

A QUALITATIVE INQUIRY OF EDUCATIONAL
REQUIREMENTS
OF SELECTED PROFESSIONS IN THE OKLAHOMA
AEROSPACE INDUSTRY

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CHAPTER I

INTRODUCTION

Oklahoma has been at the forefront of aviation innovation and history since the early beginnings of human flight. Since then, aerospace has become a driving force in Oklahoma's economy.

A 1999 Final Report to the Oklahoma Aeronautics and Space Commission reported 143,700 direct, indirect and induced jobs occupied within the state yielding \$4.7 billion in payroll. In addition to the \$4.7 billion generated by payroll income, \$11.7 billion in industrial output along with \$77 million in state income tax and \$60.6 million in state sales tax revenues were also generated within the Oklahoma Aerospace Industry (Penn, 1999).

The growth in the industry is reflected in the Oklahoma Aerospace Industry Workforce: 2007 Report (Oklahoma Department of Commerce, 2007) which estimated commercial aviation direct and indirect output in 2004 had grown to nearly \$12.4 billion which translated to approximately 10% of Oklahoma's industry output. Aerospace employment opportunities continue to expand through 2007 as the total number of Oklahomans working in the aerospace industry is estimated to be around 150,000 making this vocation one of the state's top employment fields. The 2007 Report also stated that Tinker Air Force Base is not only Oklahoma's largest aerospace employer but it also

serves as one of its biggest economic engines by pumping \$2.7 billion into the statewide economy each year. Many of the Oklahoma aerospace industry occupations are in direct support of Tinker. Educational support for those occupations involves addressing specific related skill gaps identified in the Report. (Oklahoma Department of Commerce, 2007).

This qualitative study examines educational requirements for selected professions in the Oklahoma aerospace industry in order to determine possible gaps in availability of appropriate curricula. Educational gaps can threaten Oklahoma's ability to continue to attract aerospace employers and high paying jobs to the state. Previous research has been limited to those positions which generally involve touch labor such as sheet metal workers, structural assemblers, machinists, aircraft painters, mechanics and technicians, and entry level production and maintenance workers. Very little research has been done on that portion of the industry that requires college education.

In order for Oklahoma to maintain a leading role in the aerospace industry, collaborative efforts among industry, state government, and higher educational institutions must be cohesive. The key to success is in identifying educational requirements and providing specific curricula necessary to address gaps in the educational pipeline that can affect employment within the professional segment.

Statement of the Problem

There is a segment of the Oklahoma aerospace industry that consists of aerospace positions which do not constitute touch labor and have not been included in previous

research to determine their educational requirements. Such positions as general and operational managers, management analysts, research analysts, computer software engineers, information clerks, logisticians, and professional or administrative personnel have been omitted from previous studies by the Oklahoma Department of Commerce and other state institutions. These and other selected professions, sometimes referred to as intellectual capital professions, comprise that segment of the Oklahoma aerospace industry which requires college level education. Educational requirements and gaps in the availability of curricula to meet the needs of that segment of the industry should be identified and addressed.

Purpose of the Study

The purpose of this qualitative inquiry was to identify educational requirements for selected professions within the Oklahoma Aerospace industry in order to assess and address possible gaps in the educational pipeline. Interviews of incumbents of those selected positions which comprise the *intellectual capital* segment of the aerospace industry could provide a rich source of data for determining educational requirements of that segment of the educational pipeline. This qualitative study focused on a cross-section of *intellectual capital* positions within one Oklahoma aerospace organization, the Boeing Company, which was believed to be representative of the aerospace industry in the state.

Research Questions

The following research questions were answered by the study.

1. What is the educational background of selected professional administrative personnel in the Oklahoma aerospace industry and does this background satisfy the requirements of those positions.

2. What educational requirements are essential for progression within specified fields in the Oklahoma aerospace industry? Where can those educational requirements be obtained?

3. What gaps are identified by incumbents regarding availability of education necessary to meet the needs of Oklahoma aerospace industry and how can those gaps be addressed by academic institutions in Oklahoma?

Assumptions

The following assumptions were made during the course of the study:

1. The responses were self-report and assumed to be honest and accurate and will provide a portrait of the interviewee's perceptions.

2. The incumbents interviewed during the study were occupying positions that were representative of similar aerospace organizations within the state of Oklahoma.

Scope and Limitations

The scope of the study was limited to a cross section of professional positions within one aviation organization in Oklahoma believed to be representative of the aerospace industry. These positions were specifically selected to provide an overview of

the educational requirements for key positions within the company. Although the study focused on a single company, data obtained from interviewee responses could be used to anticipate trends within the industry and identify areas for future study. The study also sought to determine gaps in educational requirements that could prevent career progression within the organization.

The study was limited by the following:

1. Collection of data was limited to one aerospace organization purposively chosen because it was believed to be representative of most of the aerospace industry organizations in the state.
2. The study was also limited to the number of personnel available within the Boeing Company's Oklahoma City Site.
3. The responses to the questions were opinions of the interviewee and not necessarily of the organization as a whole.
4. The findings of this study cannot be generalized to other populations since they were focused on a selected sample of personnel in one Oklahoma aerospace organization believed to be representative of the industry as a whole.

Definitions of Key Terms

Conceptual Definitions

MRO Facility – Maintenance, Repair and Overhaul facility. Aircraft Maintenance, Repair and Overhaul refers to services provided for aircraft, relating to the regular upkeep

and airworthiness using specially trained personnel and equipment. (AWSP, 2008).

Operational Definitions

Aerospace Industry - Aviation or space related business or organization that has a defined mission involving organized flight of vehicles or persons.

Aircraft Repair Facilities – Physical building or location used to conduct modifications, repair, and overhaul on aircraft and/or its systems.

Educational Gap - The absence of the training, educational background, and experience necessary to perform at a given level of scholastic endeavor.

Educational Institutions – An entity who has defined its function or mission to include academic instruction for the purpose of educating a population for employability.

Educational Pipeline – A method or procedure, either formal or informal, that attracts or feeds students from one educational setting to another. An example of a formalized pipeline is a transfer articulation agreement between a university and a community college that assures full acceptance of academic coursework under the associate degree by the university.

Global Economy – The exchange of goods and/or services which affects financial infrastructure on a global scale.

Higher Education – Education beyond the secondary school level to include four year colleges, universities, community colleges and institutions of technology.

Intellectual Capital – Professional level personnel within an organization who have

acquired knowledge, skills, and necessary qualifications, through completion of baccalaureate, graduate or post-graduate degree programs for the purpose of adding value to an organization or industry.

Job Description - A written statement identifying work objectives, tasks, and personal responsibilities required to meet the performance standards for a specified job title.

Logistics - The management and/or control of procurement, movement, and continuous supply of goods, services, and other resources within the aerospace industry.

Supply Chain Management – The management, planning, coordination, and implementation of a product’s supply chain to include the entire route of product lifespan, from development to consumption.

Touch Labor – A term often used to identify aerospace personnel who literally or figuratively work *hands on* with the final aviation or aerospace product. Touch labor personnel or positions typically do not require higher education baccalaureate degrees but obtain certifications through vocational and technical centers. Examples include: aircraft mechanics, painters, avionics technicians, sheet metal worker, etc...

University - An institution of higher learning characterized by scholarly teaching and research which grant academic degrees at the bachelors, masters, and doctoral levels in a variety of disciplines.

Workforce – Individuals occupying and performing specific tasks for employment positions within the aerospace industry.

CHAPTER II

REVIEW OF LITERATURE

Introduction

The purpose of this study was to identify requirements and educational gaps for selected intellectual capital positions within the Oklahoma aerospace industry. Much of previous aerospace educational research in Oklahoma has involved those who occupy touch labor positions within the industry. Such positions as general and operational managers, management analysts, research analysts, computer software engineers, information clerks, logisticians, and other professional or administrative personnel have been excluded. A series of interviews of incumbents occupying some of those positions could provide valuable insight into the educational needs of aerospace industry personnel.

Because the aerospace industry is a dynamic industry that has been in a constant state of change since the Wright brothers made the first manned flight in 1903, educational requirements have also changed rapidly with advancements in technology and other industry requirements. In that environment previous research can rapidly become obsolete and ongoing research is essential to expanding the body of knowledge.

Qualitative Inquiry Literature Review

Consistent with the dynamics of the industry and the nature of qualitative study, the review of the literature for this study was somewhat limited. According to L.R. Gay, the review of the literature and study of previous research and theory plays a significantly different role in qualitative and quantitative study. Gay states that qualitative inquiry is based on inductive reasoning and “an extensive review of the literature is not characteristic of qualitative research. The qualitative researcher wants to be open enough to get insights not necessarily predictable based on past research efforts” (Gay, 1996, p. 212). “One of the chief reasons for conducting a qualitative study is that the study is exploratory; not much has been written about the topic or population being studied, and the researcher seeks to listen to informants and to build a picture based on their ideas” (Creswell, 1994, p. 21).

This review examined the literature related to 1) national trends in aerospace industry growth and technology; 2) the impact of those trends and other rapidly changing dynamics on aerospace educational requirements; 3) Oklahoma aerospace industry trends; and 4) potential requirements and gaps in academic support to the industry. Very little literature was found specific to educational requirements and gaps in availability of those requirements for intellectual capital personnel working in the aerospace industry.

Aerospace Industry National Trends

Industry Growth

The aviation industry in the United States is growing at a record pace. During 2006, a record 741 million people traveled using commercial air transportation (FAA Aerospace Forecast Fiscal Years 2007-2020, 2007). It is estimated that over two-million people travel by air each day and around one-third of the value of all goods are transported by air cargo. The Federal Aviation Administration's 2009 Fiscal Year Budget in Brief states that the total numbers of passengers traveling by air is increasing and is expected to double within the next decade. It is estimated that the total number of people using air as their primary method of travel could reach more than a billion by the year 2015. (FAA FY 2009 Budget in Brief, 2006).

The economic impact of this industry is staggering. Government research has outlined several important statistics which show that primary and related aviation and aerospace makes up approximately 9% of America's Gross Domestic Product and is the fastest growing source for technological exports (FAA FY 2009 Budget in Brief, 2006).

Industry growth and trends indicate that the industry as a whole will see additional stress within the next decade. As the total number of air passengers increase to record levels, the demands placed on our national airspace system continues to rise to critical levels. The United States Department of Transportation's Bureau of Transportation Statistics showed that 18.90% of Causes of National Aviation System Delays can be

attributed to volume (DOT, 2007).

The Federal Aviation Administration says that changes in the airspace system are crucial and reports that by the year 2014 we could see additional flight delays 62% higher than what they are today. With various commercial flight delays, passengers are turning to alternate sources for traveling by air. Some of that travel is being redefined by what some are calling a new air-taxi service that comes in the form of very light jets. These relatively inexpensive twin-engine micro-jets will add 350 new planes into the airspace system in 2008 alone and could grow to near 500 by 2020 (FAA Aerospace Forecast Fiscal Years 2007-2020). In the Governor's Council for Workforce and Economic Development: Oklahoma's Aerospace Industry Workforce: 2007 Report, experts predict that over the course of the next 20 years the worldwide fleet of new aircraft could top 27,200 new planes (Oklahoma Department of Commerce ODOC, 2007).

All of this data significantly impacts employment levels in the industry and employees must have the education necessary to perform the ever-changing responsibilities of their positions within the industry.

Aerospace Employment

Although this increase in the number of new aircraft entering the air transportation system may add additional congestion to the airspace system, it also translates to the creation of new jobs within the industry. However, it is even more important that the industry be able to maintain their current workforce capabilities.

An immediate and critical problem that currently exists within the aerospace system is its aging workforce and their pending retirements. Statistics regarding this segment of the workforce are available through multiple resources but the Commission on the Future of the United States Aerospace Industry reported in November of 2002 that nearly 27% of all aerospace workers are eligible to retire in 2008. The report highlighted this statistics by listing the average age for workers in the commercial aerospace area to be 44 years old, workers in national defense was 53, and 51 years old at the National Aeronautics and Space Administration (Commission on the Future of US Aerospace Industry, 2002).

