1991

Perceived importance of identified duties and tasks in the area of design/drafting management

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Order Number 9217233

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University of Northern Iowa, 1991

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PERCEIVED IMPORTANCE OF IDENTIFIED DUTIES AND TASKS IN THE AREA OF DESIGN/DRAFTING MANAGEMENT

A Dissertation

Submitted

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Industrial Technology

Approved:

Dr. M. Roger Betts

Dr. Charles D. Johnson

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December 1991

PERCEIVED IMPORTANCE OF IDENTIFIED DUTIES AND TASKS IN THE AREA OF DESIGN/DRAFTING MANAGEMENT

An Abstract of a Dissertation

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Approved:

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ABSTRACT

The purpose of the study, was to determine the importance of identified duties to the career success of a newly hired design/drafting employee aspiring to become a supervisor or manager as perceived by design/drafting managers and university professors. An opinionnaire was developed which consisted of 141 tasks which were grouped into 13 general duties. The 13 duties represented the job functions for design/drafting managers. The opinionnaire was validated utilizing a jury of experts consisting of eight design/drafting managers and five university professors. It was then mailed to the membership of the American Design Drafting Association (ADDA) who identified themselves as design/drafting managers, and to university professors listed in the Industrial Teacher Education Directory and identified in the area of drafting, design/drafting, design, CAD or engineering graphics.

The two groups surveyed for this study were asked to rate the importance of each task to the career success of a newly hired design/drafting employee aspiring to become a supervisor or manager. Each task was rated by the respondents as (1) Not Essential, (2) Somewhat Essential, or (3) Essential. Of the 469 surveys mailed to the two populations, design/drafting managers returned 80 (39.22%) of 204 opinionnaires, and educators returned 69 (26.04%) of 265 opinionnaires.

The results indicated, all 13 identified duties were rated by both groups as at least Somewhat Essential, and 7 were rated Essential by both groups. It can be concluded that the 13 identified duties are important, and should be included in a design/drafting management curriculum. In comparing the mean responses of the two groups, four duties were rated significantly different and in each case the university professors rated the duty higher than the design/drafting managers.

ACKNOWLEDGEMENTS

At the conclusion of a project such as this it is appropriate to thank those involved. In my case that would take a second dissertation. The road has been long, fraught with potholes, detours and lots of construction but we are at the end. The only way I can make my peace with those who have helped along the way in any rational form is to speak to each by group.

To my family. When I started this journey we were two and two sons. Now we are two and four sons Caleb, Aaron, Matthew, and Luke. I have missed many milestones in your young lives and in the past year have not seen you for weeks at a time. That sacrifice can never be repaid but I will try. To my wife Nancy, without you this could not have happened. For the past year especially you have had to raise a family of four boys basically by yourself. That burden has finally ended. Nancy, know that without your continuous love, support, and an occasional well placed kick this would not have been possible.

To my dissertation committee. The customary sincere thanks is no where near enough. Especially, Dr. Roger Betts who has spent countless hours reading drafts, discussing results, guiding choices both professional and personal. You have gone beyond any reasonable expectation

of what a dissertation committee chair should be expected to do and for that I thank you. Your example was well taught and will not be forgotten or misused. To Dr. Charles Johnson, Mr. Arnold Freitag, Dr. Bruce G. Rogers, and Dr. Greg Stefanich. You have literally taken a sow's ear, in my case more appropriately a sheep's ear, and turned it into a functional if not silk purse. Again, thanks no matter how sincerely said is simply not enough. Your hours spent in this process, willingness to meet on short notice, and all of the hundreds of other ways in which you helped me accomplish this task will never be forgotten. The only appropriate way to repay this dept is to provide the same support and assistance to any doctoral student I become involved with in the future.

To my many friends, especially Jim and Kim Youngkent, Ed and Phyllis McDonald, Lew and Annette Elis, Chuck and Marlayna Fordham, and Ron, Sue and Jeanny Lancaster. You have been the support and sometimes the father my boys needed in my absence, and for that I am thankful.

To my Mother and Father Mary and Arza Shultz, and my Mother and Father in law Amah Lou and Dean Schreiber. You have driven for hours on short request numerous times in the last few years to help my family when I needed to be somewhere else. Your support was needed and appreciated.

To all my friends and colleagues, thanks for the support. The last I has been dotted, the last t, P, and ES calculated. "Honey its over and I'm coming home".

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CHAPTER 1

INTRODUCTION

History of Drafting

In a newsletter for the American Design/Drafting Association (ADDA), Nowers (1988) summarized the history of the drafting profession. Nowers related that for the greatest part of human history the arduous task of putting plans on paper was accomplished by the same architect, engineer, or artist who had been responsible for the concept in the first place. "Drafting," so to speak, was the pulling of ideas from the head to the hand. Somewhere within the chronology of Western civilization, the connection between conceptualization and drafting was broken. This probably occurred with the introduction of interchangeable parts and mass production, the Industrial Revolution. The break was, and remains, more noticeable in manufacturing than in architecture. The Industrial Revolution ushered in an age of extreme specialization. For the first time, there became a person known as a technical drafter, one that implemented the ideas of others. Job descriptions and licensure further defined the drafter, and even the designer, as a separate participant from the engineer or the architect. Inevitably, the professional drafter considered drawings

the product and measured contributions in terms of the quantity and quality of the documents generated.

Most drafting professionals working today have worked within an industrial structure where rewards and risk are predictable. The central problem, however, is that the economic structures in most advanced countries today are no longer centered in industry. Nowers (1988) stated,

> The implications of these shifting economic and technological tides on the design/drafting professional are enormous . . . because the world has already changed, an entire profession needs to redefine itself. Such water-shed historical opportunities are rare. The issues cannot be forced, nor can they be ignored by those most affected. (p. 27)

The Changing Role of the Drafter

The role of the modern-day drafter is changing at such a rate that it is difficult for the educational systems to keep pace. Now, instead of simply being concerned with the production of technically accurate drawings, the drafter often becomes an assistant or a support person to the engineers of the company. Parts of the design process which used to be considered the sole responsibility of the engineer are now being performed by more highly trained drafters. As an example, Finite Element Analysis (FEA), formerly required a group of engineers to set up a problem, took weeks to produce the surface mesh and boundaries and then calculate the results. Because of the time and expense, the process was

reserved for only those components whose reliability was absolutely critical to the overall safety and operation of the system. Today, the more powerful microcomputers and software packages that are available allow the drafter to be trained to use the output of the normal Computer Aided Drafting (CAD) system to develop the mesh, input the data, and perform the FEA. The results are then passed on to the engineers who can then better utilize their time to check the soundness of the design.

With these changes in the technologies, a need developed for the drafter to be educated with a much broader knowledge and skill base than was previously necessary. Today, the drafter is responsible for the integration of information which is received from the various departments and the dissemination of this graphic information to the appropriate clients. This synthesis of graphical information is the true product of the new drafter. There is a need to further train the design/drafter not only to perform the traditional duties of this career path but to also develop the vision to see the entire scope of the manufacturing environment.

The design/drafter who advances to the position of manager is assimilating a great deal more of the management of projects than in the past. The preparation of individuals to fulfill this career path of design/drafting manager is typical of the Industrial

Technology major in that it attempts to join the knowledge and skill of two related yet separate fields of study. The major purpose of this study was to determine the importance of those duties which are important to the success of a design/drafting manager. While the duties and tasks of both the general manager and the design/drafter have been carefully researched, a curriculum which combines the necessary educational experiences of each is not currently available through normal curriculum development channels nor is such a curriculum well defined in the literature. In order to provide a curriculum which adequately develops the breadth of knowledge needed in dealing with these new demands, the importance of the duties in both the management and design/drafting disciplines must be studied. By analyzing the importance of the duties of these two areas, it should be possible to develop a program of study which combines aspects of both groups. The resulting area of emphasis could develop the entry level competencies necessary to prepare individuals for entrance into the design/drafting field, and with further experience, advance into the management of a design/drafting department.

Statement of the Problem

The problem of this study was to evaluate the importance of the duties of a design/drafting manager.

This is one of the first steps which must be carried out if a valid course of study is to be developed. The statement of the research problem was formulated as follows.

In the opinion of university instructors, and design/drafting managers, what are the duties necessary for inclusion in an undergraduate curriculum to develop the desired competencies and skills of an entry level design/drafting manager? Of these duties, what is the perceived importance of each to the success of a newly hired design/drafting program graduate?

Significance of the Problem

The need to identify the duties and tasks for inclusion in a design/drafting management program is significant for several reasons. First the knowledge base itself has changed or at the very least is in a state of transition from what was relevant to know in the past to what is crucial to know in the near future. Second of the reasons for needing to identify the duties and tasks of the design/drafting manager is the initial understanding that the skills to perform as a drafter are distinctly different than the skills needed to manage a design/drafting department. Lastly, the ability to address the issue of accountability for what is being taught plays an ever increasing role in the curriculum

decisions being made. Research projects, such as this one, can serve as a basis for educational program updates. Johnson (1989) describes the changing knowledge base and the ramifications of this change as follows:

> The nature of knowledge itself is changing at such an accelerating rate that it is commonly said that what an engineer knows upon graduation today will be totally outdated in five years. This calls into serious question our traditional view of education as the process of a faculty expert pouring information into a receptive students's open mind.
>
> When the faculty-as-authority model was developed, it seemed possible for an individual to know a good deal of what there was to know about a given subject. The cliche of yellowed lecture notes reused ad nauseam could develop because the presentation of a subject didn't change radically from year to year. Today, our knowledge--including both facts and understanding--is changing so rapidly, and is becoming so intertwined dynamically with other fields that one person cannot hope or claim to know most of the information worth knowing about any given subject. Rather, the knowledge that is of use today is structural understanding and the application of skills--the conceptual and practical systems that allow us to find and plug in new facts and behaviors appropriately as needed. These "cognitive systems" enable us to function interactively, attentive to the dynamic nature of knowledge and experiential activity. (p. 75)

In order to deal with the rapidly changing knowledge base referred to by Johnson, one of the first steps is to perform a needs analysis or to locate, through the typical curriculum development channels, a needs analysis that has been performed in the past. A review of the curriculum development literature revealed that much has been done to identify the curricular needs of the general manager and the design/drafter individually. However, the review

revealed no information that dealt specifically with the design/drafting manager. The problem when trying to deal with the combined management and drafting elements was the lack of specific information in the literature. Roudebush (1988) supports this view in his study Technology Needs Assessment Model for Follow-up Studies in Engineering Technology, with the following statement: "After a search of related literature, it was determined that no research literature was available in the field of engineering technology relating to either follow-up survey research or technology needs assessment research" (p. abs.).

Purpose of the Study

The purpose of this study was to provide educators working in the design/drafting area with a list of duties and tasks performed by a manager or supervisor of a design/drafting department. The study also compared the perceptions of those educators currently teaching in the field of design/drafting with the perception of industry managers or supervisors. This comparison of perception would allow any differences in opinion between the two populations to be identified, and would also indicate the degree to which the two populations differ in their opinion. This study also will provide educators with a starting point from which curriculum can be developed

which takes into account the identified needs of industry as they pertain to newly hired drafters who aspire to become managers or supervisors of their departments or divisions.

Research Questions

The following research questions were addressed during the course of this research project.

1. What is the perceived importance of the identified duties and tasks to the success of a design/drafting department manager in the opinion of professional design/drafting managers?

2. What is the perceived importance of the identified duties and tasks of a successful design/drafting department manager in the opinion of university professors who teach design/drafting?

3. What similarities and differences exist between the perceptions of design/drafting managers and the university design/drafting professors?

Definition of Terms

The following terms used in this study, although not unique, were defined so that all readers may have a common understanding of their use within this study.

1. DACUM: Originally created in the late 1960s, DACUM (Developing a Curriculum) is a method for conducting

an occupational analysis that identifies the tasks that must be performed by persons employed in a specific job or occupational area. As a result of the occupational analysis, a profile chart is developed that identifies the duties and tasks associated with the occupation being analyzed (Pedras & Hoggard, 1985).

2. Duty: A cluster of related tasks performed by incumbent workers in an occupational domain (V-TECHS, 1988).

3. Needs Assessment: A data-gathering and decision-making process to determine the goals of any instructional system (Jonassen, 1989).

4. Task: A unit of work activity which constitutes logical and necessary steps in the performance of a duty. A task has a definite beginning and ending point in its accomplishments and generally consists of two or more definite steps (V-TECHS, 1988).

Assumptions

1. Design/Drafting managers were in the best position to provide information about the duties and tasks necessary for this area.

2. The perceived educational topics and importance of these topics to the success of a design/drafting management program could be determined using a mailed survey.

3. It is assumed that the respondents were representative of the larger population.

Limitations

The limitations of the study were noted as follows:

1. Participation in this study was voluntary.

2. Generalizability of the findings of this study was limited to the research population.

3. Accurate identification of the university instructors as a subgroup within the study was dependent on the accuracy of the Industrial Teacher Education Directory.

4. Accurate identification of the design/drafting managers was dependent on the accuracy of the American Design/Drafting Association (ADDA) membership list.

Delimitations

1. The subgroup of the study which represents the views and perceptions of academia was limited to selected full-time public university instructors who are members of NAITTE or CTTE and reside within the continental United States of America.

2. This subgroup was further limited to those instructors who reported to CTTE that their area of expertise was drafting, design/drafting, design, CAD, or engineering graphics.

3. The subgroup which represents the views and perceptions of industry was limited to those design/drafting professionals who were members of ADDA and reside within the continental United States of America.

