through statistical analysis. This was accomplished through mean score comparisons, correlation

analyses, moderator analyses and regression analysis. The results of the hypothesis testing were discovered and a summary of the findings were given.

Two open ended qualitative questions were included with the survey. The purpose of the qualitative questions was to give respondents an opportunity to describe the elements they would like to see in the best course designed to teach ICT skills. Also, they were asked to identify elements that would be less desirable.

Chapter 5 summarizes the research study, presents and discusses the conclusions resulting from the statistical analyses, delineates the implications and significance of the study, and proposes recommendations for future study.

CHAPTER 5

CONCLUSION, DISCUSSION AND RECOMMENDATIONS

The purpose of this study was to examine the relationships, if any, that exist between and among EFOs' strategic thinking capabilities and the EFOs' use of information and communication technology. The sample of EFO graduates was of particular interest for two reasons: first of all, they had never been studied before regarding their strategic thinking capabilities and how they use systems thinking and reflecting skills. Secondly, this group, although they were advanced with regard to the technology tools they use in their career, had likewise never been surveyed regarding their education/training, fluency and comfort level with ICT. The Strategic Thinking Questionnaire, version 6 was used to measure the EFOs usage of systems thinking, reflecting and reframing, both empirically and theoretically. The information and communications technology fluency questionnaire was used to measure the EFO's ICT education/training, fluency and comfort level.

Discussions regarding the relationships of strategic thinking, leadership, learning style and ICT as they impact the EFO begin the chapter. This discussion is followed by a summary of the research study, conclusions resulting from the statistical analysis, and the implications and significance of the study. Finally, recommendations for future study are proposed.

Conclusions and Discussion

The fire and emergency services field has always been heavily influenced by strategic thinking. An early course taken by new fire fighters is strategy and tactics. Curriculum for EFOs has involved courses such as: Strategic Analysis of Fire Department Operations, Strategic Analysis of Fire Prevention Programs, and Strategic Management of Change. Pisapia (2009) defines strategic leadership as "the ability to make consequential decisions about ends, actions and tactics in ambiguous environments" (Pisapia, 2009, p. 7). The scene of an emergency incident can certainly be an ambiguous environment. The incident commander must use all of their strategic leadership ability to choose the right tactics and guide the actions of their crew in order to have a positive end result. Although in this scenario, the incident commander is using a command and control leadership mode, there are many times when a collaborative approach needs to take precedence. Strategic leadership allows for that flexibility.

Bolman and Deal introduced the concept of "reframing" leadership, a way of choosing different leadership frames depending upon the leader and the circumstances (Bolman & Deal, 2003). Strategic thinking and reframing leadership are very important tools for today's EFO. This study, the first of its kind is important because it compares EFOs and their strategic thinking capabilities with aspiring leaders in other fields. What was once postulated, that EFOs were strategic thinkers using their reflecting ability and systems thinking capacity has now been substantiated through a comparison of mean scores with other aspiring school leaders in five different locations.

Since the EFO program is an educational leadership curriculum, it has also been important to investigate how EFOs learn. Seminal research regarding the most prevalent

learning style of fire and emergency services personnel was conducted by Klingensmith in 2006. Using the V.A.R.K. Preferences Instrument, 100 emergency responders were tested to determine their learning style preferences and patterns. Results showed that multimodal-visual, aural, read/write, and kinesthetic-was the learning style most preferred followed by kinesthetic. This was further corroborated by the qualitative questions in this study which showed that more than 30% of the respondents preferred an ICT course design with lots of hands-on training and various modalities that also incorporated online, interactive elements.

Gabrielle (2003) studied ICT use relating to academic performance with 784 students at an undergraduate military academy. The researcher used email, personal digital assistants (PDA), Web, CD-ROM, and other technologies to deliver instruction. Students who accessed these technologies had significantly higher levels of academic performance than the students in the control group who were without access to ICT.

Hilberg (2007) studied the ICT fluency level of 198 undergraduate students enrolled in computer and information sciences general education courses. Hilberg's study used his instrument, the ICT Fluency Questionnaire as well as the ICT Literacy Assessment, an online scenario based assessment tool acquired from Educational Testing Services (ETS). Results of the study indicated that ICT educational experience did not significantly improve student ICT fluency.

Prior to conducting this study, a pilot test using the ICT fluency questionnaire was completed, in order to establish internal reliabilities for that instrument. The population for the pilot study was similar to the larger sample. 50 EFO students responded to the pilot. Cronbach's alpha was very robust ranging from .888 to .904. The strong positive

correlation between fluency and comfort ($r = -.632$, $p < .01$) indicated that higher fluency or proficiency with ICT was associated with greater comfort. The strong negative correlation between education/training and comfort ($r = -.715$, $p < .01$) seemed to indicate that those with more education/training were significantly less comfortable with ICT than those with less education/training. Similarly, the strong negative correlation between education/training and fluency ($r = -.634$, $p < .01$) indicated that those with greater fluency were significantly less comfortable with ICT than those with less fluency. The small number of cases responding to the education/training subscale (18) compared to the other two subscales, fluency (46) and comfort (45) may have skewed these results and should be interpreted with caution. One of the benefits of the pilot test was the opportunity to make modifications to the survey instrument, which included additional choices in the education/training subscale to reduce the number of non-responses.

One of the strong foundations of the EFO program is its emphasis on research. In addition to coursework, all EFOs are required to complete a total of four applied research projects in order to fulfill the curriculum and graduate. This contributes to the body of knowledge, and many papers have addressed leadership topics. Shields (1993) measured the ability of fire service middle managers to adapt their leadership style effectively based on their understanding of Situational Leadership Theory (SLT). Wolf (2004) found that participation in the EFOP was a positive factor increasing goal setting, mentoring, transformational leadership, lifelong learning, and organizational commitment. Although strategic thinking is a large part of the EFO curriculum, this study is the first to determine the strategic thinking capabilities of EFOs.

How do EFOs' strategic thinking capabilities compare to previously reported samples from the literature?

As we would expect, by the time fire and emergency services personnel get to the level of the EFO, there are many similarities. The descriptive statistics show us a very homogeneous sample. Of the 122 respondents, 100% were between the ages of 36 to 65, 96% were white, 94% were male, 82% had 21 or more years of experience, and 82% had bachelor's degrees or higher. Although all EFOs were from the United States, they were dissimilar from the USA sample of aspiring school leaders comprised of a younger, predominantly female population. EFOs were more similar to the Hong Kong and Borneo samples in terms of age and gender.

In this study, EFOs had a mean score of 3.58 $\pm$ .447 (n = 122) in systems thinking and a mean score of 3.82 $\pm$ .445 (n = 122) in reflecting. In comparing EFOs, strategic thinking capabilities empirically with aspiring school leaders in Hong Kong, Malaysia, Shanghai, and the United States, the EFOs mean levels of systems thinking were significantly lower than the USA (3.85 $\pm$ .463; n = 64) and Borneo (3.90 $\pm$ .500; n = 59) sample and higher than Shanghai (3.01 $\pm$ .406; n = 51). EFOs mean levels in reflecting were also significantly higher than Shanghai (3.09 $\pm$ .488; n = 51) and the overall total reflecting score (3.70 $\pm$ .616; n = 328) from all five locations.

These results seem to indicate that the EFOs greater strength lies in their ability to reflect. Pisapia (2009) discusses reflection as the cognitive skill, which uses critical scrutiny of evidence, perceptions and experience to make meaning of situations. This is familiar territory for the EFO, who has been taught to debrief every incident and critically analyze all strategies and actions assessing them for strengths, weaknesses and lessons

learned. By dissecting everything from a technical standpoint to see what changes, if any need to be made, EFOs use reflection and critical thinking skills to determine their future actions in similar situations.

In looking at EFOs strategic thinking capabilities theoretically, reliabilities were consistent with previous studies. Internal reliabilities ranged between .73-.82 for the subscales and .90 for the total scale. Other studies have found similar reliabilities. For instance, Pisapia et al. (2005) reported reliabilities ranging from .77-.83 on subscales and .91 for the total scale. Not only were the EFO reliabilities consistent with previous studies, but the means were greater for all subscales and the total scale. Refer to Appendix D. which includes a comparison chart for the strategic thinking questionnaire versions 3, 4, and 6. Version 6 contains the information from this study.