Aerospace Intellectual Capital Requirements and Educational Gaps

These numbers illustrating possible retirements show a possible gap in intellectual capital developing which could cripple the industry. Even if new replacement workers enter the aerospace industry; the knowledge, experience, and relationships built over time will be difficult to replace (Commission on the Future of the United States Aerospace Industry, 2007)

Aviation Week & Space Technology reported in their article, *Shades of Gray*, (2004) that some aerospace companies say it is becoming more and more difficult to replace gaps in intellectual capital citing difficulties in replacing systems and software engineers. The imminent problem was further outlined in a study which showed 39% of

aerospace executives surveyed said they cannot find the help they need. (*Aviation Week & Space Technology*, 2004).

A 2007 workforce study completed by *Aviation Week & Space Technology* reported that there were approximately 40,000 job openings in the aerospace and defense industry by mid-year (Hedden, 2007). Even with numbers indicating a growth trend in industry employment opportunities, some aerospace and defense organizations are experiencing a shortage of workers with skills specific to the respective job. The deficiency affects both new hires and their experienced workforce already in place. Seat (2006) reported that 75% of current aerospace employees will need continuing education and training in order to maintain their current job. New college graduates are not immune to re-training either as the report indicates new employee skill sets will become stale within two years. Seat (2006) reported that 80% of the jobs will require at least some post-secondary education within the next 10 years. In addition, Seat stated that companies must prepare to educate their own workforces as only 63% of youths enroll in college and 30% receive bachelor's degrees (Seat, 2006).

Identifying and Addressing Intellectual Capital Skill Gaps

Industry/Academic Planning and Guidance

In order to succeed in identifying and addressing intellectual capital skills gaps, the aerospace industry and academia must adapt to industry changes. They must assess needs

and respond to those needs in innovative new ways through collaboration and creative partnerships.

The American Society of Training and Development (2006) issued a report called *Bridging the Skills Gap* that could assist business leaders in developing action plans and processes to meet the needs of employees as well as organizations. The report highlighted hard and soft skill deficiencies in such areas as: basic skills (reading, writing and arithmetic used in customer service and communications); technical professional skills (computer technology and specialized industry); management and leadership (supervision, team-building, goal-setting, planning, motivating, decision making, and ethical judgment); and emotional intelligence (self-awareness, self-discipline, persistence and empathy). This guidance for academia and industry is invaluable in planning for closing the gap in skills deficiencies (ASTD, 2006).

Needs Assessment and Curriculum Design

Assessment and periodic re-assessment of skill gaps within the aerospace industry provide the foundation for identifying curricula necessary to build intellectual capital. Watkins and Kaufman (1996, p. 13) state that a needs assessment “identifies gaps in results, places them in order of priority, and selects the most important for closure or reduction.” According to Rothwell and Kazanas (1994, p. 57), a needs assessment can be comprehensive or situation-specific. Needs assessment directed at intellectual capital positions as an identifiable target group already have a constituency of interested

stakeholders eager to support efforts to solve the problem. According to Rothwell and Kazanas, key line managers and other interested groups should participate in each step of design of the needs assessment plan and interpreting the results. Needs assessment followed by curricula development, academic/industry collaboration, implementation of creative partnerships, and evaluation should be part of a continual joint planning process.

According to MacLeod in *Training Design in Aviation* (2001), performance assessment involves identifying the component parts of job performance: what they do (actions) and the controlling activities they use to be expert at doing their jobs (control of action). Control of action describes the mental processes involved in defining the problem, gathering data, formulating plans, monitoring progress, and the daily automatic routines. This involves Task Analysis and Education Needs Analysis of what is needed to perform in a competent manner. By interviewing techniques we can get a sense of the problems students have in acquiring expertise. We can interview both the performer and the employer and do comparative analysis if necessary. (MacLeod, 2001)

Educational needs assessment is the first in a series of steps leading to identification of requirements and skill gaps in the educational pipeline of intellectual capital. Analysis of aerospace industry educational requirements must begin at that level and be followed by collaborative curriculum design between industry and academia.

Industry Academic Collaboration

Curriculum Design

Building curriculum can and should involve the stakeholders including academic personnel, the recipients of the education (the employee) and the recipient of the benefits of the education (the aerospace employer or executive). All have an important stake in the outcome of the educational process.

Executives play a vital role in that process. According to the American Society of Training and Development (ASTD) Handbook (1996) “executives by nature are highly pragmatic....and their development programs are, therefore, related strongly to business issues. They “learn best when they are working on relevant business issues, problems and processes”(p. 624). Their own development is “most successful when it is linked with other HR systems so that they support one another” (p. 633). Their input and support for curriculum development for their employees both during needs assessment and development of course content can be a valued resource for academic personnel. Collaboration beginning at the executive level and other levels throughout the organization streamlines the development of intellectual capital tailor-made for industry requirements.

Once curriculum objectives and course content have been identified by the assessment process, the instructional strategies become the primary responsibility of academic personnel but learning events can be enhanced by continued collaboration with industry.

Their involvement can also enhance instruction delivery through support with guest speakers, real-world case studies or simulations, job shadowing assignments, mentoring assignments, capstone activities, internships, industry-academic hiring contracts, partnerships and many other creative learning activities.

According to the constructivist framework for understanding learning, “learners actively construct knowledge by integrating new information and experiences into what they have previously come to understand, revising and reinterpreting old knowledge in order to reconcile it with the new” (Billett, 1996; Kerka, 1997). According to Knowles (1979), “the resource of highest value to adult education is the learner’s experience....Experience is the adult learner’s living textbook” (p.29). Thus the importance of building and combining experience with contextual learning in the environment of their employment can be extremely valuable. The executive and management of the organization play a vital role in the development of their own intellectual capital.

Finally, executives and managers can play a vital role in using their own experience in actual classroom teaching. “In 2004 the Executive Development Association surveyed the Global 500 and other major corporations on current trends related to using leaders as teachers. Two-thirds of the responding companies indicated that their senior and executive managers, CEOs and elected officers would be participating in leadership development programs, 25% of which would teach or serve as faculty in executive and management development.” (Bolt, 2005, p. 70)

Partnerships

Industry executives can also encourage and provide support to academic partnerships related to addressing gaps in degree availability and other issues that support development of intellectual capital. Academic and industry partnerships are just one of many tools available to identify and address the intellectual capital requirements of an industry. Partnerships between industry and academia not only help each other but it helps the professional workforce as well. Gildan and Gray (1985) referred to Krecht's 1983 study which showed that partnerships are not a new idea and cited a 1974 plan that involved Boston businesses pairing up with high schools.

Many of the partnerships under development today involve industry and higher education working together to identify specific skills needed in the workplace. Meister (1998) commented in *Forging Partnerships with Institutions of Higher Education* that businesses are working hand in hand with higher education to foster the development of joint degree programs in order to meet knowledge and competencies required for success. Collaboration between industry and higher education has been difficult at times but Reinhartsen (2003) commented that there are at least three things both parties agree on which include: additional education promotes economic growth, improved quality of life, and the world is changing faster than expected or anticipated.

The key to success for both parties is to openly discuss a shared vision. A shared vision is critical for both industry and academia because it becomes a "win/win" proposition.

Higher education wins through cooperative partnerships for several reasons. The first reason is that it combines resources for research that it may not have otherwise by blending theoretical with the practical (Gildan and Gray, 1985). What is typically used in the classroom setting may not necessarily be the method used in the corporate environment.

The second reason higher education wins is from an economic standpoint. Meister (1998) reported that customized executive education programs generate approximately three billion dollars a year for universities. A college degree developed through collaborative effort to meet an industry need directly benefits the academic institution through increased enrollment numbers. The increased enrollment increases revenue and ultimately has an economic impact within the community. An economic slowdown generally decreases available money from state appropriations. Thus it becomes even more critical for educational institutions to foster partnerships with business and industry in order to make up for the loss in revenue. One area where schools are making up financial ground is through various educational programs tailored to professionals.

Businesses stand to gain from partnerships as well. Partnering with higher education, and the subsequent development of industry tailored degrees, helps establish a natural pipeline of qualified job applicants. Today's corporate environment is a constantly changing global market that has employers seeking new ways to attract, train, and maintain the best talent possible (Caro, 2007). Several aerospace companies place value in educating their workforce but training comes at a high cost for some.

Oklahoma Aerospace Education

Industry Trends and Growth

Mark C. Snead of the University of Oklahoma, Center for Applied Economic Research, prepared the Greater Oklahoma City Region Aerospace and Aviation Industry Economic Impact Survey for 2005 for the Oklahoma City Chamber of Commerce.

Although the survey targeted a specific geographical area only, it is Oklahoma County and the Oklahoma City area which has the largest representation in the state of aerospace industry with nearly 70% of the employers and 98% of the jobs. The results of the Survey indicated that 265 public and private sector employers were directly engaged in the aerospace and aviation activities in the greater Oklahoma City region in 2005 with a total of 38,000 workers. Another 31,600 workers were employed as contract workers for a total of 73,600 workers in the industry earning \$2.9 billion in income and producing \$6.1 billion in goods and services. He developed the report based on Industry Groups and their employment including Federal Government/Military with 31,778 employees, Tinker AFB contractors with 2,079 employees, Air Transportation with 1,802 and Manufacturing and Maintenance 2,287 employees (Snead, 2005).

The Oklahoma Department of Commerce (2007) Draft Report surveyed Oklahoma aerospace industry and the results indicated strong demand with additional growth demand expected for the next five to ten years. The study indicated that “comparative growth patterns in border states such as Arkansas, Kansas, Missouri, and Texas will generate

Significant external demand for Oklahoma workers heating up the market in some occupations and regions” (DOC Report 2007).

Employment Trends

According to the study the aerospace workforce is diverse ranging from many levels of administration, sales, researchers, engineers, logisticians, safety and security experts to machinists, assemblers and many others. Many of these workers are in their fifties and soon eligible to retire. The concern for workforce needs was addressed by the Aerospace Industries Association (AIA) which identified revitalization of the US aerospace workforce as one of their top ten issues. The US House of Representatives has also passed a bill establishing a federal inter-agency task force to address aerospace workforce development. The report also revealed that concern over employment stability of the industry keeps a number of potential aerospace employees from pursuing careers in the industry. (DOC Report 2007).

The U.S. Department of Labor Statistics Career Guide to Industries reported on the occupational composition of US Aerospace Industry in 2004 showing that 31.1% are in office management occupations such as management, business, finance, sales office and administrative support and other occupations. Maintenance and Production occupations such as engineering, installation, maintenance, repair and production occupations accounted for 68.9% (Department of Labor, 2004).

The Bureau of Labor Statistics ranked Oklahoma among the top ten aerospace and

aviation states based on hiring in private sector and federal occupations such as engineers, mechanics and service technicians. The report enumerated such high-skilled civilian occupations as engineering; architecture; information technology; mathematics; statistics; medical; hospital; dental; public health; physical sciences; social science; psychology; welfare; general administrative clerical; officer services; biological sciences; business and industry; accounting and budgeting; legal; library and archives; equipment; facilities and other services; education; investigation; electrical and electronic equipment installation and maintenance; fabric and leather work; general services and support work; pilots and instructors; acquisition managers; public affairs; manpower ; personnel; communications; security,; intelligence; academic program managers; finance; executive officers; human resource managers; civil rights officers; civil aviation security officers; civil aviation registry examiners; Civil Aeromedical Institute personnel (including such professions as psychologists, examiner, doctors and medical administrative personnel); and a variety of logistics occupations (such as warehousing and stock handling, packing processing and transportation). According to the report, increasing employment trends are found in most of the occupations and assets are in place to elevate Oklahoma's standing in the aerospace community in the coming years. With key employers and supporting infrastructure and labor pool, Oklahoma's aerospace and aviation industry is ready for new levels of success in aerospace. (Greater Oklahoma City Region Aerospace and Aviation Industry Phase II Industry Assessment, 2007).

Educational Requirements and Opportunities

States in such a growth mode typically find themselves searching for innovative ways to insure that their intellectual capital keeps pace with the industry. Neighboring states can be both competition and a valuable resource.