4. This subgroup was further delimited to those design/drafting professionals who identified themselves as design/drafting managers or supervisors to the ADDA and reside within the continental United States of America.

CHAPTER 2

REVIEW OF THE LITERATURE

As the beginning of the 21st century approaches, many people and groups are inspired to polish their crystal balls and gaze longingly into them in hopes of glimpsing their future. The manufacturing profession is no different.

> The 21st century is only about 4,000 days away, a very short time for change. We (manufacturing engineers) are not ready. Most of us prefer isolation over integration, hardware over humans. We must wake up to change--change our orientation to our work, our role, and most importantly our attitude, if we are to capitalize on the opportunities before us. Working with and through people is the key to our future success. (Koska & Romano, 1988, p. 3)

The Future Company and the Changing Workforce

The introductory quote serves to point out that the manufacturing community has become more concerned with adapting to the quickening pace of change. This changing view of the role of the manufacturing engineer will also force change on many other personnel. The Profile 21 study goes on to further describe this future company as follows:

> The emphasis on how work is accomplished will be far different with more importance placed on the human aspects of production, less on the technical. Teamwork rather than individual effort will be the key to success. People, not hardware, will be the most critical aspect of work. (Koska & Romano, 1988, p. 4)

As the previous quote implies, the bulk of the Profile 21 study reports the details of a changing system of manufacturing, a system whose reliance on ever improving technologies will shift to looking for ways to enable its personnel to work more productively. The January 1986 edition of Engineering Education describes some of the key ways the technologists of tomorrow will perform their job related duties. "Today's graduates should realize that in a complex industrial world they will usually be members of a team, and skill in communicating clearly and in influencing others is important for both team and individual career success" (Garry, 1986, p. 204).

Garry (1986) goes on to state another reason for the broadening of the traditional curriculums:

> Although there is a consensus that grounding in fundamentals should be the primary focus of engineering education, it is plain that the lack of cross-functional perspectives, for example, manufacturing practice related to product area or marketing and economic considerations, is a major element missing in the knowledge today's young engineers bring to the job. (p. 205)

In yet another study, The National Action Agenda for Engineering (Edwards et al., 1987), eight areas of concern were identified. One of the areas of concern in the American curriculum was "the role of design, manufacturing, and processing" (p. 95). This study suggests the need for further studies in this area.

> The principles of engineering design, and the manufacturing . . . process should be given a more central role in undergraduate curricula. In order to do so, it is essential that individual faculty members and groups that include practicing designers conduct more educational experimentation and curricular research. (Edwards et al., 1987, p. 96)

The Need for Specific Management Skills

As the previous articles indicate their is a need to evaluate the current design/drafting curriculum to determine if these future needs are being met. The National Action Agenda for Engineering indicates a need to make the design process a more central role in the education of today's engineers and technologists. Also as indicated by the Profile 21 study the traditional technologist role will take on more of a technical management function than has been the case in the past. However, this metamorphosis from technologist to technical manager is not an easy or well defined process. Many of the pitfalls to this metamorphosis are discussed in the following section.

Sanford (1983), in her article "The Technician-Turned Manager," describes the problem as follows:

> Unfortunately, the formula "good technician = good manager" doesn't always work. Actually, the superior technician who automatically becomes the superior manager is the exception, rather than the rule.
>
> Technical organizations are surprised when new up-through-the-ranks supervisors do not perform as

> well as expected because these companies forget that the skills that spell success for the technician are not necessarily the same as those needed by a manager. The underlying problem seems to be that the profession of management is not seen as separate from the technical profession. There is no consideration of the distinct skills needed to manage people. (p. 37)

Medcof (1985) finds the following differences between technologists and managers.

> Social Interaction: Technologists are by training and usually by disposition more interested in things than people. The technologist usually likes to work alone, while management must concern itself with people. The technologist tends to deal with technical detail when his time might better be spent on human relations. He is reluctant to delegate authority because he likes to do the job himself and misses the direct contact with work.
>
> Dealing with Management Intangibles: Several writers make the point that technologists prefer to deal with the concrete, and this hinders ability as managers who must deal with intangibles." The literature indicates that it is not the dealing with the intangibles that is difficult for technologists but the switch to a totally different set of intuitively logical intangible rules that causes the difficulty. To further complicate the issue, it would appear that this manager's intuition is very difficult to learn in the formal classroom and can best be absorbed only through practical job experience.
>
> Decision Making: Technologists are not risk takers. They show an excessive need for evidence when it is time to make a decision. The manager must often make a decision without the benefit of having all the necessary information. (p. 205)

Debats (1982) states that the technologist-to-manager transition problem is as follows: "We seem to be faced with a situation in which someone is either good technically or they are good with people. Unfortunately,

the two do not frequently occur together" (p. 729). The reason for this, according to Kutsko (1982), is that the self-image of most technicians was generated in early childhood days from natural ability to solve problems (p. 730). "When a person gets into management their natural reaction is to try and solve people problems. As most managers know, unlike math or physics problems, most personnel problems usually cannot be solved by anyone other than the person having the problem" (p. 10). Krembs (1983) sums up the issue:

> Fast growth in many high-tech companies has created a pressing short-term need for a variety of technical specialists. What is now coming into view of many organizations, however, is a longer range problem of finding enough technical managers to supervise and develop such specialists and to help set technical direction. The problem is compounded by the fact that there are numbers of bright technical professionals unwilling to become managers because they don't want to let go of specialty. (p. 37)

Medcof (1985) summarizes the challenge to educators as follows:

> The rich body of suggestions and the few empirical papers have never been systematized at a conceptual level. To date there have been no attempts to coordinate the suggestions about how to train technologists with the body of suggestions about how they should change to become managers. Similarly the empirical papers do not relate systematically to either the suggestions for training programs or the differences between managers and technologists. (p. 20)

These and other articles and research reports all point to the continuing need for the incorporation of

management and leadership skills into the traditional Industrial Technology curriculum. The design/drafting emphasis is no different. If the intent of an Industrial Technology program, as the National Association of Industrial Technology (NAIT) implies, is to provide managers who are competent in the application of technology, then these programs must incorporate the necessary management and leadership skills into their curriculum. The problem then becomes one of choosing the appropriate mix of leadership, management, and technical skills to provide entry level competencies. How much of an expert in the area of drafting should the student be? Which of the leadership and management skills should be taught in an undergraduate design/drafting program? Are the management techniques more important than the operational aspects of a company? These and many other questions must be answered before an effective educational program can be developed.

The Changing Knowledge Base

Few fields of knowledge are changing at a more rapid rate than that of the design/drafting manager. Not only is the knowledge base itself changing, but the tools of the trade are constantly changing as well. It has not been 8 years ago that finding a micro computer based

CAD system at the university was a rarity. Now, it is commonplace. It has not been 5 years ago that when someone suggested developing a solid model of a project he was talking about a clay sculpture. Now the computer can render a very near photographic quality representation of any product that a designer can think of. This solid model not only appears to be a real object but can actually be assigned mass, and can be sectioned to look at the internal structure. For many, the simple act of operating these computer programs was novel, to say the least. Thought was seldom given to developing a departmental policy which took into account the integration of this computerized analysis tool into the design process. Probably even less thought was given to what the management training ramifications would be. As this example illustrates, it is no surprise that Johnson (1989) believes ". . . that one person cannot hope or claim to know most of the information worth knowing about any given subject" (p. 75). This ever changing knowledge base requires constant upgrading of the design/drafters own skills and personal knowledge base. Johnson goes on to describe a second reason for the need to develop a sound empirical knowledge basis for curriculum development such as this study provides.

> The new learners often are unable to participate, and may be uninterested in the

> traditional four-year, full--time campus experience wherein classroom learning often takes second place to growing up. Thus, they may have little patience with courses that do not achieve their purpose efficiently and effectively. How many of us have taken courses, even in highly regarded institutions, that turned out to be irrelevant, ill--prepared, and useless? Todays students, often taking only one or two courses at a time, and usually paying for them themselves on a course--by--course basis, simply won't tolerate a lack of organization and purpose. They know they can vote with their feet, and do. (p. 75)

In order to develop an educational program that teaches the necessary entry level competencies of a design/drafting manager, the logical first step is to identify the duties and the tasks which need to be performed by a competent design/drafting manager. One of the more successful methodologies utulized to identify these duties and tasks is the Developing A Curriculum (DACUM) process. Hoggard, in the abstract of his 1985 study Utilizing the DACUM Process in the Development of a CAD Curriculum, described the DACUM process as follows:

> Originally created in the late 1960s, DACUM (Developing a Curriculum) is a method for conducting an occupational analysis that identifies the tasks that must be performed by persons employed in a specific job or occupational area. As a result of the occupational analysis, a profile chart is developed that identifies the duties and tasks associated with the occupation being analyzed. The process involves use of a group of expert workers from the occupational area who are guided through a brainstorming session to reach consensus on the skills required for successful workers in that occupation. (Pedras, 1985, p.15)

Hoggard further described the benefits of utilizing the DACUM methodology of occupational analysis as follows:

> DACUM has been successfully used to analyze occupations at the professional, technical, skilled, and semiskilled levels. DACUM operates on the following three premises: (1) expert workers are better able to describe/define their job than anyone else, (2) any job can be effectively and sufficiently described in terms of the tasks that successful workers in the occupation perform, and (3) all tasks have direct implications for the knowledge and attitudes that workers must have in order to perform the tasks correctly. (Pedras, 1985, p. 15)

The necessary duties and tasks for both management and drafting are well documented. However, the specific management duties and tasks which should be included within a design/drafting management program are not currently available through typical curriculum development information agencies, nor are they well defined in the literature.

Program Accountability

Accountability for the course content is a constant issue that must be dealt with by the Instructional System Designer (ISD). To paraphrase Johnson (1989), accountability and assessment are the cornerstones in education at all levels today. It would be difficult to imagine, let alone find, an educational system from pre-school to post doctoral that has not felt the impact

of this movement. Johnson goes on to state that, "Astute policy makers and administrators in higher education have begun to perceive that simply providing entrance and exit exams to their students will neither satisfy the critics nor provide positive benefits to students" (p. 80). Johnson further defines accountability by breaking it into two classifications: internal, which he describes as "the self-conscious integrity of the educational systems that an institution develops-usually visible mainly to faculty and students," and external, which Johnson further describes as, "the outcomes that an institution maybe be required to produce (the quantifiable and public evidence) that are visible to governing boards, state and federal funding agencies, etc. proving that their graduates learned and succeeded as a result of their enrollment (p. 80).

While the technologist may consider it "common sense" to develop programs that are both relevant to the learner and accountable to the institution as well, there are many potential critics of the ISD process.

> Many critics of higher education decry the current emphasis on applied learning--and, indeed, on the whole of thought concerning career education and contracting with industry or the government to deliver on-site programs. Yet students, employers, and community leaders have expressed their unrelenting need for an education that draws from sound theoretical principles and puts them to work for the common good.

> Ernest Lynton, one of the chief spokes-persons for this position, says universities must recognize that the effective attainment of their scholarly mission calls for a complex and interactive process with their constituencies that goes beyond carrying out basic research. There is no question that such research continues to be important, yet by itself it has limited societal value and impact. Such scholarly work needs to be part of a variety of interrelated activities that link the research efforts to their eventual applications and that produce a two way flow of continuous feedback and adaption. (Johnson, 1989, p.76)

One methodology for addressing this uneasiness about the content of design/drafting curriculums and at the same time encouraging this two way flow of information was described as follows by Johnson, (1989):

> The scope of education and training targeted at adults is being rapidly transformed. Changing technologies, changing demographics, and changing goals mean that our universities, industries, and government agencies must work together in an interactive triad to restructure and redirect our notions of what people need to learn, and when. The scale of change means that we must look to education and training to provide structural, rather than individual, solutions. (p. ix)

It quickly becomes apparent that a methodology needs to be utilized which will enable educators to address the changes as noted by Johnson and others in a systematic, multi-disciplinary manner. This methodology needs to be able to identify and organize content which is distributed across different professional fields of study if it is to succeed in developing curriculum to address the needs of the learner as has been identified by the literature. One

such methodology is Instructional System Design. As described by Johnson (1989), the historical foundations of instructional design has evolved over the past 40 years as an outgrowth of several new discoveries and theories in the fields of psychology, management and engineering science as well as information science. These discoveries and developments are attributed to researchers and scholars in behavioral psychology and cognitive development and have provided much stimulus to the thinking about instructional design. Johnson further describes this development of ISD as;

> In the 60s, instructional designers in the military coupled these theories with recent advances in engineering and management, such as systems analysis and operations research, to create the formal instructional systems design process. This is still the standard upon which all instructional design variations are judged. Systems thinking has allowed educators and trainers to apply technology sensibly to large-scale instructional projects. (p. x, 1989)

Johnson, goes on to define ISD as

> . . . a systematic process, based upon instructional theory, for clarifying instructional conditions, outcomes, and methods (Reigeluth and Merrill, 1979). It consists of a theory base and a set of procedures for producing and validating outcome-based instruction. The procedures generally performed by an instructional system designer are, in order:
>
> Conduct needs assessment and analysis
> Conduct task or job analysis
> Assess learner characteristics and entry-level ability
> Generate objective-referenced test items
> Select organizational strategies

Select delivery strategies and systems
Develop management strategies
Select or produce materials
Verify instructional methods and strategies
Validate instructional systems. (p. 7, 1989)

Summary

The literature search for this research project revealed that while this ISD process has been completed in various regions of the country for both design/drafting and management, nothing could be readily found that attempted to coordinate the two systems of instruction. No curriculum could be identified which would provide an appropriate educational experience for those students who will be entering the drafting profession with aspirations of becoming a manager of their design/drafting department. The information gathered by this study can be utilized as a starting point in the curriculum development process of most educational institutions. Use of descriptive information, such as provided by this study, will help demonstrate the validity of course content for the field of design/drafting management. This task analysis, which indicates the content of the duties, can serve as a spring board for this "two way flow of information" alluded to by Johnson. The literature further supports the philosophy that a knowledge base of management skills, duties, and capabilities exists that should be present, in a design/drafting management curriculum. The literature

also indicates that these management skills are separate and distinct from those skills utilized by a successful design/drafter.