What relationships, if any, exist between the EFOs' training in ICT, their ICT fluency, and their ICT comfort level?

Two different samples were used in the analysis of this question. Because the ICT fluency questionnaire was a relatively new instrument that had been involved in a pilot test and a research study, it was important to do a pilot test to determine and substantiate reliabilities. The first sample, which was given the pilot test, consisted of 50 students currently enrolled at different stages of the EFO program. Modifications had been made to the instrument to better suit the age and experience level of the EFO population. The strong positive correlation between fluency and comfort ($r = .632$, $p < 0.01$) indicated that higher fluency or proficiency with ICT was associated with greater comfort. It makes sense that if someone feels knowledgeable and proficient in an area they would also feel very comfortable. Strong negative correlations existed between education/training and

comfort, as well as education/training and fluency; however, there were only 18 cases, a 36% response rate on education/training compared to 45 and 46 cases or a 92% response rate on the other two subscales. This may indicate skewed results. Additional choice options were added in the education/training subscale of the larger study, to reduce the number of missing cases.

The second sample population of EFO graduates showed a strong positive correlation between ICT fluency and ICT comfort (.516, $p<0.01$), once again indicating that respondents who felt proficient with ICT also felt very comfortable. There were no other significant correlations between any other ICT subscales. One could postulate that respondents, who had received education and training in ICT, would also feel more proficient or fluent in that area. Since that was not the case, given that the sample age was older, with 100% between the ages of 36 and 65, they may not have had the opportunity to take formal education and training in ICT. This group may not have been exposed to the use of technologies as a part of their daily environment as younger participants would have been.

Is there a correlation between the EFOs' strategic thinking capabilities and the results of the ICT Fluency Questionnaire?

The first test computing Pearson Correlations resulted in two correlations that were significant at the 0.01 level (two-tailed): *Systems Thinking* and *Reflecting* (.688**) and ICT Fluency and ICT Comfort (.516**). There were no direct correlations with any of the subscales between the two instruments. To double-check these results, a second test was run- a regression analysis to determine if *Systems Thinking* and *Reflecting* could predict *ICT Education/Training*, *ICT Fluency*, and *ICT Comfort*.

There were no direct statistically significant correlations between any subscale in the STQ and any subscale in the ICT. The null hypothesis was not rejected. These results were consistent with the null hypothesis that there is no relationship between the STQ and ICT. Although a search of the literature did not produce any studies indicating a relationship between strategic thinking and ICT, the fact that EFOs use technology constantly in their work life in addition to strategic thinking, could have supported the possibility that a relationship might exist. Since the ICT fluency questionnaire is such a new instrument used for the first time on this population, future research is warranted and possibly with more complex ICT questionnaires.

Are the scores on the STQ and the ICT fluency questionnaire influenced by the demographics of age, department size, education, gender, race, and years of experience?

Results show that the correlation between age and *ICT Comfort* was statistically significant ($r = -.235$, $p < 0.01$). Results also show that the correlation between years of experience and *ICT comfort* is also statistically significant ($r = -.203$, $p > 0.05$). There were no other significant correlations with demographic variables in either of the instruments subscales. Since the sample population of EFO graduates was made up of persons whose age ranged from 36 to 65, this seems to indicate that the older a person is, the more comfortable they are with ICT. Following the same inference, we note that 82% of our sample population has 21% or more years of experience. This could indicate that the more experienced a person is in their work life, the more comfortable they feel with ICT. Since constant training and retraining of EFOs with all types of equipment including communication devices and other tools is essential for preparedness, the EFOs may have been exposed to more ICT training opportunities than many people in this age category.

Is the relationship between the STQ and the ICT Fluency Questionnaire moderated by the demographics of age, department size, education, gender, race, and years of experience?

A series of moderator analyses were used to determine whether any of the five demographic variables previously cited moderated the relationship between the STQ subscales and the ICT subscales. The first series of moderator analyses used a single demographic, such as age, with one of the STQ subscales, such as systems thinking as the predictor variables to determine one of the ICT subscales, such as ICT education/training as the dependent variable. There were no significant findings as a result of this series of moderator analysis.

The second series of moderator analyses again used a single demographic but also used the product of both systems thinking and refection as predictor variables to determine one of the ICT subscales. This series of moderator analyses produced two significant ($p < 0.05$) relationships. Age was a moderator with systems thinking and reflecting on the relationship with ICT comfort ($t = -2.359$; $p = .020$). The relationship between age and ICT comfort, which we saw in Question 4 is further expanded here with systems thinking and reflecting.

In a comparative study of the use of strategic thinking skills of aspiring school leaders, Pisapia et al. noted that the use of reflection and systems thinking raises as does age. Considering that 100% of the EFO sample spans ages from 36 to 65 and that they are very similar to the Borneo and Kuala Lumpur samples; this may also apply to the EFO sample. The study also suggests that rather than an age bias, this could be a proxy for experience and/or education. It should be noted here that 82% of the EFO sample has 21+

years of experience. Again the EFO sample is by necessity well trained in reflection of their experiences and is constantly being re-educated to improve their performances.

Only one moderator was found for ICT education/training. In combination with systems thinking and reflecting, the respondents' identification of their race as a member of a minority or majority ethnic group ($t = 2.258$; $p = .026$) had a moderating effect on ICT education/training. This finding suggests that additional research needs to be conducted to determine if the same training and experiences are extended to all groups or if the composition of the workforce at various levels may need further investigation.

Further Discussion

Although there were few direct relationships between the two instruments, there were some strong correlations within each and also those that include demographics and moderators. One of the benefits of this study was the establishment of the EFOs strategic thinking capabilities, specifically their systems thinking and reflecting scores in comparison with other populations. A baseline has been set so that other groups of fire and emergency services personnel can now be studied. Similarly, this population's response to the ICT fluency questionnaire is also groundbreaking research. In addition to the three subscales of education/training, fluency and comfort, information has also been collected, showing patterns of usage, with ICT. It was interesting to note that 49.2% agreed that they prefer courses that are entirely online and have no regular classroom meetings. In sharp contrast, 69.7% disagreed when asked if they were satisfied with their ability to use ICT for work. The use of the qualitative questions, gives further depth to these issues when 30% of the respondents cited hands-on training as the most frequent theme for elements that they would like to see in a course to teach ICT skills. The

qualitative responses suggest that a more blended approach be used for instruction. Further research needs to identify what elements of the training are best for the online environment and what elements of the training should be relegated to hands-on, face-to-face training or simulations.

Limitations

All responses to the survey e-mailed to 400 EFO graduates were voluntary. . SNAP software was used to create and distribute the survey. Some recipients may have chosen not to complete the survey due to their comfort level with technology.. Since one of the instruments being used focuses on ICT fluency, this may attenuate the variance in ICT scores, which could present a possible problem. The results of the online STQ survey were compared to a previously face-to-face delivered STQ survey. This could also have been a possible limitation. As with mail-in surveys, the researcher cannot be sure that the person responding to the survey is the actual person to whom the survey was sent. In addition, the researcher teaches for the National Fire Academy; however, has not taught any EFO classes

The issue of non response bias remains a concern. There was a 30% return rate however, despite the sufficiency of the returns; the non response level is unobtainable, since there could be missing responses as well as non-delivered surveys.

Self-reporting bias is a consideration in studies using questionnaires that has the potential to affect the analysis of the data. In this study since both survey instruments involves self-reporting, the bias is not considered to be a factor in comparing the responses.

Recommendations

Although there is already a very stringent process involved in getting admitted to the EFO program, use of the strategic thinking questionnaire would be an excellent assessment tool to include in the application packet. EFO scores on systems thinking could be raised with skills training in this area. EFO scores on reflecting were higher than the total norm and further research in the area of refection-in-action, often called "thinking on your feet" and refection on action (Schön, 1983) could be beneficial. Also follow up in the areas of recognition primed decision making, first coined by Gary Klein in 1989 and later called naturalistic decision making would be another area of future study. Some fire departments currently incorporate training scenarios in this type of decision making. It would also be appropriate to test other instruments including ICT that may have been used for populations that are in critical preparedness situations.

