INSTRUCTOR PERCEPTIONS REGARDING THE INTEGRATION OF POWERPOINT® IN THE CANADIAN FORCES AIR NAVIGATION SCHOOL

A Theses presented in partial fulfilment for the degree of Master of Education to The Faculty of Graduate Studies, University of Manitoba

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by

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Instructor Perceptions Regarding the Integration of Powerpoint® in the Canadian Forces Air Navigation School

BY

B. David Cameron

A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University of Manitoba in partial fulfillment of the requirements of the degree of

MASTER OF EDUCATION

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ABSTRACT

The purpose of this study was to examine instructor perceptions regarding the integration of a computer-based multimedia instructional technology, that is, PowerPoint®, in the Canadian Forces Air Navigation School (CFANS).

A descriptive research methodology, utilizing a survey of all CFANS instructors (n=31), was used to answer the research questions. Performance analysis, derived from human performance technology theory, was used as the foundation for this research.

The research questions sought information on how PowerPoint® was currently being used in the classroom. Instructors were also asked to identify how they acquired PowerPoint® skills as well as how they felt these skills should be acquired. In addition, information was sought on the incentives, motivations, and environmental influences perceived by the instructors as affecting the integration of PowerPoint® in the instructional environment.

Major findings included:

1. Most instructors used PowerPoint® for all of their classroom instruction. The remainder used PowerPoint® in most of there classes.

2. CFANS instructors were fairly sophisticated users of PowerPoint® as an instructional technology and employed a wide array of the available features.

3. Instructors saw PowerPoint® as a valuable instructional tool and perceived students as reacting positively to the medium.

4. Instructors felt that there were adequate technological resources available.

5. Technical assistance from colleagues was frequently utilized, while manuals were almost ignored.

6. Instructors' perceptions were that superiors expected PowerPoint® to be used as an instructional tool.

7. Instructors perceived that there was a lack of presentation development time.

8. Instructors perceived that there was a lack of initial training in the use of PowerPoint®.

9. Instructors perceived little in the way of management recognition or reward for extra effort put into PowerPoint® presentation development.

Using the performance analysis model, research findings were classified as either 'barriers' or 'drivers' for the integration of PowerPoint® in the classroom. Recommendations were then derived from the 'drivers' and 'barriers' to the integration of PowerPoint® in the classroom.

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Chapter I

INTRODUCTION

Increasingly, instructors in schools, universities, and vocational institutions are using computer-based multimedia presentation systems, such as PowerPoint®, in the classroom. Where once professional graphic artists and technologists were required to create high quality presentations using text, charts, graphics, audio, and video for instruction that capability is now within the reach of the average instructor. In the Canadian Forces, the use of PowerPoint® in the classroom has become ubiquitous, or nearly so. This study will examine the instructors' perceptions regarding the integration of PowerPoint® into the classroom environment at the Canadian Forces Air Navigation School (CFANS).

Background

Like all Canadian Forces training establishments, CFANS follows a "performance oriented" philosophy of training which emphasizes accepted standards of performance "on the job" as being the ultimate goal of instruction. In order to meet the requisite "performance objectives" varied instructional methods are employed such as lecture, guided discussion, role-playing and demonstration/practice (A-PD-9000 Vol. 9 - Classroom Instruction). Classroom instruction

is essential to the learning process conducted at CFANS as it often provides the crucial building blocks required for effective performance in the operational environment.

Like many other instructional institutions, CFANS has made use of advances in computer technology in the classroom. A computer-based multimedia presentation program, in the form of Microsoft PowerPoint®, has become an integral part of CFANS instructional strategy. Captain Denis Forest (personal communication, 13 November 2000), the CFANS Training and Development Officer, describes the outline of the CFANS instructional strategy as follows:

> Our school's instructional strategy includes the provision of "electronic classrooms", each complete with a computer, a digital projector and screen, and a podium for the instructor with a computer screen mounted inside. The computer is connected to a central school server. Instructors are encouraged to develop and present classroom instruction via PowerPoint® when appropriate, as well as to maintain all school lesson plans and presentations in designated files on a central server. This means that any lesson can be retrieved and utilized by any instructor, in any classroom, as required. The

classrooms are set up so that the instructor can view the presentation from a screen set into the podium at the front of the class while the students see the presentation on a screen to the rear left of the instructor. The instructor can also use remote control to manipulate the program.

This system gives us several advantages: First, there are no more "missing" or outdated versions of lesson plans - the instructor always has access to the latest version. Second, amendments are simply, instantaneously, and universally applied. Third, if for some reason, an instructor is unable to take a class, his or her replacement has instantaneous access to both the lesson plan and the presentation. Fourth, new instructors can utilize the Notes function if necessary to assist them until they are comfortable with the lesson. Fifth, by accessing the filing system, the staff can easily see the layout and contents of the entire classroom based elements of the course, which assists lesson organization and sequencing.

With regard to classroom instruction, PowerPoint® provides the school with the potential of an incredibly powerful communication tool. As the PowerPoint® (1997) electronic help file details, the program is capable of presenting anything from text and simple graphics, to audio and video, and animation. Hyperlinks can be used to build a certain amount of interactivity. Slides can be set with automatic timing and voice dubbing so that, if desired, the instructor need not even be in the classroom. In the hands of a technologically capable, innovative instructor there is an enormous range of options available.

It is precisely because of the flexibility of the newest computer-based multimedia presentation tools, such as PowerPoint®, that many educators have welcomed them as almost a panacea. Reva Hutchins (1999, Abstract) writes, "Multimedia presentation software may be used to enrich the teaching/learning processes, to introduce students to technology thought to be prevalent in the workplace, and to engender a new approach and attitude among students and workers which would potentially make them responsible and autonomous learners." Among many others, Dobbe (1998), Bates (2000), and Smallwood (1996) have extolled the power of computer-based multimedia presentations to enhance instruction.

Not everyone, however is as purely optimistic. Some researchers feel that PowerPoint®, has the potential to become a placebo, or crutch, which may detract from the message or be used to disguise poor instructional content with flashy gimmicks (Nunberg, 1999; Thomas, 1992). Other researchers have indicated that there are no significant differences with regard to student learning achievement due to use of computer assisted instruction (Wilson, 1996; Lai, 2000). There are yet others, who, while accepting PowerPoint® as a valuable instructional tool, speak of it as just one of many tools in the toolbox (Luttig, 1998).

The perspective, which is closest to the author's own view, is summed up by Doerr (1994), who states, "The success of any training, whether it is delivered via interactive technology or by the printed page, depends on how well it is designed." The author would amplify Doerr's statement somewhat to read, "…designed *and executed*". Thus, PowerPoint®, in and of itself, should not be considered a positive instructional influence, but if well designed and well executed, there is little doubt it can be a valuable tool for instruction.

While the value of computer-based multimedia instructional tools, such as PowerPoint®, is largely accepted, some research has focused on the effectiveness of

the integration of such technology into the instructional setting and its effect on performance. Several studies have stated that the success of the integration of instructional technologies into the instructional setting is influenced by various factors (Defeo, 1997; Hamilton, 1998; Latimer, 1998; Hioco, 1995; and McCoy, 1998). Wilson (1996), for example, identifies a number of factors, such as resources, training, equipment and software, time, knowledge, and leadership support, as influencing the successful integration of technology, such as computer-based multi-media, in schools.

There are a number of theories which may be used to explain the various factors influencing performance in an organization and a there are a number of models which could be used specifically to examine the integration of computer-based multimedia presentations into the classroom. Gilbert (1978), Mager and Pipe (1970), Rummler and Brache (1990), Robinson and Robinson (1996), Chevalier (cited in Belcourt and Wright, 1996), and Rossett (1999) have all produced well-known and useful models for performance analysis. One of the best-known models is Allison Rossett's (1999, p.44), which identifies four main categories of factors which can effect performance. They are:

1. skills, knowledge, and information;
2. motivation;
3. environment; and
4. incentives.

These categories, depending on how they are addressed by the organization may be described as "drivers" or "barriers", which Rossett describes as the "…levers in an organization that encourage, maintain, or impede performance (Rossett, 1999, p. 19)." One thing that is important to note is that none of the categories work in isolation. For example, Robinson and Robinson (1996, p. 180) indicate that there are multiple causes for performance deficiencies in over 90 percent of the situations they had examined. The generalized concept being put forward is that there are always a number of factors or variables influencing the performance of the individual and by extension the organization at all times.

In addition to the normal performance issues surrounding the integration of technology in the average instructional institution, the military training establishment has one very important distinction. In most military schools, including CFANS, neither the School management, nor the CFANS instructors are professional trainers. The primary function of an Air Navigator is to

perform as a Canadian Forces Military Officer and as an Air Force Navigator. The instructor role is a secondary and temporary role. Normally, instructors are posted to the CFANS training establishment for a period of approximately 3-4 years. The constant rate of turnover means that new instructors have to master a number of new demands all at once, such as mastering the content of the lessons, developing instructional and presentational skills, developing lessons, familiarizing or re-familiarizing themselves with the aircraft, and now, the application and manipulation of computer-based multimedia software (PowerPoint®) on top of everything else. While training and orientation are provided for new instructors, it is, of necessity, focused on instruction, the aircraft and unit familiarization - not PowerPoint® application. Due to the numerous demands placed on the new instructor, the instructor may, or may not, feel that mastering PowerPoint® is a top priority.

From the organizational, or management, point of view, there are issues with regard to how much time and resources can reasonably be invested in a "temporary" instructor. Clearly a balance must be struck between creating an instructor who is capable of meeting basic instructional standards as a matter of fairness to the students, the

organization, and the instructor and investing considerable resources in order to create a 'professionally' qualified instructor who might instruct only 3-4 years out of an entire career.

The unique circumstances that exist in CFANS pose a number of interesting questions regarding the integration of PowerPoint® into the instructional environment. How sophisticated is the use of PowerPoint® in the CFANS Classroom? How do CFANS instructors acquire their PowerPoint® skills? What, if any, value do instructors see to using computer-based multimedia presentations in the classroom? What support do instructors perceive to be available in the system to assist them to develop and use computer-based multimedia presentations? What prevents them from optimizing PowerPoint® in the classroom?

Several previous studies have pointed out that the major component in the integration of instructional technology, the instructor, has been often neglected (Wilson, 96; Schrum, 1991). This research has studied the integration of an instructional technology (PowerPoint®) from the CFANS instructor's perspective.

Statement of the Problem

Studies have shown the benefits to students and to instructors of incorporating technology in classroom

instruction (Wilson, 96). Multimedia presentation programs such as PowerPoint® show enormous andragogical potential in the classroom (Hutchins, 1999; Reinhardt, 1995; Butler and Mautz, 1996).

While the use of computer-based multimedia presentations has increased in the classroom, studies show that the integration of technology in general, and computer-based multimedia presentation software specifically, has not always gone smoothly (Mahmoud, 1998; Manternach-Wigans, 1999; Smith, 1998; and Wilson, 1996). Rossett has identified four categories of factors that effect optimal performance. Depending on the specific circumstances, these factors have the potential to act as either "drivers" or "barriers" to the integration of PowerPoint® in the classroom.

The purpose of this study was to examine instructor perceptions concerning the integration of PowerPoint® in the CFANS classroom.

Research Questions

The study was based on an analysis of instructor responses to the following questions:

1. How is PowerPoint® currently employed in the CFANS classroom?
2. How do instructors acquire the skills they use for developing PowerPoint® instructional media?
3. How should instructors acquire the skills required to develop PowerPoint® instructional media?
4. How does motivation influence CFANS instructors with regard to the employment of PowerPoint® instructional media?
5. How does the environment influence CFANS instructors with regard to the employment of PowerPoint® instructional media?
6. How do incentives influence CFANS instructors with regard to the employment of PowerPoint® instructional media?

Significance of the Study

This study is significant for two reasons. First, although several studies have examined the issue of the integration of technology in the classroom environment, typically these studies involve institutions that employ professional, that is, full time instructors as opposed to CFANS, which is composed of military officers temporarily assigned to instructional duties. Without doubt there are

other organizations that rely on individuals temporarily assigned to instructional duties.

Second, few studies have looked at the issue of integration of computer-based multimedia presentation technology from the perspective of the instructors. Since it is often the instructors who must develop and enhance the computer-based multimedia presentations used in their instruction, an understanding of their perceptions of the factors effecting the integration of technology is important.

Although the findings from this study are not necessarily generalizable to other instructional establishments, this study may provide other instructional institutions, particularly those with non-professional instructors, with new perspectives on the integration of computer-based multimedia presentation technology into the classroom.

Scope and Limitations of the Study

All 31 CFANS instructors received a questionnaire. It should be noted that a wide variety of instructional experience exists. A normal tour, or posting, is approximately four years in length. Some instructors will have been at CFANS for several years while others may have been instructing for a period of several months. It is also

possible that some instructors may be on their second, and even third, instructional tour.

Instructors may have a varying awareness of the capabilities of PowerPoint®.

The perceptions of management, students, and technical support personnel, while critical elements in the integration of technology, were not surveyed in this study.

Assumptions

It was assumed that PowerPoint® is a logical subset of what are commonly described as "computer-based multimedia presentation programs", just as computer-based multimedia is logically considered a subset of instructional technology. Continuing to follow this logic, it was assumed that when the term "instructional technology" is used generically, it is meant to include all forms of technology used in instruction, including computer-based multimedia and subsequently PowerPoint® also, unless there are some indications to the contrary. To briefly amplify this concept, the author proposes the following logical example, "There are x factors identified as influencing the integration of instructional technology in the classroom. PowerPoint® is an instructional technology, therefore there are x factors influencing the integration of PowerPoint® in the classroom."

It was assumed, that PowerPoint®, when used appropriately, can be a valuable and effective instructional tool, as is indicated in a wide range of literature.

It should be noted that the term "interactive multimedia" normally refers to stand alone computer-based training or web-based training where the student interacts directly with the instructional program as opposed to the instructor employing computer-based multimedia as a presentational tool in the classroom. As this study is only concerned with the use of computer-based multimedia technologies in the classroom, "computer-based multimedia presentations" and "interactive multimedia" are assumed to be distinct and separate applications of instructional technology.

Definitions of Terms

For the purpose of this study the following definitions were used:

Barriers are those factors that inhibit the integration of technology by instructors in the classroom (Rossett, 1999, p.19).

Computer-based multimedia presentation programs consist of computer software designed to develop and present a variety of media such as text, graphics, animations, and

audio and video clips, via either a digital projection system of some sort, or a monitor.

Computer Assisted Instruction (CAI) refers to the use of a computer to generate or present instructional material. In this case the computer is assisting, not replacing, the instructor.

Drivers are those factors that encourage or maintain performance (Rossett, 1999, p.19).

Electronic classroom refers to a classroom that is capable of presenting digitally based information such as PowerPoint® presentations. Normally the electronic classroom will have a computer and either a digital projector and screen or a large screen monitor. The digital projector is also capable of presenting audio and video with the addition of a video player and speakers, if necessary. More traditional instructional media, such as blackboards or television may co-exist alongside the digital components of the electronic classroom.

Environment includes all the surroundings, personnel, processes and tools and other resources available to the individual on the job (Rossett, 1987, p. 34).

Incentives "…are things, activities or opportunities that [people] want" (Rossett, 1987, p.32). The consequences for the individual and how they are linked to performance is

a critical element. "What management does to [employees] and for [employees] as they work is the **INCENTIVE** system" (Rossett, 1987, p. 39).

Integration "…is defined as the structured and regular use of technological applications as an integral method of instruction in a given course" (Smith, 1998, p.9).

Lesson Objectives are the desired learning outcomes for the student at the completion of each lesson.

Lesson plans are formalized, written guides designed to assist the instructor to meet the objectives of a specific lesson.

