GYSLER, Randolph Louis, 1942-
A RATIONALE AND STRUCTURE FOR GRAPHIC COMMUNICATION TECHNOLOGY WITH IMPLICATIONS FOR INDUSTRIAL ARTS EDUCATION.
The Ohio State University, Ph.D., 1971
Education, curriculum development

University Microfilms, A XEROX Company, Ann Arbor, Michigan

RANDOLPH LOUIS GYSLER

© COPYRIGHT

1971

THIS DISSERTATION HAS BEEN MICROFILMED EXACTLY AS RECEIVED
A RATIONALE AND STRUCTURE FOR GRAPHIC COMMUNICATION TECHNOLOGY WITH IMPLICATIONS FOR INDUSTRIAL ARTS EDUCATION

DISSEMINATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

by

Randolph Louis Gysler, B.S., M.A.

* * * * * * *

The Ohio State University 1971

Approved by

[Signature]
Adviser
The College of Education
ACKNOWLEDGMENTS

The writer wishes to express his sincere appreciation and gratitude for the services afforded by the many persons who have made this study possible. The writer is especially indebted to Dr. James J. Buffer for serving as the major adviser during the course of his graduate program, and for unselfishly giving of his time, guidance, encouragement, and assistance throughout the pursual of this study.

Special recognition of appreciation and gratitude is also extended to Dr. James B. Gunnell and Dr. Willis E. Ray for serving as the Reading Committee members for this study. Their guidance and counsel have been invaluable.

Further appreciation is expressed to the members of the assessment jury. Their helpful suggestions and recommendations provided the means by which the study's product could be refined and evaluated.

A final word of appreciation is given to the writer's wife, Judy, without whose patience, encouragement, and understanding this study could not have been completed. Her untold hours spent in typing and correcting the manuscript were greatly appreciated.
V I T A

October 17, 1942 . . . Born - Lakewood, Ohio

1964 . . . . . . . . . . B.S. in Education, Kent State University, Kent, Ohio

1964-1965 . . . . . Graduate Assistant of Industrial Arts and Technology Education, Kent State University, Kent, Ohio

1965 . . . . . . . . . . M.A. in Fine and Professional Arts, Kent State University, Kent, Ohio

1965-1966 . . . . . Instructor of Industrial Technology Education, Ohio University, Athens, Ohio

1966-1968 . . . . . Assistant Professor of Industrial Arts and Technology, Fresno State College, Fresno, California

1968-1969 . . . . . Associate Professor of Industrial Arts and Technology, Fresno State College, Fresno, California

1969-1970 . . . . . Teaching Associate of Industrial Technology Education, The Ohio State University, Columbus, Ohio

1970-1971 . . . . . Instructor of Visual Communication Design, The Ohio State University, Columbus, Ohio
PUBLICATIONS


FIELDS OF STUDY

Major Field: Industrial Technology Education. Professors James J. Buffer, Donald G. Lux, and Willis E. Ray


# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>ACKNOWLEDGMENTS</th>
<th>ii</th>
</tr>
</thead>
<tbody>
<tr>
<td>VITA</td>
<td>iii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>viii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>ix</td>
</tr>
<tr>
<td>CHAPrER</td>
<td></td>
</tr>
<tr>
<td>I.  INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Orientation to the Problem</td>
<td></td>
</tr>
<tr>
<td>Statement of the Problem</td>
<td></td>
</tr>
<tr>
<td>Assumptions of the Study</td>
<td></td>
</tr>
<tr>
<td>Limitations and Constraints</td>
<td></td>
</tr>
<tr>
<td>Definition of Terms</td>
<td></td>
</tr>
<tr>
<td>Procedure in Solving the Problem</td>
<td></td>
</tr>
<tr>
<td>II. REVIEW OF THE LITERATURE</td>
<td>20</td>
</tr>
<tr>
<td>An Overview of Innovative Industrial Arts Education Programs to Describe the Contemporary Field</td>
<td></td>
</tr>
<tr>
<td>An Overview of Communication Study Within Industrial Arts Education and Other Related Disciplinary Fields</td>
<td></td>
</tr>
<tr>
<td>Summary and Implications for Industrial Arts Education and Its Sub-Program of Graphic Communication Education</td>
<td></td>
</tr>
<tr>
<td>III. SELECTION OF THE DEFINITIONAL CRITERIA UPON WHICH TO BASE THE STUDY'S DEVELOPMENT</td>
<td>116</td>
</tr>
<tr>
<td>A Descriptive Review of the Industrial Arts Curriculum Project Rationale and Structure for Industrial Technology to Establish Its Context Within the Study</td>
<td></td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>A Descriptive Review of the Communication Process and Theory to Establish the Context of Graphic Communication for the Study Summary and Implications</td>
<td></td>
</tr>
<tr>
<td>IV. DEVELOPMENT OF THE RATIONALE AND STRUCTURE FOR GRAPHIC COMMUNICATION TECHNOLOGY</td>
<td>184</td>
</tr>
<tr>
<td>The Structure for the Conceptual Components</td>
<td></td>
</tr>
<tr>
<td>The Development of the Taxonometric Subject Matter Outlines</td>
<td></td>
</tr>
<tr>
<td>The Development of the Conceptual Process Components</td>
<td></td>
</tr>
<tr>
<td>Summary and Implications</td>
<td></td>
</tr>
<tr>
<td>V. ADAPTATION OF THE RATIONALE AND STRUCTURE FOR GRAPHIC COMMUNICATION TECHNOLOGY TO THE GRAPHIC COMMUNICATION TECHNOLOGY EDUCATION PROGRAM AREA OF INDUSTRIAL ARTS EDUCATION</td>
<td>229</td>
</tr>
<tr>
<td>Derivation of the Graphic Communication Technology Education Instructional System Criteria</td>
<td></td>
</tr>
<tr>
<td>Development of the Graphic Communication Technology Education Instructional Program</td>
<td></td>
</tr>
<tr>
<td>An Exemplary Course of Study for Graphic Communication Technology Education</td>
<td></td>
</tr>
<tr>
<td>Summary and Implications</td>
<td></td>
</tr>
<tr>
<td>VI. ASSESSMENT AND REVISION OF THE PROPOSED RATIONALE AND STRUCTURE FOR GRAPHIC COMMUNICATION TECHNOLOGY</td>
<td>297</td>
</tr>
<tr>
<td>Purpose of the Assessment</td>
<td></td>
</tr>
<tr>
<td>Methodology of the Assessment</td>
<td></td>
</tr>
<tr>
<td>Results of the Assessment</td>
<td></td>
</tr>
<tr>
<td>VII. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS</td>
<td>315</td>
</tr>
<tr>
<td>Summary of the Study</td>
<td></td>
</tr>
</tbody>
</table>
Findings of the Study
Conclusions of the Study
Recommendations of the Study

APPENDIX

A. A Survey to Determine the Classification of Graphic/Visual Communication Programs
B. Some Selected Principles, Properties, and Elements of Aesthetic Design as Applied to Graphic Communication
C. Exemplary Course of Study Materials for Graphic Communication Typographical Design and Layout
D. Initial Contact Letter to the Assessment Jury Members
E. Assessment Letter of Introduction and Instruction
F. Formal Assessment Instrument
G. Primary Assessment Materials
H. Letters of Recommendation and Suggestion From the Assessment Jury