Further development of the ICT fluency questionnaire should be pursued. As a result of this study and the literature review associated with it, a couple of areas for future research come to mind, specifically self directed learning readiness and the importance of informal learning . Since this study references the self-directed learning readiness of executive fire officers, with original research done in that area dating back to 1989, and since precedence has already been set involving comparisons between the strategic thinking questionnaire and SDLRS including instruments such as *Assessing The Learning Strategies of Adult* (ATLAS) (Conti, 2009), these additions would be a natural fit for a future study.

Although not part of one of the ICT subscales, the relationship of informal learning must be noted. It has been estimated that 80% of what a professional learns on

the job is accomplished through informal means (Cheethman & Chivers, 2001). In this particular study, over 75% of the sample responded that they regularly and most often receive informal education on ICT through a friend, colleague or on their own. A follow up study on the impact of informal learning with this population should be considered. Though not a main themed area, many elements of the STQ address informal learning. Additional studies may unearth new information tying informal learning to strategic thinking.

In the area of information and communication technology it would be interesting to study a different group of EFOs, specifically instructors. Since they are involved in putting together course content and often times use online delivery methods or work with learning management systems such as Blackboard, it would be interesting to see the contrast between their scores and those of the current study. Analyzing the instructors' course syllabi and other course materials for the elements of use of reflection strategies, systems thinking, ICT, and other elements would be a means to determine if their practice and their methods are in synch with the findings presented in this study. As has been noted in former studies, the instructors' selection of activities, materials, and processes are not always congruent with the goals and objectives of the course, especially when related to integration of technology (Goudy, & Bryan, 2003).

Including leader effectiveness with strategic thinking and the ICT fluency questionnaire would be another interesting area for future research. Since age, experience, ICT fluency, ICT comfort and race did have select effects in the study adding these elements to the design may also yield a more definitive view of what emerged in this study. Future studies could compare and contrast the findings between the EFOs and

other populations, with particular attention given to leaders in critical care management, emergency preparedness, or law enforcement.

Summary

Based on this first-of its-kind study for this population, EFOs are strategic thinkers who are prepared to address the new world order with all its technological advancements. The EFOs' strategic thinking capabilities of systems thinking ($3.58 \pm .447$) and reflecting ($3.82 \pm .445$) compared to previously reported samples from the literature, both empirically and theoretically. Using the empirical scale, EFOs' systems thinking scores were higher than one sample and lower than two others. EFOs' reflecting scores were significantly higher than two other samples. On the theoretical scale, the EFO means were greater for all subscales and the total scale.

Although the strategic thinking questionnaire and the ICT fluency questionnaire were not significantly correlated to one another, there were some strong correlations within their subscales. ICT fluency and ICT comfort were highly correlated ($r = .516$), as well as systems thinking and reflecting ($r = .688$) at the 0.05 level. There was a significant ($p < 0.05$) correlation between age and ICT comfort ($r = -.235$), as well as between years of experience and ICT comfort ($r = -.203$). Age moderated the relationship between systems thinking*reflection, and ICT comfort. Race moderated the relationship between systems thinking*reflection, and ICT education/training. This research was significant because it was the first time that Executive Fire Officers have been studied regarding their strategic thinking capabilities and their information and communications technology fluency.

The degree to which EFOs are fluent in ICT is as follows:

- 90-100% in their use of: email, voicemail, word processing, power point presentations, browsing the web, searching and finding credible information online, and citing sources for information online
- 60-80% in their use of spreadsheets, smart phones and text messaging
- 45% in learning management systems and smart phones
- 38% in chat rooms or discussion boards, while only
- 15% in creating webpages

Regarding education/training in ICT, only 28% have had coursework in the last five years on: computers, operating systems, library or information science, productivity applications, e-mail, programming, and Internet or World Wide Web. 69% responded that they rarely acquired ICT information through formal courses; while 75% regularly or most often acquire ICT information through a friend, associate or on their own- again, a reason to investigate informal learning in future research. Acquiring ICT information work related, regularly or most often was reported by 89% of the sample population.

As a follow-up to the lack of coursework or education/training in ICT, it is interesting to note how "*un*comfortable" EFOs feel about using ICTs effectively. When we drill down into the data we find that 71% are not satisfied with their ability to effectively use ICT, yet almost half (49%) prefer courses that are entirely online and have no regular classroom meetings. EFOs want to be able to use ICT effectively, yet 75% reported that they were not adequately prepared to take courses entirely online. Since ICT fluency and ICT comfort were highly correlated ($r = .516$) at the 0.05 level, research backs up the fact that if you feel proficient in something you are comfortable doing it.

Reversely, if you do not feel proficient or fluent in the activity, perhaps because you do not have the correct education/training, then you will not be comfortable with that task. A recommendation for future research must include what ICT education/ training is available and accessible to EFOs. Though not analyzed here, the size of the department, the size of the budget and the technology equipment available, may have impacted the comfort level of the EFOs in this particular study.

This study has presented data that answers the four lines of inquiry of this study: (a) The types of information and communication technology that EFOs use; (b) Whether or not they have had training in the use of ICT; (c) How fluent or proficient they are in using ICT; and (d) How comfortable the EFOs feel using ICT.

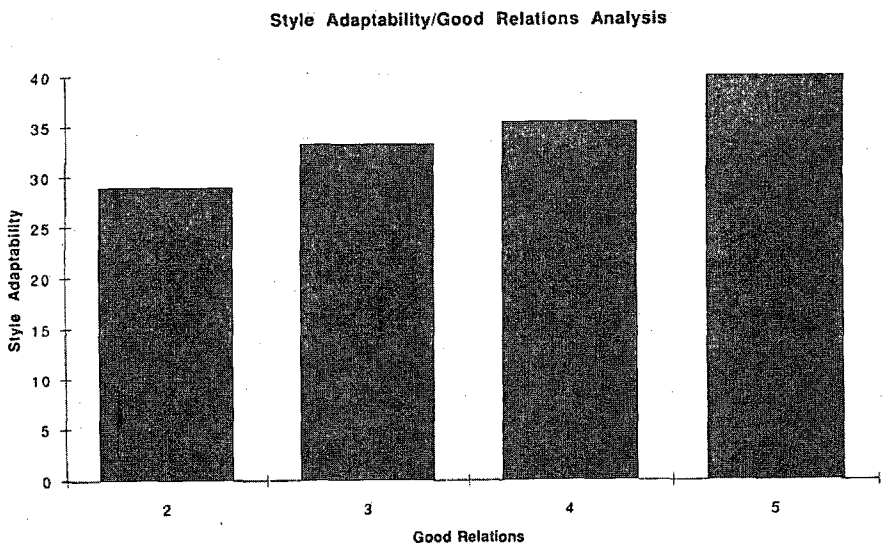
As Dr. Cortez Lawrence, former Division Director of the U.S. Fire Administration's (USFA) National Fire Program said "developing critical strategic thinking on the part of the EFO is necessary" (Burkell, 2004, p. 2). Until now no research study have been completed with EFO graduates to ascertain if they were strategic thinkers prepared to address this new world order with all of its complex technological advancements.