Motivation is defined by Rossett (1999, p.39) as "persistence of effort by people." There are two components to motivation: the value placed on the subject and the confidence of the individual to attempt the performance. "What employees believe and value about a product or procedure and themselves in relation to it contributes to their **MOTIVATION**" (Rossett, 1987, p.39).

Performance oriented training, or instruction, focuses on the concept that the objectives and subsequent outcomes of instruction should be an improvement in performance, on the part of the students, to an acceptable, pre-determined standard.

PowerPoint® is one of the most popular computer-based multimedia software programs (Hutchins, 1999). It is worth clarifying that PowerPoint® is a tool, not a product. The product that it assists to create within the context of this study is a computer-based multimedia presentation that may be used for instruction among other things.

Professional is used in the sense of employed full time and throughout one's career in a specific function, such as a professional instructor, that is the act of instruction is the primary duty ascribed to the specific occupation. In this sense, it cannot be said that the instructors at CFANS are professional instructors.

Technology as used in this thesis denotes any tool that assists in the transmission of knowledge or skill. Technology may range from the low end of chalk and blackboard to the high end of computer-based multimedia and simulation.

Training and Development Officers are the single occupation within the Canadian Forces who are responsible for providing advice on training issues. Normally Training and Development Officers serve at Canadian Forces training establishments and Headquarters.

Traditional instruction is an evolving concept, however, generally, it refers to instruction which depends on non-computerized media such as the chalkboard, whiteboard, film, print, posters, paper-based reading material, television, and video-cassette players.

Chapter II

REVIEW OF RELATED LITERATURE

This chapter presents a review of the literature related to the research topic. The literature review begins with an overview of performance analysis theory. The second section follows with the presentation of the specific model used for this research study. The third section provides an overview of instructional technology. A more focused examination of the pros and cons associated with the use of computer-based multimedia instruction is included in the fourth section. The fifth, and last, section examines the factors which effect the integration of technology in the classroom and which may act as either drivers for, or barriers to, the integration of computer-based multimedia instruction.

While the focus of this study is specific to the instructors' perceptions regarding the integration of a computer-based multimedia technology (PowerPoint®) in a military instructional setting, research on instructional technology in a variety of instructional environments has provided valuable insights into the issue of effective technological integration within the instructional setting. In reality the objectives of the elementary teacher, university professor, or military instructor, in the

classroom, are not that different. Knudson (1979), argued for use of the more general term 'humanology' as opposed to an 'andragogical versus pedagogical' philosophy. Theorists such as Knowles (1979) and Yonge (1985) have recognized that the elemental task of the instructor, whether dealing with adults or children, is essentially the same, in that the function of the instructor is to assist the learner by organizing and presenting the content in a manner which will facilitate the learning process.

The Integration of Technology as a Human Performance Issue

An overview of Human Performance Technology. Human Performance Technology provides a methodology and framework for the analysis of human performance issues such as the integration of computer-based multimedia presentations in the classroom. According to Stolovitch and Keeps (1999), 'Human Performance Technology' refers not to machinery or mechanisms but to the application of scientific procedures derived from professional research to improve human performance and solve practical problems. Rummler (1999) described the general process as a systematic approach incorporating analysis, design, development, implementation, and evaluation (the ADDIE model).

Human Performance Technology has much of its roots in the instructional field. Rossett explains the development of the ADDIE model:

> Systematic approaches to training, or instructional system development (ISD), was developed during World War II to address the pressing and technical needs of the military for trained personnel. Intuitive, random and varied ways of teaching soldiers… were undependable… (1987, p. 8).

Tyler (1949) was among the earliest educators who called for a systematic approach to curriculum planning. Eventually, this approach to instructional design was adapted by others to include all performance problems or issues and an increasingly greater emphasis was placed on the front-end of the system, that is, analysis. Joe Harless's *An Ounce of Analysis is Worth a Pound of Objectives* (1970) was one of the first works to call for "front-end analysis" of any performance situation prior to implementing interventions. For Harless, correct identification of the issues and problems involved in human performance was the key to developing successful interventions. "Diagnosing and treating human-performance problems are as complex as diagnosing and treating human

medical problems" (Harless, 1996). At approximately the same time as Harless published *An Ounce of Analysis is Worth a Pound of Objectives*, Mager and Pipe (1970) published *Analyzing Performance Problems,* which has become part of the human performance improvement canon. Both of these books were to emphasize the analysis phase as the critical step in the systematic improvement of human performance.

Rossett (1999) identified performance analysis as the front-end activity in the analysis phase that allows us to look at a performance and determine "…any and all drivers toward or barriers to successful performance…" (p.13) that should, in turn, suggest interventions to improve performance. Since the early work of Harless, and Mager and Pipe in the 1970's there have been a number of performance analysis models which have expanded on these ground-breaking concepts.

In most Human Performance Technology models there are a number of common elements including the utilization of a systematic process, a conviction that the analysis phase is critical to the success of the process, and a belief in a systems approach to problem solving. A systems approach advocates looking at the whole organizational picture rather than analyzing and developing solutions in isolation for fragments of the puzzle. There are usually multiple

variables affecting an individual's performance at any one time and thus more than one intervention is often required to significantly improve performance (Elliot, 1996; Gilbert, 1996; Hale, 1998; Harless, 1970; Mager and Pipe, 1970; Phipps, 1995; Reinhart, 2000; Robinson and Robinson, 1996; Rossett, 1999; Rummler and Brache, 1990; Rummler, 1996; Sorohan, 1996). Eventually, all performance analysis models have the objective of identifying causes of performance deficiency, identifying a variety of interventions, and ultimately improving human performance (Holton, 2000).

Several of the most significant performance analysis models are briefly described in the following paragraphs with emphasis on the analysis of performance issues, such as the integration of instructional technology into a training organization, and on how the model might recommend interventions to improve performance.

Performance Analysis. The first step of Mager and Pipe's (1970) performance analysis model is to determine the discrepancy between an individual's actual and desired performance. The second step is to determine whether the discrepancy is important enough to be worth addressing. Following this, a questioning process is used to analyze a relevant performance discrepancy by determining its causes

and then identifying solutions. The following general questions are proposed:

1. Is there a skill deficiency? Could the individual(s) do it before? Is the skill used often?
2. Is there a simpler way to accomplish the task?
3. Is performance punishing?
4. Is non-performance rewarding?
5. Does performance matter?
6. Are there obstacles preventing performance?
7. Is the individual capable of performing?

Depending on the answers to these questions a solution, or solutions, may be suggested. Examples of possible interventions include formal training, increased practice, better feedback, removing punishment for good performance, eliminating rewards for poor performance, removing any obstacles in the way of performance, and/or developing a simpler or more effective method to accomplish the task(s). If all else fails the potential or capability of the individual attempting the task or job must be evaluated. If that capability is not present then the individual should be transferred or terminated (Mager and Pipe, 1970).

Rummler and Brache (1990, p. 25) identified a number of variables that can influence performance as follows:

- *Performance Specifications*: Do the performers understand the outputs they are expected to produce and the standards they are expected to meet? (This question relates to job goals.)
- *Task Interference*: Do the performers have sufficient resources, clear signals and priorities, and a logical set of job responsibilities? (The last part of this question relates to job design.)
- *Consequences*: Are the performers rewarded for achieving the job goals?
- *Feedback*: Do the performers know whether they are meeting the job goals?
- *Skills and Knowledge*: Do the performers have the necessary skills and knowledge to achieve the job goals?
- *Individual Capacity*: In an environment in which the five questions listed above were answered affirmatively, would the performers have the physical, mental, and emotional capacity to achieve the Job Goals?

Tom Gilbert's *Human Competence: Engineering Worthy Performance* (1996) is considered a classic of human

performance technology literature. According to Gilbert, "troubleshooting", which is the identification of the most important opportunities for improving performance, is a major aim of performance analysis.

In Gilbert's *Performance Engineering Model* three levels of performance are identified, the highest level of which encompasses Policy (institutional systems), followed by Strategy (job systems), and Tactics (task systems). At each level of performance Gilbert emphasizes the importance of focusing on accomplishments (ends) versus behaviour (means). Once the specific required accomplishments have been identified, measures of opportunity including *Potential for Improving Performance (PIPs)* are identified. Once the critical PIPs that offer the largest opportunity for performance improvement are identified then specific methods of improvement can be identified.

Chevalier's model (cited in Belcourt and Wright, 1996) identified four main categories of factors effecting human performance, each with its own subsection of variables. The "Human" category includes such factors as knowledge, skills, motivations, reward systems, group norms, informal leaders, and organizational political climate. The "Technical" category examines factors such as job design, tools, equipment, standardized procedures, and changes in

technology. The "Information" category focuses on defined goals, performance measurements, availability of data, optimization of resources and effective feedback. Finally, the "Structural" category includes issues such as roles and responsibilities, flexibility and control systems.

The Canadian Forces (A-P9-000-002/PT-000) uses a diagrammatic model for conceptualizing the "Cause Analysis" of performance problems that divides factors effecting performance into four categories. The "Individual" category includes lack of knowledge, lack of skills, lack of attitude, physical condition, and emotional condition. The "Organization" category includes structure, procedures, regulations, and communications. The "Equipment" category includes lack of equipment, lack of materials, inappropriate [resources] for the task, design flaws, worn out equipment, and software flaws. The "Setting" category includes physical limits, time limits, lack of opportunity, lack of assistance, group dynamics, and hazardous conditions.

Kaufman (1996) emphasized the importance of making strategic goals explicit and relating all other endeavours to these strategic goals. His *Organizational Elements Model* (Kaufman, 1988; Watkins and Kaufman, 1996) addresses the issue of individual and organizational performance across the entire spectrum from the micro level of elemental inputs

such as resources, money, policies and regulations through the macro level to the mega level of outcomes, which is focused on the effects of outputs on society and the community. Kaufman emphasized the focus on ends or objectives as opposed to means, or process.

As we can see, the emphasis in these models is to determine the causes of sub-optimal performance. Once the root cause of the sub-optimal performance is identified the interventions required to improve human performance become much easier to identify. One thing that is important to note however is that rarely do causes of human performance problems work in isolation. Robinson and Robinson (1996) have found that there are multiple causes for performance deficiencies in over 90 percent of the situations they had examined. If there are multiple causes for a performance problem it would follow that meaningfully improving human performance often requires the development and application of a variety of interventions.

The *Human Performance Technology Handbook* (Stolovitch, H. and Keeps, E., 1999) identified a number of potential performance improvement interventions including instruction (in a variety of forms), organizational development, human resource selection, motivational systems,

feedback, compensation systems, job aids, performance support systems, and workplace design.

A Performance Analysis Model. "With a good model, one can become a better diagnostician than those who have much greater mastery of the details of a system, but no systematic way to troubleshoot it (Gilbert, 1996, p. 145)."

Allison Rossett first provided her model for performance analysis in *Training Needs Assessment* (1987). Rossett has continued to refine her concept of Human Performance Technology and in *First Things Fast* (1999) narrowed the focus of the initial analysis in order to make the process more accessible to the average practitioner. She calls this initial analysis *performance analysis*. "Performance analysis, then, becomes the front end of the front end" (1999, p. 4).

"Performance analysis is critical because performance is what matters in every organization. …Performance analysis is the study done to define solutions that go beyond the automatic to create fresh, data-driven, and coordinated approaches for customers and clients" (Rossett, 1999, pp. 12-13). Rossett emphasized the importance of the organization's, or unit's, goals as being the start and end-point of the process. Performance analysis should direct attention to these goals.

Performance analysis seeks to identify the drivers and barriers to optimal performance. "Drivers and barriers are the levers in an organization that encourage, maintain or impede performance" (Rossett, 1999 p. 19). Rossett emphasized the importance of identifying the performance 'drivers' as it is the 'drivers' (or their absence) that define the required solutions or interventions. "If you know what is causing bad performance or driving successful efforts, you know what you need to do to change or maintain" (Rossett, 1999, p. 44). Rossett identifies four kinds of performance 'drivers'.

The first driver includes skills, knowledge and information. "A successful performer knows what is expected, how to do it, and when it is appropriate to do it" (Rossett, 1999, p. 38). Information is data that is available on demand but not committed to memory. This data may be stored in manuals for example or in job aids, or in a computer database. Information management is becoming increasingly important in our increasingly 'knowledge-based' economy. Lack of skills, knowledge or information are barriers to performance.

Rossett identified the second driver as motivation. Motivation is defined as persistence of effort and is a critical component of performance. Individuals are

motivated when they see the specific task or responsibility as valuable and they are confident the task can be accomplished. If the individual does not understand why something is important or if he or she can see no organizational or personal value in performing then they will not be motivated to attempt the task. Similarly someone who has no confidence in their own abilities to undertake a specific performance will lack motivation to proceed. Lack of motivation is a barrier to performance.

The third driver focuses on the environment. Rossett (1999) included organizational issues such as policies, tools and processes under this heading. The lack of a supportive environment can act as a barrier to even skilled and motivated performers.

The fourth performance driver identified by Rossett (1999) deals with incentives. Incentives are the rewards provided to an individual by the organization for positive performance. Examples of incentives include rewards such as increases in pay, promotions, benefits, and also simple recognition for quality performance. Providing incentives for non-performance or poor performance will naturally encourage that behaviour, while ignoring desired performance will tend to extinguish that behaviour. Thus, lack of

properly applied incentives would constitute a barrier to performance.

Rossett, like other human performance technologists, advocates a systems approach to improving performance. Rossett states, "…continued excellent performance depends on the integrated elements that wrap around people - on the performance *system*, which comprises standards, feedback, knowledge, incentives, recognition, information, management, sponsorship, technology, tools, processes, and more" (199, p. 30). It follows that any effective effort to improve human performance should attempt to address a number of these elements, as required by the specific circumstances.

Computer Technology and Instruction

An overview of instructional technology. Technology is associated with all human endeavours and so it is natural that there is an instructional technology. "Instructional Technology is made up of the 'things of learning,' the devices and the materials which are used in the processes of learning and teaching (Armsey & Dahl, 1991 p. vii)" (Anglin, 1991, p. 5). Through the development of stylus, pen, printing press, and typewriter both education and technology have progressed steadily together. In the late 20th Century however, new forms of information storage, retrieval, and communications have been developing. With the advent of

electronic media, and particularly the computer, technology is becoming increasingly important in education and training (Smith, 1998). Rapid changes are occurring in military and vocational instruction as well as schools and universities.

The electronic forms of technology have expanded into general use and continue to evolve rapidly, however the attempt to integrate these new technologies into the instructional environment has not always been successful. O'Neil (cited in Wilson, 1996) noted that many of these technological innovations, such as radio, television, and language laboratories have become marginalized. He postulates that this was due primarily to the fact that the instructor was ignored as the key factor in implementing change. Now the computer is the latest form of technology to knock at the classroom door.

Wilson (1996) identified 1939 as the year the first modern electronic computer prototype was developed. The World War II requirement for computing complex ballistic tables quickly drove the development of the computer. Following the war, science and industry realized the potential of these devices and computer technology became a rapidly expanding field.

As Wilson (1996) indicated, the introduction of the micro-computer or personal computer in 1975 created a

completely new interest in the technology. As these computers became smaller, and more affordable, the general public could afford to purchase them. Wilson stated that it was in this era, the late 1970's, when educators began to use computers. In the short time-span since, the use of computers has multiplied exponentially. It is no coincidence that computers have become increasingly user-friendly and increasingly powerful. Currently, many educators and trainers use computers, both at home and in the classroom for a variety of functions.

With regard to how, and even whether, various technologies should be employed and integrated into the classroom, there are opposing perspectives. Computer-based multimedia presentation software such as PowerPoint® has its supporters and detractors (as do other instructional technologies) but few doubt that the technology is having an impact on education and instruction. Nunberg (1999) goes so far as to say that, like the book and other communications technologies, PowerPoint® is having its effects on the structure of thought itself. If this is so, and many believe it to be, then an examination of instructors' perceptions of the drivers and barriers to the integration of PowerPoint® in the classroom is of no small consequence.