The literature indicates a sequence of events which lead to the necessity of this study. First, as the history of the design/drafting profession indicated, this is an evolving field of study. Although drafting as a profession originated with the industrial revolution itself, the body of knowledge that is necessary for a design/drafting professional to be successful is increasing and changing almost daily. The literature further shows that this learning and utilization of management skills is not a natural or comfortable outgrowth of being successful as a technical professional. A different set of educational objectives and teaching styles will be required to impart this broad, cross-disciplinary knowledge base and team style of operation. Lastly, the literature indicates that efforts to conceptually integrate the necessary management skills with those technical skills needed for entry into a design/drafting position have not been made. This literature review found no indication of attempts to further focus curriculum research on the specific set of management and design/drafting duties necessary to the success of a design/drafting manager. It was this need to

focus curriculum research on the problem of integrating the management and design/drafting curriculums that served as the impetus for this project.

CHAPTER 3

METHODS AND PROCEDURES

Identification of the Population

The research population for this study consisted of two groups. The groups involved in this process were selected professionals who currently work as managers of design/drafting departments and selected full-time university instructors who currently teach in the subject area of design/drafting within departments of technology.

Identification of Design/Drafting Managers Population

The American Design/Drafting Association (ADDA), was founded in 1959. This professional organization reports a membership of approximately 2000. One of the goals of the American Design/Drafting Association is to provide a program of education for self-improvement and professionalism in design and drafting and computer-aided drafting. Membership of this group includes designers, drafters, drafting managers, chief drafters, supervisors, administrators, instructors, and student designers. Because of the extensive representation of the ADDA professional group and its establishment as the primary association representing the drafting profession, it was believed that ADDA members were the appropriate group to survey for design/drafting management skills. The

executive director of ADDA provided a list of all members describing themselves as design/drafting managers.

Identification of the Design/Drafting Educators Population

The Industrial Teacher Education Directory (Dennis, 1990-91) was utilized to identify all four year university educators teaching in the areas of drafting, design/drafting, design, CAD, or engineering graphics programs. This directory is a joint publication of the National Association of Industrial and Technical Teacher Educators (NAITTE) and the Council on Technology Teacher Education (CTTE) and is updated annually. The rationale for selecting this directory for identification of the population was that these two organizations were among the most representative of all the technical professional organizations.

Sample Size

To determine sample size, it was necessary to specify the type I error (alpha), statistical power, and effect size. Effect size was defined as the difference between the means in standard deviation units. After analyzing previous studies in which the question of perceptual difference between educators and practitioners was at question (Swanson, 1989; Gindele, 1988), no consistent

effect size was noted. On the basis of these studies, it was postulated that a medium effect size of .5 (Cohen, 1977, p. 20) would exist between the populations of the study. For this study, it was decided to set the type I error at alpha =.05, and power =.80 (Cohen, 1977, p. 56). Using these values, a minimum sample size of 64 for each group was determined to be appropriate using Cohen's 1977 tables for the difference between two means. The entire population of full time design/drafting educators and the entire population of those ADDA members who reported being either managers or supervisors of design/drafting departments were surveyed. This procedure resulted in 204 ADDA members and 265 educators, for a total population of 469 people.

Development of the Survey Opinionnaire

To answer the research questions proposed for this study, the opinionnaire included items which addressed the identified areas of concern. These areas of concern were the specific design/drafting management duties and the design/drafting technician duties which are necessary to the success of a design/drafting manager. To provide information as to the importance of each duty, the underlying tasks were studied as well.

Identification of Design/Drafting Technology Items

The results of a Developing A Curriculum (DACUM) Matrix of Occupational Competencies was utilized to identify those design/drafting duties and tasks necessary to the success of a design/drafting technician. The particular DACUM task analyses which was adapted for use in this study were originally developed by Morton College (1986) and Dundalk Community College (1985). The task listings, which made up the identified duties, were collapsed in order to reduce the number of questions necessary to obtain the desired information. All of the original duties and the descriptors of those duties were maintained.

Establishment of Opinionnaire Validity

In order to confirm that the questions being asked were valid, a jury of experts was identified and asked to review the opinionnaire. This jury of experts consisted of 13 members, eight of which were affiliated with the American Design Drafting Association and identified as qualified drafting and design managers by the executive director and were serving on the board of directors of the ADDA at the time of the survey. The remaining five jurists were university educators selected from the Industrial Teacher Education Directory and identified as

experts by the editor of the Industrial Teacher Education Directory, Dr. Ervin A. Dennis. The jury members were contacted by phone, then a cover letter, (see Appendix D) and the opinionnaire was sent. Due to the confidentiality stated by the cover letter, the names and addresses of the jury of experts were not reported. All eight of the ADDA members and all five of the educators responded to the opinionnaire. Only minor modifications in wording of directions and in the arrangement of the questions were suggested. These modifications were incorporated into the final opinionnaire which was used for the survey.

Data Collection

In accordance with the Total Design Methodology (TDM) for administering mail surveys (Dillman 1978), the following procedures were followed.

1. The survey material was mailed. The survey material contained a cover letter (Appendix B), that emphasized a reasonable explanation of the subject of the study, its benefit to a group with which the recipient identifies, and the individual importance of the respondent to the success of the study (Dillman, 1978).

2. Ten days later, a follow-up letter (Appendix B) was sent to all recipients of the first mailing. The

letter was written as a thank you and a reminder to those who had not returned the opinionnaire.

No further follow up procedures were conducted.

CHAPTER 4

PRESENTATION AND ANALYSES OF DATA

This chapter will present the data in table form with descriptions of the tabular information included. The methodology utilized to analyze the data will be described. The identified duties of this study will be presented and analyzed to identify the perceived importance of the duty by both the design/drafting managers and the university professors. The 141 individual tasks which make up 13 identified duties that are performed by design/drafting managers will be presented and analyzed in a similar manner.

Response Rate

Using Cohen's (1977) tables for the difference between two means, as described further in chapter 3, it was determined that a minimum sample size of 64 for each group was needed to be statistically appropriate. Of the 469 surveys mailed to the two populations, design/drafting supervisors returned 80 (39.22%) of 204 opinionnaires and educators returned 69 (26.04%) of 265 opinionnaires. This represents a combined response rate of 31.77%.

Data Analysis Procedures

The two groups surveyed for this study were asked to rate the importance of each task to the career success of a newly hired design/drafting employee aspiring to become a supervisor or manager. Each task was rated by

the respondents as (1) Not Essential, (2) Somewhat Essential, or (3) Essential. Unanswered items were treated as missing data in regard to analyses.

Table 1 presents the descriptive statistics as indicated by the responses of the managers and the professors. The descriptive statistics for the 13 duties consisted of the mean value of the responses (M), standard deviation (SD), *t* value (t), probability (*p*), and Effect Size (ES). The mean value was determined by dividing the sum of the responses for the tasks by the number of tasks in each duty. This calculation was performed so the mean response value of the identified duty would be in the same 1, 2, 3 rating scale as the opinionnaire. The probability (*p*) value indicates the level of confidence for the *t* value. The effect size (ES), refers to the size of the difference in terms of pooled standard deviation units. For those duties in which the *t* value does not indicate a statistically significant difference between the two populations, no ES was calculated or displayed.

Analyzing the means in Table 1 reveals that none of the 13 duties were rated as Not Essential by either group. Over half though, seven of the 13 duties, were rated by both the university professors and the design/drafting managers as being Essential to the career success of a new employee. Without knowledge and proficiency in these tasks, the employee would have to struggle to become a supervisor or manager. The seven

Table 1

Duties: Means and Standard Deviations

Duty:	Group	M	SD	t	p	ES
Managing People	Prof	2.62	.23	-.57	.57	
	Mger	2.65	.30			
Communicate	Prof	2.49	.28	.63	.53	
	Mger	2.46	.28			
Leadership Skills	Prof	2.66	.29	-.84	.40	
	Mger	2.69	.27			
Management of Financial Resources	Prof	2.23	.41	3.23	.02	.62
	Mger	2.01	.29			
Manage Information	Prof	2.57	.37	-.17	.86	
	Mger	2.58	.31			
Manage Fiscal Resources	Prof	2.42	.37	3.88	.00	.63
	Mger	2.18	.39			
Problem Solving	Prof	2.42	.31	1.16	.25	
	Mger	2.62	.27			
Project Management	Prof	1.64	.24	.22	.83	
	Mger	1.63	.24			
Enhance Professionalism	Prof	2.58	.34	1.73	.08	
	Mger	2.48	.40			
Proficiency in Drafting Knowledge and Skills	Prof	2.54	.89	.15	.87	
	Mger	2.53	.35			
Demonstrate Proficiency in Using a CAD System	Prof	2.81	.26	2.03	.04	.47
	Mger	2.67	.52			
Knowledge of Standards and Codes	Prof	2.65	.70	2.74	.01	.33
	Mger	2.45	.57			
Design Skills	Prof	2.67	.31	.36	.72	
	Mger	2.65	.41			

Note. Key: Prof = university professors,
Mger = design/drafting managers,
M (mean) of 0.0 to 1.49 = Not Essential,
1.5 to 2.49 = Somewhat Essential, 2.5 to 3.0 = Essential.

were: Managing People, Leadership Skills, Manage Information, Problem Solving, Proficiency in Drafting Knowledge and Skills, Demonstrate Proficiency in Using a CAD System, and Design Skills. Both groups ranked four duties as Somewhat Essential. These were Communicate, Management of Financial Resources, Manage Fiscal Resources and Project Management. The remaining two duties, Enhancing Professionalism and Knowledge of Standards and Codes were rated Essential by the university professors, but were rated Somewhat Essential by the design/drafting managers.

Upon further analysis which utilized a two tailed t-test, a significant difference between the two population means was indicated for four of the 13 duties at the .05 level of significance. One of the four duties, Proficiency in Using a CAD System, was rated Essential by both groups. Duties with significantly different means that were rated Somewhat Essential by both groups were Management of Financial Resources, and Manage Fiscal Resources. Only one of the four duties with significantly different means was rated differently by the two populations. Knowledge of Standards and Codes was rated Essential by the university professors and only Somewhat Essential by the design/drafting managers.

The following tables display the responses of the managers and professors to the question of perceived

importance of the tasks which are necessary in the performance of the identified duty. These tables display the tasks in the same numeric sequence as they were presented on the opinionnaire. These tables further show the response rate of the two groups, Professors and Managers, in terms of their mean value. The following values were used for purposes of interpretation of the responses. Mean values that were in a range of 0 to 1.49 were considered to be Not Essential, mean values in the range of 1.50 to 2.49 were considered to be Somewhat Essential, and those means which were in the range of 2.50 to 3.0 were considered to be Essential.

For additional information about each task, the percentage of responses in each rating for the individual tasks within each duty is displayed in Appendix A. The percentages reported in Appendix A do not total 100% due to some respondents not rating all tasks.

As shown in Table 2, 12 of the 18 tasks were rated Essential to the success of a design/drafting manager by both groups. Of the identified tasks, three were rated as Somewhat Essential by both groups while three others were rated Essential by the university professors and only Somewhat Essential by the design/drafting managers.

Table 2

Duty: Managing People

Means and Standard Deviations of Tasks Within the Duty

Task	Group	M	SD
Monitoring progress of delegated task	Professors	2.86	.35
	Managers	2.79	.41
Interviewing and hiring personnel	Professors	2.55	.53
	Managers	2.60	.61
Making employees aware of expectations	Professors	2.88	.37
	Managers	2.84	.40
Forecasting staff requirements	Professors	2.22	.66
	Managers	2.48	.63
Disciplining employees	Professors	2.22	.66
	Managers	2.47	.67
Establishing staff and working schedule	Professors	2.70	.52
	Managers	2.47	.67
Conducting meetings	Professors	2.57	.53
	Managers	2.37	.60
Responding to employees' needs	Professors	2.67	.59
	Managers	2.67	.55
Knowledge of quality systems	Professors	2.51	.56
	Managers	2.47	.57
Training and developing personnel	Professors	2.59	.52
	Managers	2.74	.52
Evaluating Personnel	Professors	2.61	.55
	Managers	2.65	.55
Dismissing personnel	Professors	2.29	.60
	Managers	2.28	.69
Delegating authority and responsibility	Professors	2.78	.45
	Managers	2.81	.45
Coping with stress	Professors	2.71	.46
	Managers	2.75	.46

Table 2 continued

Duty: Managing People

Means and Standard Deviations of Tasks Within the Duty

Tasks	Group	M	SD
Managing conflict	Professors	2.59	.49
	Managers	2.78	.42
Giving and receiving praise and criticism	Professors	2.77	.43
	Managers	2.83	.38
Establishing policies and procedures	Professors	2.65	.48
	Managers	2.64	.55
Following/enforcing policies and procedures	Professors	2.81	.39
	Managers	2.69	.52

Additional information about tasks may be found in Appendix A. Table 15 lists the same tasks as Table 2 but lists the percentage of response for both groups. Review of this table shows that the percentage of response by both groups are heavily clustered in the Somewhat Essential and Essential categories.