APPENDIX A

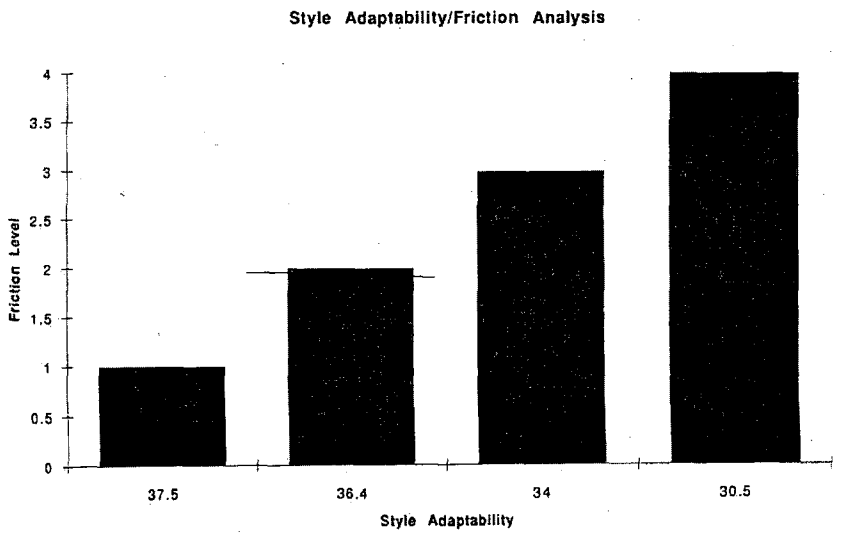
Bar Graphs (Shields, 1993)

Bar Graphs-(Shields, 1993)

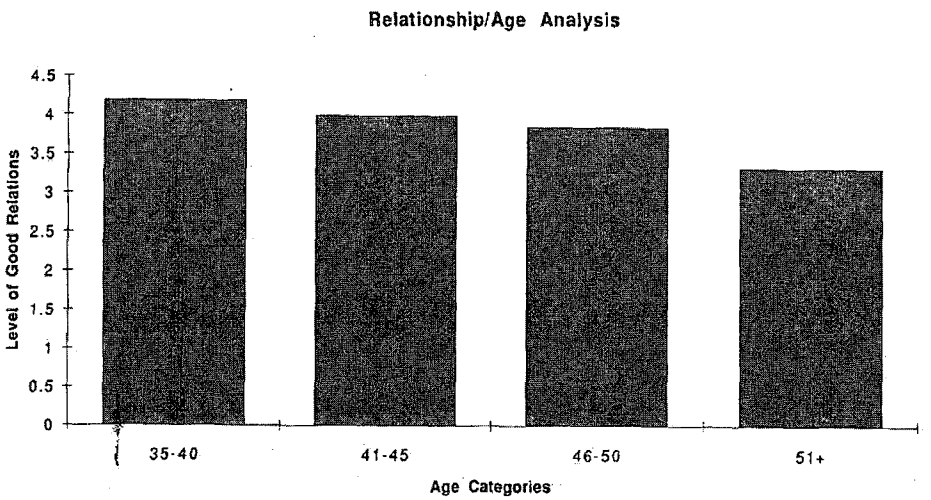
A1



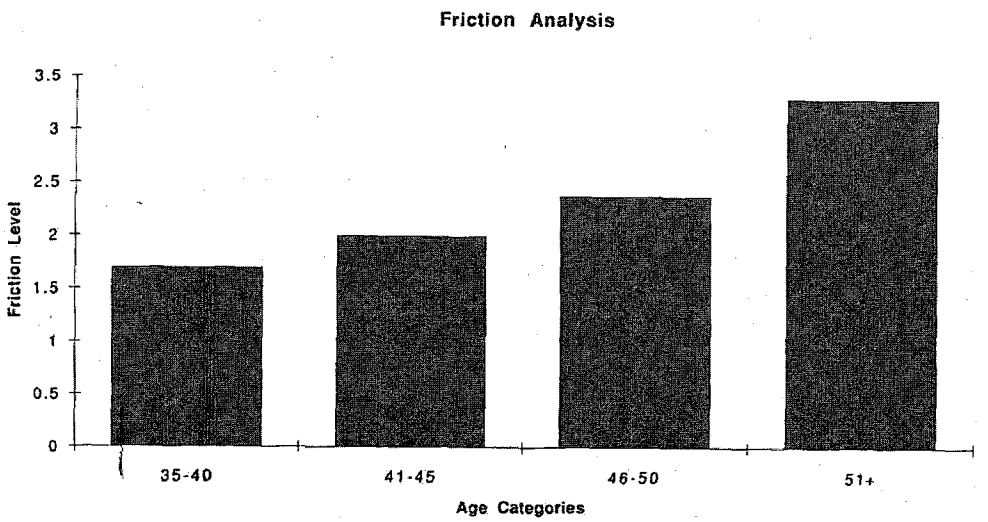
A2



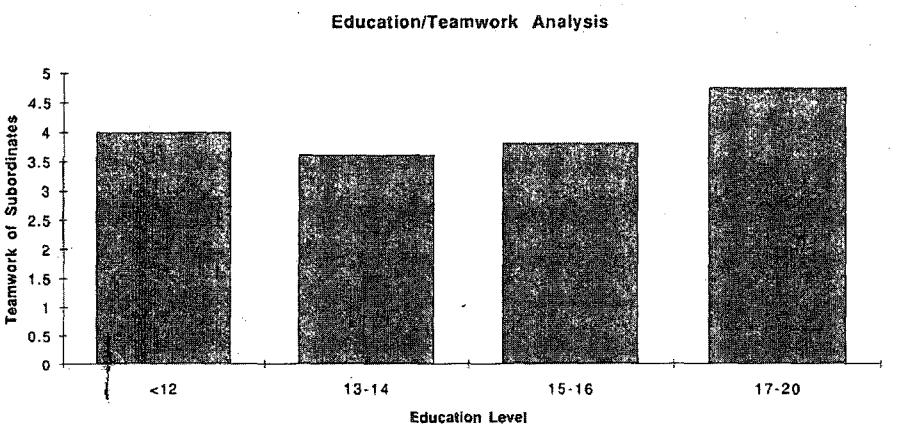
A3


Relationship/Age Analysis
Level of Good Relations
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
35-40
41-45
46-50
51+
Age Categories

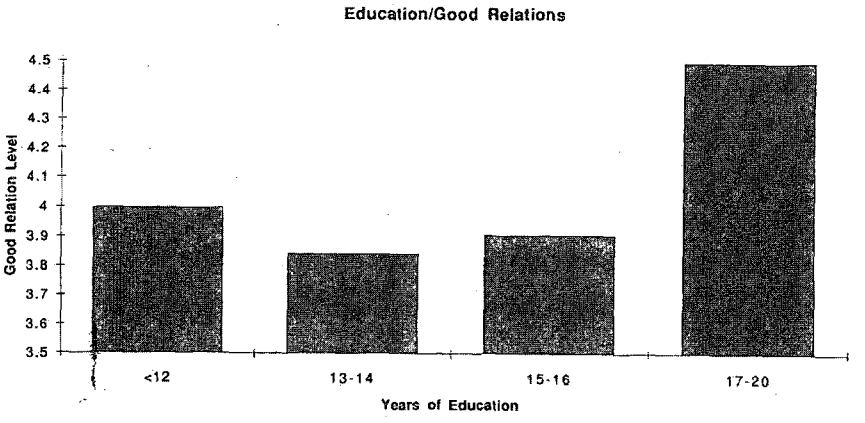
A4


Friction Analysis
Friction Level
3.5
3
2.5
2
1.5
1
0.5
0
35-40
41-45
46-50
51+
Age Categories

A5


Education/Teamwork Analysis
Teamwork of Subordinates
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
<12
13-14
15-16
17-20
Education Level

A6


Education/Good Relations
Good Relation Level
4.5
4.4
4.3
4.2
4.1
4
3.9
3.8
3.7
3.6
3.5
<12
13-14
15-16
17-20
Years of Education

APPENDIX B

Fire Rescue Organizational Chart

Palm Beach County Fire Rescue Organizational Chart

APPENDIX C

STQ Version 3, 4, and 6 Comparison Chart

	STQ Version 3				
	M	SD	N	Alpha	No. Items
Systems Thinking	3.55	.318	643	.713	12
Reframing	3.45	.286	643	.777	12
Reflecting	3.48	.281	643	.752	12
Strategic Thinking	3.50	.247	643	.891	36
	STQ Version 4				
	M	SD	N	Alpha	No. Items
Systems Thinking	3.67	.486	330	.870	17
Reframing	3.43	.433	330	.818	17
Reflecting	3.66	.416	330	.742	14
Strategic Thinking	3.59	.411	330	.926	48
	STQ Version 6 (EFO Sample)				
	M	SD	N	Alpha	No. Items
Systems Thinking	3.73	.343	119	.773	17
Reframing	3.55	.366	118	.728	17
Reflecting	3.82	.392	119	.819	14
Strategic Thinking	3.70	.322	112	.902	48

APPENDIX D

IRB Approval of Pilot Test

FAU
FLORIDA ATLANTIC UNIVERSITY

Division of Research
Institutional Review Board
777 Glades Road
Boca Raton, FL 33431
Tel: 561.297.0777
Fax: 561.297.2319
www.fau.edu/research/rcs

MEMORANDUM

DATE: June 26, 2009

TO: Valerie Bryan,
Gerri Penney,
Educational Leadership

FROM: Nancy Aaron Jones, Chair

RE: H09-165 "Pilot Test of Information and Communications Technology Fluency Questionnaire with Select Populations."