Proponents of computers in the classroom. Some proponents of the computer profess that computer technology has the potential to usher in a new 'Utopian' era of instruction:

> We have observed scores of teachers who are demonstrating that the technological revolution has the potential to provide the impetus, tools, and new structures to transform the practice, art, and meaning of teaching. … We have seen evolutionary patterns develop where technology has empowered teachers and students to transform many aspects of curriculum and teaching practice (Johnson, M., Schwab, R. and Foa, L., 1999).

Similarly Wilson argued, "Many benefits can be derived from the use of computer technology in education, most of which have been directed to better student learning" (1996, p. 32).

Collins (1991) suggested that the potential changes in education resulting from the use of the computer will be equal to those that resulted from the invention of the printing press. In general, he predicts an evolution from the current didactic models of instruction to more constructivist approaches. Specifically, he predicts educational shifts such as students being more engaged,

teachers having more time to work with slower students, transitioning from lecture type methodologies to coaching and individualized instruction, moving from the primacy of verbal thinking to the integration of visual and verbal thinking, and assessment based more directly on performance rather than memorization of information.

Many teachers appear to believe that the computer is already an important instructional tool. Clark's (2000) research into the use of instructional technology by teachers indicated that teachers believe technology is important in the classroom, that most teachers feel comfortable with technology, and that teachers believe their classrooms need more technology.

Criticisms of computers in the classroom. The use of computer technology in the classroom and in society at large has not escaped some criticism. Thirty years ago Alvin Toffler (1970) predicted that the rate of change in our society (including classrooms) would come at an increasingly faster pace, which would cause difficulties and frustration for those attempting to keep pace with technology. The literature concerning the integration of technology in the classroom appears to support this.

Many studies and articles reviewed for this research indicate there are a considerable number of problems that

occur regularly when technology is introduced into instruction. Lee (cited in Smith, 1998) has gone so far as to state that technology integration in higher education is failing and one of the main reasons for failure is that the perspectives of faculty are ignored. While "failure" is perhaps too harsh a term, difficulties and frustrations on the part of instructors dealing with the integration of technology in the classroom are not uncommon (Epps 1997; Falba, 1998; Garland, 1991; Gentry and Csete, 1991; Mahmoud, 1998; Manterich-Wigans, 1999; O'Donnell, 1996; Sorohan, 1996; Smith, 1998; Wilson, 1996; Yildirim, 2000).

Peck and Dorricott (cited in Wilson, 1996) argued that if computers were removed from the classroom, it would make little difference in the abilities students demonstrated at graduation. If so it would seem hard to justify the enormous expenditures currently made in order to equip classrooms with that technology.

Thomas (1992) argued that meaningful interaction between student, subject, and instructor is more important than the technology. He then presents us with an image of semi-comatose students huddled in a dark, cave-like classroom viewing a presentation operated by a teacher hidden in the shadows. Dwyer (cited in Wilson, 1996) argued

that the use of computers for instruction would isolate children from teachers and classmates.

One might also have misgivings concerning the 'educational' uses (or misuses) to which the computer might be put. For example, there are computer programs where, by having an individual respond to a series of questions, the computer can make decisions for the user. For example a website program exists which, after they have responded to a series of questions, tells people the right kind of dog for them to buy. A similar program exists which will recommend the proper instructional method for a subject based on the data input into the program. It is quick, convenient, and superficial - like going to 'McInformation' for a 'Big McDecision'. One cannot help but feel vaguely uneasy at the idea that there are those who might buy a dog, choose instructional methods, define a student's learning style, or perhaps even choose their spouse, without any background knowledge, understanding of the 'black box' algorithms, or ability to critically examine the decision made for them.

Computer technology as a tool. While the literature seems to be divided on the value of employing computer technology in the classroom, it is arguably more productive to examine the appropriateness and value that a specific technology might bring to the instructional situation or

environment. It would seem logical that, if a technology is misused in the classroom, it is likely to be more attributable to the user than to the technology. Technologies are tools, not ends in themselves. As Brunner and Tally stated, "Their value is in helping us do things yet somehow we become fixated on them and forget that their only purpose is to support the learning process" (1999, p. 22). Whether the appropriate technology for a specific situation is a textbook, whiteboard, video or multimedia presentation depends on the circumstances surrounding that learning event.

Thomas Russell (1997) argued, "As far as learning is concerned, there is just no significant difference." The technology used to deliver instruction will neither improve nor diminish the quality of the instruction. Russell recommended that we acknowledge that students can learn from all technologies and focus on the specific attributes of the technology such as cost, access, and target population characteristics to determine whether, or not, it is appropriate. Richard Clark, a psychologist at the University of Southern California reviewed hundreds of studies after which he concluded that, "…media such as television and computers are '…mere vehicles that deliver instruction but do not influence student achievement anymore

than the truck that delivers our groceries cause changes in our nutrition'" (cited in Nikiforuk, 2000, p. 12). Nikiforuk argued that instructional method and teacher training have more influence over the quality of instruction than the delivery method. Clark and Sugrue stated, "…it seems reasonable to assume that media are best conceptualized as delivery vehicles for instruction and not as variables that directly influence learning" (1991, p. 336).

Anglin (1991, p. 7), offered the following points regarding instructional technology;

1. technology is value free; its use or misuse depends on the values of those who employ it.
2. the application of technological solutions to one problem may create other problems which may be more serious than the original problem.
3. applications of technology should be selected and/or continued only after determination that desirable consequences outweigh undesirable consequences.
4. fear and hesitancy about using advanced technologies is largely a fear of unknown consequences. To be supportive of appropriate technologies, individuals need to progress

> through the stages of awareness, interest, trial and appraisal before either acceptance or adoption will take place (Rogers and Shoemaker, 1971, p. 100).

The quote below from the Carnegie Commission on Higher Education is as applicable today as it was in 1972.

> Technology should be the servant not the master of instruction. It should not be adopted merely because it exists, or because an institution fears that it will be left behind the parade of progress without it. We also believe that sophisticated technology is not to be equated with saturation. In some courses, the use of technology may be appropriate for a few hours in an entire term. In a few, technology may be constructively used for two-thirds of the hours allotted for a term of instruction; in a very few, it may take over the entire process (Carnegie Commission on Higher Education, cited in Anglin, 1991, p. 3)

Technology has always been a facet of the instructional environment. Just as the slate and the book opened up new opportunities for instructors the computer is doing the same. It is not a question of the technology being good or

bad. The questions should be, "What are the appropriate uses for this technology and how can it be used to support the learning process?" In the end there is little doubt that, as applications of educational technology become more user friendly the use of technology by instructors is going to continue to increase (Gentry and Csete, 1991). Computer technology is now a part of the classroom and it will become more so. It behooves us to determine the best ways to integrate it and employ it so that it serves the best interests of learning rather than frustrating it.

Computer Based Multimedia Presentations and Instruction

An overview of computer-based multimedia. "Today in many classrooms [instructors] are using multimedia, an integration of text, video, audio, animation or graphics which are often interactive in design" (Smith, 1998, p. 23). The most popular multimedia software program used in the classroom is undoubtedly PowerPoint®. Simons (2000) estimates that 90 percent of the electronic slides made in this country are created in PowerPoint®.

There is disagreement in the literature, sometimes sharply, on how appropriately multimedia presentation programs such as PowerPoint® are being used in the classroom, however there is no disagreement that computer-based multimedia is entering the general instructional

environment and changing how instruction is happening. This section will focus on the existing literature exploring the issue of computer-based multimedia presentations and instruction. As will be seen, the arguments for and against the use of multimedia presentation closely mirror the discussion in the previous section on instructional technology.

Benefits of Computer Based Multimedia Instruction. There is a no shortage of literature that supports the use of computer-based multimedia in the classroom. There are numerous entries that insist multimedia instruction will improve the learning environment and enhance the learning process (Bates, 2000; Hayes and Robinson, 2000; Holzl, 1997; Simons, 2000; Smallwood, 1996).

Reinhardt (1995) argued that multimedia presentation software could improve learning, increase access to information, save money and enhance individual performance. Wislock (cited in Hutchins, 1999) indicates that multimedia presentation software can increase knowledge, skills, and attitudes, enhance performance of the individual, and provide a multi-sensory approach to education, training, and learning. Keyes (1994) argued that there was the potential to increase audience retention of information by as much as 38 percent.

Some advocates of computer-based multimedia even argue that a new golden era of instruction is possible. Wellington (cited in Hutchins, 1999) maintained that multimedia technology can "…engender a new approach and attitude among students and workers which would make them responsible and autonomous learners rather than seekers of traditional knowledge…" (p. 5).

Criticisms of Computer Based Multimedia Instruction. There are also opponents of computer-based multimedia in the classroom and what is being done with it.

Morgan (cited in Ganzel, 2000) and Robinson (2000) believed that most users of PowerPoint® misuse the technology by creating far to many slides. Morgan argues that 99 percent of users just put their notes on the screen to use as a crutch. Both Morgan and Robinson felt that the visuals and graphics, not text, are what belong in a presentation. Stoll (1999) and Ganzel (2000) indicated that there is rampant over-use of the features available in the software. Since the software comes with colours, animations, and sound effects, a nearly irresistible urge is created to use it all.

Ganzel (2000) went on to say that the main argument against PowerPoint® is that it diverts attention to the presentation at the expense of the message and the

messenger. Where visual aids were once support, they are now the centrepiece of the presentation or instruction. Stewart adds that the multimedia presentation discourages interaction between the audience and the speaker (2001).

In what is perhaps the most damning criticism of all, Stewart (2001) and Stoll (1999) maintained that PowerPoint® presentations are boring.

Several authors maintained that it is not entirely the presenter who is at fault. In other words the software lends itself by its nature and structure to misuse. Ganzel (2000) questions whether the technology is liberating or imprisoning and Stewart (2001) described PowerPoint® as "intellectually suspect". Expanding on this complaint, Nunberg (1999) stated, "The more PowerPoint presentations you prepare, the more the world seems to package itself into slide-sized chunks, broken down into bullet items or grouped in geometric patterns that have come to have almost talismanic force".

Hlynka and Mason (1998b) described PowerPoint® as a 'double-edged' instructional technology. While acknowledging that PowerPoint® gives control over the audience via quality visuals and sequenced flow they also feel that the presentations have somehow become "sterile". Hlynka and Mason suggested that this is not an accident and

query, "Is it coincidence that we have shifted away from the power of the *individual* to communicate towards the power of *technology* to say it all for us?" (1998b, p.45). Hlynka and Mason (1998a) stated that PowerPoint®, by design and purpose, is not a neutral technology. The process of making sequenced presentations reinforces the message that the instructor's job is to deliver content, and the students' job is to receive it.

Computer-based multimedia as a valuable tool. While some experts criticize the role of computer-based multimedia in the classroom and others praise it, a number of users and researchers fall into the category which thinks the technology is useful but sometimes misused and that there are both pros and cons related to the use of any technology (Brunner and Tally, 1999; Nowaczyk, R., Santos, L., and Patron, C., 1998).

Zahn, Zahn, Rajkumar and Duracy (1999) emphasized that the objective of classroom instruction is effective communication and that multimedia technology can in fact promote effective communication. They add however that the objective must be kept in the forefront and that to often function is sacrificed to form.

Grasha and Yangarber (2000) suggested there is a need to retain a healthy skepticism and focus on the advantages

to the learner while being aware of biases for, or against, technology. While recognizing disadvantages such as the expense of remaining on the cutting edge of instructional technology they also recognize the value of PowerPoint® multimedia. For example, they maintain that PowerPoint® can aid students with a visual learning style to better process information and that it helps maintain interest because of visual novelty. They also point out that few instructors are using multimedia with any underlying conceptual philosophy or methodology that justifies their actions.

Research has demonstrated that PowerPoint® can be an effective instructional tool. It captures the interest of the students and helps them understand the content (Luttig, 1998). "Multimedia instruction is an approach to complement and supplement traditional methods of teaching" (Hayes and Robinson, 2000).

In the end, the value of newer technologies may not lie only in provision of measurable improvements in achievement but also in the "enthusiasm they create, the motivation and inspiration they provide and the insight they deliver to the instructional process" (Screnci, abstract, 1992).

Instructional Technology and Integration Factors

Integration Factors. Nantz and Lundgren (1998) identified several key factors that need to be taken into

account in order to successfully integrate technology into the classroom. First, instructors must see that using technology will improve their instruction. Second, a supportive infrastructure must be in place. Third, reward systems must be amended to so that instructors who make appropriate use of the new technology are rewarded. Fourth, time must be made available for new instructors to learn and to adapt their lessons.

Wilson (1996) identified funding, maintenance, time, training, and leadership support as being critical factors that could 'enable' or 'inhibit' the implementation of technology. Hioco (1995) identified five components affecting adoption and implementation of technology in instructional programs including, organizational culture, leadership, allocation of resources, faculty empowerment, and faculty reward systems.

These same critical factors are identified frequently in the literature relating to the integration of instructional technology in the classroom.

Training, including both initial training and continuing professional development, was the most commonly identified critical element affecting integration (Brunner and Tally, 1999; Pang, 1997; Falba, 1998; Latimer, 1998; Smith, 1998; Wilson, 1996; Wetzel and Zambo, 1996). Brunner

and Tally (1999) emphasized the requirement for training that prepares instructors to "…take a critical view of the design, content, and use of these new learning tools in relation to the curriculum and its specific learning goals and in relation to teaching practice" (p.1).

Access to equipment and resources was also widely identified as a critical element (Falba, 1998; Latimer, 1998; Nantz and Lundgren, 1998; Smith, 1998; Wetzel and Zambo, 1996) as was time (Falba, 1998; Nantz and Lundgren, 1998; Pang, 1997; Smith, 1998; Wilson, 1996).

Management support is also identified as an important element of instructional technology integration (Hioco, 1995; McCoy, 1998; Smith, 1998; Wilson, 1996). Hioco (1995) specifically identified the importance of an appropriate faculty reward system, as did Nantz and Lundgren (1998) and Smith (1998).

Interestingly, only Nantz and Lundgren (1998), Latimer (1998), Smith (1998) and Wilson (1999) stressed the importance of the instructors' motivation to use the technology and their perception of value to be gained from the use of the technology. This is curious, as it does not seem unreasonable to hypothesize that if the instructor is not motivated or sees little value in using a technology, it is unlikely to be integrated in any meaningful way. Perhaps

the lack of emphasis in the literature on instructor motivation and perceived value of the technology is related to Roger's (cited in Smith, 1998) comment that one of the major problems in research into the diffusion of technology into the classroom is the tendency of the research to have a pro-innovation bias, that is, there is an implication that the innovation, or technology, should be adopted by all members of the community, that this adoption should be occurring more rapidly, and that it should not be rejected.

In summary, the commonly identified critical factors effecting the integration of instructional technology include training, time to prepare and learn, equipment and resources, management support including appropriate rewards and incentives, and instructor motivation. These critical factors relate very closely to the four performance 'drivers' identified by Rossett (1999).

Identified barriers to technology integration. There are a number of commonly identified barriers to the integration of technology. Wilson (1996) identified inadequate resources, lack of staff development, lack of instructor interest, poor quality software, lack of planning time, small technology budgets, lack of knowledge as to the effectiveness of using technology, and inadequate on-site support as the most common barriers to technology

integration. Similarly, Falba (1998) identified lack of equipment, lack of time to learn and prepare lack of technical support, inadequate staff development, and lack of information as being common barriers.