BIBLIOGRAPHY
LIST OF TABLES

TABLE | Page
--- | ---
1. RIT: Course Listings in the General Printing Major | 58
2. RIT: Course Listing in the Printing Management Major | 59
3. RIT: Course Listings in the Journalism-Printing Major | 60
4. RIT: Course Listing in the Printing Technology Major | 61
5. RIT: Supplementary Electives | 62
6. CSPR: Printing Education Course Offerings | 64
7. SSU: Listing of Course Offerings for the Graphic Arts Major | 73
8. FSC: Listing of Course Offerings for the Graphic Arts Major | 75
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURE</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>The Proposed Relationship Between Industrial Technology and Industrial Arts Education</td>
<td>8</td>
</tr>
<tr>
<td>2.</td>
<td>A Flow Diagram Illustrating the Development of the Study</td>
<td>15</td>
</tr>
<tr>
<td>3.</td>
<td>The American Industry Project (AIP) Major Structural Concepts and Components</td>
<td>33</td>
</tr>
<tr>
<td>4.</td>
<td>Elements of the Economic Institution</td>
<td>41</td>
</tr>
<tr>
<td>5.</td>
<td>The Material Production Continuum</td>
<td>42</td>
</tr>
<tr>
<td>6.</td>
<td>Major Elements in Industrial Technology</td>
<td>43</td>
</tr>
<tr>
<td>7.</td>
<td>The IACP Evaluation Strategy</td>
<td>49</td>
</tr>
<tr>
<td>8.</td>
<td>KSU: The Graphic Communications Multi-Disciplinary Organization</td>
<td>87</td>
</tr>
<tr>
<td>9.</td>
<td>Organization of the VICOED Program for the Production of Visual Communication Materials</td>
<td>103</td>
</tr>
<tr>
<td>10.</td>
<td>The Relationship of Praxiology (Technology) to Man's Knowledge and to the Basic Societal Institutions</td>
<td>118</td>
</tr>
<tr>
<td>11.</td>
<td>A Paradigm of the Economic Institution</td>
<td>119</td>
</tr>
<tr>
<td>12.</td>
<td>Major Groups of Practices in the Economic Institution</td>
<td>120</td>
</tr>
<tr>
<td>13.</td>
<td>First Order Matrix of Industrial Technology</td>
<td>122</td>
</tr>
<tr>
<td>14.</td>
<td>Sample Third Order Matrix of Industrial Technology</td>
<td>122</td>
</tr>
<tr>
<td>Page</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. A Diagram of the Relationship of Industrial Technology and Graphic Communication Technology at the First Level of Adaptation</td>
<td>126</td>
<td></td>
</tr>
<tr>
<td>16. The Lasswell Communication Model</td>
<td>136</td>
<td></td>
</tr>
<tr>
<td>17. The Shannon &amp; Weaver Communication Model</td>
<td>138</td>
<td></td>
</tr>
<tr>
<td>18. The Schramm Communication Model</td>
<td>140</td>
<td></td>
</tr>
<tr>
<td>19. The Hovland Communication Model</td>
<td>142</td>
<td></td>
</tr>
<tr>
<td>20. The Berlo Communication Model</td>
<td>145</td>
<td></td>
</tr>
<tr>
<td>21. A Generalized Model for Human Communication</td>
<td>146</td>
<td></td>
</tr>
<tr>
<td>22. Classification of Graphic Symbols</td>
<td>165</td>
<td></td>
</tr>
<tr>
<td>23. Image-Related Graphic Symbols</td>
<td>167</td>
<td></td>
</tr>
<tr>
<td>24. Concept-Related Graphic Symbols</td>
<td>168</td>
<td></td>
</tr>
<tr>
<td>25. Arbitrarily-Related Graphic Symbols</td>
<td>169</td>
<td></td>
</tr>
<tr>
<td>27. The Generalized Components of the Communication Process</td>
<td>179</td>
<td></td>
</tr>
<tr>
<td>28. An Illustration of the Components and Elements Within the Graphic Communication Industry</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>29. The Application of the Graphic Communication Process to the Print Media Category of the Graphic Communication Industry</td>
<td>182</td>
<td></td>
</tr>
<tr>
<td>30. First Level Expansion of the Graphic Communication Industry Components</td>
<td>183</td>
<td></td>
</tr>
<tr>
<td>Chapter</td>
<td>Title</td>
<td>Page</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>31.</td>
<td>The Proposed Structural Model and Subject Matter Content for Graphic Communication Technology</td>
<td>185</td>
</tr>
<tr>
<td>32.</td>
<td>The Relationship Between the Practices of Graphic Communication Technology</td>
<td>197</td>
</tr>
<tr>
<td>33.</td>
<td>The Concepts and Major Processes of Graphic Communication Technology</td>
<td>200</td>
</tr>
<tr>
<td>34.</td>
<td>The Instructional System Model for Graphic Communication Technology Education</td>
<td>238</td>
</tr>
</tbody>
</table>
CHAPTER I

INTRODUCTION

Orientation to the Problem

Industrial education began in the United States around 1876, and since then has undergone progressive change. A definite philosophical difference as to its aims and goals laid the groundwork for the dual track system that exists today. One track emphasized vocational and occupational pursuit, and the other, industrial arts education, pursued liberal or general education values.

Over the past fifty years many exploratory programs have evolved within industrial arts education. Many of the later programs were built upon the strengths and weaknesses of their predecessors, while trying to solidify general education goals. Curriculum developments took on differing focuses, e.g., improving instructional methods and materials, modifying subject matter content, and even the restructuring of the body of knowledge. These developments remained unilateral in regards to one particular general education goal. A heavy emphasis was placed
upon developing an efficient and effective representation of the technology found to exist in the world of work.

The job and trade analysis of the 1940's was succeeded by the clustering of processes, techniques, and materials common to particular types of industry. As newer processes, materials, and techniques were developed they were incorporated, to greater or lesser degrees, into an already overflowing curriculum. Eventually, restructuring and redistribution of subject matter became mandatory. New titles for subprograms evolved with the traditional areas of woodworking, metalworking, drafting, etc., taking on new roles. As an example, the area of woods progressed through such phases as woodworking, wood industries, woods technology, and even in some cases, furniture making and wood construction. Newly absorbed areas such as printing, electricity, and automotives became graphic arts, electricity/electronics or communication, and power and transportation. Later those titles were modified and expanded by attaching the term technology to each. Unfortunately, the name change did not always signify a restructuring of the body of knowledge, nor did the terminology receive commonly agree upon usage.

In addition to the terminological problem, an over-population of the subject matter domain developed as a result of the technology explosion. The present day processes, materials, techniques, and
so on became obsolete even before implementation within a program. As a result, educators became increasingly aware of the fact that entire segments of the body of knowledge concerning industry and its "world of work" were being omitted. Processes affecting materials and things had been emphasized at the expense of processes affecting humans. Curriculums were conglomerates of skills, tools, materials, processes, products, and such. The role of the individual, his relationship to industry, and industry's relationship to society had been bluntly overlooked. Highly specialized bits and pieces were being emphasized instead of conceptual components. A series of attempts at the delineation and redefinition of purposes and subject matter began in the 1960's and has evolved until presently a broader more liberal view exists. Today, most practitioners would agree that the guiding purpose of industrial arts education is that of orienting the student within the industrial society which forms a major portion of his environment.

Even though a generalized definition can be given, the subject matter, structure, scope, and nature, etc. has not been commonly agreed upon throughout the field. Several approaches exist today, with new and innovative programs completely restructuring the subject matter domain. This may be evidenced through the widespread dissemination and implementation of such programs.
as those developed by the American Industry Project and the Industrial Arts Curriculum Project (to be detailed later).

On the other hand, the majority of programs, which lie in the traditional program category, still have a multitude of industry and technology-related subject areas. Commonly existing divisions may be found to be organized around industrial, occupational, and process and product, clusters and classifications. Of particular interest to this study are the subject matter areas which are referred to under the many differing titles of (1) printing shop, printing industry, printing technology, printing education; or (2) graphic arts, graphic arts industry, graphic arts technology, graphic arts education; or (3) the recently titled but poorly defined areas of graphic and/or visual communication-technology or education.

This subprogram area of industrial arts education has a similar terminological and subject matter content problem, as does its parent program. Bringing some order to this portion of the overall curriculum was the subject of this research and development effort.

Over the past six years, the writer has instructed in the graphic communication area of the industrial arts and technology program at four colleges and universities. The mobility of the situation demanded continuous reexamination and restructure of his philosophical basis as to the role, scope, and nature of industrial arts education and its subprogram of graphic communica-
tion. A continuous search of the literature and discussions with peers netted some direction, but it also pointed out the chaotic "state-of-the-art" within the area of graphic communication. It became evident that among graphic communication educators, professionals, and tradesmen, even a commonality agreement was lacking as to scope, nature, structure, and so on. Others have become cognizant of this problem, and several innovative programs have been sponsored or supported by the Graphic Arts Technical Foundation, the International Graphic Arts Education Association, and the Ford Foundation (as will be discussed under the review of the literature).

A review of the literature and investigation into numerous sources began by the writer in 1968 while enrolled in a graduate research course with Professor Willis E. Ray at The Ohio State University. This resulted in the development of the preliminary proposal for the study. The proposal was later revised and then submitted to and funded by the Graphic Arts Technical Foundation in 1969. Since that time, the writer has approached his graduate course work in a manner that produced useful data for this study.