The Institutional Review Board (IRB) has reviewed the above protocol. The Committee determined that the procedures described in the above protocol are **exempt** from federal regulations.

It is now your responsibility to keep the IRB informed of any substantive change in your procedures and if you encounter any problems of a human subjects' nature.

Please do not hesitate to contact either myself (6-8632) or Elisa Gaucher (7-2318) with any questions.

NJ:ceg

Email Consent Letter for Research Study

Date: TBA

Re: Study of Executive Fire Officer Graduates

Dear EFO graduate:

Thank you for your interest in participating in our research study. The purpose of the study is to look at how EFO students use and think about Information and Communications Technology (ICT). We use many technological devices to share information and communicate on our jobs and also in our day-to-day life. This study will look at the various devices we use, how we learned to use them, our attitude toward them and the how comfortable we feel using technology as part of our learning environment.

It should take you no more than 30 minutes to complete this survey. You will be directed to a secure website to answer the survey questions. Your responses will be completely anonymous. All data will be identified only by a computer generated code number and will be collected through a secure website. You may skip any questions that make you feel uncomfortable, and you are free to withdraw from the study at any time without penalty.

The risks involved with participating in this study are no more than one would experience in regular daily activities. Potential benefits that you may receive from participation in this study will be the knowledge that you are adding to the body of knowledge on approaches to learning and the use of ICT. This study can have an impact on the way future EFO students interact with ICT. As a fellow EFO graduate, I know your time is very valuable and hope that you will assist in this research project.

If you experience problems or have questions regarding your rights as a research subject, contact the Florida Atlantic University Division of Research at (561) 297-0777. For other questions about the study, you should contact the principal investigator: *Gerri Penney at 561-723-1120 or gpenney@fau.edu or Dr. Valerie C. Bryan at* brtyan@fau.edu. By completing the attached questionnaire/survey, you give consent to participate in this study.

Sincerely,

IRB
Approval Date: 6/26/09
Initials:
Expiration Date: 6/25/10

Gerri Penney

APPENDIX E

Pilot Test of ICT Fluency Questionnaire

Information and Communication Technology (ICT) Fluency Questionnaire

The purpose of this study is to evaluate the Executive Fire Officer's (EFO) perceptions and experience with Information and Communication Technology (ICT). Fluency with ICT is important in the fire service today, especially with many courses that now have online components. The survey collects data to provide a better understanding of the EFO's preparedness to effectively use ICT and to identify factors which may influence their ICT fluency. The survey contains 44 questions in 4 sections designed to collect general information and information regarding ICT usage, education, fluency and comfort level.

Participation is voluntary. There are no "right" or "wrong" answers. While most questions should be answered with a single response, a few allow multiple responses. The information you provide is very valuable, so please answer questions as best as you can. If you're not comfortable with a particular question, you may elect to not answer. Thank you for taking the time to complete this survey. This questionnaire will be matched to the Strategic Thinking Questionnaire through your unique identifying number.

Section 1 -- Usage.

This section is designed to collect information about your use of information and communication technology. Please answer the questions by selecting the appropriate responses.

Hours Spent per Week: None Under 5 5 to 10 11 to 21 21 to 30 31 to 40 41 or more

		Hours Spent per Week						
		None	Under 5	5 to 10	11 to 21	21 to 30	31 to 40	41 or more
1).	How many hours per week do you use a computer for fun (personal use)?	○	○	○	○	○	○	○
2).	Of the time you spend using a computer for fun each week, how many of those hours involve accessing the Internet/Web?	○	○	○	○	○	○	○
3).	Of the time you spend using a computer for fun each week, how many of those hours involve using written communications technology (e-mail, chat, text messaging, etc.)?	○	○	○	○	○	○	○
4).	How many hours per week do you use a computer for work?	○	○	○	○	○	○	○
5).	Of the time you spend using a computer for work each week, how many of those hours involve accessing the Internet/Web?	○	○	○	○	○	○	○
6).	Of the time you spend using a computer for work each week, how many of those hours involve using written communications technology (e-mail, chat, text messaging, etc.)?	○	○	○	○	○	○	○
7).	How many hours per week do you use a computer for school or coursework?	○	○	○	○	○	○	○
8).	Of the time you spend using a computer for school or coursework each week, how many of those hours involve accessing the Internet/Web?	○	○	○	○	○	○	○
9).	Of the time you spend using a computer for school or coursework each week, how many of those hours involve using written communications technology (e-mail, chat, text messaging, etc.)?	○	○	○	○	○	○	○
10).	How many hours per week do you use video or computer games?	○	○	○	○	○	○	○

Number of Years Using the Computer

		5 or less years	6 - 10 years	11 - 15 years	16 - 20 years	21 - 25 years	26 - 30 years
11).	How long has it been since you first started using a computer?	○	○	○	○	○	○

Section 2 -- Education/Training
This section is designed to collect information about your education and/or training in information and communicat technology. Please answer the questions by selecting the appropriate responses.
Check the ICT area(s) in which you have ever taken a course or had formal training.
Please check all that apply, and please give a timeframe in years, when the course was taken.

Coursework in ICT areas. *Please check all that apply.*

		5 or less years	6 - 10 years	11 - 15 years	16 - 20 years	21 - 25 years	26 - 30 years
12).	Introduction to computers	○	○	○	○	○	○
13).	Windows or other operating systems	○	○	○	○	○	○
14).	Research, library or information science	○	○	○	○	○	○
15).	Productivity applications such as Word, Excel, PowerPoint or Access	○	○	○	○	○	○
16).	E-mail	○	○	○	○	○	○
17).	Programming	○	○	○	○	○	○
18).	Internet or World Wide Web	○	○	○	○	○	○

Please rate your method of acquiring ICT information by using the following scale:

		Most Often	*Regularly*	*Least Often*
19).	Formal courses at school or institution	○	○	○
20).	Informal education (through a friend and/or associate, on your own)	○	○	○
21).	Work related	○	○	○

Section 3 -- Fluency
This section is designed to collect information about your fluency with computer and information technology.
Please rate your fluency (or proficiency) using the following scale:
1 = Poor (I have never heard of it and don't know how to use it).
2 = Below Average (I have heard of it, but have little or no knowledge of how to use it).
3 = Average (I use it and can do the basic operations).
4 = Above Average (I use it and can use most of its features).
5 = Excellent (I use it; I know it very well and could teach others).