Oklahoma aerospace educational opportunities are growing with new degrees being offered that address many educational needs of the industry. In spite of that growth, there are still a number of gaps in the state's educational pipeline that could better address the needs of the state.

The Oklahoma Department of Commerce study of Oklahoma aerospace industry educational requirements for their key personnel indicated that 51% of their mechanical technical and engineering workforce was required to have some level of education beyond high school, 13% of the occupations required advanced degrees, 6% Bachelor's, 3% associate degrees, 17% vocational training with certification, 12% vocational training without a certificate and 36% only a high school degree, and 3% no educational requirement. The report also points out that over 58% of Oklahoma's high school class of 2004 went on to attend an Oklahoma college or university during the 2004-2005 school year which is below the national rates according to the Oklahoma State Regents for Higher Education (ODOC, 2007). The findings of this study indicate there is still work to do in meeting the educational needs of the industry.

Oklahoma's institutions of higher education include two major universities and numerous regional universities, colleges and junior colleges with aviation and aerospace

degree programs in a variety of specialties. Each of those academic institutions play an important role in the educational pipeline required to address aerospace industry needs.

The Greater Oklahoma City Report addressed the fact that the education system that supports the development of intellectual capital in Oklahoma is in transition with increasing investment, partnership and cooperative agreements. Those agreements increase opportunities for students to prepare for global competition whether they enter the workforce after high school or choose to continue learning to the next level.

Community-Junior Colleges are key components in supporting many of the aerospace functions of the state. In the Oklahoma City Metropolitan area for example, there are at least four institutions which provide Applied Technology degrees or University Parallel programs. The primary function of the Community College system is to enhance education opportunities within a specific community.

For example, Rose State College in Midwest City, Oklahoma, is one institution that provides direct support to the aerospace industry and the Tinker Air Force community. Surrounding Tinker Air Force Base is a myriad of aerospace organizations that support the Air Force Base's mission. Since the institutions such as Rose State College focus on aiding the community with a low cost quality infrastructure they are focusing on local training opportunities (Wisner & Zapolla, 1993 as cited in Stocker, 1998) as well as expansion of educational opportunities. Since the community college mission is to serve the community, they have the ability to work directly with industry in order to develop specific degree programs tailored to aerospace industry needs. Ideally located in close

proximity to the hub of the industry, Rose State College can offer partnership opportunities to universities for two-plus-two and other creative advanced degree programs on their campus. Because of the broad scope of the Tinker Air Force Base mission and the availability of distance learning on-site, the impact of educational partnerships at Rose State have implications not only for addressing state aerospace intellectual capital requirements but for addressing national and international aerospace educational needs.

Degree programs at the colleges and universities already address numerous specialties within the aerospace industry ranging from professional pilot degree programs to aviation management, technical services, air traffic control, aerospace logistics, aerospace security and others. Oklahoma is the only state which provides a comprehensive pipeline in aerospace education ranging all the way through the post-graduate degrees. Several colleges and universities offer Master's degrees and Oklahoma State University offers coursework all the way through the Doctor of Education, Applied Educational Studies, Aviation and Space. As a part of a partnership agreement students may attend Oklahoma State University coursework toward their advanced degrees on the Rose State College campus.

Future Academic/Industry Educational Collaboration

As educational requirements move from a general education to a more tailored and focused program, academia plays a vital role in designing curriculum to meet specific company needs. According to Moulton and Fickel (1993) universities and corporations are

developing closer links in marrying research, teaching, program design and executions. Thus the linkage between universities and corporations is serving to meet the increasing demands of the business community to maintain vision, productivity, quality and international competitiveness in a rapidly changing world.” (p. 139).

The aerospace industry of the future demands academic support for a wide variety of curriculum needs to support their unique operations. Close collaboration is critical to their success in that the “intellectual capital of an organization represents significant value to the bottom line” (Frappaolo, 2006, p. 2)

CHAPTER III

DESIGN OF THE STUDY

Research Design

Purpose

The purpose of this research was to identify educational requirements of selected intellectual capital professions in the Oklahoma aerospace industry in order to assess possible gaps in the educational pipeline. These intellectual capital requirements and associated gaps in curriculum consist of the specific training and education required to keep up with changing trends in technology as well as industry standards. Findings of the research could provide valuable insights regarding the role of academic institutions in the state of Oklahoma related to meeting the intellectual capital requirements of the aerospace industry.

Interview data for this research project was collected from incumbents of selected intellectual capital positions in an aerospace organization believed to be representative of Oklahoma aerospace companies. Although limited information is available from human resource representatives of an organization, the objective of using interview data was to obtain the incumbents' perspectives of industry needs and requirements. The incumbents

were believed to be a rich source of data to identify intellectual capital requirements based on their own individual experiences. Findings of the study could facilitate development of an educational pipeline that meets the needs of the industry which would also help maintain Oklahoma's leadership status in the aerospace field.

Theoretical Perspective

The epistemology of the study was constructionism in that knowledge or truth was a product of consensus among selected employees in the context of the aerospace industry. The theoretical framework used was constructivism which is a form of interpretivism in that it focuses on the experiences of the employees interviewed and their direct lived experience. The methodology was grounded theory beginning with the study of the intellectual capital requirements of selected positions in an aerospace organization.

Interviews were conducted and analyzed using a constant comparative method to arrive at emerging themes.

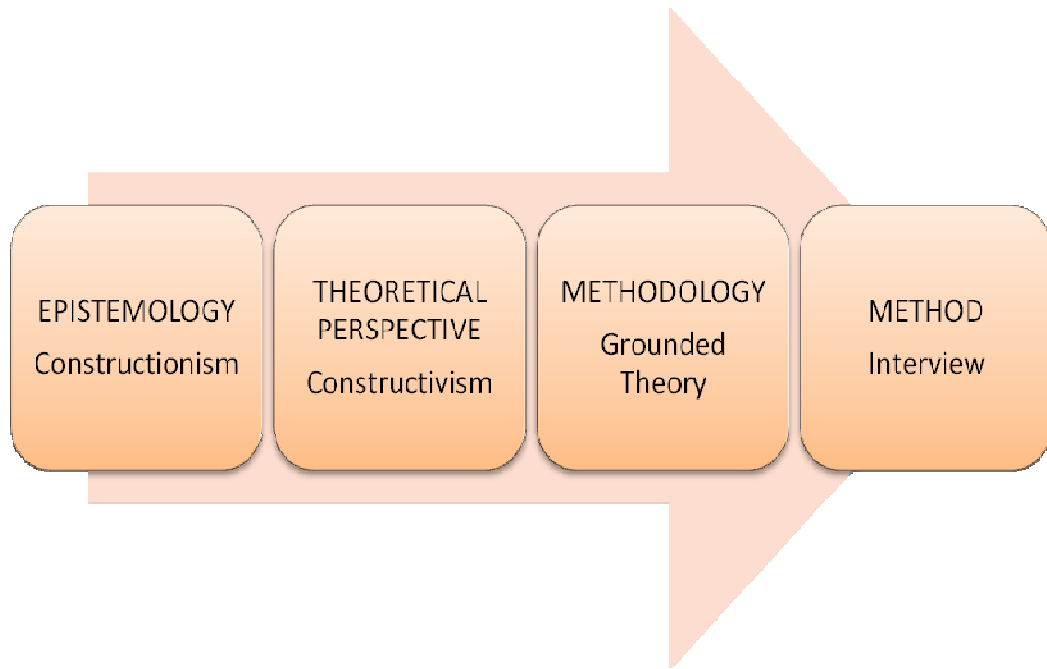


Figure 1. Research Perspective

Although this study focused on the Boeing Company as representative of the intellectual capital positions in a typical aerospace organization in the state, the findings of qualitative research cannot always be generalized to a larger population. However, the findings of the study can provide insights for further comparative research of aerospace organizations and their educational requirements statewide.

Selection of the Sample

The study consisted of a series of ten interviews of incumbents of selected positions in the Boeing Company. A purposive sample of voluntary participants was chosen from

positions believed to be representative of aerospace intellectual capital positions at Boeing as well as the aerospace industry in Oklahoma.

Selection of the sample was initiated through the use of a list of intellectual capital positions within the organization. Ten employees with a broad range of responsibilities were purposively selected from that list and invited to participate in the study. If a prospective participant declined the offer of participation, or if they gave no response at all, the next employee on the list was contacted.

The number of total participants used within the study was minimal as recommended for qualitative design (Creswell, 1998). The smaller sample allowed the researcher to increase the focus on each position and allowed more time to gain a rich set of data which complemented the thoroughness of the study. Subjects used in the study occupied a range of positions within the company to include information systems, technical analyst, procurement specialist, human resource specialist, supply chain specialists, writer editor and business manager. (Reference Table 1)

Table 1.

Positions and Number of Participants

<u>Participant Job Title</u>	<u>Number of Participants</u>
Information Systems	3 (1-Lead, 1-Manager, 1-Analyst)
Technical Analyst	1
Procurement Specialist	1
Human Resource	1
Writer	1
Supply Chain Specialist	1
Business Managers	2 (1-Senior Business Manager)

Methods

Initial contact with each subject consisted of an invitation for voluntary participation. Employees wishing to participate responded back via email or by phone. A formal letter of participation (Appendix C) was provided to each subject outlining a request for an interview, the purpose of the research, questions that would be asked, and the amount of time required for participation in the study. In addition, subjects were notified in the participant letter, consent form (Appendix B), and verbally that each interview would be recorded and transcribed to ensure the accuracy of data reporting.

Participants were notified that all tapes would be secured and destroyed upon completion of the research.

Each subject was advised by letter and verbally regarding the confidentiality of the process and that their responses would only identify them by number and not by name. Data from the interview known by the researcher to be individually identifiable would be omitted from the final report in order to protect the anonymity of each participant. Even though there were no known risks associated with participating in this study that are greater than those encountered in daily routine, participants were cautioned to note that a final report of this research will be available for public access. Therefore, it may be possible for employers to recognize comments associated with respective positions.

Each participant was advised that they could review the final report upon request and that the participant must notify the research investigator within three days after the completion of the interview if they wished to view the final report prior to its submission to the Oklahoma State University Graduate College.

Instrumentation

Subjects used in the research were asked a series of open-ended questions (Appendix D) that focused on their own perception of aerospace industry needs as well as their own personal development requirements. This instrument was the primary and critical instrument used for collecting data in order to identify educational needs or gaps.

A panel of academic personnel assessed the validity of each question used within the interview guide prior to beginning the research.

Data Analysis

Baseline data for this study consisted of several elements which included but was not limited to participant educational background, career progression, and training. Each interview was recorded with a digital audio recording device. These audio recordings were then transcribed in literal written form for coding purposes. The researcher used extensive notes and written observations taken during each interview as additional sources of data used to answer questions within the study. Data from each interview was coded, compared, and synthesized for placement into specific groups or categories for the purpose of answering questions related to the purpose of the study. Coded information was placed into categories specific to position, educational level, career progression obstacles, changes in educational requirements, recommended curricula, and career progression preparation recommendations. Coded information was compared across categories to determine relationships between sets of data.

Validity and Reliability of Data

Gay (1996) defines validity in quantitative research as “the degree to which a test measures what it is supposed to measure and consequently, permits appropriate interpretation of scores” (p. 138). Gay also states that validity can be evaluated only in

terms of purpose and there are several different types of validity including content, construct, concurrent and predictive validity.

Reliability in quantitative research refers to dependability or trustworthiness and the extent to which a test consistently measures whatever it measures. Reliability is expressed numerically, usually as a coefficient, so that a high coefficient indicates high reliability. Gay also described reliability as much easier to assess than validity. Different types of reliability are determined in a different manner and deal with a different level of consistency (Gay, 1996).

Validity and reliability is assessed differently in quantitative research than in qualitative research. Qualitative research is based on narrative rather than numbers which requires a different approach.