Statement of the Problem

The problem to be undertaken in the study was composed of
three interrelated but sequential parts. The first part consisted of a research and development effort to locate, retrieve, analyze, and synthesize data to develop the theoretical structure for the study. This conceptual framework was then used to form the rationale and structure for the body of knowledge contained within the graphic communication technology substructure of the industrial technology discipline. Corollary problems that had to be solved were (1) the relationship between industrial technology and graphic communication technology had to be established and defined; (2) graphic communication technology had to be delineated in terms of its context, i.e., inputs, outputs, and boundaries; (3) the conceptual components had to be isolated and related in a meaningful discernable order; and (4) a taxonomic structure had to be developed for the subject matter domain.

The second portion of the study concerned the problem of adapting the structured body of knowledge for graphic communication technology to the industrial technology (arts) education program. Figure 1 is provided to illustrate, at a general level, the relationship between the structured body of knowledge for industrial technology and its utilization to form the subject matter for industrial technology (arts) education. A similar relationship was proposed to exist between the subcategories of industrial technology
knowledge and the subprograms of industrial technology (arts) education. Finally, graphic communication technology was classified as a subcategory of manufacturing technology. It then became a subprogram of manufacturing technology education, and, henceforth, a subprogram of industrial technology (arts) education.

The adaptation of graphic communication technology to industrial arts education was made through the use of an instructional systems development approach. As a result of the adaptation, an instructional program composed of a sequence of courses of study was developed.

One exemplary model course of study was then further detailed as a guide to the prospective readers. The instructional materials to be provided within the exemplary course of study are (1) a course description and statement of the objectives, (2) a structured outline of subject matter content, (3) a course syllabus, (4) a series of class activity/assignment briefs, and (5) a listing of selected references and instructional aids (commercially available).

The final portion of the study involved the problem of assessing the rationale and structure for the body of knowledge contained in graphic communication technology. For this purpose, a seven-member jury was utilized from within the graphic communication education profession and industry. The members were selected
because of their acknowledged expertise in the field.

The jury was presented with a packet of assessment materials containing: (1) a cover letter which provided a summary of the total research and development effort and instructions, (2) the proposed rationale and structure as developed in Chapter IV of this dissertation, (3) an exemplary course of study syllabus and subject matter
outline, and (4) a brief questionnaire.

The questionnaire was composed of definitive and evaluative statements concerning the relevancy and adequacy of the structured body of knowledge. Of major importance was the assessment of the ability of the structured body of knowledge to (1) represent the practices, processes, information and knowledge of the graphic communication industry, (2) be an appropriate source of subject matter for the graphic communication technology education area of industrial arts education, (3) be instructionally feasible and implementable, and (4) form a logically ordered, codified, and conceptualized source of information for graphic communication technology.

The jurists were asked to respond to each statement by assigning a rank value. The rank of one (1) designated the lowest and the rank of five (5) designated the highest value in their opinion. Upon receipt of the completed instrument, the writer compared the values assigned by the respondents and drew conclusions and implications.

An additional form of assessment was employed to provide feedback data for revision. In the cover letter, the respondents were instructed to provide criticisms, suggestions, and comments pertinent to any part or aspect of the total development. They were also asked to mark-up the document wherever necessary to
point out inconsistencies, omissions, and structural errors as to organization, codification, inclusiveness and exclusiveness, or whatever. This information was used to adjust and revise the body of knowledge wherever necessary, and is contained in Chapter IV.

Assumptions of the Study

1. It is assumed that the rationale and structure for the derivation of industrial arts subject matter as proposed by the Industrial Arts Curriculum Project (IACP) is appropriate and instructionally feasible as a referent for the industrial arts education program development. With the acceptance of this assumption, the study is then directed in accordance with the constraints of the IACP industrial technology matrix.

2. It is further assumed that: (1) industrial technology is that subcategory of technological knowledge which is derived from the study of the principles of industrial practice, and (2) this body of knowledge provides the basic subject matter for the study of the natural and man-made world.

3. It is assumed that industrial technology can be liberal, pre-vocational, or vocational in the sense that it provides an understanding of: (a) how man manages industrial production, (b) the practices employed to change resources into man-made goods, and (c) the knowledge of how to efficiently and effectively use and service these goods.

4. It is assumed that graphic communication technology lies within the context of manufacturing technology, just as manufacturing technology is within the broader context of industrial technology.

5. It is assumed that the major structural elements of industrial management, production, and personnel may be carried down through the manufacturing substructure to the more highly specialized and more narrowly conceived area of graphic communication technology.
Limitations and Constraints

Two forms of limitations and constraints exist within this study. First are those which were imposed upon the study by such physical properties as time, cost, availability of data, and the ability and knowledges of the writer.

Second, are those limitations and constraints which have been developed to delimit and guide the study throughout its development. For the purpose of guiding this study, the following limits and constraints have been employed:

1. The definition of graphic communication technology, its structural elements, and conceptual components, as derived from a study of communication and manufacturing technology have been used as the major delimitation instruments.

2. The graphic communication industries have been classified into two categories. The first category are those which produce "print media products" (printing and publishing) and the second are those which produce "nonprint media products" (cinema, video, and computer graphics). The study has been limited to the print media classification of the graphic communication industry (see pages 179-183) for the models depicting this relationship. This was decided upon to facilitate instructional implementation into existing industrial arts education programs and facilities.

3. The taxonometric classification system, the methodology employed in structuring the body of knowledge, the selection of subject matter, and the development of the instructional program is in accordance with those proposed by the Industrial Arts Curriculum Project in their publication, "A Rationale and Structure for Industrial Arts Subject Matter." This document, developed by the IACP staff of The Ohio State University, in cooperation with the University of Illinois, was completed in November, 1966, after two years of research. It was sponsored by the U.S. Office of Education, Bureau of Research, Division of Adult and Vocational Research.
The completed study contains the rationale and structure for graphic communication technology; its body of knowledge; and the derivation of an instructional program sequence, including one exemplary course of study for implementation into an industrial arts education program to illustrate how the rationale may be adapted.

**Definition of Terms**

The list provided below represents only a portion of the definition of terms that have been generated for the study. Whenever appropriate, additional terms have been defined within the textual body to illustrate their context through application and use. The presentation of the terms is organized in a manner by which an earlier definition lays the groundwork for later definitions.

**Communication**: A form of message wherein information, data, knowledge, etc. is conveyed from a source to a receiver in a meaningful manner through any of the five human sense receptor channels. The communication may be purposefully designed as in a structured message, or nonpurposeful as an incidental by-product (such as the psychological or physical effects of a setting sun).

**Communication Process**: The process by which a purposefully designed message is produced and utilized. The major components of the process may be classified as that of the source, message, channel, receiver, and in appropriate cases, feedback and interference.

**Graphic**: A visual aesthetic and/or functional representation of image-, concept-, or arbitrarily-related forms.

**Graphic Communication**: A purposefully composed message of encoded graphic symbols and images which are received through the stimulation of human optical sensors and decoded and interpreted through the process of cognition.
**Graphic Communication Process:** The process by which a purposeful message, in the form of graphic symbols and images, is produced and reproduced. The process is similar to that described under "communication process," with the exception that the message is limited to graphic forms and the channel is restricted to the use of only visual (optical) stimulation and reception. At a conceptual level, the major components may be listed as that of administration, creation, generation, reproduction, and distribution (to be detailed within the text).

**Graphic Image:** A graphic configuration that is used to transmit visual information which is received as an imitation or a representation of any object, person, thing, or event. In contrast to a symbol, an image is an explicit reminder of a specific thing, while the symbol is an extrapolation of the image which suggests something different. A graphic image can be structured in a codified manner only through digital coding.

**Graphic Symbol:** Any character, letter, or codified graphic form that is used by itself or in combinations with others to transmit a message containing information, data, or knowledge. It has a specified intent or meaning which is understood to have value and is capable of invoking a response within the receiver. Graphic symbols may be classified into the categories of phonograms and logograms and are structured by analogic and digital codification (to be detailed within the text).

**Economic Institution:** The fundamental institution of human society which functions to satisfy man's wants for economic goods. (Towers, et al., 1966, p. 40)

**Industry:** "that subcategory of the economic institution which substantially changes the form of materials in response to man's wants for goods." (Towers, et al., 1966, p. 40)

**Graphic Communication Industry:** That subcategory of industry which substantially changes materials through industrial practices to create and reproduce graphic messages for the satisfaction of man's needs and wants. Two major categories exist within the industry and these may be classified as the print media (printing and publishing), and the nonprint media (cinema, video, and computer graphics).