Analysis of the means for the duty Communicate, in Table 3, indicates that six of the tasks were rated Essential by both groups, five of the tasks were rated Somewhat Essential and only 1 task was rated differently by both groups. That tasks, Writing Business Letters, Memos, Reports and Instructional Materials, were rated as

Table 3

Duty: Communicate

Means and Standard Deviations of Tasks Within the Duty

Task	Group	M	SD
Writing business letters, memos, reports and instructional materials	Educator	2.61	.49
	Managers	2.48	.59
Writing policies procedures and standards	Professors	2.46	.50
	Managers	2.49	.59
Speaking before groups	Professors	2.28	.64
	Managers	2.10	.68
Listening actively	Professors	2.78	.42
	Managers	2.88	.33
Thinking on his/her feet	Professors	2.71	.49
	Managers	2.74	.49
Presenting all sides of an issue	Professors	2.54	.63
	Managers	2.63	.53
Using and interpreting body language	Professors	2.12	.63
	Managers	2.06	.64
Presenting the corporate image	Professors	2.09	.59
	Managers	2.41	.61
Giving clear instructions	Professors	2.94	.24
	Managers	2.88	.40
Using presentation graphics	Professors	2.41	.52
	Managers	1.91	.66
Utilizing word processing skills	Professors	2.51	.58
	Managers	2.51	.61
Asking Questions	Professors	2.67	.50
	Managers	2.79	.44

Essential by the university professors while the design/drafting managers rated the same task Somewhat Essential.

When Table 16, Appendix A, is included in the analyses of the tasks for the duty Communicate, it becomes apparent that the university professors see this entire group of tasks as being more Essential than the design/drafting managers. The most striking example of this difference in rating was reflected for the task of Listening actively. None of the university professors rated this task as being Not Essential and fully 78.3% of them considered this task as Essential. By contrast, 12.3% of the managers considered this task Not Essential and only 1.2% considered the task Essential. The task, Presenting the corporate image, also shows a difference in perception of importance. The professors rate this task as Essential in 21.7% of the cases while 46.9% of the managers rate the same task as Essential.

All of the tasks listed in Table 4 were considered at least Somewhat Essential according to the reported mean response value. Strong agreement between the two groups is evident by eight of the 13 tasks being reported as Essential by both groups. A ninth task was rated as being Somewhat Essential by both groups leaving only three tasks which were rated Somewhat Essential by the professors.

Table 4

Duty: Leadership Skills

Means and Standard Deviations of Tasks Within the Duty

Task	Group	Mean	SD
Promoting teamwork	Professors	2.87	.34
	Managers	2.89	.32
Anticipating problems	Professors	2.68	.47
	Managers	2.63	.51
Promoting services and products	Professors	2.25	.67
	Managers	2.19	.73
Seeing the big picture	Professors	2.28	.59
	Managers	2.69	.54
Acting diplomatically	Professors	2.38	.62
	Managers	2.72	.48
Accepting responsibility	Professors	2.84	.37
	Managers	2.83	.38
Persuading others	Professors	2.49	.53
	Managers	2.54	.57
Responding decisively	Professors	2.70	.49
	Managers	2.83	.38
Acting as a role model	Professors	2.68	.47
	Managers	2.63	.56
Thinking creatively	Professors	2.71	.49
	Managers	2.74	.47
Managing risk taking situations	Professors	2.28	.62
	Managers	2.63	.58
Taking initiative	Professors	2.71	.46
	Managers	2.73	.45
Motivating self and others	Professors	2.83	.42
	Managers	2.86	.38

The percentages of the responses in Table 17, Appendix A, are consistent with the means displayed in Table 4 which

Table 5

Duty: Management of Financial Resources

Means and Standard Deviations of Tasks Within the Duty

Task	Group	M	SD
Applying accounting principles	Professors	2.16	.53
	Managers	1.83	.67
Applying new methods to increase profit	Professors	2.26	.61
	Managers	2.10	.72
Applying new methods to increase revenue	Professors	2.24	.61
	Managers	2.02	.76
Developing task analysis	Professors	2.28	.59
	Managers	1.98	.69
Maintaining security	Professors	2.38	.62
	Managers	2.25	.70
Applying information from market trends	Professors	2.04	.67
	Managers	1.75	.63
Analyzing financial reports	Professors	1.96	.67
	Managers	1.60	.66
Applying analysis of financial reports	Professors	1.99	.72
	Managers	1.57	.67
Controlling day-to-day expenses	Professors	2.41	.58
	Managers	1.57	.67
Preparing departmental budget	Professors	2.67	.50
	Managers	2.54	.61
Performing cost analysis	Professors	2.28	.62
	Managers	2.09	.69

indicate a close agreement as to the importance of these tasks. All the tasks for this duty were rated by both groups as being Somewhat Essential.

The results of Table 5 indicate that for the duty Management of Financial Resources, all the tasks are rated Somewhat Essential, with the exception of the task Preparing departmental budget. This task was the only one to be rated Essential by both groups. For this duty, all tasks are rated higher by the professors than the managers.

Table 6, which lists the tasks for the duty, Managing Information, indicates that all of the tasks were rated Somewhat Essential or Essential. Of the 10 tasks, all but 3 were rated Essential by both groups. The task, Conducting research, was rated as Somewhat Essential by both groups and the tasks Disseminating information and Applying information systems technology were both rated Essential by the university professors and only Somewhat Essential by the managers. Table 19, Appendix A, supports these views in that the response percentage to the perceived importance of the tasks were consistent with the results displayed in Table 6.

Table 7 reveals that the only tasks in this group rated Essential by both the professors and the managers were, Planning purchases and determining replacement needs, and Complying with purchasing policies and procedure. The tasks, Scheduling use of equipment and Responding to new developments, were rated Somewhat Essential by the

university professors and Essential by the design/drafting managers. The remaining six tasks all received ratings of Somewhat Essential by both groups. Table 20, Appendix A, is consistent with these findings.

Table 6

Duty: Manage Information

Means and Standard Deviations of Tasks Within the Duty

Task	Group	Mean	SD
Reading and acting on information in a timely manner	Professors	2.77	.43
	Managers	2.69	.46
Interpreting information	Professors	2.65	.48
	Managers	2.73	.45
Analyzing and interpreting information	Professors	2.65	.51
	Managers	2.64	.51
Setting priorities	Professors	2.87	.34
	Managers	2.94	.24
Conducting research	Professors	1.88	.61
	Managers	2.05	.59
Disseminating information	Professors	2.52	.53
	Managers	2.05	.59
Maintaining records	Professors	2.62	.55
	Managers	2.71	.46
Complying with laws and regulations	Professors	2.80	.41
	Managers	2.69	.52
Applying information systems technology	Professors	2.51	.56
	Managers	2.23	.64
Verifying facts	Professors	2.51	.61
	Managers	2.64	.53

Table 7

Duty: Manage Fiscal Resources

Means and Standard Deviations of Tasks Within the Duty

Task	Group	Mean	SD
Acquiring Inventory	Professors	1.76	.56
	Managers	2.23	.57
Overseeing contracts	Professors	1.87	.74
	Managers	2.26	.57
Responding to new developments	Professors	2.37	.58
	Managers	2.58	.53
Complying with purchasing policies and procedure	Professors	2.59	.57
	Managers	2.67	.47
Controlling day-to-day efficiency	Professors	2.46	.55
	Managers	2.51	.56
Planning purchases and determine replacement needs	Professors	2.51	.62
	Managers	2.70	.49
Applying safety regulations	Professors	1.74	.70
	Managers	1.91	.66
Distributing Product	Professors	2.23	.64
	Managers	2.32	.65
Maintaining equipment and inventory	Professors	2.23	.64
	Managers	2.32	.65
Scheduling use of equipment	Professors	2.20	.62
	Managers	2.52	.58

The mean response values for Table 8 indicates strong agreement between the two populations perceptions of the importance of the tasks for the duty Problem Solving. All of the tasks in Table 8 were rated as Essential by both

Table 8

Duty: Problem Solving

Means and Standard Deviations of Tasks Within the Duty

Task	Group	Mean	SD
Defining and determining the significance of the problem	Professors	2.78	.45
	Managers	2.90	.30
Gathering information	Professors	2.72	.45
	Managers	2.70	.45
Analyzing the data	Professors	2.71	.45
	Managers	2.70	.46
Brainstorming potential solutions	Professors	2.67	.56
	Managers	2.73	.45
Evaluating solutions	Professors	2.88	.32
	Managers	2.79	.41
Making a decision	Professors	2.94	.24
	Managers	2.91	.28
Implementing solutions	Professors	2.94	.24
	Managers	2.91	.28
Following-up	Professors	2.75	.47
	Managers	2.86	.34
Utilizing flow and process diagrams	Professors	2.30	.58
	Managers	2.04	.66
Applying Statistical process control	Professors	2.22	.64
	Managers	1.80	.72

groups with the exception of the tasks Utilizing flow and process diagrams and Applying statistical process control. These two exceptions were rated Somewhat Essential by both groups. Table 21, Appendix A, which displays the percentage

of responses for these tasks, is consistent with responses displayed in Table 8. It should be noted that the percentage of managers who rated the tasks, Utilizing flow and process diagrams and Applying statistical process control, as Not Essential was larger as would be expected from the mean displayed in Table 8.

Table 9 indicates a strong agreement as to the perceived importance of the listed tasks. Both groups rated seven of the eight tasks as being Essential to the career success of a design/drafting manager. The one exception, Conducting research, had both groups rating this task as Somewhat Essential. The results shown in Table 22, Appendix A, are consistent with the results displayed in Table 9.

Only three tasks listed in Table 10 were perceived to be Essential by both groups. Of the remaining five tasks, two were rated as being Somewhat Essential. The tasks, Continuing education, Developing a career plan, and Reading professional publications, were all seen as Essential by the university professors but only Somewhat Essential by the design/drafting managers.

Table 9

Duty: Project Management

Means and Standard Deviations of Tasks Within the Duty

Task	Group	Mean	SD
Assessing the task	Professors	2.75	.43
	Managers	2.73	.50
Setting objectives	Professors	2.81	.39
	Managers	2.83	.44
Conducting research	Professors	2.25	.67
	Managers	2.27	.63
Establishing a plan	Professors	2.84	.37
	Managers	2.77	.45
Coordinating resources	Professors	2.77	.43
	Managers	2.73	.50
Meeting deadlines	Professors	2.81	.43
	Managers	2.88	.33
Presenting recommendations	Professors	2.78	.42
	Managers	2.67	.50
Implementing the plan evaluating the results	Professors	2.76	.50
	Managers	2.72	.48

Of the 16 Tasks listed in Table 11, eight were rated as Essential and six were rated Somewhat Essential by both groups. The remaining two tasks, Producing a detail working drawing and Producing an assembly drawing, both were rated Essential by the university professors but only Somewhat Essential by the design/drafting managers.

Table 10

Duty: Enhance Professionalism

Means and Standard Deviations of Tasks Within the Duty

Task	Group	Mean	SD
Using assertion skills	Professors	2.35	.51
	Managers	2.48	.57
Acting within business ethics	Professors	2.78	.42
	Managers	2.75	.46
Applying time management skills	Professors	2.71	.49
	Managers	2.60	.56
Evaluating self	Professors	2.51	.63
	Managers	2.64	.53
Participating in professional organizations	Professors	2.45	.58
	Managers	2.25	.62
Continuing education	Professors	2.57	.53
	Managers	2.48	.53
Developing a career plan	Professors	2.55	.53
	Managers	2.43	.59
Reading professional publications	Professors	2.61	.52
	Managers	2.31	.61

Both the university professors and the design/drafting managers rated all of the tasks listed in Table 12 as Essential. The tasks for which the managers had a higher mean value response were, Demonstrating organized file management, Developing custom graphic element libraries and Producing and plotting drawings.

Table 11

Duty: Proficiency in Drafting Knowledge and Skills

Means and Standard Deviations of Tasks Within the Duty

Task	Group	M	SD
Displays good manual draftsmanship (lettering,line weights, neatness)	Professors	2.61	.52
	Managers	2.70	.51
Producing orthographic projections	Professors	2.87	.34
	Managers	2.65	.53
Producing sections, auxiliaries	Professors	2.83	.38
	Managers	2.71	.49
Using instruments correctly	Professors	2.65	.51
	Managers	2.64	.53
Utilizing dimensioning and tolerancing standards	Professors	2.45	.58
	Managers	2.25	.62
Producing a detail working drawing	Professors	2.57	.53
	Managers	2.48	.53
Producing an assembly drawing	Professors	2.55	.53
	Managers	2.43	.59
Producing a bill of materials	Professors	2.58	.53
	Managers	2.54	.57
Applying welding symbols	Professors	2.31	.58
	Managers	2.35	.73
Developing a sheet metal layout	Professors	2.16	.72
	Managers	2.05	.73
Selection of views	Professors	2.71	.46
	Managers	2.69	.52
Principles of drawing revision control	Professors	2.51	.56
	Managers	2.57	.65

Table 11 continued

Duty: Proficiency in Drafting Knowledge and Skills

Means and Standard Deviations of Tasks Within the Duty

Task	Group	M	SD
Interpreting electrical schematics and wiring diagrams	Professors	2.20	.58
	Managers	2.05	.57
Interpreting process piping diagrams	Professors	2.16	.58
	Managers	2.05	.71
Interpreting mechanical component drafting	Professors	2.39	.62
	Managers	2.47	.57
Solving basic trigonometry and Algebra problems	Professors	2.81	.30
	Managers	2.71	.48

Table 13 indicates that all of the tasks under the duty Knowledge of Standards and Codes were considered Essential by the University Professors while only two were rated essential by managers. It should be noted that in all cases the university professors rated the individual tasks for the duty, Proficiency in Using a CAD System, higher than the design/drafting managers.