Validity and reliability of qualitative research is addressed repeatedly in the literature including the work of Creswell (1998), Guba (1985), Frankel and Wallen (2003), Stenbacka (2001) and Gay (1996). Validity and reliability of qualitative research is viewed differently in the literature. Stebacka (2001) believes that “reliability concerns measurement and has no relevance in qualitative research” (p. 138). Lincoln and Guba (1985) believe that “demonstration of validity is sufficient to establish reliability” (p. 316). Gay (1996) describes qualitative validity as the “degree to which observations accurately reflect what was observed and interviews accurately reflect feelings, opinions, and so forth, of those interviewed” (p. 242). Rubin and Rubin (1995) believed that “trying to apply

validity and reliability to qualitative work distracts more than it clarifies” (p. 87).

They judge the credibility of qualitative work by transparency and conscientiousness of the interviewer; consistency-coherence based on reexamination and explanation of why inconsistencies occurred; and communicability or richness of detail.

Regardless of the viewpoint expressed by different authors related to reliability, it is believed that validity was established in this study by an accurate reflection of the interview data. That accuracy was clearly based on the transparency and skill of the person conducting the interview. Qualitative validity can be further established by triangulation or use of multiple methods, sources, or data collection strategies including researcher notes, recordings, and questioning strategies.

Validity was established in this study by a combination of methods. Triangulation of data was accomplished by conducting a pilot study to determine the validity of the interview questions. Interview questions were frequently rephrased and asked in different ways to probe for consistency or possible misinterpretation of previous phrasing. Interview data was further examined for inconsistencies and to determine if and why contradictions occurred.

CHAPTER IV

FINDINGS

Introduction

To date, most of the research related to educational deficiencies within the aerospace industry has centered on touch labor positions. An important segment of the aerospace workforce has been overlooked. Examples of professional fields left out of previous research include general and operational managers, management analysts, research analysts, computer software engineers, information clerks, logisticians, and other professional or administrative personnel. These positions, sometimes referred to as intellectual capital, comprise that segment of the Oklahoma aerospace industry which requires college level education.

The purpose of this qualitative inquiry was to identify educational requirements for selected professions in the Oklahoma aerospace industry in order to address possible gaps in the educational pipeline. Interviews of incumbents of selected positions in a representative aerospace company could provide a rich source of data. The Boeing Company in Oklahoma was chosen as representative of the aerospace industry operating in the state and incumbents of 10 positions within that company were purposively selected for

interview regarding specific educational requirements for their positions. Although formal educational requirements of the positions could have been obtained by simply reviewing the official human resource documents, it was believed that interviews of incumbents would provide a richer source of data in that those incumbents could offer personal observations of educational gaps not revealed in the official documents. Interview data could be analyzed for similarities and differences and the findings would provide a clearer picture of the educational requirements, identify gaps in the current educational pipeline not readily apparent and explore incumbent suggestions related to addressing any gaps in the educational pipeline.

Demographic Data

The following data is a summary of demographic data obtained from responses by participants to interview questions. Data from the interviews has been paraphrased for purposes of the study.

Position Title and Description

Participants in the study occupied the following positions: technical analyst, information systems personnel, procurement specialist, human resource personnel, business managers, supply chain specialists, and writer positions. (Table 2, page 39).

Broad duties of the positions are included below.

The Procurement Specialist handled purchases, developed and closed contracts,

negotiated terms and conditions, as well as prices and delivery schedules. Systems personnel performed a range of functions from managing the infrastructure for servers and connections to and from shares and group members to gathering requirements for software projects, translating them into technical specifications and creating websites based on the requirements. Writers were responsible for source data for engineering projects related to aircraft installations and modifications and incorporating the data into technical manuals for installation of equipment. Human resource positions involved handling multiple human resource issues ranging from compensation to performance, disciplinary processes, to union and labor relations issues. Business managers were responsible for proposal and financial business planning and activity. Supply Chain personnel were responsible for specific programs and were in charge of funding.

Educational/Training Requirements and/or Internship Experience for Position

Participant #1 was required to have a Bachelor's degree but indicated a Master's was preferred.

Participant #2 was required to have a Bachelor's degree, preferably business specific.

Participant #3 was required to have a Bachelor's degree and 12 to 15 years of experience.

Participant #4 was required to have a business degree or other job related degree

and 8 -10 years of experience.

Participant #5 was required to have a Bachelor's degree and job related experience.

Participant #6 was required to have a Bachelor's degree, preferably in the field, and many years of experience.

Participant #7 was required to have a Bachelor's degree in Business, preferably in the field.

Participant #8 was required to have a Bachelor's degree.

Participant #9 was required to have a Bachelor's degree and 15 years of experience.

A Master's degree could be substituted for experience.

Participant #10 indicated a Bachelor's degree preferably in a related field was required.

Only one of the participants had served in an Internship position prior to employment. The individual who had been involved in an Internship had done so in another unrelated field.

Career Path to Current Position

One participant followed a military career path prior to his/her current position. Another participant began working in warehouses in college and became involved in purchasing and finance prior to a current career. Still another participant worked in the banking industry while obtaining a degree which led to a related position. That position led to an assignment which included a database project and an opportunity to become

involved in a technical field while completing a degree. One of the participants had several years of experience in their career field, progressed to the next level in the field, then moved back to a previous position with more responsibility. One of the participants graduated from college and began a career in a specialized area of his/her field which involved learning appropriate skills. Within a few years of employment he/she accepted a position which involved using those skills. Still another participant was hired into a job in a specialized field after graduating with a degree in that field. With experience in that field, he/she eventually moved into a management position.

One of the participants began as a Clerk and progressed through a number of positions to the current position. He/she then completed a Bachelor's Degree and went on to graduate school. One of the participants began his/her career building personal computers using an Associates Degree in electronics. He/she eventually finished a Bachelor's Degree and has used specialized training and education toward career advancement in his chosen field. Still another participant completed a Bachelor's Degree and obtained a specialized certificate.

The only participant to experience an Internship did so in an unrelated field. He/she later moved into his/her chosen field which ultimately led to the opportunity to teach in that field.

Obstacles to Career Progression

Participant 1 described his/her career obstacles in terms of human factors related to people worrying more about their career than doing the job right. He/she commented that

educational obstacles were primarily attributed to the process of getting through and completing educational goals.

Participant 2 could not define any obstacles prohibiting progress toward career goals.

Participant 3 spent a year away from his/her field and stated that the rapid change in technology during that absence was a challenge with respect to continuing education. He/she indicated that a degree in Psychology in lieu of a hard science was a drawback but direct experience in the technical field had helped overcome any limitations encountered.

Participant 4 indicated that there was a “disconnect” from what was learned in a classroom setting versus what was experienced on the job. It was further stated that classes stopped just short of connecting to real life experience.

Participant 5 described obstacles in career progression which could be attributed to personality. For example, the use of humor in the work environment could be interpreted by some as poor judgment which could limit career advancement opportunities.

Participant 6 had a solid background in his/her chosen field but lacked direct experience in the technical aspects as electronics, aircraft systems, and physics of the aircraft which was an obstacle to be overcome. The participant believed he/she had to adjust to the magnitude of the serious responsibility of communicating effectively in a technical environment.

Participant 7 identified one obstacle to career progression which centered on mobility or the willingness to change geographical location in order to gain enough

experience for advancement. He/she stated “if you are willing to move, you’re going to move up faster.” In addition, competitiveness can be an obstacle.

Participant 8 had no obstacles to career progression and indicated that employment opportunities are exponential.

Participant 9 stated that within his/her present field of employment there are no obstacles prohibiting career progression. However, if the participant should desire to go into a highly technical field, advancement would not be possible without the appropriate educational background.

Participant 10 stated that the big obstacle in advancing in a major organization was spending time working at a “major hub” location and getting to know the right people. Since politics is an issue for advancement, time spent at a hub would be important to become a president of the company.

The following chart summarizes demographic data from the participants.

Position	Level	Type of Degree/Coursework	Experience	Internship
Technical Analyst	Bachelor's / Master's Pref.	Unknown	Unknown	No
Procurement	Bachelor's/ Master's Pref.	Business. Course(s): Government, Negotiation Skills, People Skills	Unknown	No
Systems Lead	Bachelor's/ Master's Pref.	MIS or MBA or Hard Science degree	12-15 years	Yes
Program Analyst	Bachelor's	Computer Science and/or Business	8-10 years	No
Human Resource Generalist	Bachelor's/ Master's Optimal	Unknown	HR Experience	No
Writer III	Bachelor's	Communication (MFG or AV). Courses: Tech Writing, English Writing, Electronics	Yes	No
Business Manager	Bachelor's/ Master's Optimal	Business, Finance, Communications or MIS	Unknown	No
Information Technology Manager	Bachelor's	Computer Science, MBA. Courses: People Skills and Accounting	Yes	No
Supply Chain Specialist	Bachelor's	Courses: Logistics, People Skills, Airframe, Project Management	15 years or Master's degree	No
Senior Business Manager	Bachelor's / Master's Optimal	Accounting or MBA. Courses: CPA certification courses, Leadership	Unknown	Unknown

Table 2 Demographic Data

Research Question 1. Educational Background Required for Existing Positions

Education/Training Necessary to Improve Ability to Meet Requirements of Position

Participant 1 believed it was helpful to have an education in the same field you are in because you need to integrate people, machinery and everything that goes along with achieving success. An example was offered pertaining to the difficulty an English major

might have in trying to learn logistics or operate in that field without previous logistics experience or education.

Participant 2 believed that any kind of education dealing with government and government procedures would have improved his/her ability to meet the requirements of the position since the government is a unique entity from the private sector and has its own set of rules and acronyms.

Participant 3 believed that a degree in a “hard science” might improve ability to meet the requirements of his/her position. He/she suggested that a major in Business might be better than another type of major. Many people already in the field are from a technical area and they like to see someone with a hard science background rather than a soft science background.

Participant 4 suggested that a lot of the technologies being used in school are older technology and are not kept up to date. For example, C and Cobal are object-oriented languages that are outdated when most of the technology today is web-based. Exposure to some of the more modern languages could have been better, but many of those technology decisions are controlled by the money factor.

Participant 5 believed that it would have been helpful to have had more of a focus in school on learning specifically directed to his/her field. He/she believed the focus should have been on what it takes to be a leader which is very different from management. The participant commented that if he/she could go back for something, it would be a focus on leadership and on mathematics. “When you go through school, you believe you will

never use math but that is simply not true. At some time in your life, you will need something that you did not pay attention to.”

Participant 6 had not foreseen during college the fact that he/she would be in his/her current position. The participant stated that engineering courses, business courses, communications courses or some technical background could offer a better understand of the technical aspects of his/her position.

Participant 7 believed that verbal communications would have been helpful in the beginning and commented that universities are becoming more focused on that and we are starting to see a difference. The participant deals with kids coming out of college right now that do not know how to do PowerPoint which is used regularly in meetings and presentations.

Participant 8 had moved into management from a technical position because it was necessary in order to be promoted. The participant commented that he/she had been good at technical things but not with people skills. However it had all worked with the good group of people in the organization. The participant commented on a desire to expand knowledge of accounting aspects of the job and employee relations.

Participant 9 suggested that Project Management courses would have been helpful in his/her career especially since they were outlined in the Professional Development Plan (PDP). Basic classes in general airframe were also suggested. For example, “this is a 747. It has this many square feet.”

Participant 10 believed spending more time with leadership training, not necessarily a degree but training, would also be helpful.

Changes in Educational Requirements of Current Position.

Participant 1 indicated that education requirements have not changed.

Participant 2 indicated that the education requirements have not changed.

Participant 3 said the educational requirements for this position have lessened to a degree in that the company is pushing for common systems.

Participant 4 commented that basic educational requirements have not changed since completing an undergraduate degree with the exception of programming languages and operating systems both of which continue to evolve.

Participant 5 stated that the training background for that position is probably the same but education requirements may have increased. For example, some peers started within the company without a college degree but today a baccalaureate degree is required.

Participant 6 believed that industry looks for someone with a good education who can effectively communicate. He/she suggested it would be important to have a background in communication or in the communication field and a requirement for producing or writing something toward a deadline every day would be an especially important skill. Participant 6 commented that “the main changes have been in technology and the tools being used to write.” For example, at first an index model on 3 x 5 cards was used and now Microsoft is the tool. They now have the ability to pull up manuals

electronically on the aircraft. He/she further comments that we are in the midst of an information explosion presenting data in new formats.