Please rate your fluency (or proficiency) using the following scale:

		Poor = 1	Below Average = 2	Average = 3	Above Average = 4	Excellent = 5
22).	E-mail	○	○	○	○	○
23).	Voicemail	○	○	○	○	○
24).	Text messaging	○	○	○	○	○
25).	Instant messaging	○	○	○	○	○
26).	Smart phones or PDAs, like Blackberry or iPhone	○	○	○	○	○
27).	Chat rooms and discussion boards	○	○	○	○	○
28).	Course management systems like Blackboard	○	○	○	○	○
29).	Browsing the web	○	○	○	○	○
30).	Searching and finding credible information online	○	○	○	○	○
31).	*Citing sources for information found*	○	○	○	○	○
32).	Creating, editing and formatting a document using a word processor	○	○	○	○	○
33).	*Creating, editing and formatting a* spreadsheet (like Excel)	○	○	○	○	○
34).	Creating, editing and formatting the presentation (like PowerPoint)	○	○	○	○	○
35).	Creating, editing and formatting a webpage	○	○	○	○	○
36).	Creating, editing and managing data in a database (like Access)	○	○	○	○	○

Section 4 – Comfort
This section is designed to collect information about your comfort using information and communication technology. Please indicate how strongly you agree or disagree with the statement using the following scale:
1 = *Strongly* Agree
2 = Somewhat Agree
3 = Neutral
4 = Somewhat Disagree
5 = Strongly Disagree
If the statement does not apply to you, select N/A

Please rate your fluency (or proficiency) using the following scale:

		Strongly Agree = 1	Somewhat Agree = 2	Neutral = 3	Somewhat Disagree = 4	Strongly Disagree = 5
37)	I prefer to improve my ICT skills by *experimenting and trial-and-error*	○	○	○	○	○
38).	I prefer to improve my ICT skills by taking courses	○	○	○	○	○
39).	The courses I've taken have improved my ICT skills	○	○	○	○	○
40).	My ability to effectively use ICT has a significant impact on my performance in work/school	○	○	○	○	○
41).	I am adequately prepared to take a course which is partially online (some regular classroom meetings)	○	○	○	○	○
42).	I am adequately prepared to take courses *entirely online (no regular classroom* meetings)	○	○	○	○	○
43).	I prefer courses that meet in the classroom and do not require using ICT	○	○	○	○	○
44).	*I prefer courses that include some online* component, but continue to have some regular classroom meetings	○	○	○	○	○
45).	I prefer courses that are entirely online and have no regular classroom meetings	○	○	○	○	○
46).	Others often seek my help when they are using ICT	○	○	○	○	○
47).	I am usually able to resolve technical issues I have when using ICT	○	○	○	○	○
48).	I am satisfied with my ability to effectively use ICT for personal use	○	○	○	○	○
49).	I am satisfied with my ability to effectively use ICT for work	○	○	○	○	○
50).	I am satisfied with my ability to effectively use ICT for school	○	○	○	○	○
51).	Overall, I am satisfied with my ability to *effectively use ICT*	○	○	○	○	○
52).	Compared to my peers, I am more fluent with ICT	○	○	○	○	○

Demographic Information:
It is important for this study to learn more about the people participating in the survey. Your answers to these questions are anonymous. In each of the areas below, please check the appropriate column that best describes you and your organization.

53). Gender

- ○ Male
- ○ Female

54). Race

- ○ American Indian
- ○ Aisan
- ○ Black
- ○ White
- ○ Hispanic

60). **Department Size- Number of Staff**

- ○ 0-50
- ○ 51-100
- ○ 101-250
- ○ 251-500
- ○ 501-1000
- ○ 1001-2000
- ○ 2001-4000
- ○ 4000& above

61). **Department Classification**

- ○ Wilderness- No access by road
- ○ Rural- under 10,000 pop. or less than 1,000 sq. mi.
- ○ Suburban- between 10,000-29,999 pop. or 1,000-1,999 sq. mi.
- ○ Urban- between 30,000-199,999 pop. or 2,000-2,999 sq. mi.
- ○ Metro- 200,000 and up pop. or 3,000+ sq. mi.

Please feel free to make any comments you would like regarding this survey... It's ease of use, relevance of the questions or any suggestions you would make to improve this survey. We value your opinions. Thank you for your participation and input.

Please click the submit button below to complete the survey.

APPENDIX F

IRB Approval of Larger Study

Email Consent Letter for Research Study

Date: TBA

Re: Study of Executive Fire Officer Graduates

Dear EFO graduate:

Thank you for your interest in participating in this research study. As a fellow EFO graduate, I know your time is very valuable and hope that you will assist with this important project. The purpose of the study is to investigate EFO graduates' strategic thinking capabilities, as well as how they use and think about, Information and Communications Technology (ICT). This study will look at whether EFO graduates are strategic thinkers and how they compare to leaders in other professions. It will also study the various technological devices they use, how they learned to use them, their attitude toward them and the how comfortable they feel using technology as part of their learning environment.

It should take you no more than 60 minutes to complete this survey. You do not have to complete the survey at one time. You can stop, save your answers and return later to complete the survey. You will be directed to a secure website to answer the survey questions. Your responses will be completely anonymous. All data will be collected through this secure website. You may skip any questions that make you feel uncomfortable, and you are free to withdraw from the study at any time without penalty.

The risks involved with participating in this study are no more than one would experience in regular daily activities. Potential benefits that you may receive from participation in this study will be the knowledge that you are adding to the body of knowledge on EFO graduates strategic thinking, their approaches to learning and their use of ICT. This study could have an impact on the way future EFO students learn and interact with ICT.

If you experience problems or have questions regarding your rights as a research subject, contact the Florida Atlantic University Division of Research at (561) 297-0777. For other questions about the study, you should contact *Gerri Penney at 561-723-1120 or gpenney@fau.edu* or the principal investigator: *Dr. Valerie C. Bryan at* bryan@fau.edu

By completing the attached survey, you give consent to participate in this study.

Sincerely,

FAU Institutional Review Board

Approved on:	9/8/2009
Expires on:	N/A

Gerri Penney, PhD candidate
Florida Atlantic University
1994 EFO Graduate

APPENDIX G

Letter of Consent

Email Consent Letter for Research Study

Date: TBA

Re: Study of Executive Fire Officer Graduates

Dear EFO graduate:

Thank you for your interest in participating in this research study. As a fellow EFO graduate, I know your time is very valuable and hope that you will assist with this important project. The purpose of the study is to investigate EFO graduates' strategic thinking capabilities, as well as how they use and think about, Information and communication Technology (ICT). This study will look at whether EFO graduates are strategic thinkers and how they compare to leaders in other professions. It will also study the various technological devices they use, how they learned to use them, their attitude toward them and the how comfortable they feel using technology as part of their learning environment.

It should take you no more than 60 minutes to complete this survey. You do not have to complete the survey at one time. You can stop, save your answers and return later to complete the survey. You will be directed to a secure website to answer the survey questions. Your responses will be completely anonymous. All data will be collected through this secure website. You may skip any questions that make you feel uncomfortable, and you are free to withdraw from the study at any time without penalty.

The risks involved with participating in this study are no more than one would experience in regular daily activities. Potential benefits that you may receive from participation in this study will be the knowledge that you are adding to the body of knowledge on EFO graduates strategic thinking, their approaches to learning and their use of ICT. This study could have an impact on the way future EFO students learn and interact with ICT.

APPENDIX H
Survey Instrument – Larger Study

STQv6 and ICT Fluency Questionnaire

Participation is voluntary. There are no "right" or "wrong" answers. While most questions should be answered with a single response, a few allow multiple responses. The information you provide is very valuable, so please answer questions as best as you can. If you're not comfortable with a particular question, you may elect to not answer.

Thank you for taking the time to complete this survey.