Table 12

Duty: Proficiency in Using a CAD System

Means and Standard Deviations of Tasks Within the Duty

Task	Group	Mean	SD
Demonstrating the correct function of hardware	Professors	2.81	.39
	Managers	2.80	.40
Utilizing the capabilities of the software	Professors	2.90	.30
	Managers	2.65	.53
Demonstrating organized file management	Professors	2.80	.41
	Managers	2.86	.35
Producing lines, circles, arcs, splines, cross-hatch	Professors	2.86	.35
	Managers	2.72	.50
Producing dimensions, notes and balloons	Professors	2.83	.38
	Managers	2.67	.55
Moving, copying, mirroring, and rotating drawing elements	Professors	2.84	.37
	Managers	2.77	.45
Developing custom graphic element libraries	Professors	2.54	.56
	Managers	2.74	.54
Producing and plotting drawings	Professors	2.57	.50
	Managers	2.79	.44

Of the 11 tasks listed in Table 14, both groups rated all tasks as Essential except one. The task, Creating the bill of material, was rated Somewhat Essential by the managers.

Table 13

Duty: Knowledge of Standards and Codes

Means and Standard Deviations of Tasks Within the Duty

Task	Group	Mean	SD
Utilizing the Machinist Handbook	Professors	2.57	.50
	Managers	2.29	.77
Utilizing association/ society product Standards	Professors	2.67	.50
	Managers	2.38	.64
Utilizing corporate/ company standards	Professors	2.67	.50
	Managers	2.79	.47
Applying A.N.S.I. standards	Professors	2.81	.39
	Managers	2.59	.61
Identifying and applying international standards	Professors	2.52	.50
	Managers	2.21	.71

Table 14

Duty: Design Skills

Means and Standard Deviations of Tasks Within the Duty

Task	Group	Mean	SD
Developing and laying out the initial design	Professors	2.70	.43
	Managers	2.76	.43
Negotiating design concerns with engineering and manufacturing	Professors	2.59	.55
	Managers	2.56	.61
Submitting layout to engineer for approval	Professors	2.61	.57
	Managers	2.71	.51

Table 14 continued

Duty: Design Skills

Means and Standard Deviations of Tasks Within the Duty

Task	Group	Mean	SD
Finalizing the design	Professors	2.58	.55
	Managers	2.71	.51
Documenting the design	Professors	2.62	.58
	Managers	2.84	.39
Making the drawing	Professors	2.74	.47
	Managers	2.81	.42
Creating the bill of material	Professors	2.54	.56
	Managers	2.41	.65
Checking the drawing	Professors	2.80	.44
	Managers	2.86	.38
Revising existing drawings	Professors	2.77	.46
	Managers	2.75	.52
Resolving problems	Professors	2.81	.39
	Managers	2.68	.47
Maintaining reference library and pursuing professional development	Professors	2.61	.52
	Managers	2.53	.52

Summary

Chapter 4 presented the response rate, the data analysis procedures, and the data from the study. The data were presented in tabular form and included descriptions of the tabular information. A summary table was provided to enable comparison of the data for the 13 identified duties. Tables were also produced to display the means and standard

standard deviations for each of the tasks within the identified duties.

CHAPTER 5

SUMMARY, DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to determine the importance of the identified duties and tasks performed by a manager of a design/drafting department. The identified duties and individual tasks were rated on their importance to the success of a design/drafting manager by university educators and professional design/drafting managers.

Summary

A review of literature was conducted to conceptualize the problem of the study as it related to (a) the changing role of the worker in the future workforce, (b) specific management skills for the design/drafting manager, (c) the changing knowledge base and the curriculum implications, (d) educational program accountability, and (e) appropriate population. The review of literature revealed the descriptive survey as an appropriate first step to establish the knowledge base necessary for beginning the Instructional Systems Design Process (Johnson, 1989).

The survey instrument used for this study was adapted from a DACUM analysis of the design/drafting and general manager which was obtained through the Vocational Technical Education Consortium of States. The two task analyses were collapsed in order to shorten the list of tasks and duties to the point of being manageable through the use of an opinionnaire. The resulting 141 tasks were

grouped into 13 duties. The number of tasks within each duty ranged from a low of 8 to a high of 18. The 13 duties were presented and analyzed under the following headings: (1) Managing People, (2) Communicate, (3) Leadership Skills, (4) Management of Financial Resources, (5) Manage Information, (6) Manage Fiscal Resources, (7) Problem Solving, (8) Project Management, (9) Enhance Professionalism, (10) Proficiency in Drafting Knowledge and Skills, (11) Demonstrate Proficiency in Using a CAD System, (12) Knowledge of Standards and Codes, and (13) Design skills.

The opinionnaires were mailed to the members of the American Drafting Design Association (ADDA), who identified themselves as design/drafting managers and the university professors listed in the Industrial Teacher Education Directory, who reported their area of expertise was drafting, design/drafting, design, CAD, or engineering graphics. Of the 469 opinionnaires which were mailed to the two populations, 148 (32%) usable responses were received. Of the 204 opinionnaires mailed to the design/drafting managers, 80 (39.22%) were returned, while 69 of 265 (26.04%) were returned from the university professors.

Discussion

The duties and tasks were identified for this study by adapting two duty and task listings which had been developed utilizing the DACUM methodology (V-TECHS, 1986). This finding would support the continued utilization of the DACUM methodology for performing the initial needs analysis. In the Instructional System Design process, the needs analysis is the first and one of the more critical steps in developing effective, accountable curriculum.

In the review of literature for this study, one of the predictions of the study Countdown to the future: The manufacturing engineer in the 21st century, Koska and Romano, it was reported that,

> The emphasis on how work is accomplished will be far different with more importance placed on the humane aspects of production, less on the technical. Teamwork rather than individual effort will be the key to success. People, not hardware, will be the most critical aspect of work. (1988, p. 4)

This prediction of Koska's and Romano's study was not supported by the findings of this report. Of the 13 identified duties for this report, nine were considered to be management duties and the remaining four were considered to be design/drafting duties. From these findings one interpretation could be that while manufacturers in the Koska and Romano study believe "People, not hardware, will be the most critical aspect of

work" (p. 4), this study suggests that what is Essential to their jobs is proficiency in technical (design/drafting) rather than the interpersonal (design/drafting management) skills.

Importance as Perceived by Design/Drafting Managers

The first research question was to determine the perceived importance of the identified duties and tasks to the success of a design/drafting department manager in the opinion of professional design/drafting managers. It was found that none of the 13 identified duties were rated Not Essential by the design/drafting managers, while seven were rated Essential. These were Managing People, Leadership Skills, Manage Information, Problem Solving, Proficiency in Drafting Knowledge and Skills, Demonstrate Proficiency in Using a CAD System, and Design Skills. The duties Communicate, Management of Financial Resources, Manage Fiscal Resources, Project Management, Enhance Professionalism, and Knowledge of Standards and Codes, were rated Somewhat Essential by the design/drafting managers.

All of the 141 tasks were rated at least Somewhat Essential by the design/drafting managers. The total number of tasks rated Somewhat Essential was 47, leaving 94 rated Essential. Tables 15 through 27, Appendix A, displays the percentage of responses for each rating.

Importance as Perceived by University Professors

The second research question was to determine the perceived importance of the identified duties and tasks to the success of a design/drafting department manager in the opinion of university professors. None of the 13 duties were rated Not Essential by the university professors. The university professors rated the duties Communicate, Management of Financial Resources, Manage Fiscal Resources, and Project Management as being Somewhat Essential. The remaining nine duties rated by the professors as Essential are Managing People, Leadership Skills, Manage Information, Problem Solving, Enhance Professionalism, Proficiency in Drafting Knowledge and Skills, Proficiency in Using a CAD System, Knowledge of Standards and Codes, and Design Skills.

Of the 141 individual tasks, none of them were rated Not Essential by the university professors, 41 were rated Somewhat Essential, and 100 were rated as Essential.

Similarities and Differences

The third research question was to determine the similarities and differences that exist between the perceptions of design/drafting managers and the university design/drafting professors with regard to the identified duties and tasks. There were four duties in which the value of the mean importance rating between the two populations was significantly different. Those duties

were Management of Financial Resources, Manage Fiscal Resources, Demonstrate Proficiency in Using a CAD System, and Knowledge of Standards and Codes. The Effect Sizes indicate the size of these difference (i.e., Effect), were medium for all four duties (Cohen, 1977). While the curriculum developer might take the differences into consideration when designing curriculum, it should be realized that there was not strong disagreement.

The most striking similarity between the two groups is the fact that neither group rated any of the duties or the tasks as Not Essential. The design/drafting managers rated six of the duties and 47 of the tasks as Somewhat Essential, while the university professors rated nine of the duties and 41 of the tasks as Somewhat Essential. Those duties for which there was a difference in the rating by the two populations were Enhance Professionalism and the duty Knowledge of Standards and Codes. In both cases the university professors rated the duties as Essential and the design/drafting managers rated them as Somewhat Essential.

Conclusions

Subject to the stated assumptions and limitations of this study, the following conclusions are presented.

1. Due to the fact that none of the duties were rated as Not Essential by either population, the data supports the conclusion that the identified duties and the

individual tasks which are necessary to perform those duties could be adopted as course and class objectives.

2. Seven of the 13 identified duties of this study were considered to be Essential by both groups (see Table 1). As a result of this finding it can be concluded that, if the curriculum developer cannot include all 13 of the identified duties in their instructional system, then priority should be given to the inclusion of those duties identified as Essential by this study.

3. Of the 13 identified duties, only two were shown to have a difference in perceived importance by the two groups. Of those two duties in which each group perceived the importance of that duty differently, only in one case was the difference shown to be statistically significant. Because of this high degree of agreement in rating the perceived importance of the duties, it can be concluded that the university professors have an accurate grasp of industries educational needs for the design/drafting manager.

4. When the duties of this study were analyzed to compare management duties with design/drafting duties, the result was four of the nine management duties were perceived to be Essential by both groups. The for design/drafting duties were perceived as Essential by the professors, and three of the four were perceived to be Essential by the managers. This finding supports the

conclusion that emphasis on specific drafting/design skills should be retained.

5. If an undergraduate degree program does not allow for the inclusion of all four of the design/drafting duties, heavier emphasis should be placed on inclusion of those duties perceived to be Essential.

Recommendations

The following recommendations are based upon the review of related literature, data analysis from this study, and identified conclusions. The recommendations made in regard to this study are:

1. Since significant differences exist between the managers and the professors perceptions of the importance in four of the identified duties, designers of curriculum for design/drafting programs at the college and/or university level should develop advisory panels and work closely with them in order to meet the needs of industry. These advisory panels should consist of a mix of industrial representatives which mirrors the manufacturing makeup of the university service area.

2. In all cases where a significant difference exists between the ratings of the two populations, the university educators rated the duties higher in all cases. Because of this consistent tendency to consider the duties as more important than the managers, it is recommended that university programs concerned with

the development of "technical management skills", evaluate the emphasis their individual programs place on those skills through the use of survey information and advisory panels.

3. Due to the significant agreement between the two populations perceptions of the importance of the identified duties of this study, it is suggested that college and/or university design/drafting program curriculum designers utilize the list of identified duties in this study to evaluate the effectiveness of their existing programs.

Recommendations for Further Research

Given the findings and outcomes of this study, recommendations for further study are warranted and can be utilized to define the curricular needs of college and/or university design/drafting programs so that competency requirements of the design/drafting industry can be met.

1. It is recommended that further study be performed to identify and validate the management duties specific to other technical management areas (i.e., Manufacturing, Engineering, etc.), to determine if there is an identifiable common core of management duties which should be included in all technology programs.

2. A similar study should be conducted in three to five years to verify that the identified list of duties and tasks are current.

3. Further study should be conducted to identify methodologies to ease the transition from technologist to technical manager.

4. A more focused study should be conducted to develop educational experiences that could increase the students ability to identify and correctly apply management skills.

5. Due to the numerous comments and phone calls the researcher received as to availability of management seminars with their focus being the needs of the design/drafter, further studies should be conducted and possibly seminars developed to provide the most appropriate method of meeting the retraining needs of industry.