Participant 7 commented that the bar of education is being pushed higher. Today a Bachelor's degree is more like a high school diploma than when he/she was entering the field, and a Master's degree is more like a Bachelor's today.

Participant 8 does not believe the educational requirements have changed. He/she stated that the company has always tried to hire the right person for the job but if they do not have the right capabilities they would give them on the job training.

Participant 9 stated that the minimum educational requirement for the position has not changed. The position still requires a Bachelor's degree and 15 years experience, Master's degree preferred.

Participant 10 was not sure if educational requirements had changed over time.

Optimum Level and Type of Education Required for Current Position

Participant 1 believed that a Bachelor's degree was the optimal level and type of education for his/her position although the Master's degree would be nice to have since it implies that you are willing to go the extra mile and they often look for those who are motivated to do more than just the requirement. If you really want to do a little more through educational opportunities, it gets noticed and that is how you end up in charge of things with a sense of reward to go with it. With that comment Participant 1 referenced a doctoral degree.

Participant 2 believed that a Bachelor's degree is the optimum level of education

for his/her position. He/she suggested that Business degrees are more helpful but non-business degrees are acceptable.

Participant 3 suggested that a Bachelor's degree or Master's degree would be acceptable, Master's preferred. Although a Master's of Business Administration (MBA) would be preferred, Participant 3 leaned toward a Master's of Information Systems (MIS) degree as a hard science degree.

Participant 4 stated that the Bachelor's degree would be optimum. The Bachelor's degree gives the foundation and provides an indication that you can start something and finish it which equates to ambition and ability to stick it out and finish. Without the degree the question would be whether or not you had enough experience to offset not having the degree and whether or not you were a job hopper

Participant 5 believed a Master's degree was optimum but did not see a need for a doctorate. Even though the Bachelor's provides a good foundation, the master's level would be better in that you start addressing leadership and real world scenarios rather than hypothetical situations. You can take your real life experiences and apply them toward your Master's degree and visa versa.

Participant 6 believed a Communication degree would be ideal. You have to learn the basics, be a good listener, communicate well on paper and verbally, relate to people, ask questions, look at things from more than one angle and kind of be a jack of all trades so a communication degree would be excellent. A technical writing degree would be fantastic. Participant 6 also suggested that the communication degree might be called

manufacturing communication or aviation communication. You could learn about interphone communications on aircraft, wireless communication, electronics, systems, writing skills, interviewing skills, engineering drawings and so forth. There would be a little bit of engineering and a little bit of communication and electrician. You could tailor all of these to manufacturing those things to work on any system of an airplane.

Participant 7 suggested that a Master's Degree would be optimum for the position. At minimum you would need a Bachelor's Degree for his/her position, especially if your employees have one. Financial communications based on the accounting and finance side of the job would be helpful but a mixture of communications and presentation skills would be good with Management and Information Systems (MIS) wrapped back into accounting and finance.

Participant 8 suggested that a Bachelor's Degree was an entry level for his/her position. The Master's was not necessarily the optimal degree. Twenty years ago a Bachelor's degree said something but now is like a high school education, just enough to get your foot in the door. Participant 8 believed that he/she needed to be able to help employees come up with the right answer. Without experience they can "snow me but if I don't have any input then I won't get the best solutions." Perhaps a Bachelor's in Computer Science and then maybe a Master's of Business Administration (MBA) would be the best multifaceted degrees.

Participant 9 suggested a minimum of a Bachelor's degree and some good solid people skills that can work with multiple personalities. The ideal degree for this position

would probably be called a Logistics Program Management degree because you have to know some of everything including finances, budgeting, dealing with government customers, contracting, funding obligations, distribution of money, human resource and human relationship courses, communications (written and oral) and aircraft courses.

Participant 10 suggested that the optimal degree would be finance, economics, CPA certificate or an MBA.

Current Enrollment or Plans to Enroll Within Six Months (Interview Question 9)

Participant 1 was not enrolled in college but has a desire to earn a doctorate. However, family considerations preclude enrollment at this time. Some concern was expressed regarding the possibility of becoming over qualified.

Participant 2 was not currently enrolled but plans on enrolling in a Master's program in the next six months for his/her own personal enrichment.

Participant 3 was not enrolled at this time but considering enrollment for Fall 2008 but just waiting for the "right time." Unsure of the benefit to him/her on his/her current position, he/she believed that it would give him "that piece of paper (Master's Degree) people like to see. That's not my point of view but there are those that like to see that piece of paper and in some cases that will add some legitimacy."

Participant 4 had no plans to take additional college coursework.

Participant 5 had no plans to go back to school.

Participant 6 had considered going back to school but not at this time. He/she has interest in a Master's of Fine Arts in Creative Writing.

Participant 7 was currently enrolled in a Master's degree program.

Participant 8 was currently finishing a doctoral dissertation for personal improvement.

Participant 9 was in the process of finishing a Master's degree but is not currently enrolled. The Master's degree would be used to obtain a teaching position at a local community college.

Participant 10 was currently enrolled in a Master's degree program. Participant is unsure of the added career benefits of the degree but believed that it is an example of the importance of education.

Perspectives on How College Enrollment Will Help in Current Position

Participant 1 commented that additional education would not help in this position but additional education could open the door for future opportunities.

Participant 2 indicated interest in taking additional coursework that centers on negotiation skills. Since part of the job is spending time on the phone, the participant commented that coursework on how to deal with difficult people would be helpful.

Participant 3 commented that additional education would help. Participant 3 has had computer classes but believes a stringent academic setting would be beneficial by affording the opportunity to study subject matter more in-depth.

Participant 4 was undecided with his response to this question but commented additional education could propel him/her into management type positions.

Participant 5 stated additional education centers around personal aspirations and it could help but in order for the education to help, it would require mobility and flexibility.

Participant 6 believed any additional skills learned might add to existing skills.

Participant 7 did not know whether additional education would be beneficial in the current position but stated it could be an equalizer.

Participant 8 stated additional education helps any position and that educating yourself through self-help books also helps to qualify for self-education.

Participant 9 did not feel any additional formal education would help unless it led into management. The participant expressed an interest in Human Resources if the management path were chosen.

Participant 10 stated education might contribute toward upward mobility and that additional education is beneficial.

Research Question 2. Education Availability for Career Progression

Career Path Options and Availability of Education to Meet Position Requirements

Participant 1 believes that there are advancement opportunities primarily through management.

Participant 2 could advance to a finance position with relative ease; however; in order to transition to an engineering position, additional schooling would be required to specialize in that area even though Business degrees cover a broad range of job choices.

Participant 3 had several options with regard to possible career path. Some of the options for career progression are as follows: Analyst, Coordinator, Project Manager, Networking Specialties, and Cyber Security.

Participant 4 did not give a clear description of a career path option but commented on an interest in obtaining additional education for the purposes of learning about website programming.

Participant 5 indicated career progression opportunities are somewhat limited because of geographic location as compared to opportunities available at the major hubs or locations. A willingness to relocate to other sites would be required.

Participant 6 recently turned down a position which was an attractive position but it did not seem to fit at the time. Participant 6 also commented the pursuit of this particular position in the future was not out of the question.

Participant 7 has several career options within the aerospace industry itself but already has a thorough understanding of his field and is unsure whether education will help foster professional growth.

Participant 8 indicated that some fields such as IT would be more flexible positions in that they permit going anywhere, anytime. Even though the participant was pursuing a doctoral degree he/she did not foresee parting with the current organization but expressed concerns over appearing over-qualified with post-graduate education.

Participant 9 was currently at the highest level of achievement for that position with the exception of a management position. However, he/she indicated the organization has multiple layers and opportunities.

Participant 10 believed additional education would be beneficial to career path options on the business side of the field.

Additional Educational Needs for Career Advancement

Participant 1 indicated that additional education would help further career advancement with some reservation about whether or not it would be worth the benefit.

Participant 2 believed that a business degree would be helpful to advancement but having a technical background would improve current skills. The participant commented that a military background, particularly in a field related to working with or flying aircraft, would be the best course to take and that obtaining a Master's Degree would help advance career goals.

Participant 3 believed strongly about additional education and that it can help advance knowledge in any field or occupation. The participant commented that attending boot camps where hands-on training and successful testing would provide certifications. He/she elaborated that certification in a particular area buys credibility.

Participant 4 believed additional degrees would be beneficial and that a bachelor's degree in business was enough education to have options; however, a different specialization could require additional academic preparation.

Participant 5 has a Master's degree but believed a doctorate could provide additional opportunities for career advancement.

Participant 6 stated additional continuing education is paramount to staying abreast of technology and software. The participant insisted that once software is outdated, it will necessitate re-training.

Participant 7 commented "I think it helps but a lot of my career is that I want to

stay in Oklahoma.” The participant attributed selection for some positions to the level of education and experience obtained.

Participant 8 stated additional education would help but not as much in the current field. Additional responsibility in lieu of additional education would be beneficial.

Participant 9 commented when an individual moves from one area to another within the organization, it sometimes requires re-education. For example, career paths into Engineering would require complementing education with science courses, blue print reading and Computer Aided Design (CAD) classes.

Participant 10 stated there are several ways to advance within the organization especially with a Master’s degree. A Master’s degree would allow advancement within the business side of the organization. A change in expertise would require additional education.

Research Question 3. Perceived Gaps in Availability of Aerospace Education

Location of Available Education/Training

Participant 1 believed that training for his/her position would have been available in Oklahoma but was not here at the time. There are aviation technology opportunities at the University of Oklahoma. There are a lot of educational opportunities on the Base for aviation management. Those programs should be expanded and the participant would be interested in teaching some.

Participant 2 stated that all of the education and training required for his/her

position was available in Oklahoma. He/she received an Associates and a Bachelor's degree within the Oklahoma City metropolitan area. He/she believed the same kind of degree would have been available from any of our four-year institutions and that there was nothing specific required to get that job.

Participant 3 found the education and training needed for his/her current position in Oklahoma. One of the positions held by the participant was a professional training company which used Excel and other similar products and required proficiency in order to train someone else.

Participant 4 went to a community college within the Oklahoma City metropolitan area for an Associates degree and then to a state university for a Bachelor's degree. He/she believed the education and training opportunities are definitely available in Oklahoma and that there are several colleges that offer helpful degree programs.

Participant 5 obtained an education in Oklahoma for his/her current position but most of the training was on-the-job. A degree indicates training and commitment and the ability to set goals and achieve them.

Participant 6 did not believe that Oklahoma offered what was required for his/her position. As a sub-contractor for six years, there was a group who communicated required information about maintenance and flight manuals. The group helped transition into the technical world currently required. He/she did not know a lot of what curricula were available at other schools but had looked at OU and OSU and Gordon Cooper and Frances Tuttle and some of the technical schools. Pieces of curricula were available here and there

but when you leave high school, the road seems to split and you have to go to Gordon Cooper to be a technician and work on the nuts and bolts of the airplane. If you are going to be an engineer, you have to go to engineering school or if you are going to go to the business side, then you have to go that way. Nobody has everything in one course, not even the big schools and that is unfortunate. If there is a way to go to Francis Tuttle and take one course that links to a degree, maybe a consortium or agreement between the schools would be helpful but right now only bits and pieces are available.

Participant 7 suggested that more computer and communication classes should be included in a degree, specifically presentations.

Participant 8 could not say that education did not help. It was not a check-mark on a promotion but it is now for some people.

Participant 9 did all of his coursework in another state but is certain that a degree in Organizational Communication would be available somewhere here.

Participant 10 believed what he/she needed was available in Oklahoma but chose to go to another state. Participant 10 is currently in a Master's program at an Oklahoma university and commented that schools within Oklahoma offer national CPA certificates and degrees as well.

Availability of Education Necessary for Career Progress

Participant 1 commented that right now their Boeing educational needs are met online with a weekend course in Wichita.

Participant 2 suggested that he/she could go to any of the four year institutions or any higher learning institution and would not have to go out of state or country.

Participant 3 was fairly certain that educational needs could be met in Oklahoma but had not researched it thoroughly. There are Management Information Technology (MIT) degrees available at Phoenix and the University of Oklahoma has a Management of Information Systems (MIS) degree.