Q0.1 By checking the box next to: I AGREE in the space below and by completing the attached survey I am giving my consent to participate in this study. You may access the project consent form here: ICA.TAU.EDU/SURVEYS/SNAP/GP1022009.HTM

I agree ○

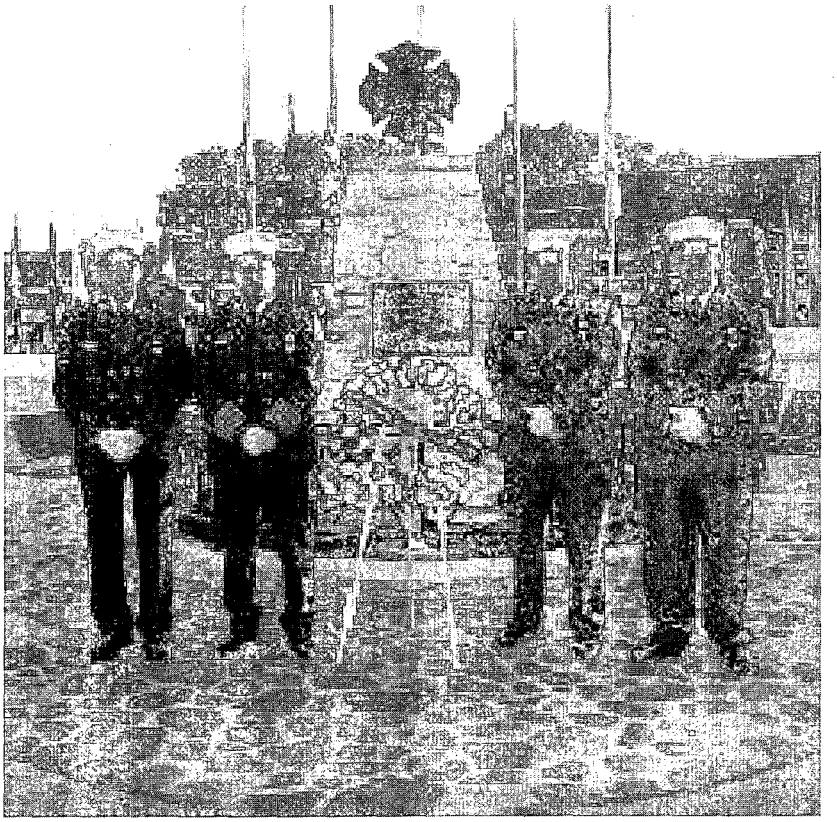
The Strategic Thinking Questionnaire Version 6

The Strategic Thinking Questionnaire (STQ) provides you an opportunity to evaluate your thinking behaviors. The STQ consists of 53 statements. Please read each statement carefully. Consider each statement in the context of how you think through problems, dilemmas, or opportunities that confront you, or have confronted you, in your work life, home life, and community life. Then rate yourself in terms of how frequently you engage in the behavior described. The STQ was developed to measure the way individuals gather and process information.

IMPORTANT NOTE
When Rating Yourself!
Please Rate the Frequency in which you use these processes WHEN FACED WITHPROBLEMS, DILEMMAS, or OPPORTUNITIES. In order for this assessment to be accurate:
- Be realistic about the extent to which you actually engage in the behavior.
- Base your answers on what you Actually Do!
- Do Not Base your answers what you think is IDEAL or WHAT you would do if you had the time.
- Do Base your Answer in terms of how you typically behave on most days, and on most problems.

SECTION I – Strategic Thinking Skills
In this section you will find 53 questions about your use of mental behaviors. Read each question carefully. Choose the number that best applies to each statement.
1 = Rarely or Almost Never
2 = Once in a While
3 = Sometimes
4 = Often
5 = Frequently or Almost Always

		Rarely / Almost Never = 1	Once in a While =2	Sometimes = 3	Often= 4	Frequently / Almost Always = 5
1).	I seek different perceptions.	○	○	○	○	○
2).	I review the outcomes of past decisions.	○	○	○	○	○
3).	I try to extract patterns in the information available.	○	○	○	○	○
4).	I track trends by asking others if they notice changes in our context, or environment."	○	○	○	○	○
5).	I reconstruct an experience in my mind.	○	○	○	○	○
6).	I mentally try to find a common goal when two or more parties are in conflict.	○	○	○	○	○
7).	I ask those around me what they think is changing.	○	○	○	○	○
8).	I consider how I could have handled the situation after it was resolved.	○	○	○	○	○



		Rarely / Almost Never = 1	Once in a While =2	Sometimes = 3	Often= 4	Frequently / Almost Always = 5
9).	I find that in most cases external changes require internal changes.	○	○	○	○	○
10).	I discuss the situation only with people who share my beliefs.	○	○	○	○	○
11).	I accept that my assumptions could be wrong.	○	○	○	○	○
12).	I investigate the cause before taking action.	○	○	○	○	○
13).	I engage in discussions with those whose values differ from mine.	○	○	○	○	○
14).	I acknowledge the limitations of my own perspective.	○	○	○	○	○
15).	I include everyone affected when creating a policy or goal.	○	○	○	○	○
16).	I use different viewpoints to map out strategies.	○	○	○	○	○

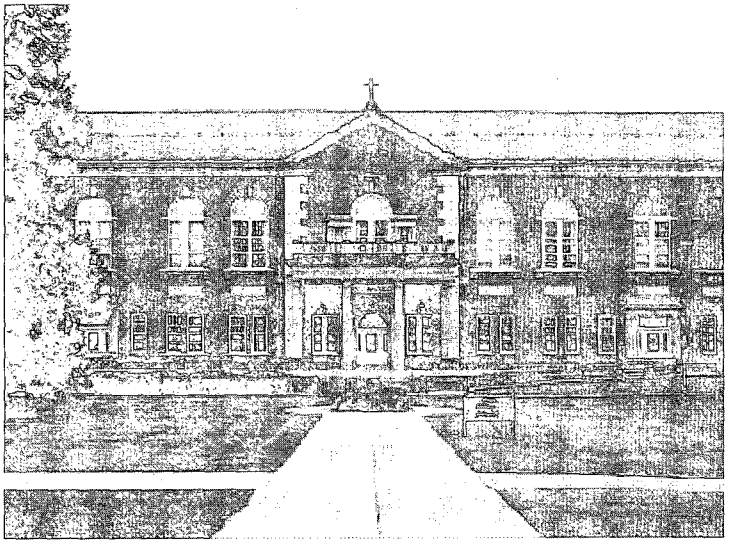
		Rarely / Almost Never = 1	Once in a While =2	Sometimes = 3	Often= 4	Frequently / Almost Always = 5
17).	I consider the effect of past actions in similar situations.	○	○	○	○	○
18).	I find that one thing indirectly leads to another.	○	○	○	○	○
19).	I recognize when information is being presented from only one perspective.	○	○	○	○	○
20).	I ask "WHY" questions when trying to solve a problem.	○	○	○	○	○
21).	I view individuals as being independent rather than as part of an interwoven network.	○	○	○	○	○
22).	I try to understand how the facts in the situation are related to each other.	○	○	○	○	○
23).	I set aside specific periods of time to think about why I succeeded or failed.	○	○	○	○	○
24).	I try to identify external environmental forces which affect my work.	○	○	○	○	○

		Rarely / Almost Never = 1	Once in a While =2	Sometimes = 3	Often= 4	Frequently / Almost Always = 5
25).	I try to understand how a problem worked out after it was resolved.					
26).	I try to understand how the people in the situation are connected to each other.					
27).	I recognize when information is presented from only one perspective.					
28).	I ignore past decisions when considering current similar situations.					
29).	I look at actions being taken to correct discrepancies between what is desired and what exists.					
30).	I decide upon a point of view before seeking a solution to a problem.					
31).	I look at problems from different perspectives.					
32).	I look for fundamental long-term corrective measures.					

		Rarely / Almost Never = 1	Once in a While =2	Sometimes = 3	Often= 4	Frequently / Almost Always = 5
33).	I use different points of view to map out different strategies.					
34).	I think about the results of my actions.					
35).	I look for fundamental changes that could lead to significant improvements.					
36).	I listen to everyone's version of what happened before making a decision.					
37).	I connect current problems to my personal experiences.					
38).	I look at the "Big Picture" in the information available before examining the details.					
39).	I usually find only one explanation for the way things work.					
40).	I ignore my past experiences when trying to understand situations presented to me.					

		Rarely / Almost Never = 1	Once in a While =2	Sometimes = 3	Often= 4	Frequently / Almost Always = 5
41).	I seek specific feedback.					
42).	I engage in discussions with people who have different beliefs about the situation.					
43).	I stop and think about why I succeeded or failed.					
44).	I think about how different parts of the organization influence the way things are done in the rest of the organization.					
45).	I create a plan to solve a problem before considering other viewpoints.					
46).	I reconstruct an experience in my mind to understand my feelings about it.					
47).	I define the entire problem before breaking it down into parts.					
48).	I take into account the decisions of others in similar situations.					