**Technology:** The science of the application of knowledge to practical purposes. Its content relates to both theoretical knowledge and its modification to form the theory of practice. (Towers, et al., 1966, p. 39)
Industrial Technology: That subcategory of praxiological knowledge which is derived from the study of the principles of industrial practices. (Towers, et al., 1966, p. 42)

Graphic Communication Technology: A body of knowledge within a subcategory of the industrial technology discipline. It is composed of praxiological knowledge which is derived from the study of the principles of industrial practices and communication.

Industrial Arts Education: The structured study of that body of knowledge pertaining to the industrial practices which affect materials and humans in that subcategory of the economic institution which is known as industry. (Towers, et al., 1966, p. 43)

Graphic Communication Technology Education: A subprogram area of industrial arts education. It is a structured body of knowledge pertaining to the industrial practices which affect humans and materials in the graphic communication industry.

Praxiology: "the product of the organized, disciplined study of the practices of man. It has to do with all of the practices which ultimately affect individual and social behavior." (Towers, et al., 1966, p. 39)

Procedure in Solving the Problem

The model presented in Figure 2 and its explanation are provided to illustrate both the procedural steps and the areas of knowledge that were investigated.
Problem Awareness Stage (1964-1967), wherein the unmet needs and unsolved problems of industrial arts education and its subprogram area of graphic communication aroused the writer's concern.

Problem Conceptualization Stage (1967-1968), wherein a search for definitional criteria began through (1) a study of the current literature of the educational profession and the printing industry, (2) a series of discussions and dialogue concerning the problem area with peers at professional meetings, conventions, and the like, (3) review of the industrial arts and graphic communication...
programs of the California State College system, and (4) entrance into a program of graduate study with, as one purpose, the formal pursual of the problem area.

3 A review of information necessary to isolate and gain background data about the problem areas of the industrial arts education program.

4 A review of information necessary to isolate and gain background data about the role of graphic communication as a subprogram area of industrial arts education.

5 Problem Design Stage (1968-1969), involving problem delineation, project focus, and proposal redevelopment.

6 Revision of the original proposal. The proposal was then submitted to and funded by the Graphic Arts Technical Foundation for the following school year.

7 Data collection began as pertinent substudies were undertaken through graduate course work. The "individual studies" (under the guidance of professors) produced the data described in steps 7.1 and 7.2.

7.1 An investigation into the historical and philosophical background, the rationale and structure, and the subject matter content of traditional and contemporary programs in industrial arts education. (Directed by the needs established in step 3.)
An investigation into the historical and philosophical background, the rationale and structure, and the subject matter content of the graphic communication subprograms. (Directed by the needs established in step 4.)

The development of a master list of guiding questions and sources of data from steps 7.1 and 7.2.

Data Collection and Analysis Stage (1969-1970), wherein an analysis and synthesis of the collected data and new data was used to redefine and extend the problem.

A revision and delimitation of the original proposal.

The continuation of data collection by completing several individual studies. The areas investigated provided the data reports listed in 11.1 through 11.6.

A "Datrix" search of the University Microfilms, Inc. to locate pertinent dissertations from 1950 to 1970, in the area of communication program development, curriculum, and so on in several disciplinary areas.

A preliminary partial adaption of the IACP rationale and structure for industrial arts subject matter to the subprogram area of graphic communication.

An investigation into disciplinary and interdisciplinary programs in communication study, with a heavy emphasis on visual
communication as found in the behavioral sciences (psychology, sociology, etc.) and the design discipline.

11.4 The completion of a progressive series of "individual studies" of information relative to general and applied systems theory, information theory, and message formation theory.

11.5 An investigation into communication theory and systems.

11.6 A review of educational curriculums, instructional systems, research and evaluation methodology and design through normal graduate course work and individual studies.

12 A preliminary development of a model for graphic communication technology through a synthesis and application of information collected at that point in time.

13 Problem Synthesis and Solution Stage (1970-71), wherein a synthesis of previously collected data was made through the development and writing of the dissertation proposal.

14 The final proposal revision and its presentation to the dissertation committee for review, suggestions, and approval.

15 The formation of the rationale and structure for the body of knowledge that is a viable part of the subject matter domain of graphic communication technology, a subcategory of the industrial technology discipline.

16 The adaptation of graphic communication technology to the industrial arts education program through the development of
an instructional sequence, and one exemplary course of study.

[17] Problem Assessment and Revision Stage (1971), wherein the assessment of the graphic communication technology structural elements was accomplished by a jury of experts from the graphic communication field. Revisions were then made to the rationale and structure, based upon the responses and recommendations of the jury. (Refer back to pages 8-10 for detailed.)

[18] Assessment of the Product (1971), wherein a rough draft of the completed product was submitted to and critically reviewed by the dissertation committee. Based upon the committee's recommendations, the final revisions and readjustments were made to complete the dissertation writing.
CHAPTER II

REVIEW OF THE LITERATURE

The review of the literature served the purpose of establishing a descriptive overview of the field of industrial arts education and one of its subprograms, "graphic communication." This was considered to be an essential step before any developmental effort could begin. Insight had to be gained into what had already occurred and what information presently existed within the field in order to identify methods of approach and to establish guidance. Once this had been accomplished, a theoretical framework for the search was developed and this in turn would produce the means for further penetration into detailed component areas.

The presentation of the review of the literature has been organized into three sections. The first two sections briefly report the information located in the literature, while the third section synthesizes that information and draws implications for the study. The first section is titled, "An Overview of Innovative Industrial Arts Education Programs to Describe the Contemporary Field." The areas of review contained in this section are (1) innovative
industrial arts curriculum projects, (2) the American Industry Project (AIP) and (3) the Industrial Arts Curriculum Project (IACP).

The second section is titled, "An Overview of Communication Study Within Industrial Arts Education and Other Related Disciplinary Fields." The areas of review contained in this section are (1) the classification of direct and indirect communication programs of study, (2) printing arts and printing education programs, (3) graphic arts programs, (4) graphic communication programs, and (5) visual communication programs (interdisciplinary).

The criteria used to select particular studies, projects, and programs was their professional recognition, reputation, and status in the field. Also of importance was the availability of information describing the component parts of the selected studies, projects, and programs.

Several writers and historians have examined curriculum efforts in industrial arts education prior to the 1960 surge of innovative curriculum development projects. Reviews of the developmental history may be found in the writings of Bennett, Barlow, and Sredl. Before discussing some of the more current curriculum efforts, it is felt to be useful to summarize the earlier traditional curriculum developments. For the purpose of this study, a general summary of the earlier developmental efforts (prior to 1960) is presented by paraphrasing Hauenstein (1966, pp. 22-23) when he
suggests that:

1. Industrial arts curriculum has changed to keep abreast of society and discipline change.

2. A national unifying force in regards to philosophy, aims, objectives, curriculum methods, etc. within industrial arts education never developed.

3. The general education emphasis of industrial arts came about as both a result of the shortcomings of manual training and the influence of Frederick Bonser.

4. The curriculum content of industrial arts has been ever broadening and expanding.

5. The industrial arts curriculum has continuously been readjusted to meet life needs, to study industry and its components, to study trades and occupations through tools, materials and processes, and to relate to such disciplines as science and mathematics.

6. In its evolutionary process, industrial arts has been searching for an adequate base upon which to study industry and its relationship to society.

7. Within industrial education, the subprograms of industrial arts and vocational trade and industry education share similar subject matter, but administer programs of totally differing content and emphasis as a result of nonsimilar objectives and goals.

As suggested by the observations above, industrial arts educa-
tion has shown itself to be a viable program. It has continuously searched for more efficient and effective ways of providing pertinent subject matter for general education purposes. However, due to the diversity of philosophical opinion in the field, it appears that a unified curriculum base has not been established by the traditional programs. Therefore, the need to review contemporary programs was indicated in order to locate that information.

An Overview of Innovative Industrial Arts Education Programs to Describe the Contemporary Field

During the 1960's, public and private funding was made more readily available for the development of curriculum projects within industrial education. As a result, many innovative programs were proposed. The degree of organization and structure within these programs were found to have a wide spread. Highly structured organizations were developed by the use of formal research development, dissemination, and evaluation procedures. Nevertheless, some developmental efforts proceeded with little concern for empirical research practices or for what had been accomplished previously, or what developmental efforts were in process at that time.