Participant 4 went to an Oklahoma City metropolitan community college for an Associates degree and then to a state university. The education and training he/she needed was definitely here in Oklahoma where several colleges offer degree programs that can help.

Participant 5 commented that it makes it a bit more difficult without having advanced education from a state school besides the University of Oklahoma (OU). It would be nice to have something more centrally located. OU and the University of Central Oklahoma are here but it would be nice to have the major schools in the downtown metropolitan area. Partnerships in higher education provide excellent opportunities for the aerospace industry.

Participant 6 suggested that there are opportunities at OU and even at Gordon Cooper to take a basic electrical course. The participant suggested that he/she had been working in aerospace for a number of years and kind of had a layman's perspective. The best thing to do is to come into the company like a sponge and soak up everyone's knowledge which is where it is important to "have a communication degree that helps you

be inquisitive and understand the who, what, why to pick up the knowledge and the background.”

Participant 7 previously had to go to Stillwater to meet educational needs. The participant commented that pairing between OSU and Rose State College was a great thing in that people really cannot work half days which makes the convenience of having Rose handy where you can finish work and then run over there.

The participant commented on the importance of partnerships and the win/win situation they offer and suggested that it is important for the company to stand behind the institution where they are getting their degree. He/she has offered to go to other industries and meet with some of those people to talk about the programs because we all have a common interest.

Participant 8 did not respond to the question.

Participant 9 commented that OSU had a great engineering school and OU has good math and science courses and suggested that he/she believed Rose State was offering a Logistics degree.

Participant 10 suggested that you would need to go to an accredited school but could go online or to a training center for the leadership issue.

Coursework Available in Oklahoma for Career Opportunities

Participant 1 referenced a colleague as the go-to-person to respond to this question.

Participant 2 referenced the University of Oklahoma as a college that offered a

Bachelor's or Master's in Supply Chain Management which is similar to the job functions of a Procurement II.

Participant 3 had previously answered this question.

Participant 4 recommended that training places, not necessarily higher education institutions, would be the place to learn about the next programming language and cited Microsoft certification as an example. He added that it may now be offered at some colleges.

Participant 5 suggested that most of the universities and even the two-year colleges have some type of coursework that would offer additional training or even a higher level degree. Even though they probably did not offer coursework for Human Resources specifically addressing the aerospace industry, a knowledge of matrix organizations would be helpful to Boeing to learn how you fit in.

Participant 6 did not comment on Question 15

Participant 7 suggested that a plain business degree would be available anywhere. He/she believed that an accredited university for a Master's is something that is more recognized than somewhere like Phoenix.

Participant 8 suggested that any type of management and IT go together so you work with computers, statistics and IT. You need to become familiar with it as a tool to progress into management and be able to manage people.

Participant 9 indicated he/she would probably go to the University of Oklahoma (OU) or Oklahoma State University (OSU) and pick up science classes. He/she would go to OSU for Logistics Management.

Participant 10 would choose any Oklahoma school that offers coursework related to current position and career progression.

Curricula Recommendations for Incumbents of Similar Aerospace Positions in Oklahoma

Participant 1 recommended classes that interpret information as well as leadership and decision-making processes.

Participant 2 recommended courses dealing with the government.

Participant 3 recommended cyber security classes, Microsoft certified classes, Cisco certification classes since they are a Cisco shop and other end-user types of programs such as word, Excel and PowerPoint. Currently a lot of those classes are available through the Boeing web. They are in online format or take-home format and are available with the local professional training companies.

Participant 4 recommended a database class and exposure to multiple environments computer-wise.

Participant 5 recommended more on leadership, more on knowledge of matrix organization, and familiarization with acronyms or terminology used in this industry.

Participant 6 did not respond to Question 16.

Participant 7 suggested basic finance, computer, speech and project management classes.

Participant 8 recommended courses that give you the IT slant, the ability to know

the day-to-day life cycle and keep the people trained to meet the needs of the engineers.

Participant 9 recommended a solid logistics program and added that he/she was not aware of any logistics management type college courses. The participant did not think you get the same in-depth coverage in a college course as in a seminar.

Participant 10 suggested that the curricula might be more fiscally focused than aerospace focused in terms of national standards. For example, hiring a zoology major in finance and then training the employees to be unique to their job is often done by large companies. Analytical skills and knowledge base would not be as important as a specific accounting degree. There are certain types of employees such as engineers that require an engineering degree. But on the finance side, a lot of analytical type functions are used. Typically Boeing tends to want compliance on a national level.

Recommendations for Preparing for Career Technology Changes

Participant 1 believed it is important to educate yourself by doing your own research to stay current regarding trends within the industry.

Participant 2 believed we should become totally paperless.

Participant 3 believed continuous learning in the Information Technology (IT) field is essential. The participant commented on the importance of becoming familiar with the software and new programs.

Participant 4 did not comment on this question.

Participant 5 believed familiarity with all the Microsoft products and PeopleSoft

product would be beneficial along with an understanding of the internet and electronic mail. "I am more apt to answer an e-mail as opposed to answering the phone."

Participant 6 believed individuals should take courses that provide a challenge and add to one's skill set. The participant believes it will create a more wholesome work history and that it reinforces current knowledge.

Participant 7 believed it is important to know Excel and further stated that during employment interviews, he/she asked participants to rate themselves and then provided an actual test to obtain knowledge levels. The participant commented "instructors make you think when you get out of here, you know the whole world; but they don't provide too many case studies for them to do and it's just not real."

Participant 8 believed in the importance of being open and having the ability and willingness to change. The participant also commented that 30-40% of the Engineers will retire in the next four or five years and that a lot of knowledge will walk out the door when the Engineers leave.

Participant 9 commented "our core business is to make sure we have the platform to support our systems constantly. As the systems change, we need to be able to keep up. If we're doing a mod to the aircraft, a new or older system, those are the things we need to be made aware of, to be able to grasp the changes coming down."

Participant 10 believed professionals cannot be afraid of technology and must be current. The participant commented that more and more people are getting further and further away from face-to-face contact but rather rely on electronic mail for simple communication.

Personal Mentorship and Advice on Furthering Education

Participant 1 had been mentored but had been mentored in the process of mentoring other people.

Participant 2 had been mentored by the manager of the organization about furthering education and has had discussions about taking classes.

Participant 3 stated he/she did not receive a lot of advice on education but the supervisor supports and encourages staff to continue their education. The participant commented on possible opportunities for mentoring others and looks forward to that becoming a reality.

Participant 4 stated “we have the Professional Development Plan (PDP) and that’s what we pretty much use every year.”

Participant 5 had not been encouraged by anyone to go on to obtain a Master’s degree.

Participant 6 relied on a former pilot within the industry for mentoring.

Participant 7 has had several mentors. One mentor has advised several career path options. In addition, the mentor had advised on how to look at things from a business perspective.

Participant 8 stated his/her dad had a college degree and noticed how it afforded great things. The participant had family members who were divided on the importance of a college degree which made the participant realize exactly just how important education is.

Participant 9 did not specifically identify one particular individual as a mentor.

Participant 10 stated there was not one specific individual that provided mentoring; however, the organization has an excellent program that fosters continued learning and encourages the expansion of college courses.

Summary of the Findings Related to Demographic Data

Participant Position Titles and Descriptions

Interviews consisted of occupants of the following positions: Technical Analysts responsible for program management of aircraft; Procurement Specialists responsible for purchasing and contracting; Information Technologists responsible for systems administration and programming; Human Resources Generalists responsible for performance management, compensation, discipline, and labor relations; Supply Chain Specialists responsible for funding; Writers responsible for technical manuals; and , Business, Financial and Information Technology Managers responsible for managing specifically identified areas of their operations.

Education/Training Requirements of Current Position

All ten participants indicated they were required to hold a Bachelor's degree. Only one indicated that a Master's was preferred. One of the participants indicated that the Master's could be substituted for experience.

Some preferences for the types of degree were identified. For example, a business degree was recommended in procurement; computer science or business degree was

preferred for the information technologist professionals; a communications degree was preferred for the writer; a business or finance degree was preferred for the managers.

Some incumbents perceived that a combination of experience and education was needed for their positions. For example, some involved in information technology needed 12-15 years of experience in addition to the Bachelor's degree or could substitute 8-10 years of experience for education depending upon the type of position they occupied. A Bachelor's degree was required in the human resource field; a Bachelor's degree and many years of experience were needed for a Writer position; the individual in supply chain had a Bachelor's degree and 15 years experience.

Although experience was important to most of the incumbents, only one of the participants had served in an internship during their educational experience. In hindsight, a follow-up question should have been asked regarding the reason so few incumbents had served in an internship. Perhaps internships were not available when they were needed or incumbents did not recognize the advantages an internship could provide.

Career Path and Obstacles to Career Progression

The majority of the participants pursued a career path that was directly related to their specific career goals. Only a couple of the participants made career changes unrelated to their current profession.

Most of the participants responded that human and personality factors were the biggest obstacles to career progression including communications, politics, competitiveness, and mobility requirements. Additional obstacles addressed were the direct

need for experience in technical fields and the “disconnect” experienced between what is learned in the classroom and what is experienced in real life.

Summary of Findings Related to Research Question 1.

Background Required for Existing Oklahoma Aerospace Positions

Supplemental Education/Training Requirements for Current Position.

Three of the participants stressed the importance of the degrees being related to the position. For example, one of the participants explained the difficulty an English major might have in trying to learn logistics or operate in that particular field without previous logistics experience or education. Additional education and training requirements for some positions were identified. For example, suggested coursework included: government procedures and terminology, leadership, mathematics, verbal communications including presentation skills, people skills, accounting, employees relationships, and project management. Some recommendations indicated the importance of coursework indirectly applicable to the position, (e.g. general airframe courses in logistics, and engineering courses in technical writing). It was also suggested that technology and software should be kept updated in the classrooms.

Educational Requirement Changes in the Current Position.

Six of the ten participants did not perceive any changes in the educational requirement of their position. However, two of the participants stressed the fact the bar of education has been pushed higher and that today’s baccalaureate degree is equivalent to a

high school diploma for some positions. The implication is gaining strength as the educational norm of the future. One of the participants addressed rapid changes in technology and the tools used to perform day to day job functions using an analogy of the use of 3 x 5 cards versus today's requirement of Microsoft. The participant cited the current use of electronic manuals as an example of "information explosion" in today's aerospace environment.

Optimum Level and Type of Education for Current Position.

A Master's degree was the optimum level suggested by four of the participants. Two of the six participants that identified a bachelor's degree as optimal did so with a caveat that a baccalaureate degree appears to have diminishing value. One participant stated that twenty years ago a bachelor's degree said something but now it is like a high school education and it allows you just enough to get your foot in the door. Note the slight difference in the number of participants suggesting a Master's degree as optimal versus the number who stated in a previous question that a Master's was preferred. After discussion and rephrasing of questions, the number went from two to four who realized the importance of a Master's degree.

Current Educational Enrollment of Participants

Seven of the participants are not currently enrolled in school. Four of the seven participants are planning on enrolling within the next six months and three have no plans to

enroll in college coursework in the near future.

Three of the participants in the study are currently enrolled. Two of these three are enrolled in a Master of Science in Aviation and Space at Oklahoma State University and one is completing a Doctor of Education.

Participant Opinion on Importance of Additional Education

All of the participants stated that additional education was important contingent upon the position occupied.

Summary of Findings Related to Research Question 2.

Availability of Educational Requirements for Career Progression

Career Path Options and Educational Requirements for Career Progression.

All but one of the participants identified at least one career path option which would require additional education. Options identified generally fell in the category of their current fields of expertise. Four of the 10 participants identified business or management positions as options for career progression, two identified finance and two identified information technology as options. The one participant who did not identify a career path referred to the issues of mobility as a limitation. That participant already held a Master's degree but believed a doctorate would provide additional options for career advancement. Another participant who was working on a doctorate expressed concern about over-qualification.

Summary of Findings Related to Research Question 3.