Lack of training, both front-end and professional development, is frequently identified as a major barrier to instructional technology integration (Mahmoud 1998; Manternich-Wigans, 1999; Wilson, 1996). Yildirim (2000) stated, "A large body of literature supports the idea that the biggest obstacle to teachers using technology in their classrooms is the lack of adequate teacher training" (Beaver, 1992; Brooks & Kopp, 1990; Ingram, 1992; Vagle & College, 1995; Yaghi, 1997; Yildirim & Kiraz, 1999). O'Donell (1996) stated that the one outstanding reason why teachers are not using computers to a greater extent in classroom instruction is lack of training. Falba (1998) also identified the lack of training as being one of two primary constraining factors influencing the integration of technology.

Somewhat related to lack of training, and perhaps overlapping, is a barrier described as lack of awareness, lack of knowledge, or lack of information (Falba, 1998; Garland, 1991; Sotone-Meyer, 1999; Wilson, 1996). If instructors are unaware of the value that instructional technology could add

to their instruction or do not have the information required to make appropriate decisions they are perhaps unlikely to attempt to use the technology. It is suggested that training could alleviate, or perhaps eliminate, these problems.

Lack of time is also widely identified as a critical barrier to the integration of instructional technology (Epps, 1997; Falba, 1999; Mahmoud 1998; Manternich-Wigans, 1999; Sotone-Meyer, 1999; Wilson, 1996).

Lack of resources and equipment is a third critical barrier (Mahmoud, 1998; Manternich-Wigans, 1999; Sotone-Meyer, 1999; Wilson, 1996). Lack of equipment was identified by Falba (1998) as the other of the two primary constraining factors influencing he integration of technology in the classroom.

Technical support has also been identified regularly as a barrier (Falba, 1998; Mahmoud, 1998; Manternich-Wigans, 1999; Wilson, 1996).

Garland (1991) stated that the major barriers are people issues such as cultural tradition, risk aversion, lack of knowledge, and lack of user acceptance. In general, people are reluctant to change if things are going well.

Epps (1997, Abstract) provided further argument that "… there were two significant factors that seemed to

override every positive motivating factor toward the use of computers…. The first was the perception of low perceived benefit to the time and effort necessary to overcome non-user inertia…. The second was the perception that there needs to be a pedagogical, or an administrative imperative to overcome non-user inertia."

Summary

Instruction and technology are inseparably combined. Both instruction and technology have evolved tremendously in the last 50 years. Where teachers once used chalkboards and textbooks, computers are increasingly being used as a medium of choice.

This development is not without controversy. There are both proponents and opponents of the use of computers in the classroom and, more particularly, of the use of computer-based multimedia presentation programs in the classroom. Despite the controversy, it is obvious that computers have become a part of the instructional environment, nevertheless the integration of instructional technologies, including computer-based multimedia presentation programs, have not always been trouble free.

Studies by researchers such as Falba (1998), Hioco (1995), Latimer (1998), and Wilson (1996), identified a variety of factors that influence the integration of

instructional technology. The key factors affecting computer technology integration include training and/or professional development, time (for both learning and developing presentations), adequate resources (equipment and funding) and infrastructure, leadership support, technical support, personal motivation, reward systems, and organizational culture.

Any of the factors described in the paragraph above may act as either 'drivers' for or 'barriers' against the successful integration of computer-based multimedia presentation technology in the classroom. The literature shows that the three factors which are the principle barriers to integration include lack of training and professional development, lack of time, lack resources and technical support (Epps, 1997; Falba, 1999; Mahmoud 1998; Manternich-Wigans, 1999; O'Donell, 1996; Sotone-Meyer, 1999; Wilson, 1996; Yildirim, 2000).

Human Performance Technology provides a methodology and a framework for studying any human performance situation including the integration of a computer-based multimedia presentation program such as PowerPoint® into the classroom environment. Allison Rossett's (1999) performance analysis methodology allows the researcher to examine the performance situation in a systemic (holistic) and systematic (logical)

manner. Rossett identifies four performance 'drivers'. The first encompasses skills, knowledge, and information. The second 'driver' examines motivation. The third focuses on the environment and the fourth area of performance includes the incentives provided for appropriate performance. An examination of each of these areas may yield performance drivers or barriers. Once barriers to performance are identified, solutions can be developed in order to alleviate or eliminate the problem.

Chapter III

RESEARCH DESIGN AND METHODOLOGY

The purpose of this study was to examine instructor perceptions concerning the integration of PowerPoint® technology in the CFANS classroom.

The study was based on the following research questions:

1. How is PowerPoint® currently employed in the CFANS classroom?
2. How do instructors acquire the skills they use for developing PowerPoint® instructional media?
3. How should instructors acquire the skills required to develop PowerPoint® instructional media?
4. How does motivation influence CFANS instructors with regard to the employment of PowerPoint® instructional media?
5. How does the environment influence CFANS instructors with regard to the employment of PowerPoint® instructional media?
6. How do incentives influence CFANS instructors with regard to the employment of PowerPoint® instructional media?

The first section of this chapter addresses setting followed by target population, research design,

instrumentation, data analysis and organization, and data collection procedures.

Setting

The setting for the study is the Canadian Forces Air Navigation School (CFANS). CFANS is a Canadian Forces military training establishment. CFANS is tasked to train Air Navigation Officers for the air force. It is located at 17 Wing, Winnipeg, Manitoba, Canada.

CFANS is, in many ways, typical of a Canadian Forces training establishment. To accomplish its mandate, it uses a variety of instructional techniques and methods. Instruction is conducted in the classroom, in the simulator, and in the aircraft. Like many other Canadian Forces training establishments, and civilian instructional institutions, CFANS has increasingly been using computer-based multimedia presentation technology in the classroom. The CFANS classrooms have been modified into what are described as "electronic classrooms". These classrooms are specifically designed and equipped with computer-based multimedia technology such as computers and digital projectors. The software program used throughout the Canadian Forces, including CFANS, is Microsoft PowerPoint®.

Target Population

The target population of this census study included all CFANS staff who instruct in the classroom (n=31). The target population includes members of the Navigator and Pilot occupations as well as a single Training Development Officer. All instructors are officers in the Canadian Forces, with a minimum rank of Captain. All instructors are occupationally and operationally qualified and have completed the *Flight Instructor's Course* (or equivalent). The *Flight Instructor's Course* provides basic classroom and practical instructional theory and techniques.

Instructors will normally be posted to CFANS for one tour, the normal duration of which is three to five years. Optimally, there should be a full spectrum of experience among the instructional staff. Thus, assuming a four year posting cycle and 31 instructors, at any one time there could be around seven or eight first year, second year, third year, and fourth year instructors. This would assure maintenance of a relatively stable level of experience among the instructional staff.

Research Design

A descriptive research method was used to answer the research questions presented in the introductory paragraph of this chapter. "Descriptive research involves collecting

data in order to… answer questions concerning the current status of the subject of the study. A descriptive study determines and reports things the way things are."(Gay, 1996, p.249) A self-reporting, survey questionnaire was developed by the researcher and administred to all CFANS staff who instruct in the classroom. All of the instructors were surveyed because of the small population size (n=31). The majority of the survey items are fixed-choice with the exception of several open-ended questions, which have allowed the collection of additional data, to supplement the fixed-choice survey data.

Utilization of a survey questionnaire was appropriate for this research. The survey questionnaire provided a straightforward and reliable means of obtaining the information required, with minimal intrusion by the researcher and minimal effort on the part of the respondents. Respondents could be assured that their responses would remain confidential. The survey method ensured standardization of responses. The survey method provided data that could be used for quantitative statistical analysis as well as qualitative information, the results of which can be presented clearly and precisely.

Instrumentation

The survey instrument, entitled *CFANS Integration of PowerPoint In the Classroom Survey* (attached as Appendix A), consisted of four sections that focused on the use of PowerPoint® in the classroom, the development of PowerPoint® skills, instructor perceptions of regarding PowerPoint® integration, and a section of open-ended questions. The questionnaire was designed to address the six research questions. The texts, *Research Methods in the Social Sciences* (Frankfort-Nachmias and Nachmias, 1996) and *How to Conduct Surveys: A Step by Step Guide* (Fink and Kosecoff, 1985) were used as the primary sources of guidance for developing and executing the questionnaire, as well as analyzing the data.

The first section, which is entitled *The Use of PowerPoint in the Classroom*, addressed research question one of the survey, that is, "How is PowerPoint® currently employed in the CFANS classroom?". The purpose of this section is to provide context for the rest of the research. In this section there are five survey items that required the respondent to identify, by circling or checking, the response that was most appropriate as well as one open-ended question.

The first question in section one asked the respondent to identify whether or not PowerPoint® was employed as an instructional tool. The responses allowed the instructors to indicate whether PowerPoint® presentations were developed by themselves, presented only (no development), or not used at all. If the respondent identified that he, or she, did not use PowerPoint® in the classroom (response "c.") then they were directed to discontinue responding to the questionnaire and return it in the addressed envelope. Due to the nature of instruction at CFANS, it was not anticipated that many (if any) respondents would indicate that they do not use PowerPoint® in the classroom, however the response item was included to pick up any aberrations or unforeseen information.

In addition to the pivotal first question, section one also requested information on the frequency of PowerPoint® usage, the respondents rating of his, or her, own PowerPoint® skill level, and in question four, which PowerPoint® features have been employed in the classroom. The researcher has separated the PowerPoint® functions into three general skill levels that are described as basic (items a. to f.), intermediate (items g. to n.) and advanced (items p. to w.). The researcher will apply judgment to determine where a candidate fits should there be a wide

dispersal of functional usage. Finally, question five, an open-ended question, provided the opportunity for the respondent to identify what he, or she, feels are the most useful features of PowerPoint®.

Section two is entitled *Development of PowerPoint Skills*. It is similar in design to section one. This section relates to research questions two and three. Specifically, this section sought to identify how the respondent had acquired his or her PowerPoint® skills, how the respondent preferred to solve problems encountered while using the technology and the respondent's opinion, or recommendation, as to the best method for acquiring the required skills. Question four allows for both closed-ended and open-ended response.

Section three, *Instructor Perceptions of PowerPoint Integration*, sought to address research questions four, five, and six by identifying instructor perspectives on incentives, motivators, and environmental enablers that effect the integration of PowerPoint in the school. In this section instructors were asked to respond to 33 different statements by identifying the most appropriate choice on a rating scale. The scale employed the following fixed-choice alternatives: Strongly Disagree; Disagree; Agree; and, Strongly Agree. A neutral choice was deliberately omitted

in order to force the respondent to take a position on the survey items.

Research question four, which dealt with motivators for using PowerPoint®, was addressed by the following section three survey items: 10-13,15,17-21,23-30, totaling 18 items. Research question five focused on how the environment influenced the use of PowerPoint® in the classroom. It was addressed by section three survey items 2,3,7,8,9,22, and 32 - totaling seven items. Research question six which seeks to identify the incentives which are available to encourage instructors to developing PowerPoint® instructional media was addressed by the following questions: 1,4,5,6,14,16,31, and 33 - totaling eight items in all.

In section four of the survey, simply entitled *Open-Ended Questions*, respondents were given the opportunity to provide qualitative data in three open-ended questions. Question one asked the respondent to list one to three things which management is doing and should continue to do, to assist instructors to develop quality PowerPoint® instructional presentations. This survey question relates to research questions two, five, and six. Question two, asked the respondent to indicate from one to three of the greatest impediments to the development of quality

PowerPoint® media for instruction. Responses indicated barriers to the integration of PowerPoint® and had the potential to relate to questions three, four, five and six. Question three asked the respondent to indicate if there was anything management, in the form of school leadership or the Canadian Forces, should be doing to improve the quality of PowerPoint® presentations used in instruction. Any responses to this question would indicate barriers to the integration of PowerPoint® in the instructional environment as well as potential drivers. This question could potentially relate to research questions three, five and six.

Prior to implementation of the survey, the questionnaire was checked for face and content validity by two methods. The first method consisted of having individuals, experienced in developing surveys, critique the survey for ease of use, validity and formatting. Second, a field-test of the instrument was held, using several non-participating instructors. Suggested improvements resulting from the reviews and the field-test were considered and incorporated as required.

Data Analysis and Organization

Data collected from the survey were collated and presented as both frequency counts in Appendix B, *Responses*

to Close-ended Questions, and percentages in Chapter IV. The data was then analyzed by the researcher to provide answers to the problem research questions in Chapter V.

Descriptive statistics, such as described by Fink and Kosecoff (1985), were used to analyze the collected data. Frequency distribution and percentages were employed to organize the data. Responses to open-ended questions were analyzed using content-analysis methods, as described by Frankfort-Nachmias and Nachmias (1996, pp. 324-329). Key words and phrases were analyzed to identify patterns and then categorized. Survey results were reported in narrative description and in table form.

The information derived from responses to section one provided a snapshot of how PowerPoint® is employed in the CFANS classroom and provided an indication of the skill levels of the instructors. This section provided the context for the remainder of the study.

Responses to section two were analyzed to provide information regarding to how instructors acquired their PowerPoint presentation skills, how they sought to solve presentation development problems and how they felt these skills should be acquired.

In section three, the data generated by the responses was analyzed to determine the motivators, environmental

support and incentives influencing the instructors' integration of PowerPoint® into the classroom.

Responses to the three open-ended questions in section four were content-analyzed for recurring themes and patterns. The resultant data were categorized, related to research questions one, three, five and six, and presented in narrative style.

The analysis of instructor responses is presented in narrative and table form in *Chapter IV, Results*, and the resulting information was then used to develop *Chapter V, Discussion*.

Data Collection Procedures

The survey was distributed to the target population on 23 April 2001. The survey package included an individually addressed covering letter (see appendix C), the survey instrument, and an envelope addressed to the researcher. It was requested, in the covering letter, that the surveys be completed and returned, in the return-addressed envelope by 11 May 2001. Each survey was coded and numbers were compared against the master list to determine which instructors required reminders. Directions were provided on how to return the completed survey. Due to the small sample size, high return numbers are critical.

23 instructors responded to the initial survey. A follow-up set of identical questionnaires with a slightly amended covering letter (Appendix D) were provided to the nine instructors who did not respond to the first round of questionnaires. This covering letter and questionnaire was dated 29 May 2001 and was forwarded in order to provide additional encouragement for study participants to respond to the survey and consequently increase the survey response rate. As a result of the follow-up letter and questionnaire, three additional completed surveys were returned by the deadline date of 14 June 2001 when it was assumed that all instructors who wished to respond to the survey had done so.

Summary

Descriptive research was conducted, using a self-reporting, survey questionnaire, administred to all CFANS classroom instructors. The survey was developed, distributed, collected and analyzed, by the researcher, in order to answer the problem research questions. Results were presented in narrative and table format.

Chapter IV

RESULTS

This chapter presents the collated responses to the survey, the purpose of which was to examine instructor perceptions concerning the integration of PowerPoint® technology in the CFANS classroom.

The study was based on the following research questions:

1. How is PowerPoint® currently employed in the CFANS classroom?
2. How do instructors acquire the skills they use for developing PowerPoint® instructional media?
3. How should instructors acquire the skills required to develop PowerPoint® instructional media?
4. How does motivation influence CFANS instructors with regard to the employment of PowerPoint® instructional media?
5. How does the environment influence CFANS instructors with regard to the employment of PowerPoint® instructional media?
6. How do incentives influence CFANS instructors with regard to the employment of PowerPoint® instructional media?

A descriptive research method was used to answer the research questions. All instructors were surveyed because of the small population size, (N=31). The initial survey was distributed to respondents on 23 April, 2001. This initial survey collected 23 completed surveys and was followed up with a second distribution on 29 May, 2001, which collected three additional completed surveys for a total of 26 out of 31 possible completed surveys, that is, a final return rate of 84%.

Analysis of Data

Instrumentation. The survey instrument, *CFANS Integration of PowerPoint In the Classroom Survey* (attached as Appendix A), consisted of four sections entitled, *The Use of PowerPoint in the Classroom, Development of PowerPoint Skills, Instructor Perceptions of PowerPoint Integration,* and *Open-Ended Questions.* The survey consisted of both close-ended and open-ended questions.