The following list presents twenty-two of the more widely publicized curriculum development proposals and projects of the industrial arts education field:

1. American Industry Project - Stout State University (Face and Flug)
2. Crafts and a Vocation - Eastern Kentucky University (Hansson)

3. Correlated Curriculum Project - City of New York, Bd. of Education (Lebowitz)

4. Enterprise: Man and Technology - Southern Illinois University

5. Functions of Industry - Wayne State University (Bateson and Stern)

6. Galaxy Plan for Career Preparation - Detroit Public Schools (Turnquist)

7. Industrial Arts: A Study of Industry and Technology - University of Maryland (Maley)

8. Industrial Arts Curriculum Project - The Ohio State University (Lux and Ray) (in cooperation with the University of Illinois)

9. Industriology Project - Wisconsin State University, Platterville (Kirby)

10. Interdisciplinary Vocational Education - Kansas State University (Agon)

11. Introduction to Vocations - North Carolina State University - Raleigh (Clary)

12. Occupational, Vocational and Technical Program - Pittsburgh, Penn. Public Schools (Olson)

13. Occupational Work Experience - Warren City Schools (Williams)

14. Orchestrated Systems Approach - Indiana State University (Yoho)

15. Technology for Children Project - New Jersey State Department - Trenton (Hunt)

16. The Alberta Plan - University of Alberta (Ziel)
17. The Georgia Plan for Industrial Arts - Georgia Southern College (Hackett)

18. The Parma Approach - Parma Public Schools - Ohio (Fricker)

19. The Partnership Vocational Education Project - Central Michigan University (Minelli)

20. The Richmond Plan - San Francisco State College (Champion)

21. Training for Families of Skills - Quincy Public Schools, Quincy, Massachusetts (Daly) (Project Able)


A review of the entire listing of curriculum proposals and projects was neither within the practical limitations nor within the purpose of this study. The reader is referred to three sources, if interested in a review of that nature. First, and most appropriate, would be published and unpublished information and data about individual projects, available from the respective project directors. Second, a brief but comprehensive review of many of the major projects is provided in the Industrial Arts Curriculum Project publication titled "A Rationale and Structure for Industrial Arts Subject Matter" (Towers, et al., 1966, pp. 86-130). Finally, Cochran (1970) compares and contrasts twenty curriculum projects and proposals in a book concerning industrial education programs.
Program Classification

In an attempt to categorize curriculum projects and proposals, Cochran developed four major classifications. Many similarities can be seen between Cochran's classification and that which was proposed by Swanson (1965) for the "14th Yearbook of the ACIATE." A brief review of these classification systems is presented to illustrate the differing degrees of direction and emphasis taken by individuals in the industrial arts field.

Swanson proposed that industrial arts education programs could be classified under the four major headings of:

1. The study of common life needs created by or related to industrial and technological advances.
2. The study of crafts or trades, processes, tools, machines, materials, and products.
3. The study of applications of mathematics and the sciences.
4. The study of industry (1965, p. 47)

The first classification proposed by Cochran was that of the "Intergrative Program" curriculums, wherein the interrelationships between two or more subject matter areas are emphasized. The purpose of such an organization is that of unifying the educational activities to be experienced by the student. Through this type of organization the student should be able to:

1. Perceive relationships between different subjects.
2. Make an easy transition from school to the world of work.
3. Observe natural relationships within the field.

4. Obtain a realistic view of career development (1970, p. 22)

The curriculum projects included within this classification are (1) Correlated Curriculum Project, (2) Interdisciplinary Vocational Education, (3) Introduction to Vocations, (4) Partnership Vocational Education Project, and (5) Richmond Plan.

The second classification proposed by Cochran (1970, p. 38) was that of the "Interpretation of Industry Program" curriculums, wherein the emphasis is placed upon interpreting the totality of industry in terms of marketing, production materials, research and development, organizational patterns and services. Curriculum projects within this category are (1) American Industry Project, (2) Functions of Industry, (3) Georgia Plan for Industrial Arts, (4) Industriology, and (5) Orchestrated Systems Approach.

The third classification proposed by Cochran (1970, p. 57) was that of the "Occupational Family Program" curriculums, wherein emphasis is placed on the development of skills applicable to a cluster of occupational families, rather than specific types of job employment. Curriculum projects falling within this classification are (1) Crafts as a Vocation, (2) Galaxy Plan for Career Preparation, (3) Occupational, Vocational, and Technical Program, (4) Occupational Work Experience, and (5) Training for Families of Skills.
The fourth and last classification proposed by Cochran (1970, p. 73) was that of the "Technology Oriented Program" curricula, wherein the technology of industry is related to man and society. Technical developments, scientific management, and product demands are aspects to be emphasized. The curriculum projects within this classification are (1) The Alberta Plan, (2) Industrial Arts Curriculum Project, (3) Industrial Arts: A Study of Industry and Technology, (4) Industrial Arts Technology: A Study of American Industry, and (5) The Parma (Ohio) Approach.

There may be some points of contention and disagreement with these particular classifications. However, at a general level, it was decided that they could be useful in providing an overview of differing program focuses, purposes, etc., within the field of industrial education. In addition to classifying program curriculum, Cochran compared several programs by use of a fifty-item questionnaire and the Q-sort technique. It was of interest to note that only about a 50 per cent agreement was received from the respondents on items pertaining to objectives, content, and teaching method. These conclusions were drawn from the similarities of response:

1. A lesser degree of emphasis is placed on manipulative type activities, while the emphasis on the application of scientific principles through experiences in research and development has been increased.
2. Provision for individual differences is made through multiactivity organization so the student can progress from a general understanding of industry to more specific tasks.

3. There is little classification of instructional content under such areas as "woodworking" and "metalworking," and activities directed toward avocational interests and the crafts are de-emphasized.

4. A middle-of-the-road position is evidenced in regards to the emphasis placed on good design and craftsmanship, the use of common hand and machine tools, and consumer knowledges as related to the selection, purchasing, and wise use of industrial products. (1970, p. 110)

In order to gain a more comprehensive picture of contemporary industrial arts curriculum projects, the two most prominently known programs have been reviewed in depth. These projects are the American Industry Project (AIP), which was initiated at Stout State University, Menomonie, Wisconsin, in 1964, and the Industrial Arts Curriculum Project (IACP), developed at The Ohio State University, Columbus, Ohio (in cooperation with the University of Illinois at Urbana), in 1965.

The American Industry Project (AIP)

The American Industry Project was initiated in 1964 through a proposal developed by Wesley Face, which was submitted to and funded by a small grant from the U.S. Office of Education. This work resulted in an additional proposal by Face and Eugene Flug,
which was submitted to and funded by the Ford Foundation. Finally, a third grant was received from the U.S. Office of Education for a five year period beginning in 1965. (Cochran, 1970, p. 39)

The American Industry Project development has proceeded through five phases: (1) preliminary planning during a summer session, (2) a developmental year including a summer session revision, (3) a demonstration year and another summer revision, (4) expansion of the program to eight teaching centers with a once-a-month visit and evaluation by the project staff to the twenty centers, and (5) development of a parallel teacher education program with an extensive teacher education program redesign.

The project classifies itself as a replacement for traditional industrial arts education. Its rationale and instructional goals appear to be so similar in nature to industrial arts that it was selected as an exemplary program to be included in the discussion. It has been designed to bridge the gap between general education and vocational education.

Industry was identified as the source of the body of knowledge from which the AIP subject matter is drawn. Industry is defined as:

an institution in our society which intends to make a monetary profit, applies knowledge, and utilizes natural and human resources to produce goods and services to meet the needs of man. (Nelson, 1969, p. 37)
The AIP focused around two major objectives or goals. The first objective was "to develop an understanding of those concepts which directly apply to industry." (Gebhart, 1968, p. 2) The term "concept" is interpreted by Face to mean:

psychological constructs resulting from a variety of experiences, by a word or idea and having functional value to the individual in his thinking and behavior. (Face, et al., 1965, p. 65)

The second major objective of the project was to "develop the ability to solve problems related to industry." (Gebhart, 1968, p. 2)

The project surmised that it was not practical to study the totality of industry, so a conceptual approach was developed. The approach was based upon Bruner's conceptual schema, wherein a variety of industries were analyzed to isolate and interrelate common concepts. (Wenig, 1970, p. 38) Originally fourteen major concepts were developed, with that number being reduced to thirteen at a later date. Each concept was then subdivided and structured into a taxonomy with each proceeding level leading to a higher order of specificity. The point stressed by the AIP was that the analytical breakdown was based on categorizing concepts which emphasize an "understanding of industry" rather than a trade, skill or job analysis of any one particular industry.