Gaps in Availability of Aerospace Education

Availability of Education/Training

Six out of 10 participants commented that their education and training had been available in Oklahoma or believed that it could have been even though two chose to obtain degrees from out of state. The following academic institutions and degree programs were mentioned: University of Oklahoma for technology, Rose State College and Oklahoma City University for business related, Oklahoma City Community College and University of Central Oklahoma for Information Technology, and Oklahoma State University for Human Resources. Two of the participants are currently enrolled in a Master's program at Oklahoma State University.

Source of Education for Career Progression

Six participants identified Oklahoma academic institutions as the source of potential coursework for career progression, two referenced online coursework available through the Boeing website supplemented by a weekend course in Wichita. One of the participants commented on the importance of partnerships and the win/win situation they offer and suggested it is important for the company to stand behind the institution when they are getting their degree.

Higher Educational Institutions Offering Coursework Related to Current and Career Progression

One participant mentioned the Bachelor's or Master's in Supply Chain Management at the University of Oklahoma. One participant referenced the Aerospace Logistics degree at Oklahoma State University. One suggested that a knowledge of matrix organizations would be helpful; another mentioned a combination of management and information technology with an emphasis on statistics and computers.

Specific Curricula Recommendations for Aerospace Industry Positions in General

Participants recommended curricula in leadership, decision-making processes, government, cyber security, software certification, database management, matrix organizations, aerospace and government acronyms and terminology, government contract negotiations, aerospace finance, computers, speech, project management classes, business presentation classes, information technology, analytical skills, and logistics.

Preparation for Technology Changes

Five of the 10 participants identified the need to address technological changes in terms of software such as Microsoft Office to include programs like Excel, Outlook, PowerPoint, and Word. One mentioned self-education on trends within the industry and another mentioned change management.

Mentoring

Nine of the ten participants confirmed that they had been mentored during their

career with respect to their educational and career advancement. Five of the 10 specifically mentioned they had been mentored by their manager or supervisor, one was mentored by a family member; the rest by other people.

CHAPTER V

CONCLUSIONS, RECOMMENDATIONS AND SUMMARY

Conclusions

Demographic Conclusions

1. Although the level of education recommended by the participants was generally a Bachelor's Degree, this study found a broad range of intellectual capital positions within Boeing with an equally broad range of types of curricula requirements which raised the question as to whether other aerospace organizations in Oklahoma have a similar range of educational requirements.
2. In today's technologically advanced society, students insist on convenience and are more apt to take coursework in close proximity to their workplace or via distance learning, preferably online. Prospective students indicated that convenience is the driving factor for continuing their education in support of career progression goals.
3. The study found that a Bachelor's degree was the minimum education requirement for most positions particularly if it was combined with a certain amount of experience measured in years. A Master's degree was preferred or even considered the optimum degree under some circumstances, especially if it could be substituted for experience. It is

not known if the level of degree requirement identified was influenced by the level of the degree held by the incumbent since all of the participants held at least a Bachelor's degree. The common denominator appeared to be in the type of degree that the majority of participants identified. The majority of the participants identified some type of Business degree as the optimum with a broad range of specialization in areas of finance, communications, computer science, procurement, logistics, leadership, and management.

4. Only one of the participants indicated that they had been involved in an internship but the majority emphasized the importance of experience to complement their education. The study did not explore why only one participant had experienced an internship.

5. The dominant obstacles to career progression were identified as human factors related to geographic mobility, political associations, and competitiveness. One participant mentioned a "disconnect" between what was learned in the classroom setting versus what was experienced on the job.

Research Question 1 Conclusions

Educational Background Required for Existing Oklahoma Aerospace Positions

6. Although the Bachelor's degree was generally considered sufficient for most of the aerospace positions at Boeing, the number of participants who identified the Master's degree as optimal would suggest that perhaps the organization should encourage employees to consider that level of education. That conclusion was further enhanced in that all of the participants agreed that additional education could be beneficial but it was

contingent upon the type of position. Some participants even expressed concerns about the declining value of the Bachelor's and the trend toward the importance of a Master's degree which further reinforces the importance of continued education. Yet only three of the 10 participants were currently enrolled in an academic program.

7. Regardless of the level of education, the type of degree was important and should be related to the position. For example, a logistics degree would be preferred for a logistics position. Additional coursework was identified by the participants that would enhance their performance and help them adjust to changes in requirements of the position.

Research Question 2 Conclusions. Educational Requirements for Career Progression

8. Although employees identified their current education as adequate, several acknowledged additional education as optimal to perform in existing positions and aid in career progression. Only three of the 10 participants interviewed at Boeing were pursuing that education even though they commented on its importance and acknowledged that Boeing would pay for their additional education. Rationale for the decision not to pursue further education was not included in this study. This snapshot of one aerospace organization raises the question regarding why more participants are not actively enrolled in academic programs or courses that would facilitate career progression. Although this sample is small and the findings cannot be generalized to the larger aerospace industry population, it could be advantageous to pursue further study of other organizations to determine if this sample is representative of the educational requirements of the industry as a whole in Oklahoma and the willingness of employees to pursue additional education.

Research Question 3. Gaps in Aerospace Educational Availability

Although the findings of the study did not surface gaps in availability of generic degree programs, it did surface some gaps in the availability of aerospace-related coursework required for the participant's current positions as well as their career progression. The majority of those interviewed stated that their degree requirements either were or could have been met by Oklahoma academic institutions. However, throughout the interviews and while analyzing the findings it became evident that the standardized education specific to their degree was not specific to the aerospace industry, and in turn, uncovered knowledge gaps that had to be filled by the employer. Academic institutions should work with industry to provide industry-specific curricula and learning opportunities. For example, employees without a previous military or government background were at a decided disadvantage due to the unique government terminology, acronyms and procedures. In all occupations there were similar educational gaps encountered which were being addressed either through organizational training or self-education. Organizational training and self-education included but was not limited to industry regulatory requirements, contract negotiation, software platforms, aircraft design, aerospace engineering and electronics terminology, specialized communications, writing and presentation skills, organizational structure as well as government terminology and procedures.

It is anticipated that the gaps in aerospace education can only increase due to technological and organizational changes because of the dynamic nature of the aerospace

environment. Generic curricula supplemented by industry-specific coursework and course materials could address the terminology and procedural gaps specific to the aerospace field. Although academic degree programs are critical to addressing those gaps, organizational mentoring and academic capstone and internship arrangements are valuable tools to supplement coursework.

Recommendations

1. Supplement this study with a follow-up survey of additional aerospace organizations for the purpose of determining similarities and differences in intellectual capital positions and in educational requirements identified by incumbents of those positions.

2. An additional parallel study of aerospace executives and/or management personnel opinions regarding the educational requirements of their organizations and the industry as a whole could also provide a different perspective and address more in depth those issues that were raised in this study. It could also validate some responses which could have varied with the position and perspective of the participant. Contingent upon the outcome of subsequent studies, a more comprehensive educational pipeline could be established that better addresses the requirements of both the student and the industry for the most common positions.

3. Continue to expand partnerships between the aerospace industry and higher education to design coursework or degrees that include opportunities for specialized

coursework that satisfies curriculum needs of Oklahoma's aerospace workforce.

4. The findings of this study appear to support establishment of degree programs whereby the first two years of the educational pipeline could consist of a university parallel program beginning with an Associate of Science degree in Business (at a location in close proximity of the place of employment) followed by a baccalaureate program in Aerospace Administration and Operations with coursework that exposes the student to a variety of specializations (e.g. Finance, Communication, Computer Science, Procurement, Logistics, Leadership, and Management). At the Master's level students could then specialize in any one of the same program emphasis areas which includes aerospace- specific specialized coursework. This Master's program could be called a Master's of Aerospace Administration and Management with options for specialization in Aerospace Finance, Aerospace Communication, Aerospace Information Systems, Aerospace Procurement, Aerospace Logistics, Aerospace Leadership, and Management. These options would encourage employees to advance their education in their current field or broaden their career path options by choosing a complimentary degree option.

Degree Path Options

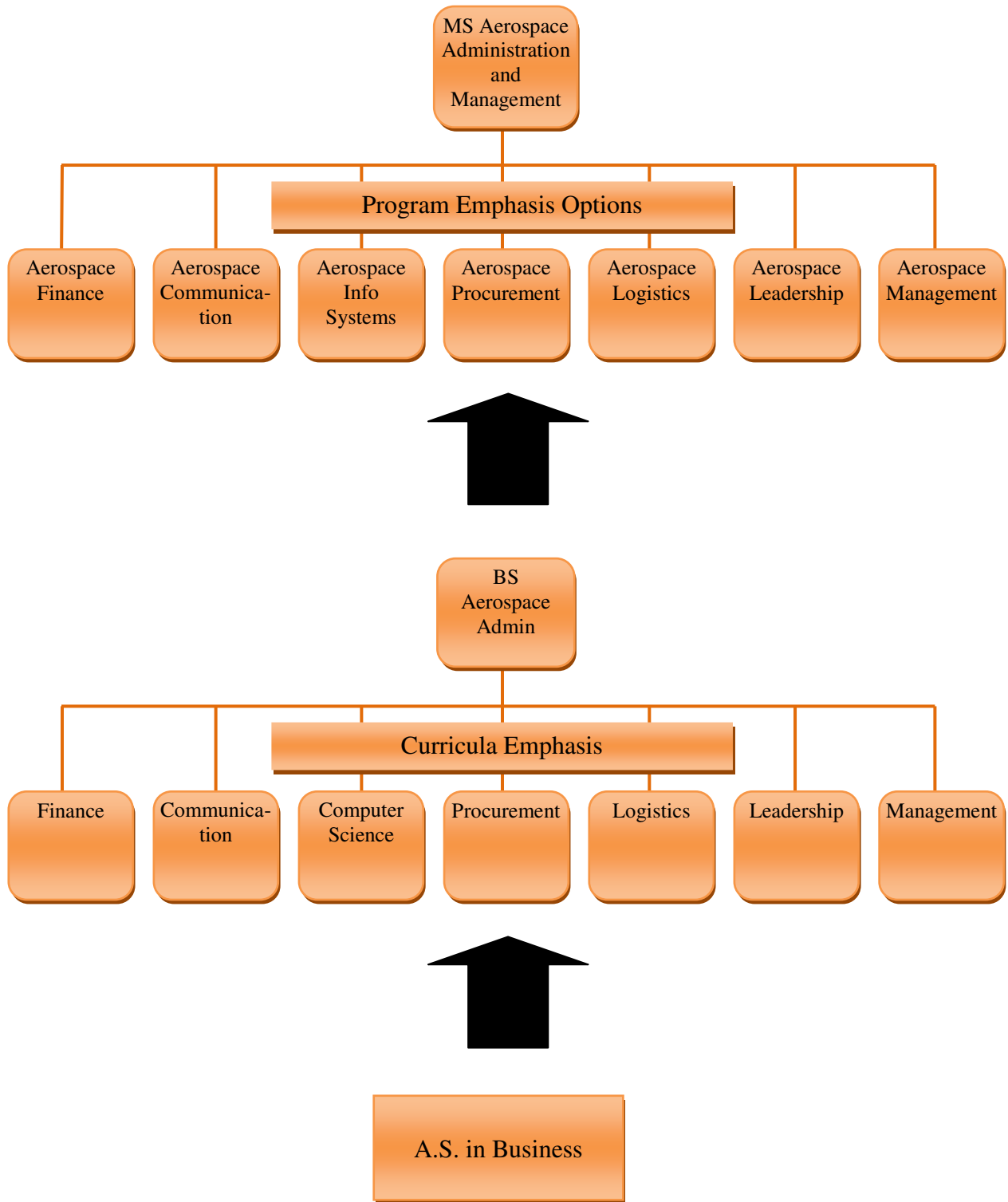


Figure 2. Recommended Curricula

5. Aerospace industry representatives should continue to work with higher education institutions to develop creative new capstone, internship, employment agreements, and other opportunities at all academic levels beginning at the associate degree and continuing those opportunities through the post-graduate level.

6. Communications, networking, and human relations coursework should be incorporated into core requirements for all aerospace degree options to address the identified obstacle of a “disconnect” between classroom and real life experiences. In addition to the recommended coursework, creative shared work-academic relationships between students and aerospace organizations should be developed to provide exposure to real world scenarios.