Section I: The use of PowerPoint® in the classroom. The first section of the survey addressed research question one.

The first question in Section I asked the respondent to identify whether or not PowerPoint® was employed as an instructional tool. Nine (34.6%) instructors indicated that they developed their own presentations. Sixteen (61.5%)

indicated that they normally use completed presentations, and nil (0%) responses indicated that PowerPoint® was never used in the classroom. One instructor did not respond to the question for some reason, but as this individual completed the remainder of the survey he/she clearly, as a minimum, uses PowerPoint® in the classroom; therefore 100% of the respondents have indicated that they use PowerPoint® in the classroom.

Section I, question two, also requested information on the frequency of PowerPoint® usage. In question two, 19 instructors (73.1%) indicated that they use PowerPoint® for 'every class'. Seven (26.9%) indicated that they use PowerPoint® for 'most classes'. Zero respondents indicated that they used PowerPoint® for 'some classes' and zero respondents indicated that they 'rarely' use PowerPoint®. Clearly, CFANS instructors are frequent users of PowerPoint® as a combined total of 100% of the respondents indicated that they used this program either 'most' or 'every' class. Figure 1 illustrates the frequency of PowerPoint® usage in the CFANS classroom.

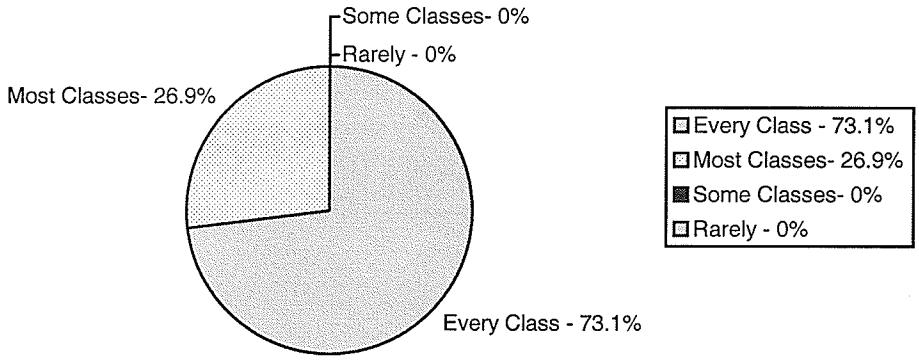

Figure 1. Frequency of PowerPoint® utilization by the instructors in the CFANS Classroom as expressed in percentages.

Question three asked instructors to rate their own PowerPoint® skill level. Four (15.4%) respondents rated their expertise as 'basic'. Sixteen (61.5%) rated themselves as 'intermediate' users and 6 (23.1%) respondents rated themselves as 'advanced' PowerPoint® users. Figure 2 illustrates the respondents' self-assessed expertise in the use of PowerPoint®.

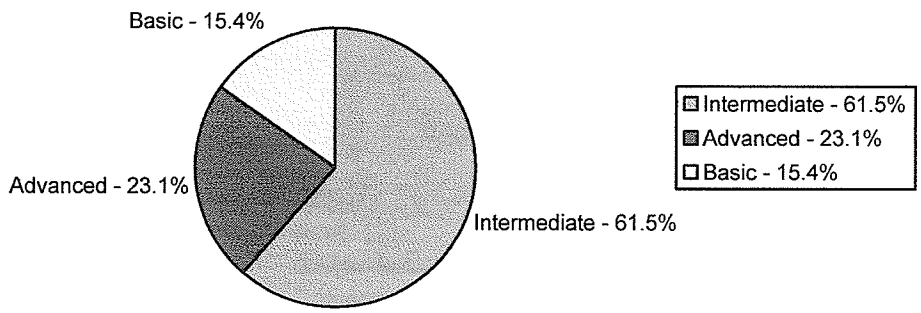

Figure 2. Instructors' self-categorization regarding their level of skill in the utilization of PowerPoint® as expressed in percentages.

Question four asked the respondents to indicate which PowerPoint® features they have employed in the classroom.

Items a. to f. were classified as 'basic' PowerPoint® functions by the researcher. The results are not surprising. The majority of respondents have used all of these functions at one time or another. 'Text' is the most frequently used feature at 100% utilization. One interesting finding was that the 'screen transitions' feature was used much less frequently than expected (69.2% seldom or never use the feature). Perhaps this was due to a perception on the part of the respondents that it is not an

essential feature for classroom instruction. Table 1 presents the survey results as percentages.

Table 1

Frequency of Use of Basic PowerPoint® Features

		Always	Often	Seldom	Never
a.	Text	80.8%	19.2%	0%	0%
b.	A variety of text colours and fonts	34.6%	50%	15.4%	0%
c.	A variety of background colours/designs	7.7%	50%	38.5%	0%
d.	Text animations (e.g. bullet text enters from left, right, etc)	23.1%	30.8%	38.5%	7.7%
e.	Screen transitions (e.g. fade or barn door transitions between slides)	11.5%	19.2%	46.1%	23.1%
f.	Printed slide handouts	7.7%	53.8%	34.6%	3.8%

Items g. to n. were classified as 'intermediate' PowerPoint® functions by the researcher. It is apparent that CFANS instructors have been making extensive use of the various graphical presentation features. 100% of the respondents, for example, have used 'diagrams, charts or tables', as well as a very substantial majority (90.2%) who have employed scanned images, such as photographs, in their instruction. It is noteworthy that 100% of the respondents have indicated that they have employed the 'speaker/ instructor notes' feature. As was described in Chapter I, this is undoubtedly due to the fact that CFANS lesson plans are maintained using this feature. It was also unexpected that the 'pen' function is so seldom used. One might think that this could be a valuable instructional tool when

displaying charts, diagrams and other images. Table 2 presents the survey results as percentages.

Table 2

Frequency of Use of Intermediate PowerPoint® Features

		Always	Often	Seldom	Never
g.	Diagrams, charts, or tables	15.4%	50%	34.6%	0%
h.	Clip art	7.7%	26.9%	50%	15.4%
i.	Photographs or other scanned images	11.5%	46.1%	34.6%	7.7%
j.	Black or white screen during presentation	3.8%	7.7%	46.1%	42.3%
k.	Speaker/instructor notes	65.4%	30.8%	3.8%	0%
l.	Special text effects (e.g. Wordart,3D and shadow)	11.5%	26.9%	42.3%	19.2%
m.	"Pen" function to mark/write on slide	0%	0%	23.1%	73.1%
n.	Object animations (e.g. appear, fly in)	11.5%	19.2%	46.1%	19.2%

Items o. to w. were classified as 'advanced' PowerPoint® functions by the researcher. As might be expected these advanced features are used less frequently, and by a fewer number of instructors, than some of the 'Beginner' and 'Intermediate' features, however the results present CFANS instructors as quite highly developed PowerPoint® users. It is however, noteworthy that 65.3% respondents have used the 'autoshapes' feature to develop their own images. This reinforces a strong trend, previously displayed in table 2, towards the employment of graphical images. Also the fact that 'video clips' were employed by 46.1% of the respondents is not insignificant, and indicates a fairly sophisticated group of PowerPoint® users. The frequent use of 'hidden slides' (84.6%) also

provides indication of a relatively sophisticated user. Table 3 presents the survey results as percentages.

Table 3

Frequency of Use of Advanced PowerPoint® Features

		Always	Often	Seldom	Never
o.	Video clips	0%	3.8%	42.3%	53.8%
p.	Audio clips (e.g. jet or clapping sounds for transition sound effects)	0%	0%	30.8%	69.2%
q.	Recorded audio (e.g. voice narration)	0%	0%	7.7%	92.3%
r.	Hyperlinks and/or bookmarks to other files or sections in the presentation	0%	7.7%	23.1%	69.2%
s.	Action buttons (clicking on it initiates an action, e.g., hyperlinks)	0%	7.7%	34.6%	57.7%
t.	Hidden slides	0%	38.5%	46.1%	15.4%
u.	Taking notes while in Presentation mode	0%	11.5%	11.5%	73.1%
v.	automatic timings for bullets and/or transitions	0%	0%	23.1%	76.9%
w.	Autoshapes (to develop your own images)	0%	42.3%	19.2%	38.5%

Based on their employment of the 23 PowerPoint® features identified in question four, instructors were categorized by the researcher as 'basic', 'intermediate', or 'advanced'. The researcher was required to apply judgment to determine where a candidate fits due to a wide dispersal of functional usage. For example, an instructor who used all of the basic elements, several of the intermediate, and several of the advanced might be described as an intermediate user, however depending on the functions employed he or she might also arguably be placed in the advanced category. The purpose of this survey item was to provide a broad outline of the target population and is not

meant to be an exact or specific description of individual instructors.

After analysis by the researcher, three (11.5%) instructors were identified as 'basic' users of PowerPoint®. Two of these instructors identified themselves as basic users in question three and one identified themselves as an intermediate user.

Sixteen (61.5%) of the instructors were identified by the researcher as 'intermediate' users. Of these 16 instructors, four identified themselves as advanced users, two identified themselves as basic users, and nine identified themselves as intermediate users in question three.

Seven (26.9%) instructors were identified by the researcher as 'advanced' users. Of these advanced users, only two identified themselves as advanced and the remaining five identified themselves as intermediate users in question three.

This analysis provides an informal face validity of the researcher's classification at least at the basic and intermediate levels. Figure 3 illustrates the researcher assigned PowerPoint® skill levels of the CFANS instructors.

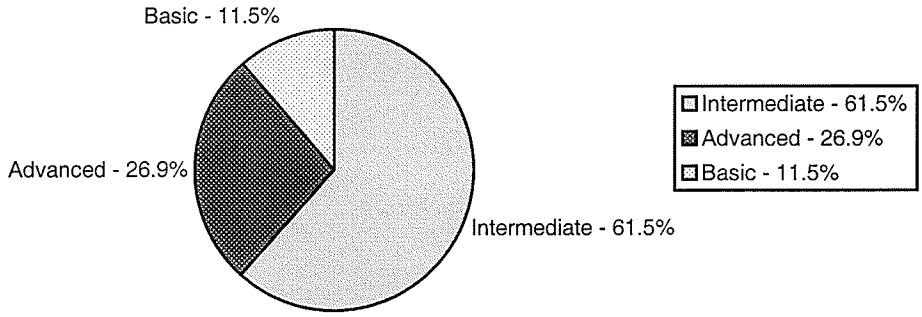

Figure 3. Researcher categorization of instructors' PowerPoint® skill levels based on the instructors' utilization of PowerPoint® features as expressed in percentages.

Question five, was an open-ended question that provided the opportunity for the respondent to identify what he or she feels are the three most useful features of PowerPoint®. All instructors responded to this question although not all instructors chose to identify three features. All responses were collated by the researcher. The three most useful PowerPoint® features were clearly identified by the respondents as the ability to display graphics, the ability to display text, and the speaker notes function. This corresponds very closely with the most frequently used features identified in Table 1, Table 2, and Table 3.

The ability to create and/or display graphics was the most frequently identified as one of the three most useful features of PowerPoint® by 15 (57.7%) instructors. Seven respondents identified 'graphics' as useful, five identified 'import graphics' as useful, and three identified the 'create graphics' as useful. The capability to display 'Text' was also frequently identified as one of the three most useful PowerPoint® features. Fourteen (53.8%) respondents identified the build or bullet transition feature as useful. In addition three (11.5%) respondents identified "text" as useful. 'Speaker Notes' were identified as one of the three most useful features by nine (34.6%) respondents.

Interestingly three respondents identified 'ease of use' and three respondents identified 'saves time' as useful features, although these are not PowerPoint® features per se.

Section II. Development of PowerPoint® Skills. Section II relates to research questions two and three.

Question one sought to determine the instructors' perceptions as to whether or not they had received adequate training in the use of PowerPoint® in order to develop good quality instructional presentations. Three choices were offered to the instructor. Eight respondents (30.8%)

indicated that they required more training in the use of PowerPoint®. Twelve (46.1%) indicated that more training would be nice, but is not required. Six (23.1%) indicated that they have had more training in PowerPoint® than they require to develop good quality instructional presentations.

Question two asked the instructor to identify how they learned PowerPoint®. The instructor was directed to indicate *all* the responses that applied to him or her. The responses to this question were not anticipated by the researcher. The extremely high use of 'trial and error' (84.6%) to acquire skills is particularly significant, especially as it is not normally recognized as a particularly efficient way to learn a skill. The very high rate (65.4%) of peer coaching taking place amongst colleagues is also quite significant. In contrast 'The manual' (15.4%) and 'The help function' (38.5%) were relatively infrequently used. The low percentage (23.1%) of instructors acquiring PowerPoint® skills through formal training is also significant. The collated data is provided in Table 4, arranged in descending order from the most often used method to the least often used method.

Table 4

The Acquisition of PowerPoint® Skills by CFANS Instructors

Method	Percentage
Trial and error	84.6%
Co-worker assistance	65.4%
The help function	38.5%
Formal PowerPoint® training	23.1%
The manual	15.4%
Unit professional development programs	7.7%
In-house computer technologist assistance	3.8%

Question three identified the method(s) instructors would most likely use to solve problems encountered while creating a presentation. 'Trail and error' (76.9% 'Often', 7.7% 'Always') and 'A knowledgeable colleague' (57.7% 'Often', 19.2% 'Always') were by far the most significant problem-solving methods. 'The electronic help function' (38.5% 'Often' and 7.7% 'Always') was also used relatively frequently, but not to an extent approaching the two previously identified problem-solving methods. The instructor responses are illustrated in Table 5.

Table 5

How CFANS Instructors Attempt to Solve Presentation Development Problems

	Always	Often	Sometimes	Never
The manual	0%	3.8%	26.9%	50%
The electronic help function	7.7%	38.5%	50%	3.8%
A knowledgeable colleague	19.2%	57.7%	19.2%	3.8%
An in-house computer technologist	0%	3.8%	42.3%	34.6%
Trial and error	7.7%	76.9%	11.5%	0%

In Figure 4 the 'always' and 'often' choices, presented in question three, were combined to provide another perspective of how instructors are most frequently solving PowerPoint® development problems.

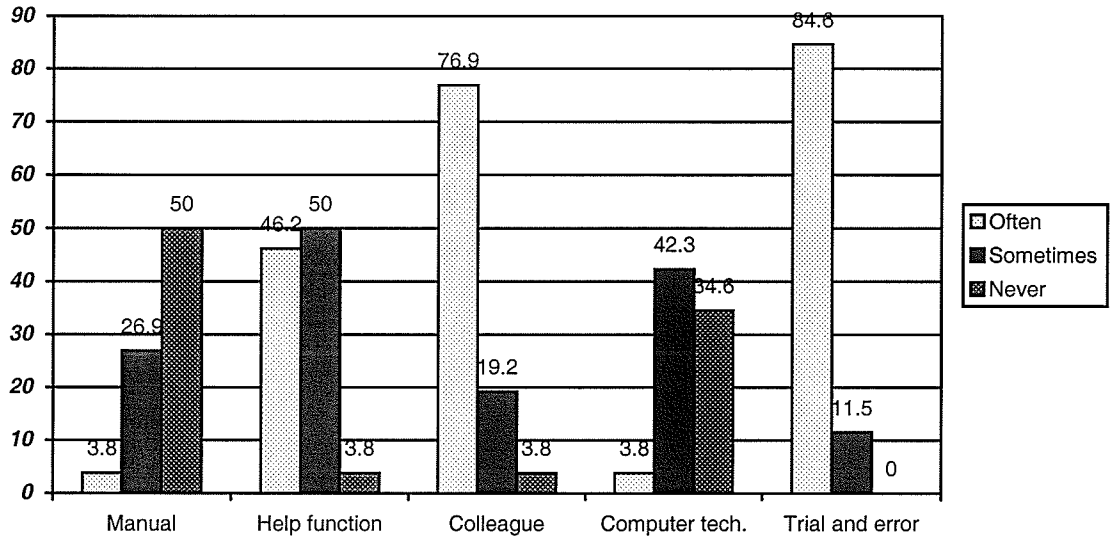

Figure 4. Frequency of methodology utilization to solve PowerPoint® presentation development problems, expressed in percentages.