The original conceptual areas that were developed to identify and classify industry are as follows: (1) energy, (2) processes,
(3) materials, (4) production, (5) management, (6) marketing, (7) personnel and industrial relations, (8) purchasing, (9) research, (10) physical facilities, (11) financing, (12) public interest, (13) transportation, and (14) communication. (Face, 1967, AIAA Convention address)

Subconcepts were then isolated within each of the major conceptual areas. As an example, under the major concept of "energy" would be the forms of energy, harnessing of energy, storage and transmission of energy, and the use of energy. Becoming more specific, under the "forms of energy" would be mechanical, chemical, thermal, electrical, and atomic.

As another example, under the major concept of "processes" would be the subconcept of "fastening." "Adhesion" is a more specific subconcept of fastening, and "brazing" and "gluing" are subconcepts of adhesion.

Gebhart (1968) shows the reduction of the AIP major structural components from fourteen to thirteen in the model given in Figure 3.

The rationale used in organizing the knowledge of industry through conceptual components, qualifies this structure as that of being discipline-centered. A great deal of effort was expended by the project to develop eighteen "generalization" guidelines by which to derive the concept structure. Many of the principles of
learning theory, instructional program development, implementation, and evaluation theory, objective writing guides, and so on may be found to exist within these concept generalizations.

The instructional program developed through the concept-oriented structure consists of three levels which were intended for the 8th, 10th, and 12th grade level, but capable of being generalized to other levels.

Level I focused on an overview and general understanding of the major industrial concepts and their relationships, while solving
simple problems related to industry.

Level II concerned an increase in the depth of penetration into the major conceptual areas, with an increase in the complexity of industrial problem solving.

Level III assumed that a data base had been established through the first two levels. It involved student selection of one of the conceptual areas of industry, wherein a significant problem was identified, researched, solved, and reported.

Little information has been made publicly available by which to assess the degree of adequacy or successfulness of the AIP. Therefore, any judgment based upon the available AIP literature must be made at a very general level.

In this writer's opinion, it seems that an apparent high level of success was attained by the AIP in terms of industrial orientation and general education goals. However, two major difficulties appear to be present. First, a review of the AIP literature suggests that the evaluation has been limited to the field testing of instructional materials. Data was gathered by use of achievement testing and teacher feedback, and then yearly revisions took place. The extent of the actual evaluation of the instructional program, product development and revision, and the current acceptance, cannot be accurately determined by the writer because of a lack of pertinent and informative data. It has been reported that a terminal evalua-
tion report is in the process and should soon be available for review.

A second difficulty in the AIP lies within the context of the identification of its major structural concepts. When examined in their totality, the major concepts relate the study of industry to the entire American economic system. The problem arises out of the fact that segments of the economic system have been omitted, and henceforth, the concepts are not totally inclusive. Such areas as recreation, entertainment, and personal services have been omitted.

In addition, the concepts of procurement, finance, and marketing have interrelated parts which are most difficult to separate into dichotomous structures. When a dichotomy is artificially formed, a substantial portion of the data and information is lost through structural and organizational constraints. Therefore, as a result, the major concept areas have difficulty in maintaining mutual and total exclusiveness.

The Industrial Arts Curriculum Project (IACP)

The Industrial Arts Curriculum Project (IACP) is the second prominent innovative program that has been reviewed in depth. A major review of this project was made for it was the basis on which the study interprets the context of industrial arts education
and industrial technology. In this chapter (II), the report of the review consists of an explanation of the IACP industrial arts educational program, while the next chapter (III) reports a review of the IACP structural elements for industrial technology. For additional information the reader is referred to the writings of Peter (1969), "The IACP Rationale: A Brief Description" (1968), and Towers, et al., (1966).

The IACP began its research and development effort in 1965, under the direction of Towers, Lux, and Ray at The Ohio State University. In addition to the project staff of professional industrial arts theorists and specialists, other noted professionals from the entire university community took part in the research effort. A national advisory committee and a task force was composed of philosophers, logicians, historians, sociologists, economists, pedagogists, and industrialists (labor, management, and specialists from all phases of industry). Funding for the project was made available through a grant from the Bureau of Research of the U.S. Office of Education.

The first task of the massive research effort was to formulate a rationale and structure for the body of knowledge to be contained within industrial arts subject matter. In order to guide this stage of the research, three assumptions concerning the nature of industrial arts were proposed:
1. Industrial arts is a study of industry. It is an essential part of the education of all students in order that they may better understand their industrial environment and make wise decisions affecting their occupational goals.

2. Man has been and remains curious about industry, its materials, processes, organizations, research, and services.

3. Industry is so vast a societal institution that it is necessary, for instructional purposes, to place an emphasis on conceptualizing a fundamental structure of the field, i.e., a system of unifying themes. (Towers, et al., 1966, p. 2)

Later as the study progressed, four additional assumptions were derived to guide the search to identify the body of knowledge and its structure. These assumptions were used to identify the body of knowledge:

1. For the purposes of analysis, man's knowledge can be categorized and ordered logically.

2. To provide for the most effective and efficient transmission of knowledge, the educator must codify and structure disciplined bodies of knowledge.

3. The structure of a body of knowledge can be developed before the total curriculum is designed.

4. All domains of man's knowledge must be included in an effective general educational program. (Towers, et al., 1966, p. 3)

As the body of identifiable knowledge was retrieved and analyzed, a system for organization and structure became necessary. To adequately structure the body of knowledge in discipline form, the
IACP proposed:

1. The context must be defined, i.e., the boundaries or limitations must be established.

2. The elements must be identified in a meaningful order.

3. The sum of the elements must equal the context.

4. The relationships among elements must be discernible (IACP: A Brief Description, 1968, p. 5)

The search of the literature to structure man's knowledge led to the acceptance of the four domains or classes of knowledge as proposed by Maccia. In essence, the IACP interpretation is as follows: (Peter, 1969, pp. 12-13)

Formal Knowledge - are those knowledges that are established through such disciplines as logic, mathematics, linguistics, etc., and which provide the necessary tools for ordering all other forms of knowledge.

Descriptive Knowledge - are those knowledges that are established through such disciplines as the physical, biological, and behavioral sciences, and which provide data about events and phenomena and describe their interrelationships.

Prescriptive Knowledge - are those knowledges that are established through such disciplines within the humanities as literature, philosophy, and non-manipulative fine arts. They provide the data and the systems to determine discernible relationships and establish value judgments.
Praxiological Knowledge - are those knowledges that are established through such disciplines as medicine, law, engineering, education, etc., which provide the knowledge of practice and the science of efficient actions. Furthermore, praxiology is an extension beyond the realm of a single domain of knowledge in that it is composed of three essential parts:

1. Traditional knowledge (formal, descriptive, and prescriptive);

2. Knowledge of practice (less traditional or less recognizable knowledge); and

3. Practice - per se (the term per se was added to the quote) (IACP Rationale: A Brief Description, 1968, p. 8)

The domain of praxiological knowledge came the focus point of the project research. In order to stabilize terminology, the term praxiology was equated with the term technology. This was performed to facilitate understanding, due to the general acceptance of the significance of the term technology in the industrial arts literature. However, it must be noted that in this instance technology was interpreted to mean "the science of the application of knowledge to practical purposes." (Peter, 1969, p. 13)

The search began to isolate those technological knowledges (practices) of man which might be classified into the industrial arts domain of study. To conceptualize and structure the prac-
tices of man into a manageable organization, Cuber's five "fundamental societal institutions" were employed as a delimiting device. In accordance with this schema, man's practices which interact within the human society to provide life's function may be classified into the five basic societal institutions of familial, religious, political, educational, and economic. (Peter, 1969, p. 9)

The economic institution was identified as the appropriate base from which further delineation should proceed. From this base the technological knowledges (practices) upon which to build the structure of industrial arts subject matter could be drawn. The function of the economic institution was defined as that of satisfying man's wants and needs for economic goods. (Towers, et al., 1966, p. 40) These functions are accomplished through either "material production" (genetic, extractive, or industrial) or "other economic activities" such as transportation, recreation, education, and so on, as shown in Figure 4.