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APPENDICES

Appendix A

Responses by Percentage for Tasks Within Duties

Table 15

Duty: Managing People

Responses by Percentage for Tasks Within the Duty

Task	Group	1	2	3
Monitoring progress delegated task	Professors	0.0	14.5	85.5
	Managers	0.0	21.0	79.0
Interviewing and hiring personnel	Professors	1.4	42.0	56.5
	Managers	6.2	27.2	66.7
Making employees aware of expectations	Professors	1.4	8.7	89.9
	Managers	1.2	13.6	85.2
Forecasting staff requirements	Professors	2.9	50.7	46.4
	Managers	0.0	14.5	85.5
Disciplining employees	Professors	13.0	53.4	34.8
	Managers	9.9	3.3	56.8
Establishing staff and working schedules	Professors	2.9	24.6	72.5
	Managers	4.9	23.5	71.6
Conducting meetings	Professors	1.4	40.6	58.0
	Managers	6.2	50.6	43.2
Responding to employees' needs	Professors	2.9	24.6	72.5
	Managers	3.7	25.9	70.4
Knowledge of quality systems	Professors	1.4	40.6	58.0
	Managers	3.7	45.7	50.6
Training and developing personnel	Professors	1.4	37.7	60.9
	Managers	3.7	18.5	77.8
Evaluating Personnel	Professors	2.9	33.3	63.8
	Managers	3.7	27.2	69.1
Dismissing personnel	Professors	7.2	56.5	36.2
	Managers	13.6	44.4	42.0

Table 15 Continued

Duty: Managing People

Responses by Percentage for Tasks Within the Duty

Tasks	Group	1	2	3
Delegating authority and responsibility	Professors	1.4	18.8	79.7
	Managers	2.5	13.6	84.0
Coping with stress	Professors	0.0	29.0	71.0
	Managers	1.2	22.2	76.5
Managing conflict	Professors	0.0	40.6	59.4
	Managers	0.0	22.2	77.8
Giving and receiving praise and criticism	Professors	0.0	23.2	76.8
	Managers	0.0	17.3	82.7
Establishing policies and procedures	Professors	0.0	34.8	65.2
	Managers	3.7	28.4	67.9
Following/enforcing policies and procedures	Professors	0.0	18.8	81.2
	Managers	2.5	25.9	71.6

Table 16

Duty: Communicate

Responses by Percentage for Tasks Within the Duty

Task	Group	1	2	3
Writing business letters, memos, reports and instructional materials	Professors	0.0	39.1	60.9
	Managers	4.9	42.0	53.1
Writing policies Procedures and Standards	Professors	0.0	53.6	46.4
	Managers	4.9	40.7	54.3

Table 16 Continued

Duty: Communicate

Responses by Percentage for Tasks Within the Duty

Task	Group	1	2	3
Speaking before groups	Professors	10.1	52.2	37.7
	Managers	10.5	53.1	28.4
Listening actively	Professors	0.0	21.7	78.3
	Managers	12.3	86.4	1.2
Thinking on his/her feet	Professors	1.4	26.1	72.5
	Managers	2.5	21.0	76.5
Presenting all sides of an issue	Professors	7.2	31.9	60.9
	Managers	2.5	32.1	65.4
Using and interpreting body language	Professors	14.5	58.0	26.5
	Managers	17.3	59.3	23.5
Presenting the corporate image	Professors	13.0	65.2	21.7
	Managers	6.2	46.9	46.9
Giving clear instructions	Professors	0.0	5.8	94.2
	Managers	2.5	7.4	90.1
Using presentation graphics	Professors	8.7	49.3	42.0
	Managers	12.3	64.2	23.5
Utilizing word processing skills	Professors	1.4	56.5	42.0
	Managers	25.9	56.8	17.3
Asking Questions	Professors	1.4	30.4	68.1
	Managers	1.2	18.5	80.2

Table 17

Duty: Leadership Skills

Responses by Percentage for Tasks Within the Duty

Task	Group	1	2	3
Promoting team work	Professors	0.0	13.0	87.0
	Managers	0.0	11.1	88.9
Anticipating problems	Professors	0.0	31.9	68.1
	Managers	1.2	34.6	64.2
Promoting services and products	Professors	13.0	49.3	37.7
	Managers	18.5	44.4	37.0
Seeing the big picture	Professors	4.3	24.6	71.0
	Managers	3.7	23.5	72.8
Acting diplomatically	Professors	0.0	33.3	66.7
	Managers	1.2	25.9	72.8
Accepting responsibility	Professors	0.0	15.9	84.1
	Managers	0.0	8.6	91.4
Persuading others to follow	Professors	1.4	47.8	50.7
	Managers	3.7	38.3	58.0
Responding decisively	Professors	1.4	27.5	71.0
	Managers	0.0	17.3	82.7
Acting as a role model	Professors	0.0	31.9	68.1
	Managers	3.7	29.6	66.7
Thinking creatively	Professors	1.4	26.1	72.5
	Managers	1.2	23.5	75.3
Managing risk taking situations	Professors	1.4	53.6	44.9
	Managers	4.9	27.2	67.9
Taking initiative	Professors	0.0	29.0	71.0
	Managers	1,2	21,0	77.8
Motivating self and others	Professors	1.4	14.5	84.1
	Managers	1.2	11.1	87.7

Table 18

Duty: Management of Financial Resources

Responses by Percentage for Tasks Within the Duty

Task	Group	1	2	3
Applying accounting principles	Professors	7.2	69.6	23.2
	Managers	32.1	53.1	14.8
Applying new methods to increase profit	Professors	8.7	55.1	34.8
	Managers	21.0	48.1	30.9
Applying new methods to increase revenue	Professors	11.6	52.2	34.8
	Managers	27.2	43.2	29.6
Developing task analysis	Professors	7.2	58.0	34.8
	Managers	24.7	53.1	22.2
Maintaining security	Professors	7.2	47.8	44.9
	Managers	14.8	45.7	39.5
Applying information from market trends	Professors	20.3	55.1	24.6
	Managers	34.6	54.3	9.9
Analyzing financial reports	Professors	24.6	55.1	20.3
	Managers	49.4	40.7	9.9
Applying analysis of financial reports	Professors	26.1	49.3	24.6
	Managers	53.1	37.0	9.9
Controlling day-to-day expenses	Professors	4.3	50.7	44.9
	Managers	8.6	42.0	49.4
Preparing departmental budget	Professors	1.4	30.4	68.1
	Managers	6.2	33.3	60.5
Performing cost analysis	Professors	8.7	55.1	36.2
	Managers	19.8	51.9	28.4

Table 19

Duty: Manage Information

Responses by Percentage for Tasks Within the Duty

Task	Group	1	2	3
Reading and acting on information in a timely manner	Professors	0.0	23.2	76.8
	Managers	0.0	30.9	69.1
Interpreting information	Professors	0.0	34.8	65.2
	Managers	0.0	27.2	72.8
Analyzing and interpreting information	Professors	1.4	31.9	66.7
	Managers	1.2	33.3	65.4
Setting priorities	Professors	0.0	13.0	87.0
	Managers	6.2	92.6	1.2
Conducting research	Professors	24.6	60.9	13.0
	Managers	14.8	65.4	19.8
Disseminating information and maintaining records	Professors	1.4	44.9	53.6
	Managers	28.4	70.4	1.2
Complying with laws and regulations	Professors	0.0	20.3	79.7
	Managers	2.5	25.9	71.6
Applying information systems technology	Professors	2.9	43.5	53.6
	Managers	9.9	49.4	39.5
Verifying facts	Professors	5.8	36.2	56.5
	Managers	2.5	30.9	66.7

Table 20

Duty: Manage Fiscal Resources

Responses by Percentage for Tasks Within the Duty

Task	Group	1	2	3
Acquiring Inventory	Professors	7.2	62.3	30.4
	Managers	29.6	63.0	6.2
Overseeing contracts	Professors	13.0	47.8	39.1
	Managers	33.3	44.4	21.0
Responding to new developments	Professors	1.4	39.1	59.4
	Managers	4.9	51.9	40.7
Complying with purchasing policies and procedure	Professors	1.4	39.1	59.4
	Managers	11.1	51.9	35.8
Controlling day-to-day efficiency	Professors	0.0	33.3	66.7
	Managers	3.7	33.3	61.7
Planing purchases and determine replacement needs	Professors	2.9	43.5	53.6
	Managers	2.5	49.4	48.1
Applying safety regulations	Professors	1.4	27.5	71.0
	Managers	6.2	35.8	56.8
Distributing Product	Professors	26.1	55.1	17.4
	Managers	40.7	44.4	14.8
Maintaining equipment and inventory	Professors	10.1	47.8	42.0
	Managers	11.1	54.3	34.6
Scheduling use of equipment	Professors	4.3	40.6	55.1
	Managers	11.1	58.0	55.1

Table 21

Duty: Problem Solving

Responses by Percentage for Tasks Within the Duty

Task	Group	1	2	3
Defining and determining the significance of the problem	Professors	1.4	18.8	79.7
	Managers	0.0	9.9	90.1
Gathering information	Professors	0.0	27.5	72.5
	Managers	0.0	29.6	70.4
Analyzing the data	Professors	0.0	29.0	71.0
	Managers	0.0	29.6	70.4
Brainstorming potential solutions	Professors	4.3	24.6	71.0
	Managers	0.0	27.2	72.8
Evaluating solutions	Professors	0.0	11.6	88.4
	Managers	0.0	21.0	79.0
Making a decision	Professors	0.0	5.8	94.2
	Managers	0.0	8.6	91.4
Implementing solutions	Professors	1.4	21.7	76.8
	Managers	0.0	13.6	86.4
Flowing-up	Professors	1.4	23.2	75.4
	Managers	1.2	21.0	77.8
Utilizing flow and process diagrams	Professors	5.8	58.0	36.2
	Managers	19.8	55.6	23.5
Applying Statistical process control	Professors	11.6	55.1	33.3
	Managers	37.0	44.4	17.3

Table 22

Duty: Project Management

Responses by Percentage for Tasks Within the Duty

Task	Group	1	2	3
Assessing the task	Professors	0.0	24.6	75.4
	Managers	2.5	22.2	75.3
Setting objectives	Professors	0.0	18.8	81.2
	Managers	2.5	12.3	85.2
Conducting research	Professors	13.0	49.3	37.7
	Managers	9.9	53.1	37.0
Establishing a plan	Professors	0.0	15.9	84.1
	Managers	1.2	21.0	77.8
Coordinating resources	Professors	0.0	23.2	76.8
	Managers	2.5	22.2	75.3
Meeting deadlines	Professors	1.4	15.9	82.6
	Managers	0.0	12.3	87.7
Presenting recommendations	Professors	0.0	21.7	78.3
	Managers	1.2	30.9	67.9
Implementing the planed evaluating the results	Professors	2.9	17.4	76.2
	Managers	1.2	25.9	72.8

Table 23

Duty: Enhance Professionalism

Responses by Percentage for Tasks Within the Duty

Task	Group	1	2	3
Using assertion skills	Professors	1.4	60.9	36.2
	Managers	3.7	44.4	50.6
Acting within business ethics	Professors	0.0	21.7	78.3
	Managers	1.2	22.2	75.3
Applying time management skills	Professors	1.4	26.1	72.5
	Managers	3.7	32.1	64.2
Evaluating self	Professors	1.4	31.9	66.7
	Managers	2.5	30.9	65.4
Participating in professional organizations	Professors	4.3	46.4	49.3
	Managers	9.9	55.6	34.6
Continuing education	Professors	1.4	40.6	58.0
	Managers	1.2	49.4	49.4
Developing a career plan	Professors	1.4	42.0	56.5
	Managers	4.9	46.9	348.1
Reading professional publications	Professors	1.4	36.2	62.3
	Managers	7.4	54.3	38.3

Table 24

Duty: Proficiency in Drafting Knowledge and Skills

Responses by Percentage for Tasks Within the Duty

Task	Group	1	2	3
Displays good manual draftsmanship (lettering, line weights, neatness)	Professors	13.0	33.3	53.6
	Managers	2.5	24.7	72.8
Producing sections, auxiliaries	Professors	0.0	17.4	82.6
	Managers	1.2	17.3	81.5
Using instruments correctly	Professors	0.0	11.6	88.4
	Managers	3.7	25.9	70.4
Utilizing dimensioning and tolerancing standards	Professors	0.0	14.5	85.5
	Managers	1.2	7.4	90.1
Producing a detail working drawing	Professors	0.0	21.7	78.3
	Managers	4.9	16.0	79.0
Producing an assembly drawing	Professors	1.4	39.1	59.4
	Managers	3.7	38.3	58.0
Producing a bill of materials	Professors	5.8	56.5	36.2
	Managers	14.8	34.6	49.4
Applying welding symbols	Professors	18.8	46.4	34.8
	Managers	23.5	46.9	28.4
Developing a sheet metal layout	Professors	0.0	29.0	71.0
	Managers	2.5	25.9	71.6
Selection of Views	Professors	2.9	43.5	53.6
	Managers	8.6	25.9	34.6
Principles of drawing revision control	Professors	8.7	62.3	29.0
	Managers	17.3	44.4	35.8
Interpreting electrical schematics and wiring diagrams	Professors	10.1	63.8	26.1
	Managers	22.2	48.1	27.2
Interpreting process piping diagrams	Professors	7.2	33.3	58.0
	Managers	3.7	25.9	70.4

Table 24 Continued

Duty: Proficiency in Drafting Knowledge and Skills

Responses by Percentage for Tasks Within the Duty

Task	Group	1	2	3
Interpreting mechanical component drafting	Professors	7.2	46.4	46.4
	Managers	3.7	44.4	49.4
Solving basic trigonometry and algebra problems	Professors	1.4	37.7	60.9
	Managers	1.2	25.9	70.4

Table 25

Duty: Proficency in Using a CAD System

Responses by Percentage for Tasks Within the Duty

Task	Group	1	2	3
Demonstrating the correct function of hardware	Professors	0.0	18.8	81.2
	Managers	0.0	19.8	77.8
Utilizing the capabilities of the software	Professors	0.0	10.1	89.9
	Managers	0.0	13.6	84.0
Demonstrating organized file management	Professors	0.0	20.3	79.7
	Managers	1.2	24.7	71.6
Producing lines, circles, arcs, splines, cross-hatch	Professors	0.0	14.5	85.5
	Managers	2.5	22.2	72.8
Producing dimensions, notes and balloons	Professors	0.0	17.4	2.6
	Managers	2.5	18.5	76.5
Moving, copying, mirroring, and rotating drawing elements	Professors	0.0	15.9	84.1
	Managers	1.2	19.8	76.5