Question four asked instructors to provide their opinion as to how instructors should be acquiring the necessary skills to develop quality instructional presentations. This question allowed for both closed-ended and open-ended responses. It is evident from the data that the respondents felt that some form of formal training in the use of PowerPoint® is required. It is highly significant that 92.3% of the respondents 'recommended' (and

57.7% 'highly recommended') that basic PowerPoint® skills should be provided on the instructor course.

What is interesting about the responses to question four is that all of the possible processes for acquiring PowerPoint® skills offered by the researcher were recommended by a majority of respondents, though none to such a high degree as formal training on the instructor course. Significantly, 'Informal methods such as trial and error or colleagues' were still recommended as methods of acquiring PowerPoint® skills by 84.6% of the respondents. Table 6 presents the collated data for the close-ended questions.

Table 6

Instructor Opinions as to How PowerPoint® Skills Should be Acquired

	highly recommend	recommend	not required
Informal methods such as trial and error or colleagues	3.8%	80.8%	15.4%
Formal introduction to basic PowerPoint® functions during the instructor course	57.7%	34.6%	11.5%
Increased out-service training for individual instructors	30.8%	19.2%	38.5%
Occasional in-house professional development programs for all instructors	15.4%	46.1%	34.6%
Provision of in-house PowerPoint® presentation development support	19.2%	34.6%	42.3%

Question 4.f. was open-ended and allowed instructors to provide any suggestions they felt applicable to the issue as to how instructors should be acquiring the skills to use PowerPoint® in the classroom setting. Fourteen instructors did not respond to the question, which is not problematic as those not responding may have already identified their preferences in the preceding questions. There was a fairly wide range of responses among the remainder. Four (15.4%) instructors indicated that some type of training is required, while two (7.7%) instructors indicated that no training is required and instructors should be able to learn on their own. Analysis did not identify any other trends or patterns.

Section III. Instructor Perceptions of PowerPoint® Integration. Section III sought to address research questions four, five, and six by identifying instructor perspectives on incentives, motivators, and environmental enablers which effect the integration of PowerPoint® in the school.

Research question four, which dealt with motivators for using PowerPoint®, was addressed by the following Section III survey items: 10-13, 15, 17-21, 23-30 - totaling 18 items.

In order to more easily display the collated survey results, these survey items have been further sub-divided into survey items which have queried instructors for specific information concerning PowerPoint®'s effects on instructional quality and survey items which deal more broadly with various other motivators.

Responses to motivational factors concerned with instructional quality related information is presented in Figure 5. The data presented clearly shows that respondents overwhelmingly supported the use of PowerPoint® in the classroom from a qualitative standpoint. 96.2% of the respondents indicated that PowerPoint® is a valuable instructional tool and 73% of the respondents indicated that PowerPoint® improved the quality of their own instruction. A significant percentage, 61.5, agreed that PowerPoint® type classroom presentations are the way of the future and an instructor that is not competent with the technology will become obsolete. It is also significant that 88.4% of the respondents indicated that PowerPoint® special effects can be more overused and irritating than useful. These results imply that, although CFANS instructors were strongly in favour of the use of PowerPoint® as an instructional technology, they were also keenly aware of the potentials for misusing the technology.

Motivational Factors Concerning PowerPoint® Effects on Instructional Quality	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
10. PowerPoint® does not allow flexibility in instruction.	23.1%	69.2%	7.7%	0%
12. PowerPoint® imposes limitations on classroom instruction which was not present in traditional instruction.	26.9%	61.5%	7.7%	3.8%
15. PowerPoint® is nothing more than a flashy light-show.	38.5%	57.7%	0%	3.8%
18. PowerPoint® improves the quality of my instruction.	3.8%	19.2%	61.5%	11.5%
19. PowerPoint® is replacing good instruction with poor instruction.	15.4%	80.8%	0%	3.8%
21. I believe the quality of instruction, in general, has declined in quality since the introduction of PowerPoint®.	23.1%	73.1%	3.8%	0%
24. The "special effects" often used in PowerPoint presentations are more overused and irritating than useful.	0%	11.5%	53.8%	34.6%
26. I believe many instructors overuse PowerPoint® in the classroom.	3.8%	76.9%	15.4%	3.8%
27. I believe PowerPoint® is a valuable instructional tool.	0%	3.8%	73.1%	23.1%
28. PowerPoint® shifts interest and focus away from the content of the lesson onto the presentation.	11.5%	69.2%	15.4%	3.8%
29. PowerPoint® type classroom instruction is the 'way of the future' and any instructor who does not become competent using such technology in the classroom will soon become obsolete.	3.8%	30.8%	42.3%	19.2%

Figure 5. Instructor responses to survey items relating to instructional quality motivators, expressed in percentages.

Instructor responses to additional motivational factors are presented in Figure 6. On the negative side, it is significant that 69.2% of the respondents indicated that more time is required to develop PowerPoint® presentations than traditional instruction. It is also significant that 65.4% of respondents felt it is becoming increasingly difficult to keep pace with technological change. Nevertheless the responses to most of the statements were clearly positive in support of the use of PowerPoint® as an instructional technology.

Motivational Factors	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
11. More time is required to develop PowerPoint® presentations than traditional instruction.	0%	26.9%	50%	19.2%
13. PowerPoint® assists instructors to logically organize their lessons.	0%	11.5%	61.5%	26.9%
17. The increased pace of technological change is making it difficult to do your job and keep up with technology.	15.4%	50%	34.6%	0%
20. Instructing is much easier with PowerPoint®.	0%	26.9%	69.2%	0%
23. Creating PowerPoint® presentations is frustrating.	7.7%	57.7%	26.9%	7.7%
25. Using PowerPoint® is too complicated.	23.1%	76.9%	0%	0%
30. Instructional time spent in developing PowerPoint® presentations could be better spent elsewhere.	7.7%	76.9%	11.5%	3.8%

Figure 6. Instructor responses concerning motivational factors (of a non-instructional quality nature) affecting the use of PowerPoint® as an instructional tool, expressed in percentages.

Research question five focused on how the environment influenced the use of PowerPoint® in the classroom. It was addressed by Section III survey items 2,3,7-9,22, and 32 - totaling seven items. The most significant finding is clearly the availability of adequate technological resources

such as computers, scanners and projectors as indicated by 92.3% of the respondents. The availability of adequate technical resources is obviously an important factor concerning the integration of any technology, including PowerPoint® in the classroom. It is also noteworthy that 73.1% of the respondents disagree with the statement, "Creating PowerPoint® presentations is too time consuming". Figure 7 presents the collated data.

Environmental Factors	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
2. Superiors realize that extra time is required to develop quality instructional PowerPoint® presentations and provides extra lesson development time.	26.9%	30.8%	42.3%	0%
3. There is sufficient access to adequate technology: computers, software and accessories (e.g. scanner, digital camera, etc.) to develop quality PowerPoint presentations.	3.8%	3.8%	57.7%	34.6%
7. There is adequate administrative support, such as: job aids, templates, and standard operating procedures for completing lesson plans and presentations.	0%	30.8%	57.7%	7.7%
8. There is adequate in-house technical support available.	3.8%	15.4%	73.1%	7.7%
9. Computer technology is prone to failure.	7.7%	50%	30.8%	11.5%
22. Creating PowerPoint® presentations is too time consuming.	0%	73.1%	19.2%	7.7%
32. The School has clear guidelines on how and when PowerPoint® should be used in the classroom.	19.2%	34.6%	34.6%	7.7%

Figure 7. Instructor responses concerning environmental factors affecting the use of PowerPoint® as an instructional tool, expressed in percentages.

Research question six focused on identifying the incentives that are available to encourage instructors to develop quality PowerPoint® instructional media. It was

addressed by the following survey items in Section III: 1,4-6,14,16,31, and 33 - totaling eight items in all.

It is highly significant that 96.1% of the respondents indicated that superiors encourage the use of PowerPoint® in the classroom. It is also highly significant that 95.2% of the respondents felt that students react positively to the use of PowerPoint® in the classroom. On the negative side, 73.1% of the respondents indicated that superiors do not recognize or reward instructors for extra effort put into the development of PowerPoint® instruction. In addition, 73.1% of respondents indicated that they received little in the way of feedback with regard to the quality of their PowerPoint® presentations. Figure 8 presents the data collated from the instructor responses.

Incentives	Strongly Disagree	Disagree	Agree	Strongly Agree
1. Superiors encourage the utilization of PowerPoint® presentations in the classroom.	0%	3.8%	53.8%	42.3%
4. Superiors recognize and reward the extra effort made by instructors in the development of PowerPoint® presentations.	30.8%	42.3%	26.9%	0%
5. I feel pressured to present my lessons in PowerPoint® whether or not I feel it is the appropriate method.	7.7%	61.5%	23.1%	7.7%
6. Superiors discourage the use of PowerPoint® in the classroom.	69.2%	26.9%	0%	3.8%
14. Students react positively to PowerPoint® presentations.	0%	3.8%	80.8%	15.4%
16. The use of PowerPoint® increases student interest in the lessons.	7.7%	23.1%	61.5%	3.8%
31. I receive frequent, or at least occasional, feedback from superiors on the quality of my use of PowerPoint® in classroom instruction.	34.6%	38.5%	26.9%	0%
33. Classroom instructors who are proficient in PowerPoint® are thought of as being more qualified and skilled than those who are weak in the use of PowerPoint®.	15.4%	42.3%	38.5%	0%

Figure 8. Instructor responses concerning incentives to use PowerPoint®, expressed in percentages.

Section IV. Open-Ended Questions. In Section IV of the survey respondents were given the opportunity to amplify

the quantitative data by means of three open-ended questions.

Question one asked the respondent to list from one to three things which management is doing, and should continue to do, to assist instructors to develop quality PowerPoint® instructional presentations. Only two of the instructors did not respond to this question. The respondents emphasized several issues. Fifteen (57.7%) indicated that management should continue to ensure standardization of the lesson plans and lesson formats. Five (19.2%) indicated that management should continue to monitor classrooms to ensure the quality of lessons. Four (15.4%) indicated that management was doing nothing to assist instructors to develop quality PowerPoint® presentations, although one of these respondents also mentioned having a standard PowerPoint® layout. Three instructors mentioned the availability of computer equipment and in a related response one instructor mentioned the availability of technologically advanced classrooms as something management should continue to do.

Question two, asked the respondent to indicate from one to three of the greatest impediments to the development of quality PowerPoint® media for instruction. Only one instructor did not respond to question two. Two impediments

were clearly identified, lack of time and lack of training. Lack of time was the major concern of instructors with 18 (69.2%) identifying it as a barrier. Lack of training was also widely identified as a barrier by 11 (42.3%) of the instructors. In a related response three (11.5%) of the instructors indicated that the lack of knowledge of the software was a barrier. No other trends were identified.

Question three asked the respondent to indicate if there was anything management, in the form of school leadership or the Canadian Forces, should be doing to improve the quality of PowerPoint® presentations used in instruction. Four instructors did not respond to question three. By far the most common suggestion was to provide training, which was made by 13 (50%) instructors. This response was made in a variety of formats such as during the Flying Instructor Course, a basic level PowerPoint® course to those who need it only, and continual formal out-service training. Two respondents specifically emphasized the requirement for training to focus on how they should be using the technology in the classroom rather than how to use the features. Three (11.5%) instructors identified the provision of additional time for presentation development as something management should be doing. Four (15.4%) instructors provided responses that were related to

management involvement such as the demonstration of appreciation or recognition for instructor efforts and performance.

Summary

This chapter presented the collated data from the survey in both frequency count and in percentages. The use of PowerPoint® in the classroom by CFANS instructors was addressed in a series of questions designed to provide a picture of the employment of the technology in the classroom as well as the level of expertise exhibited by the instructors. The data collected from Section II of the survey, which focused on the development of PowerPoint® skills was also presented as well as the qualitative data derived from the instructors' recommendations as to how they should be acquiring these skills. Finally, the qualitative data concerning the instructors' perceptions regarding the integration of PowerPoint® as an instructional technology were content analyzed and presented.

Chapter V will present a summary of the findings as well as conclusions, recommendations and implications.

CHAPTER V

DISCUSSION

The purpose of this chapter is to discuss the study findings. The chapter has been divided into three sections. The first section provides a summary of the major findings, which are presented within the context of the research questions that are based on Allison Rossett's (1999) proposed methodology for performance analysis. These findings are then classified as either 'Drivers' or 'Barriers' to the integration of PowerPoint® in the CFANS classroom. The second section presents the requirement for further research, and the third section provides recommendations derived from the study.

Summary of Findings

This section is concerned with presenting the study findings in relation to the following research questions:

1. How is PowerPoint® currently employed in the CFANS classroom?
2. How do instructors acquire the skills they use for developing PowerPoint® instructional media?
3. How should instructors acquire the skills required to develop PowerPoint® instructional media?

4. How does motivation influence CFANS instructors with regard to the employment of PowerPoint® instructional media?
5. How does the environment influence CFANS instructors with regard to the employment of PowerPoint® instructional media?
6. How do incentives influence CFANS instructors with regard to the employment of PowerPoint® instructional media?

Questions two and three have been combined under the sub-section entitled, *The acquisition of PowerPoint skills*.

The target population of this study included all CFANS classroom instructors (n=31). The target population included members of the Navigator and Pilot occupations as well as a single Training Development Officer. All instructors are officers in the Canadian Forces, with a minimum rank of Captain. All instructors are occupationally and operationally qualified and have completed the *Flight Instructor's Course* (or equivalent). This study was conducted using a descriptive research method. All instructors were surveyed because of the small population size, (N=31). A total of 26 out of 31 possible completed surveys were returned for a final return rate of 84%.

PowerPoint® employment in the classroom. The survey indicated that PowerPoint® is used as an instructional technology by 100% of the survey respondents. Seventy-three percent of the instructors indicated that they use the program 'every' class, while the remainder (26.9%) indicated that they use the program in 'most' classes.

The majority of instructors, 61.5%, were categorized by the researcher as 'intermediate' PowerPoint® users. A significant minority, 26.9%, were identified as 'advanced' users and the smallest group, 11.5%, were identified as 'beginners'. Researcher categorization and instructor self-categorization corresponded very closely and clearly indicated a group of instructors who are relatively skilled in the technical applications of PowerPoint®, as approximately 90% were categorized as intermediate or advanced users.

The respondents indicated that they used a wide range of the available PowerPoint® features. All of the features identified as basic features were frequently used as well as many of the intermediate and advanced features.

CFANS instructors identified the three most useful PowerPoint® features as the ability to create and display graphics, text, and speaker notes.

The acquisition of PowerPoint® skills. Rossett (1999) identified skills, knowledge and information as one of the critical drivers of performance. This sub-section summarizes the data concerning the acquisition of PowerPoint® skills.

Instructors acquired their PowerPoint® skills in a variety of ways, however, informal methods such as 'trial and error' (85%), 'co-worker assistance' (65%), and the 'help function' (38%) were clearly the most commonly identified methods for acquiring PowerPoint® skills. Only 23% identified 'formal training' as a methodology through which they acquired PowerPoint® skills.

'Trial and error' was identified as the most likely method of problems solving followed by a 'knowledgeable colleague', and the 'electronic help function'. The other methods were used to a much lesser extent.

The majority of instructors indicated that they have had enough training in the use of PowerPoint®, however, a fairly large minority of 30.8% indicated that they required more training in the use of PowerPoint®.