From within this broader context, industry was defined as that element of the economic institution which substantially changes the form of materials through either manufacture or construction to satisfy man's material wants. This is depicted by the diagram in Figure 5.
FIGURE 4.

ELEMENTS OF THE ECONOMIC INSTITUTION (Towers, et al., 1966, p. 73)
Industrial arts was then defined as the "organized study of the knowledge of practice within that subcategory of the economic institution which is known as industry." (Towers, et al., 1966, p. 43) To derive possible subject matter components, the practices of industry were isolated, conceptualized, and ordered into a taxonometric classification. Through the use of matrix analysis and display techniques, the major structural elements of industrial technology were established. As shown in Figure 6, the major elements of industrial management, production, and personnel technology became the structural components for industrial technology, and henceforth, the subject matter for industrial arts education.
As a result of this research effort, the IACP instructional program for industrial arts education was developed in the form of a two-course sequence, i.e., "The World of Construction," and "The World of Manufacturing." To guide the selection of subject matter, the formation of teaching-learning activities, the development of instructional materials, and so forth, a series of additional substudies were incorporated into the project's research. Principles from such areas as learning and instructional theory,
student behavioral characteristics and change, instructional materials and process model development, etc., were identified and formulated into guides. In addition, an extensive evaluation schema, with detailed assessment and feedback loops, was designed prior to instructional system development and its implementation and testing.

The objectives for both courses were designed to prepare students for enlightened citizenship and to provide educational-occupational guidance for the world of work. The following list is a composite of both sets of course objectives as adapted from the Teacher's Guide. The reader is asked to interchange or omit one of the words "manufacturing technology" or "construction technology" as he proceeds to read through each objective.

1. Place (manufacturing - construction) technology in the broader context of industrial technology and all technology.

2. Be aware of the past, present, and future of the (manufacturing - construction) phase of industry.

3. Appreciate, understand, and perform the selected management practices of planning, organizing, and controlling as they relate to (manufacturing - construction) production systems.

4. Appreciate, understand, and perform the selected personnel practices of hiring, training, working, and retiring as they relate to (manufacturing - construction) production systems.
5. Appreciate, understand, and perform the selected practices in preprocessing, processing, and post-processing or servicing as they relate to (manufacturing - construction) production systems.

6. Appreciate and understand interrelationships within and between management, production, and personnel.

7. Appreciate and have some understanding of (manufacturing - construction) products and the utilized tools and materials.

8. Utilize the knowledge and skills of (manufacturing - construction) management and production to (manufacture - construct) representative products.


10. Develop responsible and safe work attitudes and the ability to function as a member of a group.

11. Utilize knowledges of construction technology outside the classroom, currently and in the future. (A construction program objective only)

12. Understand the interrelationships of construction technology and community development. (A construction program objective only)

The instructional program was designed for and implemented into the junior high school industrial arts program using a comprehensive evaluation schema. The first-year program was completely devoted to "The World of Construction," and the second year with "The World of Manufacturing." In addition to the program's detailed course of study, a complete package consisted of: (1) textbook, (2) workbook, (3) laboratory manual, (4) teacher's guide, and (5) all instructional aids and devices.
Both programs have received multiple assessments and revisions and were recycled with new additions or deletions four times during the 1967 to 1971 field testing program. The evaluation was applied to the entire range of program functions and parts, from program objectives, to daily objectives, to terminal behavioral objectives, to teaching-learning activities - texts - materials, and so on. The evaluation strategy involved two independent but also interrelated forms of assessment. The first form of assessment, called "formative evaluation" was the quality control phase of the program development and its subsequent revisions. Prior to actual field testing, IACP staff members, pedagogists, and substantive experts validated content, pilot-tested model units, and edited all written materials. The materials were then implemented through classroom tryout, along with quality control procedure. Some of the assessment criteria used in this phase are reported by Buffer (1971), under the categories of software and hardware. They were reported as:

**Software**

1. Appropriate educational specifications
2. Valid and accurate representation
3. Complete and adequate coverage
4. Appropriate readability level
5. Format consistency
6. Grammatical correctness
7. Error free copy
8. Workable with children
9. Appropriate operational directions and procedures.

Hardware
1. Appropriate to meeting educational specification
2. Functional
3. Operationally adequate (can be effectively used by children)
4. Error free
5. Adequate specifications (for ordering materials, fabrication, and operation)
6. Safe (pp. 77 and 80)

The second form of assessment, called "summative evaluation" involved the testing of the finished product. The major purpose of this assessment was to determine whether the instructional materials, sequence, and teaching methods validly attained the established educational specifications. Some of the instruments used to gather pertinent data were reported as:

1. Daily evaluation by individual teachers (marked copy and feedback forms)
2. Weekly groups evaluation by centers
4. Summer evaluation conference

5. Occasional questionnaires

6. Field visitation by headquarters staff (observation, interviews, and group sessions with teachers, pupils, and administrators)

7. Anecdotal reports (p. 80)

The gathered data was analyzed and then used to revise such things as:

1. Corrections and modifications of software and hardware

2. Preparation of new manuscripts for software

3. Design and manufacture of new hardware

4. Creation of new audio visual media (slides, transparencies, and movies)

5. Recommendations for changes in teaching strategies and program design (p. 81)

The model in Figure 7 provides a graphic illustration of the relationship between the two forms of evaluation.

Upon completion of the six year program (one year extension), the publishing rights of the entire instructional package was awarded to the McKnight & McKnight Publishing Company, Inc., by the U.S. Commissioner of Education for commercial marketing. (A five year copyright is held by the Ohio State University Research Foundation). The IACP program has been disseminated nationally and can be found to exist in over 250 schools at the date of this writing.
Schneller, 1971, p. 1) It appears that it will have a great impact on the future of industrial arts education, for even now plans are being made for further adaptation of the industrial technology knowledge structure for the development of additional programs.

In review, the purpose of this first section of the review of the literature has been to gain a general overview of contemporary industrial arts education programs. An overall picture has now been established as to the scope, nature, and rationale of individual segments within the field. In addition, some of the philosophical differences and backgrounds, aspiration levels and accomplishments have been uncovered. These in turn will be used
An Overview of Communication Study Within Industrial Arts Education and Other Related Disciplinary Fields

Now that an overview of the larger field of industrial arts education has been accomplished, a review of one of its subprograms can be reported. This section of the review presents a discussion of the existing graphic communication subprograms of industrial arts education. In addition, a review of other related forms of communication study has been included.

By this means, several guidelines and constraints have been established. Later, in the summary section of this chapter, implications will be drawn from both reviews and used to guide further data collection, analysis, and synthesis.

The primary sources selected for this section of the review were as follows: (1) Visual Communications Journal, 1969-1970, (2) Visual Communication Instructor, 1966-1970, (3) Business Graphics, 1967-1969, (4) The Journal of Industrial Arts and Vocational Education, 1966-1970, (5) the various publications of the Graphic Arts Technical Foundation and the International Graphic Arts Education Association, (6) published information concerning the VICOED Program, (7) a questionnaire sent to visual/graphic design programs within the fine arts discipline, and (8) curriculum...
proposals, college catalogs of course offerings and descriptions, and other related information.

**Classification of Direct and Indirect Communication Programs**

The review of the literature revealed many broad classification systems for programs of communication study. In some cases, it was impossible to isolate, separate, and classify particular programs. This was found to be especially true in the behavioral sciences wherein some programs have been so well incorporated into others that they could not be singled out for inspection.

For the purpose of organizing the findings of the review, the writer has accepted the communication program classification as suggested by Scheid and Associates (1966, p. 7-28). The exhaustive study undertaken by Scheid was concerned with three questions:

1. What are the principal university and college programs in the area of communication?

2. What seems to be the major strategies and trends that govern these programs?

3. What general uniformities and commonalities exist among these programs? (p. 7)

The findings and conclusions of that study have been reorganized by this writer into two major categories, each including several subcategories. The two major categories are (1) direct
communication study programs, and (2) indirect communication study programs.

Direct communication study programs are those programs concerned with the production of communications and may be further divided into:

1. Programs emphasizing the theory of the communication processes and their effects in terms of social, cultural, political, and economic relationships. These programs are generally found at the graduate level and emphasize study in the field of public information, including journalism, publishing, and broadcasting.