Table 25 Continued

Duty: Proficency in Using a CAD System

Responses by Percentage for Tasks Within the Duty

Task	Group	1	2	3
Developing custom graphic element libraries	Professors	1.4	36.2	62.3
	Managers	6.2	44.4	46.9
Producing and plotting drawings	Professors	0.0	15.9	84.1
	Managers	1.2	17.3	77.8

Table 26

Duty: Knowledge of Standards and Codes

Responses by Percentage for Tasks Within the Duty

Task	Group	1	2	3
Utilizing the machinist Handbook	Professors	0.0	43.5	56.5
	Managers	18.5	33.3	46.9
Utilizing association/ society product standards	Professors	1.4	30.4	68.1
	Managers	8.6	44.4	45.7
Utilizing corporate/ company standards	Professors	1.4	30.4	68.1
	Managers	2.5	16.0	80.2
Applying A.N.S.I. standards	Professors	0.0	18.8	81.2
	Managers	6.2	28.4	64.2
Identifying and applying international standards	Professors	0.0	47.8	52.2
	Managers	16.0	45.7	37.0

Table 27

Duty: Knowledge of Standards and Codes

Responses by Percentage for Tasks Within the Duty

Task	Group	1	2	3
Developing and laying-out the initial design	Professors	1.4	27.5	71.0
	Managers	0.0	23.5	75.3
Negotiating design concerns with engineering and manufacturing	Professors	2.9	34.8	62.3
	Managers	6.2	30.9	61.7
Submitting layout to engineer for approval	Professors	4.3	30.4	65.2
	Managers	2.5	22.2	74.1
Finalizing the design	Professors	2.9	36.2	60.9
	Managers	2.5	23.5	72.8
Documenting the design	Professors	5.8	24.6	69.6
	Managers	4.9	21.0	72.8
Making the drawing	Professors	1.4	23.2	75.4
	Managers	1.2	16.0	81.5
Creating the bill of material	Professors	2.9	40.6	56.5
	Managers	8.6	40.7	49.4
Checking the drawing	Professors	1.4	17.4	81.2
	Managers	1.2	11.1	86.4
Revising existing drawings	Professors	1.4	20.3	78.3
	Managers	3.7	17.3	77.8
Resolving problems	Professors	0.0	18.8	81.2
	Managers	0.0	32.1	66.7
Maintaining reference library and pursuing Professional development	Professors	1.4	36.2	62.3
	Managers	3.7	39.5	55.6

Appendix B

University Opinionnaire

Northern Illinois University
DeKalb, Illinois 60115-2854

Department of Technology
College of Engineering
and Engineering Technology
(815) 753-1349

Dear Dr.

The job of supervising or managing a drafting/design function, like many other careers, is much more technically challenging than in the past. The effects these factors are having nationwide on the educational needs of the Drafting/Design profession are not fully understood. That is why I am asking you to fill out the enclosed short opinionnaire. working cooperatively to address the curriculum needs of a drafting/design management program is the only way the universities can respond to the need to produce technically competent drafting/design managers.

You have been chosen as part of a select group to represent a cross section of drafting/design professors covering all areas of drafting/design specialization. Your responses will be used to help describe present, and identify future employment skills needed by the supervisor of a drafting/design department. The data should help educators and industrial trainers in upgrading their curriculum, as well as providing better career guidance for students majoring in Drafting/Design. A summary will be made available to you upon your request.

Be assured your responses will be kept confidential. To keep track of returns, only numbers are used on the opinionnaire.

I hope you will find the study interesting and that you will complete it while you have it at hand. For your convenience in replying, a stamped self addressed return envelope is enclosed. Please call if you have any questions or comments about the study.

Sincerely,

John E. Shultz
Assistant Professor
Drafting/Design

PS. Just to make it fun, all who return their opinionnaire postmarked by Oct. 23, 1991 will be entered in a drawing for a $25.00 cash prize.

Northern Illinois University
DeKalb, Illinois 60115-2854

Department of Technology
College of Engineering
and Engineering Technology
(815) 753-1349

Dear

I'm writing to you today to say thank-you for your generous donation of time and expertise in completing the opinionnaire you recently received which concerned the Design/Drafting Managers Duties and their Perceived Importance. I realize how busy you are and how many questionnaires such as this you must receive.

If you have not been able to find the time to complete the opinionnaire please consider the fact that you were selected specifically because of your expertise and knowledge to represent the national views of your profession. The lack of even one person's opinionnaire will make a large difference in the validity of the results. Please, if you have not returned the opinionnaire take the few minutes to do so now. If you do not respond to this survey a valuable chance for your profession to show its responsiveness to the changing times we live in will be lost. If you need another opinionnaire or have any questions do not hesitate to call me at (815) 753-1754. Thanks again for your help and concern for your profession.

Sincerely,

John E. Shultz
Assistant Professor
Design/Drafting

Code: _____
(For follow-up Purposes ONLY)

Design/Drafting Managers Duties And their Perceived Importance

University Opinionnaire

Your opinion is needed regarding the educational needs and issues concerning today's drafting/design students. The information will be used to help Drafting/Design Management faculty identify current and future career preparation needs of the profession.

The opinionnaire should take approximately 30 minutes to complete

Your responses will be kept strictly confidential. Please answer all questions.

Your assistance in completing this opinionnaire is critical to the success of this research project.

Thank you for your help.

Endorsed by the American Design/Drafting Association

Directions

To assist in the completion of this opinionnaire, the following directions and definitions are provided for use in this study.

Directions: Carefully read each of the managerial duty statements. Then, circle the number to the right of the statement which most closely represents your perception of the importance of that duty, to the career success of a newly hired design/drafting employee aspiring to become a supervisor or manager.

	Not Essential	Somewhat Essential	Essential
Example:			
Managing conflict	1	2	(3)

In this example the respondent believes it is **Essential"** (3) for a manager of a design/drafting department to know how to deal with conflicts that arise during the performance of their jobs.

Essential. Essential to the career success of a new employee. Without knowledge and proficiency in this task, the employee's career would be a struggle to become a supervisor or manager.

Somewhat essential. Without knowledge and proficiency in this task, a new employee would have survived the first three (3) years of their career, but they would be playing catch up.

Not Essential. Knowledge and proficiency in this task is not critical to the career success of a new employee.

I. Design/Drafting Managers Duties

Please rate how important these duties are to an employee's career success.

Please respond to all items. Thank You!

	Not Essential	Somewhat Essential	Essential
Managing People		(Circle Your Response)	
1 Monitoring progress of delegated tasks	1	2	3
2 Interviewing and hiring personnel	1	2	3
3 Making employees aware of expectations	1	2	3
4 Forecasting staff requirements	1	2	3
5 Disciplining employees	1	2	3
6 Establishing staff and work schedules	1	2	3
7 Conducting meetings	1	2	3
8 Responding to employees' needs	1	2	3
9 Knowledge of quality systems	1	2	3
10 Training and developing personnel	1	2	3
11 Evaluating personnel	1	2	3
12 Dismissing personnel	1	2	3
13 Delegating authority and responsibility	1	2	3
14 Coping with stress	1	2	3

Design/Drafting Managers Duties

Managing People,(cont.)

	Not Essential	Somewhat Essential	Essential
15 Managing conflict	1	2	3
16 Giving and receiving praise and criticism	1	2	3
17 Establishing policies and procedures	1	2	3
18 Following/enforcing policies and procedures	1	2	3
Communicate			
1 Writing business letters, memos, reports and instructional materials	1	2	3
2 Writing policies procedures and standards	1	2	3
3 Speaking before groups	1	2	3
4 Listening actively	1	2	3
5 Thinking on his/her feet	1	2	3
6 Presenting all sides of an issue	1	2	3
7 Using and interpreting body language	1	2	3
8 Presenting the corporate image	1	2	3
9 Giving clear instructions	1	2	3
10 Using presentation graphics	1	2	3
11 Utilizing word processing skills	1	2	3
12 Using the chain of command	1	2	3
13 Asking questions	1	2	3
Leadership Skills			
1 Promoting team work	1	2	3
2 Anticipating problems	1	2	3
3 Promoting services and products	1	2	3
4 Seeing the big picture	1	2	3
5 Acting diplomatically	1	2	3
6 Accepting responsibility	1	2	3
7 Persuading others to follow	1	2	3
8 Responding decisively	1	2	3
9 Acting as a role model	1	2	3
10 Thinking Creatively	1	2	3
11 Managing risk taking situations	1	2	3
12 Taking initiative	1	2	3
13 Motivating self and others	1	2	3
Management of Financial Resources			
1 Applying Accounting Principles	1	2	3
2 Applying new methods to increase profit	1	2	3
3 Applying new methods to increase revenue	1	2	3
4 Developing task analysis	1	2	3
5 Maintaining security	1	2	3

Design/Drafting Managers Duties

Management of financial resources,(con.)

	Not Essential	Somewhat Essential	Essential
6 Applying information from market trends	1	2	3
7 Analyzing financial reports	1	2	3
8 Applying analysis of financial reports	1	2	3
9 Controlling day-to-day expenses	1	2	3
10 Preparing departmental a budget	1	2	3
11 Performing cost analysis	1	2	3
Manage Information			
1 Reading and acting on information in a timely manner	1	2	3
2 Interpreting information	1	2	3
3 Analyzing and interpreting information	1	2	3
4 Setting priorities	1	2	3
5 Conducting research	1	2	3
6 Disseminating information	1	2	3
7 Maintaining records	1	2	3
8 Complying with laws and regulations	1	2	3
9 Applying information systems technology	1	2	3
10 Verifying facts	1	2	3
Manage Fiscal Resources			
1 Acquiring Inventory	1	2	3
2 Overseeing contracts	1	2	3
3 Responding to new developments	1	2	3
4 Complying with purchasing policies and procedure	1	2	3
5 Controlling day-to-day efficiency	1	2	3
6 Planing purchases and determining replacement needs	1	2	3
7 Applying safety regulations	1	2	3
8 Distributing product	1	2	3
9 Maintaining equipment and inventory	1	2	3
10 Scheduling use of equipment	1	2	3
Problem Solving			
1 Defining and determining the significance of the problem	1	2	3
2 Gathering information	1	2	3
3 Analyzing the data	1	2	3
4 Brainstorming potential solutions	1	2	3
5 Evaluating solutions	1	2	3
6 Making a decision	1	2	3

Design/Drafting Managers Duties	Not Essential	Somewhat Essential	Essential
Problem Solving (Con.)			
7 Implementing solution	1	2	3
8 Following-up	1	2	3
9 Utilizing Flow and Process Diagrams	1	2	3
10 Applying Statistical Process Control	1	2	3
Project Management			
1 Assessing the task	1	2	3
2 Setting Objectives	1	2	3
3 Conducting research	1	2	3
4 Establishing a plan	1	2	3
5 Coordinating resources	1	2	3
6 Meeting deadlines	1	2	3
7 Presenting recommendations	1	2	3
8 Implementing the plan and Evaluating the results	1	2	3
Enhance Professionalism			
1 Using assertion skills	1	2	3
2 Acting within business ethics	1	2	3
3 Applying time management skills	1	2	3
4 Evaluating self	1	2	3
5 Participating in professional organizations	1	2	3
6 Continuing education	1	2	3
7 Developing a career plan	1	2	3
8 Reading professional publications	1	2	3

II. Duties of the Design/Drafter

These duties relate to drafting skills. Please rate how important these duties are to a new employees career success.

Proficiency in Drafting Knowledge and Skills			
1 Displays good manual draftsmanship, (lettering line weights, neatness)	1	2	3
2 Producing orthographic projections	1	2	3
3 Producing sections, auxiliaries	1	2	3
4 Using instruments correctly	1	2	3
5 Utilizing dimensioning and tolerancing standards	1	2	3
6 Producing a detail working drawing	1	2	3
7 Producing an assembly drawing	1	2	3
8 Producing a bill of materials	1	2	3
9 Applying welding symbols	1	2	3
10 Developing a sheet metal layout	1	2	3
11 Selection of Views	1	2	3
12 Principles of Drawing Revision Control	1	2	3

Design/Drafting Managers Duties

Proficiency in Drafting Knowledge and Skills (Con.)	Not Essential	Somewhat Essential	Essential
13 Interpreting electrical schematics and wiring diagrams	1	2	3
14 Interpreting process piping diagrams	1	2	3
15 Interpreting mechanical component drafting	1	2	3
16 Solving basic trigonometry and algebra problems	1	2	3
Demonstrate Proficiency in Using a CAD System			
1 Demonstrating the correct function of hardware	1	2	3
2 Utilizing the capabilities of the software	1	2	3
3 Demonstrating organized file management	1	2	3
4 Producing lines, circles, arc, splines, cross-hatch	1	2	3
5 Producing dimensions, notes, and balloons	1	2	3
6 Moving, copying, mirroring, and rotating drawing elements	1	2	3
7 Developing custom graphic element libraries	1	2	3
8 Producing and plotting drawings	1	2	3
Knowledge of Standards and Codes			
1 Utilizing the Machinist Handbook	1	2	3
2 Utilizing association/society product standards	1	2	3
3 Utilizing Corporate/Company Standards	1	2	3
4 Applying A.N.S.I. Standards	1	2	3
5 Identifying and applying International Standards	1	2	3
Design Skills			
1 Developing and laying-out the initial design	1	2	3
2 Negotiating design concerns with engineering and manufacturing	1	2	3
3 Submitting layout to engineer for approval	1	2	3
4 Finalizing the design	1	2	3
5 Documenting the design	1	2	3
6 Making the drawing	1	2	3
7 Creating the bill of material	1	2	3
8 Checking the drawing	1	2	3
9 Revising existing drawings	1	2	3
10 Resolving problems	1	2	3
11 Maintaining reference library and pursuing professional development	1	2	3

Please indicate any questions or comments you may have regarding this study or about any of the questions in this opinionnaire.