Research Question 1 Recommendations. Educational Background Required for Existing Oklahoma Aerospace Positions

7. Establish a system of collaborative relationships between academia and industry to promote the importance of continued education and facilitate the availability and opportunities for pursuing those degrees pertinent to their positions. This would not only involve designing degree programs specific to the aerospace positions but should provide options for supplemental learning in such related areas as contract negotiations, government procedures and terminology, leadership, mathematics, verbal communications including presentation skills, people skills, accounting, employee relationships, state-of-the-art technology, and project management.

Research Question 2 Recommendations Regarding Availability of Education for Career Progression

8. Conduct subsequent research of companies that provide financial assistance to employees to determine educational requirements versus the number of employees currently enrolled in educational programs and using organizational financial assistance. These findings could suggest a review of financial aid policies, career advisement procedures, and/or curricula availability issues.

Research Question 3 Recommendations Regarding Gaps in Aerospace Availability

9. The primary gap which surfaced in this study indicated that degrees were not specialized enough for their area of expertise. In turn, workers had to train themselves or this became the responsibility of the organization. It is recommended that once the findings of the follow-up survey (reference Recommendation 1) have identified the dominant occupations and requirements of the industry, collaborative efforts should be established between higher education and industry to design industry-specific curricula for the major job titles.

Summary of Conclusions and Recommendations

In addition to addressing the broad research questions of this study related to educational requirements and gaps in availability of related degrees and curriculum, the findings of this study surfaced some significant issues for future study. Because the study was confined to only one aerospace company, the findings could not be generalized to a larger population but did provide insights for future study of Oklahoma aerospace

organizations. Using this study as a baseline, a subsequent study of a larger aerospace population could further refine recommendations related to common requirements of the aerospace industry and assist in development of an educational pipeline that better addresses gaps in availability of curriculum.

Although most of the incumbents of aerospace intellectual capital professions in this one representational company described their Bachelor's Degree as adequate, there were some differences of opinion regarding whether or not that level of education was optimal. Concerns were expressed about an increasing need for higher level degrees and devaluation of the Bachelor's degree. Yet only three of the ten participants were enrolled in higher education in spite of their recognition of need and the organization's generous policy of financial assistance for education. Follow-up research should be conducted of this company and other Oklahoma aerospace companies to determine the percentage of employees enrolled in higher education degrees and why aerospace employees fail to take advantage of educational opportunities even when financial aid is offered.

The most significant differences noted in participant responses related to educational requirements of their positions was not necessarily related to the level of education needed but the type of curriculum available within a given degree. Almost all participants identified needed curriculum that had not been included in their more generic degree programs. That curriculum had generally been supplemented by their employer through organizational training. Although the majority of the participants believed most of their aerospace educational requirements could be met in Oklahoma, one suggested it was "piecemeal" and scattered over numerous educational institutions. Expansion of this study to a larger population was recommended to address those gaps by identifying commonality

of requirements across the industry in similar intellectual capital professions. If significant numbers of professions in aerospace organizations support a more specialized curriculum, new degree specializations could be identified and made available.

One significant issue that surfaced in this research which merits some attention in future research is the issue of ease of access and flexibility of educational choices including the possibility of college coursework being made available at the work site

Although much of the data pertaining to educational requirements of professional positions in the aerospace industry is available through organizational Human Resource departments, this study was designed to surface opinion of actual incumbents who could be a rich source of data to identify other issues not readily apparent in existing HR documentation. The findings of this study go a step further and reflect participant perceptions regarding specific deficiencies and gaps in the aerospace educational process for selected intellectual capital positions within the industry. The findings surfaced numerous questions for future study and reflected the importance of continued collaboration between industry, employees and academic personnel to insure availability of the right education in the right place to meet the educational requirements of the industry.

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APPENDICES

APPENDIX A

IRB APPROVAL FORM

Oklahoma State University Institutional Review Board

Date: Monday, February 04, 2008
IRB Application No ED087
Proposal Title: A Qualitative Inquiry of Educational Requirements of Selected Professions in the Oklahoma Aerospace Industry
Reviewed and Processed as: Expedited

Status Recommended by Reviewer(s): Approved Protocol Expires: 2/3/2009

Principal Investigator(s)

Casey J. Walker 605 S. Hillcrest Ct. Ln. Mustang, OK 73064	Mary Kutz 6108 Winfield Dr. Okla. City, OK 73162
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The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 219 Cordell North (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,



Shelia Kennison, Chair
Institutional Review Board

APPENDIX B

PARTICIPANT CONSENT FORM

CONSENT FOR PARTICIPATION

Information about the investigator:

Casey Walker, Candidate for the degree of Doctor of Education
605 S. Hillcrest Ct. Lane.
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Residential Phone: (405) 256-0059
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Faculty Advisor:

Dr. Mary Kutz
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6108 Winfield Dr.
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E-mail: drkutz@cox.net

Research Title: A QUALITATIVE INQUIRY OF EDUCATIONAL REQUIREMENTS OF
SELECTED PROFESSIONS IN THE OKLAHOMA AEROSPACE
INDUSTRY

Research Procedures:

As an employee of the *Boeing* organization, you have been identified as a possible voluntary participant in a research study that will identify educational and training requirements for specific career positions in the Oklahoma aerospace industry.

Interviews will be conducted during the months of February and March 2008 at the Oklahoma City Boeing offices located at 2601 Liberty Parkway. The research investigator will contact you for a convenient interview time. Interviews will last approximately one hour. Please be advised that if an interview must be interrupted for unforeseen circumstances, it may be necessary to re-schedule the interview when it can be completed in its entirety during one setting.

You will receive interview questions prior to the scheduled interview time. These questions will request information related to your personal educational and professional background. Your response to the interview questions are intended to be your personal views toward career development in the aerospace industry. The interview will be audio-taped and transcribed strictly for post-interview data analysis. Please be advised you will remain anonymous throughout the study and your responses will not be recorded by name. Your interview will be assigned a number, which will be used to identify the data. The research investigator, the researcher's faculty advisor, and the transcriptionist will be the only individuals that will have access to audio-tapes and transcriptions from the interview. When the data is not being analyzed by the principal investigator all audio-tapes and transcripts will be secured in the research investigator's home office. In addition, audio tapes will be secured in a locked safe located in the transcriptionist's home when not being analyzed.

Please be advised in addition to those listed above, the Oklahoma State University Institutional Review Board (IRB) has the authority to inspect this consent form, audio-taped data and transcriptions at any time during the research process to ensure the integrity and procedural compliance of the study. Also, all parties involved in transcribing audio taped interviews will be required to sign a confidentiality agreement. This agreement will help protect your privacy and will preclude them from discussing information with persons other than Mr. Casey J. Walker, Dr. Mary Kutz, or any official from the Oklahoma State University Institutional Review Board.

Upon completion of the study, all audio-tapes and transcriptions will be destroyed to protect the confidentiality of the participants. The research investigator will make written record of the destruction of data.

You must notify the research investigator within three days after the completion of your interview if you wish to view the final report prior to its submission to the Oklahoma State University Graduate College.

There are no known risks associated with participating in this study that are greater than those encountered in your daily routine. The participant should note that a final report of this research will be available for public access. Therefore, it may be possible for employers to recognize comments associated with respective positions.

This study does not provide an immediate benefit to participants. Long-term benefits as a result of this study may allow for educational and training opportunities which could advance a participant's career.

Confidentiality Statement:

No foreseeable risks to participants have been identified. Measures explained in the preceding paragraphs have been declared by the research investigator to guarantee the confidentiality of each participant and any information he/she provides for the purposes of this study.

Participant's Rights:

Your participation in this study is completely voluntary. You may discontinue your participation in this study at any time without reprisal or penalty. There are no known risks associated with your withdrawal from this study.

Signature:

I, (print name in full) _____, am an employee of Boeing. By signing this document, I am declaring that I have read and understand the above information and willingly agree to participate in the study conducted by the research investigator.

Participant's Signature

Date

I verify explained the information contained in this document to the participant prior to asking for his/her signature.

Casey J. Walker, Research Investigator

Date

For inquires about this research please contact: Researcher, Casey Walker at (405) 590-8507 or via e-mail: okieaviator@cox.net; Faculty Advisor, Dr. Mary Kutz at (405) 744-9892 or via e-mail: drkutz@cox.net
For information about participant's rights please contact: IRB Chair, Dr. Shelia Kennison at Oklahoma State University, 219 Cordell North, Stillwater, OK 74078 or (405) 744-1676.

APPENDIX C
PARTICIPATION LETTER

Dear Sir or Madam,

My name is Casey Walker, I am a Doctoral Candidate at Oklahoma State University. I am working toward a degree in Applied Educational Studies with an Aviation and Space Science emphasis. As part of an ongoing research project, I would like to invite you to participate in helping to make a difference within your organization and industry as a whole. I am asking for your cooperation by participating in a study allowing me the opportunity to interview you in-person (or by phone) during the month of _____ . Interviews conducted in-person will take place in a private conference room at the Oklahoma City Boeing offices located at 2601 Liberty Parkway.

The purpose of this study is to help identify areas where additional education and training would be required for professional advancement. Your participation as a member of the *Boeing* organization would provide administrators with the information necessary to aide their employees in career progression.

Sample questions that will be used during the interview are attached for your reference. In order to record accurate data, with your consent as a participant, I will audio-tape and transcribe our interview. Please be assured the interview transcripts will not identify you by name but by number and are used strictly for data analysis. Your responses to questions will be paraphrased and used in the final research report. This final report will be available for public access. Therefore, it may be possible for employers to recognize comments associated with respective positions.

Upon completion of data analysis all audio-tapes and transcripts will be destroyed. If you so choose, a copy of the final report will be available for your viewing prior to the submission to the Graduate College. Please be advised, there are no known risks associated with this research.

I will contact you via phone _____(insert date) for any informational questions you may have regarding the research project prior to participating in this study. Please contact me anytime throughout the study at (405) 590-8507 with questions or clarification.

Thank you in advance for your cooperation and in helping your organization promote education and training for your industry.

Sincerely,
Casey Walker

APPENDIX D
INTERVIEW QUESTION GUIDE
INTERVIEW GUIDE

PARTICIPANT CAREER & DEMOGRAPHIC DATA.

1. What is your current position title and briefly describe what you do?
2. Did you do an internship prior to taking this position? If so, what type?
3. What are the educational/training requirements for your current position?
4. Describe your career path to your current position.
5. Describe the factors that have been obstacles to you in progressing through your career. If any.

PARTICIPANT PERSPECTIVES:

**RESEARCH QUESTION 1. EDUCATIONAL BACKGROUND REQUIRED FOR
EXISTING OKLAHOMA AEROSPACE POSITIONS**

6. What education/training might have improved your ability to meet the requirements of your position or at least made the transition easier?
7. Have the educational requirements of your current position changed? If so, how?
8. What would you consider the optimum level and type of education for your current position?
9. Are you currently enrolled in college or are you planning on enrolling in the next 6 months? If so, how do you feel this will help you in your current position?
10. Do you feel additional education will help you in your current position? If so, how?

RESEARCH QUESTION 2. AVAILABILITY OF EDUCATIONAL REQUIREMENTS ESSENTIAL FOR *CAREER PROGRESSION*

11. Describe your career path options at Boeing and the aerospace industry and the educational requirements for those options.
12. Do you feel additional education would help further your career at Boeing? If so, how? What are your specific educational needs in order to advance your career?

RESEARCH QUESTION 3. *GAPS IN AEROSPACE EDUCATIONAL REQUIREMENTS AND AVAILABILITY*

13. Where were you able to find the education and training you needed for your current position? Was that training available in Oklahoma? If so, where?
14. Where would you have to go to meet your educational needs for career progression?
15. What higher educational institutions in Oklahoma and elsewhere offer coursework related to your current and career progression opportunities?
16. What specific curricula would you recommend to meet the needs of people in aerospace industry positions such as yours?
17. As technology in our society continues to be more prevalent, how do you believe people in your career should be prepared?
18. Where or with whom do you get advice on furthering your education? Has anyone mentored you in furthering your education?