		Rarely / Almost Never – 1	Once in a While –2	Sometimes – 3	Often– 4	Frequently / Almost Always – 5
49).	I listen to my intuition.	○	○	○	○	○
50).	I ask myself "how do the 'dots' connect in this situation?"	○	○	○	○	○
51).	I think of what is interesting, unique, beautiful or unusual about the situation.	○	○	○	○	○
52).	I think about questions I am neglecting to ask.	○	○	○	○	○
53).	I think about what's so important about this challenge.	○	○	○	○	○



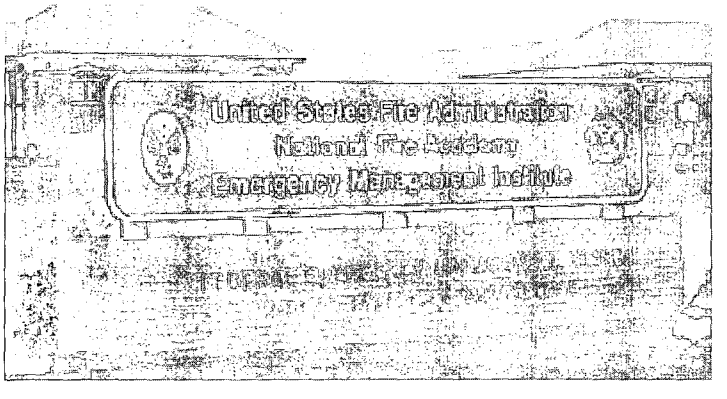
Section 2 – Education/Training
This section is designed to collect information about your education and/or training in information and communication technology. Please answer the questions by selecting the appropriate responses.
Check the ICT area(s) in which you have ever taken a course or had formal training. Please check all that apply, and please give a timeframe in years, when the course was taken.

Coursework in ICT areas. *Please check all that apply.*

		Within the last 5 years	6 - 10 years ago	More than 10 years ago	None at all
53.12).	Introduction to computers	☐	☐	☐	☐
53.13).	Windows or other operating systems	☐	☐	☐	☐
53.14).	Research, library or information science	☐	☐	☐	☐
53.15).	Productivity applications such as Word, Excel, PowerPoint or Access	☐	☐	☐	☐
53.16).	E-mail	☐	☐	☐	☐
53.17).	Programming	☐	☐	☐	☐
53.18).	Internet or World Wide Web	☐	☐	☐	☐

Please rate your method of acquiring ICT information by using the following scale:

		Most Often	*Regularly*	*Least Often/ Rarely*
53.19).	Formal courses at school or institution	☐	☐	☐
53.20).	Informal education (through a friend and/or associate, on your own)	☐	☐	☐
53.21).	Work related	☐	☐	☐



Section 3 -- Fluency
This section is designed to collect information about your fluency with computer and information technology.
Please rate your fluency (or proficiency) using the following scale:
1 = Poor (I have never heard of it and don't know how to use it).
2 = Below Average (I have heard of it, but have little or no knowledge of how to use it).
3 = Average (I use it and can do the basic operations).
4 = Above Average (I use it and can use most of its features).
5 = Excellent (I use it; I know it very well and could teach others).

Please rate your fluency (or proficiency) using the following scale:

		Poor = 1	Below Average = 2	Average = 3	Above Average = 4	Excellent = 5
53.22).	E-mail					
53.23).	Voicemail					
53.24).	Text messaging					
53.25).	*Instant messaging*					
53.26).	Smart phones or PDAs, like Blackberry or iPhone					
53.27).	Chat rooms and discussion boards					
53.28).	Course management systems like Blackboard					
53.29).	Browsing the web					
53.30).	Searching and finding credible information online					
53.31).	Citing sources for information found					
53.32).	*Creating, editing and formatting a* document using a word processor					
53.33).	Creating, editing and formatting a spreadsheet (like Excel)					
53.34).	Creating, editing and formatting the presentation (like PowerPoint)					
53.35).	Creating, editing and formatting a webpage					
53.36).	Creating, editing and managing data in a database (like Access)					

Section 4 – Comfort

This section is designed to collect information about your comfort using information and communication technology. Please indicate how strongly you agree or disagree with the statement using the following scale:

1 = Strongly Agree
2 = Somewhat Agree
3 = Neutral
4 = Somewhat Disagree
5 = Strongly Disagree

If the statement does not apply to you, select N/A

Please rate your comfort level using the following scale:

		Strongly Agree = 1	Somewhat Agree = 2	Neutral = 3	Somewhat Disagree = 4	Strongly Disagree = 5	Not applicable
53.37)	I prefer to improve my ICT skills by experimenting and trial-and-error	○	○	○	○	○	○
53.38).	I prefer to improve my ICT skills by taking courses	○	○	○	○	○	○
53.39)	The courses I've taken have improved my ICT skills	○	○	○	○	○	○
53.40).	My ability to effectively use ICT has a significant impact on my performance in work/school	○	○	○	○	○	○
53.41).	I am adequately prepared to take a course which is partially online (some regular classroom meetings)	○	○	○	○	○	○
53.42).	I am adequately prepared to take courses entirely online (no regular classroom meetings)	○	○	○	○	○	○
53.43).	I prefer courses that meet in the classroom and do not require using ICT	○	○	○	○	○	○
53.44).	I prefer courses that include some online component, but continue to have some regular classroom meetings	○	○	○	○	○	○
53.45).	I prefer courses that are entirely online and have no regular classroom meetings	○	○	○	○	○	○
53.46).	Others often seek my help when they are using ICT	○	○	○	○	○	○
53.47).	I am usually able to resolve technical issues I have when using ICT	○	○	○	○	○	○
53.48).	I am satisfied with my ability to effectively use ICT for personal use	○	○	○	○	○	○
53.49)	I am satisfied with my ability to effectively use ICT for work	○	○	○	○	○	○
53.50).	I am satisfied with my ability to effectively use ICT for school	○	○	○	○	○	○
53.51).	Overall, I am satisfied with my ability to effectively use ICT	○	○	○	○	○	○
53.52).	Compared to my peers, I am more fluent with ICT	○	○	○	○	○	○

53.53). If you were designing the best learning experience or course for you to acquire ICT skills, what would that experience or course look like?

Please identify elements that you would prefer to see or have.

53.54). If you were designing the best learning experience or course for you to acquire ICT skills, what would that experience or course look like?

Please identify elements that would be less desirable.

Demographic Information:
It is important for this study to learn more about the people participating in the survey. Your answers to these questions are anonymous. In each of the areas below, please check the appropriate column that best describes you and your organization.

53.55). Gender

- Male
- Female

53.56). Race

- American Indian
- Asian
- Black
- White
- Hispanic

53.57). Age

- 18-24
- 25-35
- 36-45
- 46-55
- 56-65
- 66-75
- 75+

53.58). **Education- Highest Level Achieved**

- High School Diploma
- Associate Degree
- Bachelor Degree
- Masters Degree
- Specialist Degree
- Doctorate Degree

53.59). **Type of Fire Department**

- Career
- Volunteer
- Combination

53.60). **Current status**

- Paid Full Time
- Paid Part Time
- Volunteer
- Disaster Reservist

53.61). **Years of Experience**

- 0-5
- 6-10
- 11-15
- 16-20
- 21-25
- 26-30
- 31-35
- 36+

53.62). **Department Size- Number of Staff**

- 0-50
- 51-100
- 101-250
- 251-500
- 501-1000
- 1001-2000
- 2001-4000
- 4000& above

53.63). Department Classification

- Wilderness- No access by road
- Rural- under 10,000 pop. or less than 1,000 sq. mi.
- Suburban- between 10,000-29,999 pop. or 1,000-1,999 sq. mi.
- Urban- between 30,000-199,999 pop. or 2,000-2,999 sq. mi.
- Metro- 200,000 and up pop. or 3,000+ sq. mi.

Thank you for your participation and input.

Please click the submit button below to complete the survey.

You must provide your consent in order to take the survey.

If you consent please us the back button below to return to the previous question and select the button for "I agree". Otherwise please click the submit button below to exit the survey site.

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