THANK YOU FOR YOUR COOPERATION AND PROMPT RESPONSE!

Please return this opinionnaire post-marked on or before Oct. 18 in the enclosed return envelope to:

If you would like a summary of the results of the research, please write your name and address on the back of the return envelope. You will receive a copy after the research is completed.

Appendix C

Design/Drafting Opinionnaire

Code:_____
(For follow-up Purposes ONLY)

Design/Drafting Managers Duties And their Perceived Importance

Managers Opinionnaire

Your opinion is needed regarding the educational needs and issues concerning today's drafting/design students. The information will be used to help Drafting/Design Management faculty identify current and future career preparation needs of the profession.

The opinionnaire should take approximately 30 minutes to complete

Your responses will be kept strictly confidential. Please answer all questions.

Your assistance in completing this opinionnaire is critical to the success of this research project.

Thank you for your help.

Endorsed by the American Design/Drafting Association

Northern Illinois University
DeKalb, Illinois 60115-2854

Department of Technology
College of Engineering
and Engineering Technology
(815) 753-1349

Dear Dr.

The job of supervising or managing a design/drafting function, like many other careers, is much more technically challenging than in the past. The effects these factors are having on the educational needs of the design/drafting profession are not fully understood. That is why I am asking you to complete the enclosed short opinionnaire. working cooperatively to address the curriculum needs of a design/drafting management program is the only way the universities can respond to the need to produce technically competent design/drafting managers.

You have been chosen as part of a select group to represent a cross section of design/drafting managers and supervisors covering all areas of design/drafting specialization. Your responses will be used to help describe present, and identify future employment skills needed by the supervisor of a design/drafting department. The data should help educators and industrial trainers in upgrading their curriculum, as well as providing better career guidance for students majoring in design/drafting. A summary will be made available to you upon your request.

Be assured your responses will be kept confidential. To keep track of returns, only numbers are used on the opinionnaire.

I hope you will find the study interesting and that you will complete it while you have it at hand. for your convenience in replying, a stamped self addressed return envelope is enclosed. Please call if you have any questions or comments about the study.

Sincerely,

John E. Shultz
Assistant Professor
design/drafting

PS. Just to make it fun, all who return their opinionnaire postmarked by Oct.18, 1991 will be entered in a drawing for a $25.00 cash prize.

Directions

To assist in the completion of this opinionnaire, the following directions and definitions are provided for use in this study.

Directions: Carefully read each of the managerial duty statements. Then, circle the number to the right of the statement which most closely represents your perception of the importance of that duty, to the career success of a newly hired design/drafting employee aspiring to become a supervisor or manager.

		Not Essential	Somewhat Essential	Essential
Example:	Managing conflict	1	2	③

In this example the respondent believes it is **Essential"** (3) for a manager of a design/drafting department to know how to deal with conflicts that arise during the performance of their jobs.

Essential. Essential to the career success of a new employee. Without knowledge and proficiency in this task, the employee's career would be a struggle to become a supervisor or manager.

Somewhat essential. Without knowledge and proficiency in this task, a new employee would have survived the first three (3) years of their career, but they would be playing catch up.

Not Essential. Knowledge and proficiency in this task is not critical to the career success of a new employee.

I. Design/Drafting Managers Duties

Please rate how important these duties are to an employee's career success.

Please respond to all items. Thank You!

	Not Essential	Somewhat Essential	Essential
Managing People		(Circle Your Response)	
1 Monitoring progress of delegated tasks	1	2	3
2 Interviewing and hiring personnel	1	2	3
3 Making employees aware of expectations	1	2	3
4 Forecasting staff requirements	1	2	3
5 Disciplining employees	1	2	3
6 Establishing staff and work schedules	1	2	3
7 Conducting meetings	1	2	3
8 Responding to employees' needs	1	2	3
9 Knowledge of quality systems	1	2	3
10 Training and developing personnel	1	2	3
11 Evaluating personnel	1	2	3
12 Dismissing personnel	1	2	3
13 Delegating authority and responsibility	1	2	3
14 Coping with stress	1	2	3

Design/Drafting Managers Duties

	Not Essential	Somewhat Essential	Essential
Managing People,(cont.)			
15 Managing conflict	1	2	3
16 Giving and receiving praise and criticism	1	2	3
17 Establishing policies and procedures	1	2	3
18 Following/enforcing policies and procedures	1	2	3
Communicate			
1 Writing business letters, memos, reports and instructional materials	1	2	3
2 Writing policies procedures and standards	1	2	3
3 Speaking before groups	1	2	3
4 Listening actively	1	2	3
5 Thinking on his/her feet	1	2	3
6 Presenting all sides of an issue	1	2	3
7 Using and interpreting body language	1	2	3
8 Presenting the corporate image	1	2	3
9 Giving clear instructions	1	2	3
10 Using presentation graphics	1	2	3
11 Utilizing word processing skills	1	2	3
12 Using the chain of command	1	2	3
13 Asking questions	1	2	3
Leadership Skills			
1 Promoting team work	1	2	3
2 Anticipating problems	1	2	3
3 Promoting services and products	1	2	3
4 Seeing the big picture	1	2	3
5 Acting diplomatically	1	2	3
6 Accepting responsibility	1	2	3
7 Persuading others to follow	1	2	3
8 Responding decisively	1	2	3
9 Acting as a role model	1	2	3
10 Thinking Creatively	1	2	3
11 Managing risk taking situations	1	2	3
12 Taking initiative	1	2	3
13 Motivating self and others	1	2	3
Management of Financial Resources			
1 Applying Accounting Principles	1	2	3
2 Applying new methods to increase profit	1	2	3
3 Applying new methods to increase revenue	1	2	3
4 Developing task analysis	1	2	3
5 Maintaining security	1	2	3

Design/Drafting Managers Duties

Management of financial resources,(con.)

	Not Essential	Somewhat Essential	Essential
6 Applying information from market trends	1	2	3
7 Analyzing financial reports	1	2	3
8 Applying analysis of financial reports	1	2	3
9 Controlling day-to-day expenses	1	2	3
10 Preparing departmental a budget	1	2	3
11 Performing cost analysis	1	2	3
Manage Information			
1 Reading and acting on information in a timely manner	1	2	3
2 Interpreting information	1	2	3
3 Analyzing and interpreting information	1	2	3
4 Setting priorities	1	2	3
5 Conducting research	1	2	3
6 Disseminating information	1	2	3
7 Maintaining records	1	2	3
8 Complying with laws and regulations	1	2	3
9 Applying information systems technology	1	2	3
10 Verifying facts	1	2	3
Manage Fiscal Resources			
1 Acquiring Inventory	1	2	3
2 Overseeing contracts	1	2	3
3 Responding to new developments	1	2	3
4 Complying with purchasing policies and procedure	1	2	3
5 Controlling day-to-day efficiency	1	2	3
6 Planing purchases and determining replacement needs	1	2	3
7 Applying safety regulations	1	2	3
8 Distributing product	1	2	3
9 Maintaining equipment and inventory	1	2	3
10 Scheduling use of equipment	1	2	3
Problem Solving			
1 Defining and determining the significance of the problem	1	2	3
2 Gathering information	1	2	3
3 Analyzing the data	1	2	3
4 Brainstorming potential solutions	1	2	3
5 Evaluating solutions	1	2	3
6 Making a decision	1	2	3

Design/Drafting Managers Duties Problem Solving (Con.)	Not Essential	Somewhat Essential	Essential
7 Implementing solution	1	2	3
8 Following-up	1	2	3
9 Utilizing Flow and Process Diagrams	1	2	3
10 Applying Statistical Process Control	1	2	3
Project Management			
1 Assessing the task	1	2	3
2 Setting Objectives	1	2	3
3 Conducting research	1	2	3
4 Establishing a plan	1	2	3
5 Coordinating resources	1	2	3
6 Meeting deadlines	1	2	3
7 Presenting recommendations	1	2	3
8 Implementing the plan and Evaluating the results	1	2	3
Enhance Professionalism			
1 Using assertion skills	1	2	3
2 Acting within business ethics	1	2	3
3 Applying time management skills	1	2	3
4 Evaluating self	1	2	3
5 Participating in professional organizations	1	2	3
6 Continuing education	1	2	3
7 Developing a career plan	1	2	3
8 Reading professional publications	1	2	3

II. Duties of the Design/Drafter

These duties relate to drafting skills. Please rate how important these duties are to a new employees career success.

Proficiency in Drafting Knowledge and Skills			
1 Displays good manual draftsmanship, (lettering line weights, neatness)	1	2	3
2 Producing orthographic projections	1	2	3
3 Producing sections, auxiliaries	1	2	3
4 Using instruments correctly	1	2	3
5 Utilizing dimensioning and tolerancing standards	1	2	3
6 Producing a detail working drawing	1	2	3
7 Producing an assembly drawing	1	2	3
8 Producing a bill of materials	1	2	3
9 Applying welding symbols	1	2	3
10 Developing a sheet metal layout	1	2	3
11 Selection of Views	1	2	3
12 Principles of Drawing Revision Control	1	2	3

Design/Drafting Managers Duties

Proficiency In Drafting Knowledge and Skills (Con.)	Not Essential	Somewhat Essential	Essential
13 Interpreting electrical schematics and wiring diagrams	1	2	3
14 Interpreting process piping diagrams	1	2	3
15 Interpreting mechanical component drafting	1	2	3
16 Solving basic trigonometry and algebra problems	1	2	3
Demonstrate Proficiency In Using a CAD System			
1 Demonstrating the correct function of hardware	1	2	3
2 Utilizing the capabilities of the software	1	2	3
3 Demonstrating organized file management	1	2	3
4 Producing lines, circles, arc, splines, cross-hatch	1	2	3
5 Producing dimensions, notes, and balloons	1	2	3
6 Moving, copying, mirroring, and rotating drawing elements	1	2	3
7 Developing custom graphic element libraries	1	2	3
8 Producing and plotting drawings	1	2	3
Knowledge of Standards and Codes			
1 Utilizing the Machinist Handbook	1	2	3
2 Utilizing association/society product standards	1	2	3
3 Utilizing Corporate/Company Standards	1	2	3
4 Applying A.N.S.I. Standards	1	2	3
5 Identifying and applying International Standards	1	2	3
Design Skills			
1 Developing and laying-out the initial design	1	2	3
2 Negotiating design concerns with engineering and manufacturing	1	2	3
3 Submitting layout to engineer for approval	1	2	3
4 Finalizing the design	1	2	3
5 Documenting the design	1	2	3
6 Making the drawing	1	2	3
7 Creating the bill of material	1	2	3
8 Checking the drawing	1	2	3
9 Revising existing drawings	1	2	3
10 Resolving problems	1	2	3
11 Maintaining reference library and pursuing professional development	1	2	3

Please indicate any questions or comments you may have regarding this study or about any of the questions in this opinionnaire.

THANK YOU FOR YOUR COOPERATION AND PROMPT RESPONSE!

Please return this opinionnaire post-marked on or before Oct. 18 in the enclosed return envelope to:

If you would like a summary of the results of the research, please write your name and address on the back of the return envelope. You will receive a copy after the research is completed.

Appendix D

Jury of Experts Cover Letter

Northern Illinois University
DeKalb, Illinois 60115-2854

Department of Technology
College of Engineering
and Engineering Technology
(815) 753-1349

Dear (Personalized):

Thank you for accepting the opportunity to assist in the research project being conducted by Northern Illinois University. Please find enclosed a copy of the opinionnaire which has been developed for this study.

Your help is needed in determining the validity of the questions being asked. The opinionnaire consists of a list of duties performed by a manager of a drafting design department such as yourself. This list of duties was developed through previous research. the object of the study is to determine the relative importance of each of the duties listed. The results of finding the answer to the question of importance will serve several purposes. One purpose will be to assist university professors in the development or modification of existing programs to optimize the opportunity for success by the design/drafting graduate. Another purpose could be to enable industrial trainers an opportunity to fine tune management training programs to focus on those management skills specific to the design/drafter.

your part in this study is to read through the opinionnaire, respond to the questions as you would if you had received it in the mail like any other research questionnaire. Please include any comments which you feel are relevant to the study, such as wording of the directions or cover letter, questions you feel are irrelevant, and most importantly identify any duties which are left out that you believe should be included.

Thank you for your time in this effort. Your input will remain confidential. Be assured your feedback will be incorporated into the final document before it is mailed to our colleagues. If you would like a copy of the results of the study, please feel free to indicate that on the back of the return envelope and I will see that you receive them as soon as the study is finished.

In order for the study to be conducted in a timely manner I am requesting you return the document with your comments as soon as possible. I have enclosed a postage paid priority mail envelope for this purpose.

Sincerely,

John E. Shultz
Assistant Professor
Design/Drafting

P.S. Please accept the enclosed technical pencil as a token of appreciation of your time.
Enclosures

Northern Illinois University
DeKalb, Illinois 60115-2854

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College of Engineering
and Engineering Technology
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Assistant Professor
Design/Drafting

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