Each of the six researcher presented methods for acquiring PowerPoint® skills were recommended by a majority of the instructors. A very large majority 'recommend' (34.6%) or 'highly recommend' (57.7%) that instructor

candidates receive formal PowerPoint® training during the *Flying Instructor Course*, which is given prior to CFANS instructors undertaking their instructional duties. This contrasts somewhat to the responses to an open-ended question where 50% of the instructors indicated that management should be providing training in order to improve the quality of instructional presentations. Since instructors so overwhelmingly recommended PowerPoint® training during the *Flying Instructor Course*, the author speculates that instructors may have felt they had already indicated their preference so did not feel required to repeat themselves. In any case the recommended course of action indicated by the instructors is evident.

Motivational factors. Motivation is a critical component of performance. Motivation is created by the perceived value of the application combined with the confidence level of success in using the application (Rossett, 1999). This sub-section summarizes the findings concerning motivational factors.

Instructors overwhelmingly indicated that PowerPoint® is a valuable instructional tool (96.2%) and a majority of instructors believed that those who do not become competent with computer-based multimedia presentation technology will be left behind and become obsolete (67.5%).

In each of the questions querying instructors on their perception of the value of PowerPoint® as an instructional technology instructors indicated strongly that PowerPoint® is of value to them. Instructors believed that PowerPoint® improves their instruction. They believed instructing is easier with PowerPoint® and that it assists them to logically organize their instruction.

A majority of instructors did not believe that PowerPoint® is being over-used in the classroom, however, a clear majority did find the special effects more overused and irritating than useful. They did not believe that PowerPoint® imposes any great limitations on them, nor did they believe that PowerPoint® is frustrating or too complicated. Instructors overwhelmingly disagreed with the statement, "PowerPoint is nothing more than a flashy light show".

While most instructors believed that PowerPoint® requires more time to prepare than traditional instruction, 85% of instructors believed the time they spend developing PowerPoint instructional presentations was worth the effort. Most instructors did not agree that creating PowerPoint® presentations is too time consuming, however, a majority of instructors did agree that the increased pace of

technological change has been making it difficult to keep up with technology and do their job.

Environmental influences. Rossett (1999) identified environmental factors such as policies, equipment, resources and processes as being critical factors affecting performance. This sub-section summarizes the findings relating to environmental factors.

Nearly all of the instructors (92%) strongly agreed that there is sufficient access to technology such as computers, scanners, and digital projectors. Instructors generally indicated that there is adequate administrative support such as job aids, templates, and standard operating procedures for completing lesson plans and presentations. Instructors indicated there is adequate in-house technical support available. The majority of instructors did not feel that the technology is prone to failure, however a sizable minority of 42% were concerned with technology failure.

There is some disagreement among instructors with regard to the provision, by management, of the extra time required to develop quality PowerPoint® instructional presentations. Fifty-seven percent of the respondents (27% strongly) felt that management does not provide the extra time required. On the other hand, a significant minority (42%) did feel that management is aware of the requirement

and provided extra time for presentation development. A clear majority of instructors felt that using PowerPoint® itself was not too time-consuming.

There is some disagreement as to whether clear guidelines as to how and when PowerPoint® should be used in the classroom are available. The majority, 54%, indicated that existing guidelines are insufficient, while a significant minority, 42%, said there were sufficient guidelines.

Incentives. Incentives are the rewards provided by the organization, or management, for positive performance (Rossett, 1999). This sub-section summarizes the findings that reflect issues involving incentives.

Instructors overwhelmingly agreed that superiors encouraged the use of PowerPoint® in the classroom however they did not believe that they were pressured to use PowerPoint® when they did not feel it is appropriate. In addition, an overwhelming majority of 96% indicated that students reacted positively to PowerPoint® presentations and a smaller majority of 65% indicated that using PowerPoint® increased student interest in the lessons.

A clear majority of 73%, indicated that superiors did not recognize or reward the extra effort made by instructors in the development of PowerPoint® presentations. In

addition, a clear majority of 73%, indicated that they did not receive adequate feedback from superiors on the quality of their PowerPoint® presentations. Instructors appeared to believe that supervisors take the quality of their presentations for granted.

Most instructors believed that classroom instructors who are proficient in PowerPoint® are not thought of as being more qualified or skilled than those who are weak in the use of PowerPoint®.

Drivers. Drivers are the factors in an organization that encourage or maintain performance. Based on the study a number of drivers for the integration of PowerPoint® were identified.

Arguably, the most prominent driver for the use of PowerPoint® in the CFANS classroom was the fact that instructors clearly view PowerPoint® as a valuable instructional tool. Instructors saw PowerPoint® as improving their lessons and they perceived students as reacting positively to the use of PowerPoint® presentations. This supports the existing research completed by Nantz and Lundgren (1998), Latimer (1998), Smith (1998), and Wilson (1999).

Instructors indicated that they did have the resources and equipment to develop quality instructional

presentations, which contrasted with several previous studies. Falba (1999), for example, identified lack of resources as one of two primary constraining factors influencing the integration of instructional technology.

Instructors appeared to be making good use of their colleagues to acquire new PowerPoint® skills and to solve problems encountered when developing PowerPoint® instructional presentations. Pang (1997) argued that, "…coaching is helpful in lending general support, extending skills, and transferring skills into the classroom practice" (abstract). Thus colleague coaching, or mentoring, appeared to be a powerful driver towards the successful integration of PowerPoint® at CFANS.

Instructors' responses indicated that the standardization of lesson plans and lesson formats constitutes a driver for the integration of PowerPoint® in the classroom. Hutt (cited in Ganzel, 2000) argued that organizational guidelines which limit presenters to a few well organized templates, increases efficiency by preventing each individual from running off and designing his or her own templates. Wilson (1999) also advocated the creation of policies and standards to assist with the integration of computer technology.

The perception that superiors expected instructors to use PowerPoint® in the classroom is a driver to the integration of PowerPoint®. Marcinkiewicz (cited in Manternich-Wigans, 1999) found that for instructors to successfully integrate computers and the technology into their classrooms there had to be a perception on the instructors' part that integration was expected of them by management.

Barriers. Barriers are the factors in an organization that impede performance. Based on the study a number of barriers to the integration of PowerPoint® in the CFANS classroom were identified.

The most frequently identified impediment to the integration of PowerPoint® instructional presentations in the classroom was the lack of time. This finding reflects the existing literature (Epps, 1997; Falba, 1999; Mahmoud, 1998; Manternich-Wigans, 1999; Sotone-Meyer, 1999; Wilson, 1996). While the majority of instructors felt that creating PowerPoint® presentations is not too time-consuming, a clear majority of the also indicated PowerPoint® requires more time to develop than traditional instruction. Compounding this problem is a perception that the increased pace of technological change is making it difficult to keep up with technology and do the job. In addition, a majority of

respondents felt that management was not providing enough time to develop good quality instructional presentations.

The second impediment to the integration of PowerPoint® instructional presentations in the classroom was identified as lack of training. Training has been widely identified in the literature as a common deficiency in the integration of instructional technology (Mahmoud, 1998; Manternich-Wigans, 1999; O'Donnell, 1996; Wilson, 1996; Yildirim, 2000).

There were indications that lack of management involvement or recognition of instructor efforts in this area may be influencing instructor perceptions as to the value placed on developing high quality instructional presentations. There seemed to be few incentives (organizational reward or recognition) for instructors to maximize the quality of their PowerPoint® instructional presentations.

Suggestions for Further Research

This section provides a number of recommendations for further research both inside the CFANS setting and in the instructional environment at large.

Further research in the CFANS setting would provide a more complete picture of the various factors affecting the integration of PowerPoint® in the classroom. CFANS has, as a minimum, two additional populations, management and

students, which have not had the opportunity to provide input concerning the integration of PowerPoint® in the classroom. Further research is indicated to determine the perspectives of these populations concerning PowerPoint® integration as an instructional technology. In addition, an evaluative study focusing on the quality of instructional presentations created by CFANS instructors would provide complimentary data concerning how effectively the technology is being used in the classroom. The addition of this data to the present study would create a more complete picture of the integration of the instructional technology in CFANS.

Since the findings of a specific case study are not generalizable, further research on instructor perceptions regarding the integration of instructional technology is warranted, both in educational and vocational training settings.

Management perspectives from a number of instructional institutions should be examined with regard to the integration of instructional technology in general, and computer-based multimedia technology specifically. There are few, if any, studies that examine this facet of instructional technology integration.

Student perspectives from a variety of instructional institutions should be examined to provide a better

understanding of the impact of instructional technology on students.

Perhaps most importantly, would be an examination of the androgogical implications of the use of PowerPoint® in the classroom.

Recommendations

This section will present a number of recommendations based on the research findings.

As discussed in the Chapter II, performance analysis must examine the system holistically to be affective. This study has examined only one "slice of the pie". The recommendations presented are based solely on the instructors' perceptions rather than a complete analysis of the situation and must be examined from that context. There has been no input from either management or students, nor has any evaluation been carried out to determine how effectively PowerPoint® has been used as an instructional technology.

The second step in Mager and Pipe's (1970) performance analysis process was to determine whether or not a performance discrepancy is worth addressing. In brief, the following recommendations are presented for consideration.

Instructor responses indicated that consideration should be given to providing a training program on

PowerPoint® to include, not only basic technical skills but also how and when computer-based multimedia presentations should be used. Almost 100% of the respondents indicated that the best place to acquire these skills would be on the *Flight Instructor Course*. Consideration should take into account the fact that instructors overwhelmingly endorsed PowerPoint® as a valuable instructional tool. Management needs to assess this factor to determine whether the return on investment for additional training would be worthwhile. Management may also want to consider that trial and error is by far the most used method of solving problems followed by colleague assistance. Trial and error is generally considered a rather inefficient means of learning a skill. One could speculate that in the long run the instructor may actually be spending far more time and resources engaged in trial and error, or using the assistance of a colleague, than would be the case if the skills were simply provided in up-front training. In the words of one instructor, "We use PowerPoint in 99% of the lessons, yet there is no training whatsoever!"

The survey responses indicated that the majority of instructors believed that each and every method of acquiring the PowerPoint® skills is valid, emphasizing the fact that methodologies for acquiring PowerPoint® skills are not

mutually exclusive propositions and that a number of interventions can be used to compliment and supplement each other. For example, occasional professional development on the use and application of instructional technology could be used to supplement front-end training. Consideration should be given to the best means of maximizing instructional effectiveness given the methods and resources, such as time and money, available.

Management should consider providing increased time for the development of computer-based multimedia instructional presentations.

Management expectations concerning presentation quality should be explicitly stated, and possibly raised should there be an increase in the provision of lesson development time and training. Wilson (1999) advocated the creation of policies and standards for the integration of computer technology. Management should be aware of the factors that identify effective instructional presentations and ensure that instructors are also aware of them.

Management should also monitor and provide feedback to instructors. Recognition should be provided to those instructors who develop and use PowerPoint® presentations effectively.

Finally, it is important that the integration of new instructional technologies be undertaken with consideration given to factors identified as having the potential to act as either drivers or barriers to technology integration in the classroom. By identifying and acting on these barriers and drivers to performance, organizations can maintain performance in areas where that performance is already effective and improve in areas were there are performance deficiencies.

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Appendix A

CFANS INTEGRATION OF POWERPOINT IN THE CLASSROOM SURVEY

Instructor code #:

It should take you approximately 10-15 minutes to complete this survey. Unless otherwise directed, you can respond to most survey items simply by circling the letter next to the most appropriate response. However, there are a few questions which will indicate that more than one response is acceptable and three questions requiring you to rate your responses. Your time and effort taken to complete this survey is greatly appreciated. **BE ASSURED THAT ALL INDIVIDUAL SURVEY RESULTS WILL BE KEPT STRICTLY CONFIDENTIAL. AT NO TIME, UNDER ANY CIRCUMSTANCES, WILL INDIVIDUAL RESPONSES BE MADE KNOWN TO ANYONE OTHER THAN THE RESEARCHER.**

SECTION I. THE USE OF POWERPOINT IN THE CLASSROOM

This section will ask you questions referring to how you, as an instructor, employ PowerPoint as a multimedia instructional tool in the classroom. Circle the letter of the most appropriate response, unless otherwise directed.

1. Circle the letter of one of the following responses:

   a. I normally develop my own PowerPoint instructional presentations.

   b. I normally use PowerPoint presentations which are already put together.

   c. I **NEVER** use PowerPoint in the classroom. **(See the following NOTE)**

**** If you have circled response "c", which indicates that you have NEVER used PowerPoint, as a CF instructor, [redacted] now. Seal the questionnaire in the enclosed, addressed envelope and return it to Captain David Cameron, Central Flying School, through the 17 Wing internal mail system. Thank you for your participation.**

2. How often do you use PowerPoint in your classroom instruction?

   a. Every class
   b. Most classes
   c. Some classes
   d. Rarely

3. How would you rate your PowerPoint skills?

   a. Basic
   b. Intermediate
   c. Advanced

4. Place a checkmark in the appropriate column to indicate how often you have used the following PowerPoint features:

		Always	Often	Seldom	Never
a.	Text	____	____	____	____
b.	A variety of text colours and fonts	____	____	____	____
c.	A variety of background colours/designs	____	____	____	____
d.	Text animations (e.g. bullet text enters from left, right, etc)	____	____	____	____
e.	Screen transitions (e.g. fade or barn door transitions between slides)	____	____	____	____
f.	Printed slide handouts	____	____	____	____
g.	Diagrams, charts, or tables	____	____	____	____
h.	Clip art	____	____	____	____
i.	Photographs or other scanned images	____	____	____	____
j.	Black or white screen during presentation	____	____	____	____
k.	Speaker/instructor notes	____	____	____	____
l.	Special text effects (e.g. Wordart,3D and shadow)	____	____	____	____
m.	"Pen" function to mark/write on slide	____	____	____	____
n.	Object animations (e.g. appear, fly in)	____	____	____	____
o.	Video clips	____	____	____	____
p.	Audio clips (e.g. jet or clapping sounds for transition sound effects)	____	____	____	____
q.	Recorded audio (e.g. voice narration)	____	____	____	____
r.	Hyperlinks and/or bookmarks to other files or sections in the presentation	____	____	____	____
s.	Action buttons (clicking on it initiates an action, e.g., hyperlinks)	____	____	____	____
t.	Hidden slides	____	____	____	____
u.	Taking notes while in Presentation mode	____	____	____	____
v.	automatic timings for bullets and/or transitions	____	____	____	____
w.	Autoshapes (to develop your own images)	____	____	____	____

5. As an instructor, what 3 PowerPoint features do you find most useful?

(1) _____

(2) _____

(3) _____

SECTION II. DEVELOPMENT OF POWERPOINT SKILLS

This section will ask you questions regarding the acquisition of PowerPoint skills. Circle the letter next to the most appropriate response or place a checkmark in the most accurate category. Some questions may allow more than one response.

1. I believe, with regard to developing good quality instructional PowerPoint presentations that:

a. I require more training in the use of PowerPoint.
b. more training in the use of PowerPoint would be nice, but is not required.
c. I have had more training in PowerPoint than I require.

2. I learned PowerPoint (circle **ALL** letters which apply):

a. through trial and error
b. by using the help function
c. by using the manual
d. with the assistance of co-workers
e. through formal training in the use of PowerPoint
f. with the assistance of an in-house computer technologist
g. during unit professional development programs

3. Which methods would you be likely to use to help solve a problem encountered while creating a presentation. Place a checkmark in the appropriate blank for each statement. (You may only use "Always" once, of course.)

	Always	**Often**	**Sometimes**	**Never**
a. the manual	____	____	____	____
b. the electronic help function	____	____	____	____
c. a knowledgeable colleague	____	____	____	____
d. an in-house computer technologist	____	____	____	____
e. trial and error	____	____	____	____

4. How do you believe CFANS' instructors should be acquiring the necessary skills to develop acceptable quality instructional presentations? (Place a checkmark in the appropriate blank for each statement).

	highly recommended	**recommend**	**not required**
a. informal methods such as trial and error or colleagues	____	____	____
b. formal introduction to basic PowerPoint functions during the instructor course	____	____	____
c. increased out-service training for individual instructors	____	____	____
d. occasional in-house professional development programs for all instructors	____	____	____
e. provision of in-house PowerPoint presentation development support	____	____	____

f. Do you have any other suggestions?_____

_____

_____

SECTION III. INSTRUCTOR PERCEPTIONS OF POWERPOINT INTEGRATION

Indicate your agreement with each of the following statements by circling the number in the appropriate column that agrees with your choice.

1. **Strongly Disagree** 2. **Disagree** 3. **Agree** 4. **Strongly Agree**		Strongly Disagree	Disagree	Agree	Strongly Agree
1.	Superiors encourage the utilization of PowerPoint presentations in the classroom.	1	2	3	4
2.	Superiors realize that extra time is required to develop quality instructional PowerPoint presentations and provides extra lesson development time.	1	2	3	4
3.	There is sufficient access to adequate technology: computers, software and accessories (e.g. scanner, digital camera, etc.) to develop quality PowerPoint presentations.	1	2	3	4
4.	Superiors recognize and reward the extra effort made by instructors in the development of PowerPoint presentations.	1	2	3	4
5.	I feel pressured to present my lessons in PowerPoint whether or not I feel it is the appropriate method.	1	2	3	4
6.	Superiors discourage the use of PowerPoint in the classroom.	1	2	3	4
7.	There is adequate administrative support, such as: job aids, templates, and standard operating procedures for completing lesson plans and presentations.	1	2	3	4
8.	There is adequate in-house technical support available.	1	2	3	4
9.	Computer technology is prone to failure.	1	2	3	4
10.	PowerPoint does not allow flexibility in instruction.	1	2	3	4
11.	More time is required to develop PowerPoint presentations than traditional instruction.	1	2	3	4
12.	PowerPoint imposes limitations on classroom instruction which was not present in traditional instruction.	1	2	3	4
13.	PowerPoint assists instructors to logically organize their lessons.	1	2	3	4
14.	Students react positively to PowerPoint presentations.	1	2	3	4
15.	PowerPoint is nothing more than a flashy light-show.	1	2	3	4
16.	The use of PowerPoint increases student interest in the lessons.	1	2	3	4
17.	The increased pace of technological change is making it difficult to do your job and keep up with technology.	1	2	3	4

1. Strongly Disagree **2. Disagree** **3. Agree** **4. Strongly Agree**	Strongly Disagree	Disagree	Agree	Strongly Agree
18. PowerPoint improves the quality of my instruction.	1	2	3	4
19. PowerPoint is replacing good instruction with poor instruction.	1	2	3	4
20. Instructing is much easier with PowerPoint.	1	2	3	4
21. I believe the quality of instruction, in general, has declined in quality since the introduction of PowerPoint.	1	2	3	4
22. Creating PowerPoint presentations is too time consuming.	1	2	3	4
23. Creating PowerPoint presentations is frustrating.	1	2	3	4
24. The "special effects" often used in PowerPoint presentations are more overused and irritating than useful.	1	2	3	4
25. Using PowerPoint is too complicated.	1	2	3	4
26. I believe many instructors overuse PowerPoint in the classroom.	1	2	3	4
27. I believe PowerPoint is a valuable instructional tool.	1	2	3	4
28. PowerPoint shifts interest and focus away from the content of the lesson onto the presentation.	1	2	3	4
29. PowerPoint type classroom instruction is the 'way of the future' and any instructor who does not become competent using such technology in the classroom will soon become obsolete.	1	2	3	4
30. Instructional time spent in developing PowerPoint presentations could be better spent elsewhere.	1	2	3	4
31. I receive frequent, or at least occasional, feedback from superiors on the quality of my use of PowerPoint in classroom instruction.	1	2	3	4
32. The School has clear guidelines on how and when PowerPoint should be used in the classroom.	1	2	3	4
33. Classroom instructors who are proficient in PowerPoint are thought of as being more qualified and skilled than those who are weak in the use of PowerPoint.	1	2	3	4

SECTION IV. OPEN-ENDED QUESTIONS

1. List one to three things that management is doing, and should continue to do, that assists instructors to develop quality PowerPoint instructional presentations?

_____

_____

_____

2. List one to three of the biggest problems impeding you from developing high quality PowerPoint instructional presentations?

_____

_____

_____

3. Is there anything the school or the CF should be doing to assist instructors to improve the quality of PowerPoint instructional presentations at the school?

_____

_____

_____

The time you have taken to complete this survey is very much appreciated. Please seal the completed survey in the self-addressed envelope provided and return it, using the 17 Wing internal mail system, to Captain David Cameron, Central Flying School.

Appendix B

Responses to Close Ended Questions

SECTION I. THE USE OF POWERPOINT IN THE CLASSROOM

This section will ask you questions referring to how you, as an instructor, employ PowerPoint as a multimedia instructional tool in the classroom. Circle the letter of the most appropriate response, unless otherwise directed.

1. Circle the letter of one of the following responses:

(9) a. I normally develop my own PowerPoint instructional presentations.

(16) b. I normally use PowerPoint presentations which are already put together.

(0) c. I **NEVER** use PowerPoint in the classroom. **(See the following NOTE)**

**** If you have circled response "c", which indicates that you have NEVER used PowerPoint, as a CF instructor, [redacted] now. Seal the questionnaire in the enclosed, addressed envelope and return it to Captain David Cameron, Central Flying School, through the 17 Wing internal mail system. Thank you for your participation.**

2. How often do you use PowerPoint in your classroom instruction?

(19) a. Every class
(7) b. Most classes
(0) c. Some classes
(0) d. Rarely

3. How would you rate your PowerPoint skills?

(4) a. Basic
(16) b. Intermediate
(6) c. Advanced

4. Place a checkmark in the appropriate column to indicate how often you have used the following PowerPoint features:

		Always	Often	Seldom	Never
a.	Text	21	5	0	0
b.	A variety of text colours and fonts	9	13	4	0
c.	A variety of background colours/designs	2	13	10	0
d.	Text animations (e.g. bullet text enters from left, right, etc)	6	8	10	2
e.	Screen transitions (e.g. fade or barn door transitions between slides)	3	5	12	6
f.	Printed slide handouts	2	14	9	1
g.	Diagrams, charts, or tables	4	13	9	0
h.	Clip art	2	7	13	4
i.	Photographs or other scanned images	3	12	9	2
j.	Black or white screen during presentation	1	2	12	11
k.	Speaker/instructor notes	17	8	1	0
l.	Special text effects (e.g. Wordart,3D and shadow)	3	7	11	5
m.	"Pen" function to mark/write on slide	0	0	6	19
n.	Object animations (e.g. appear, fly in)	3	5	12	5
o.	Video clips	0	1	10	14
p.	Audio clips (e.g. jet or clapping sounds for transition sound effects)	0	0	8	18
q.	Recorded audio (e.g. voice narration)	0	0	2	24
r.	Hyperlinks and/or bookmarks to other files or sections in the presentation	0	2	6	18
s.	Action buttons (clicking on it initiates an action, e.g., hyperlinks)	0	2	9	15
t.	Hidden slides	0	10	12	4
u.	Taking notes while in Presentation mode	0	3	3	19
v.	automatic timings for bullets and/or transitions	0	0	6	20
w.	Autoshapes (to develop your own images)	0	11	5	10

SECTION II. DEVELOPMENT OF POWERPOINT SKILLS

This section will ask you questions regarding the acquisition of PowerPoint skills. Circle the letter next to the most appropriate response or place a checkmark in the most accurate category. Some questions may allow more than one response.

1. I believe, with regard to developing good quality instructional PowerPoint presentations that:

(8) a. I require more training in the use of PowerPoint.
(12) b. more training in the use of PowerPoint would be nice, but is not required.
(6) c. I have had more training in PowerPoint than I require.

2. I learned PowerPoint (circle **ALL** letters which apply):

(22) a. through trial and error
(10) b. by using the help function
(4) c. by using the manual
(17) d. with the assistance of co-workers
(6) e. through formal training in the use of PowerPoint
(1) f. with the assistance of an in-house computer technologist
(2) g. during unit professional development programs

3. Which methods would you be likely to use to help solve a problem encountered while creating a presentation. Place a checkmark in the appropriate blank for each statement. (You may only use "Always" once, of course.)

		Always	Often	Sometimes	Never
a.	the manual	0	1	7	13
b.	the electronic help function	2	10	13	1
c.	a knowledgeable colleague	5	15	5	1
d.	an in-house computer technologist	0	1	11	9
e.	trial and error	2	20	3	0

4. How do you believe CFANS' instructors should be acquiring the necessary skills to develop acceptable quality instructional presentations? (Place a checkmark in the appropriate blank for each statement).

		highly recommended	recommend	not required
a.	informal methods such as trial and error or colleagues	1	21	4
b.	formal introduction to basic PowerPoint functions during the instructor course	15	9	3
c.	increased out-service training for individual instructors	8	5	10
d.	occasional in-house professional development programs for all instructors	4	12	9
e.	provision of in-house PowerPoint presentation development support	5	9	11

SECTION III. INSTRUCTOR PERCEPTIONS OF POWERPOINT INTEGRATION

Indicate your agreement with each of the following statements by circling the number in the appropriate column that agrees with your choice.

1. **Strongly Disagree** 2. **Disagree** 3. **Agree** 4. **Strongly Agree**	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
1. Superiors encourage the utilization of PowerPoint presentations in the classroom.	0	1	14	11
2. Superiors realize that extra time is required to develop quality instructional PowerPoint presentations and provides extra lesson development time.	7	8	11	0
3. There is sufficient access to adequate technology: computers, software and accessories (e.g. scanner, digital camera, etc.)to develop quality PowerPoint presentations.	1	1	15	9
4. Superiors recognize and reward the extra effort made by instructors in the development of PowerPoint presentations.	8	11	7	0
5. I feel pressured to present my lessons in PowerPoint whether or not I feel it is the appropriate method.	2	16	6	2
6. Superiors discourage the use of PowerPoint in the classroom.	18	7	0	1
7. There is adequate administrative support, such as: job aids, templates, and standard operating procedures for completing lesson plans and presentations.	0	8	15	2
8. There is adequate in-house technical support available.	1	4	19	2
9. Computer technology is prone to failure.	2	13	8	3
10. PowerPoint does not allow flexibility in instruction.	6	18	2	0
11. More time is required to develop PowerPoint presentations than traditional instruction.	0	7	13	5
12. PowerPoint imposes limitations on classroom instruction which was not present in traditional instruction.	7	16	2	1
13. PowerPoint assists instructors to logically organize their lessons.	0	3	16	7
14. Students react positively to PowerPoint presentations.	0	1	21	4
15. PowerPoint is nothing more than a flashy light-show.	10	15	0	1
16. The use of PowerPoint increases student interest in the lessons.	2	6	16	1
17. The increased pace of technological change is making it difficult to do your job and keep up with technology.	4	13	9	0

1. Strongly Disagree **2. Disagree** **3. Agree** **4. Strongly Agree**	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
18. PowerPoint improves the quality of my instruction.	1	5	16	3
19. PowerPoint is replacing good instruction with poor instruction.	4	21	0	1
20. Instructing is much easier with PowerPoint.	0	7	18	0
21. I believe the quality of instruction, in general, has declined in quality since the introduction of PowerPoint.	6	19	1	0
22. Creating PowerPoint presentations is too time consuming.	0	19	5	2
23. Creating PowerPoint presentations is frustrating.	2	15	7	2
24. The "special effects" often used in PowerPoint presentations are more overused and irritating than useful.	0	3	14	9
25. Using PowerPoint is too complicated.	6	20	0	0
26. I believe many instructors overuse PowerPoint in the classroom.	1	20	4	1
27. I believe PowerPoint is a valuable instructional tool.	0	1	19	6
28. PowerPoint shifts interest and focus away from the content of the lesson onto the presentation.	3	18	4	1
29. PowerPoint type classroom instruction is the 'way of the future' and any instructor who does not become competent using such technology in the classroom will soon become obsolete.	1	8	11	5
30. Instructional time spent in developing PowerPoint presentations could be better spent elsewhere.	2	20	3	1
31. I receive frequent, or at least occasional, feedback from superiors on the quality of my use of PowerPoint in classroom instruction.	9	10	7	0
32. The School has clear guidelines on how and when PowerPoint should be used in the classroom.	5	9	9	2
33. Classroom instructors who are proficient in PowerPoint are thought of as being more qualified and skilled than those who are weak in the use of PowerPoint.	4	11	10	0

Appendix C

Cover Letter to Participants

4500-1 (CFS TDO)

23 Apr 2001

Good-day,

I am the Central Flying School Training Development Officer and I am currently involved in research for the completion of a Masters of Education thesis at the University of Manitoba. I am seeking your assistance for this research. The topic deals with the integration of PowerPoint in classroom instruction.

CFANS is a recognized instructional leader in the Canadian Airforce. Your input, through the completion of the attached survey, will provide valuable data which may be used to assist with the integration of instructional technology in other CF training establishments. The survey is supported by Comdt CFANS who has provided permission for the research to be conducted. Upon completion of the research a summary of findings will be mailed to Comdt CFANS and to CFANS instructors.

This protocol has been approved by the Research Ethics Board. You may direct any ethical concerns to the University of Manitoba Human Ethics Secretariat at (204) 474-7122. Be assured that individual surveys will be kept strictly confidential and in a secure location. The survey form you have received has an identification code for distribution and tracking purposes only. Once the data collection phase of the research is complete all identifying records will be destroyed. No one, other than myself, will have access to your completed survey and the results will be published in such a way that no individual responses can be identified.

Your participation in the survey is voluntary. You may choose not to participate in this study without prejudice or consequences. I do, however, encourage you to respond as there is not a large sample population and therefore every response is important in order to validate the research findings. Completion of the survey will be interpreted as voluntary and informed consent. I estimate that only 10-15 minutes of your time will be required.

When you have completed the survey, please return it in the pre-addressed envelope provided by 11 May 2001.

If you have any questions feel free to contact me at .

Thank you for your time and assistance.

Sincerely,

B. David Cameron
Captain
Central Flying School (Operational Training and Human Factors Flight)

Enclosure: 1

Appendix D

Follow-up Cover Letter to Participants

4500-1 (CFS TDO)

29 May 2001

Good-day,

On the 23 April 2001, you were provided with a survey dealing with the integration of PowerPoint in classroom instruction and requested to respond to the survey by 11 May. My records indicate that I have not received your response so I am providing you with a second survey in case the original survey has become lost or misplaced in some manner.

Your assistance for this research is very important, particularly because of the small sample size. The survey is supported by Comdt CFANS who has provided permission for the research to be conducted. Upon completion of the research a summary of findings will be mailed to Comdt CFANS and to CFANS instructors.

This protocol has been approved by the University of Manitoba Research Ethics Board. You may direct any ethical concerns to the University of Manitoba Human Ethics Secretariat at (204) 474-7122. Be assured that individual surveys will be kept strictly confidential and in a secure location. The survey form you have received has an identification code for distribution and tracking purposes only. Once the data collection phase of the research is complete all identifying records will be destroyed. No one, other than myself, will have access to your completed survey and the results will be published in such a way that no individual responses can be identified.

Your participation in the survey is voluntary. You may choose not to participate in this study without prejudice or consequences. Completion of the survey will be interpreted as voluntary and informed consent. I estimate that only 10-15 minutes of your time will be required.

When you have completed the survey, please return it in the pre-addressed envelope provided by 14 June 2001.

If you have any questions feel free to contact me at

Thank you for your time and assistance.

Sincerely,

B. David Cameron
Captain
Central Flying School (Operational Training and Human Factors Flight)

Enclosure: 1