2. Programs emphasizing graphic or visual communication design. Included among these programs are such areas as photography, film making, and television. In these cases, emphasis is placed on the form and effect rather than on technical processes. This type of program is exemplified by the fields of public persuasion; including advertising, public relations, politics, and the formation of public opinion.

3. Programs emphasizing the operations (hardware) of communication technologies. These programs are concerned with the analytical and technical design of one or more types of communication systems. Originally, only a few programs such as technical printing, photographic science, and communication options in
electrical engineering composed this area. Presently, this area is being represented by the fields of professional, technical, engineering and scientific disciplines, including computer sciences, information acquisition, and storage and dissemination.

Indirect communication study programs are those programs concerned with the use of communication media and form. They may be divided into:

1. Programs emphasizing a blending of the direct communication programs to prepare personnel for management in business, industry, and education. These fields are placing more and more emphasis on the use of communications for the purposes of information direction, and motivation for control of human organizations in an economical and efficient way. Concern is not only for the operating practice, but also for an analysis of disciplinary fundamentals.

2. Programs that emphasize the use of communication theory to focus upon the quality effects, and regulation of communication media. These programs are exemplified by the fields of culture, entertainment, and education and training professions.

The literature seems to suggest that the industrial education form of communication study lies in the "indirect communication study" category. It appears to be a blend of the theoretical
and practical applications of a singular or multiple grouping of communication systems. It must be noted though that most of these industrial education programs are concerned only with skill and process development of a single media, such as forms of printing processes, rather than concerned with a broad overall communication conceptual approach. As a result of a critical review of the literature, the writer agrees with J. A. Nieminen (1969) in his conclusion that the organization of communication programs in industrial education yields four broad individual programs of emphasis: (1) printing education (and arts), (2) graphic arts, (3) graphic communication, and (4) visual communication (composed of independent fields of study) (p. 32). These areas will now be discussed in detail.

Printing Education (and arts) Programs

Printing education is strictly a vocational program emphasizing skills, materials, processes, and techniques that are necessary to obtain a saleable skill. (Nieminen, 1969, p. 33) This type of program on the college level generally leads to a B.S. degree in printing management, production, etc.; while on the technical-vocational level it leads to the obtainment of a particular job skill or position.
Printing arts is generally conceived to be pre-vocational. Its program is designed as an introduction to printing with three possible objectives: (1) an introduction for those planning to enter a printing college, (2) instruction for those who wish to pursue further training in the craft, and, (3) for those needing an entry level into a printing occupation. (Nieminen, 1969, p. 33) This type of program generally leads to an Associate Degree (A.A.) and can be used for entry into some particular aspects of the printing industry.

The two definitions given above are exemplary of the type found in the literature for such programs. A synthesis of several of these similar definitions yields the following generalized statement: Printing education is a blanket term that is applied to both trade-technical (secondary and post-high school) and professional education (collegiate). At the trade-technical level, it is generally composed of skill procurement activities that lead to a level of competency that is necessary for entry into printing and its allied industries. Occupations arising from these types of programs may be such as a layout artist, stripper, camera man, pressman, etc. The professional level of printing education is generally a degree granting program at a higher technical institute, college or university. The curriculum components at this level lead to the obtainment of a printing industry position in such areas
as management, production, sales, service, etc.

The curriculum (subject matter) components of printing education programs are generally quite similar in nature. Two programs have been selected for inclusion in this review, due to their reputation and standards of excellence. These programs are presently being offered at Rochester Institute of Technology (RIT) and California State Polytechnic College (CSPC).

The printing education program of RIT. The printing education program offered at RIT is organized and administered under the College of Graphic Arts and Photography; which consists of the School of Photographic Arts and Sciences, the School of Printing, and the Graphic Arts Research Center.

The School of Photographic Arts and Sciences offers undergraduate and graduate programs in photographic science and instrumentation leading to the B.S. degree in professional photography, and the B.F.A. degree in photographic illustration.

The Graphic Arts Research Center conducts three functions for the overall program: (1) it is a resource center, (2) it carries out research in various fields of graphic arts, and (3) it administers short highly specialized courses for professional personnel in the graphic arts industry.

The School of Printing offers four majors leading to the B.S. Degree in: (1) General Printing, (2) Printing Management,
(3) Journalism and Printing, and (4) Printing Technology. The two-year program in each of the above areas yields the Associate in Applied Science Degree.

The two-year programs prepare the student wishing to enter employment upon completion of the program. Graduates of the program are employed as assistants in estimating, production, control, specification writing, purchasing, copy preparation, typography and layout, and so on.

The four-year program prepares the student for a variety of positions in the graphic arts industry, with such being: administration and general management, production management, production and quality control, sales and sales management, process and plant development, research and so on.

The graphic arts subject matter related courses in each of the four majors, has been taken from the 1969 catalogs and is presented in Tables 1 through 5. (RIT, 1969, pp. 102-105)

General Printing Major — is an overview of many aspects within the graphic arts industry. It may be adapted so that emphasis may be placed in any particular industrial area, i.e., book industry, forms industry, etc. In addition to general education courses, the major is composed of the graphic arts courses listed in Table 1.
TABLE 1.

RIT: COURSE LISTING IN THE GENERAL PRINTING MAJOR

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Quarter Hours of Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typographic Composition</td>
<td>2</td>
</tr>
<tr>
<td>Linotype-Intertype Composition</td>
<td>3</td>
</tr>
<tr>
<td>Monotype Composition</td>
<td>3</td>
</tr>
<tr>
<td>Layout and Lettering</td>
<td>3</td>
</tr>
<tr>
<td>Letterpress Press</td>
<td>3</td>
</tr>
<tr>
<td>Reproduction Photography</td>
<td>3</td>
</tr>
<tr>
<td>Offset Plates</td>
<td>3</td>
</tr>
<tr>
<td>Offset Press</td>
<td>3</td>
</tr>
<tr>
<td>Imposition and Stripping</td>
<td>4</td>
</tr>
<tr>
<td>Science Option</td>
<td>24</td>
</tr>
<tr>
<td>Technical Electives</td>
<td>32</td>
</tr>
<tr>
<td>Estimating</td>
<td>8</td>
</tr>
<tr>
<td>Elements of Production Management</td>
<td>3</td>
</tr>
<tr>
<td>Printing Management Electives</td>
<td>20</td>
</tr>
</tbody>
</table>

Printing Management Major -- provides the opportunity for students to emphasize comprehensive study in the areas of management beyond that included in the general major. It is designed for those whose career objectives lie principally in the fields of business management, production management, sales management, and such related areas as industrial and personnel relations. This major entails only an overview of the basic technical background in printing technology and production. In addition to the general education courses, the major is composed of the graphic arts courses listed in Table 2.
TABLE 2.

RIT: COURSE LISTING IN THE PRINTING MANAGEMENT MAJOR

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Quarter Hours of Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imposition and Stripping</td>
<td>4</td>
</tr>
<tr>
<td>Typographic Composition</td>
<td>2</td>
</tr>
<tr>
<td>Linotype-Intertype Composition</td>
<td>3</td>
</tr>
<tr>
<td>Monotype Composition</td>
<td>3</td>
</tr>
<tr>
<td>Layout and Lettering</td>
<td>3</td>
</tr>
<tr>
<td>Letterpress Press</td>
<td>3</td>
</tr>
<tr>
<td>Reproduction Photography</td>
<td>3</td>
</tr>
<tr>
<td>Offset Plates</td>
<td>3</td>
</tr>
<tr>
<td>Offset Press</td>
<td>3</td>
</tr>
<tr>
<td>Technical Electives</td>
<td>22</td>
</tr>
<tr>
<td>Science Option</td>
<td>24</td>
</tr>
<tr>
<td>Estimating</td>
<td>8</td>
</tr>
<tr>
<td>Elements of Production Management</td>
<td>3</td>
</tr>
<tr>
<td>Integrated Approaches to Problem Analysis</td>
<td>15</td>
</tr>
<tr>
<td>Economics of Production Management</td>
<td>4</td>
</tr>
<tr>
<td>Statistics of Quality Control</td>
<td>4</td>
</tr>
<tr>
<td>Printing Management Electives</td>
<td>15</td>
</tr>
</tbody>
</table>

Journalism-Printing Major -- seeks to develop a strong foundation of skills in communication techniques, printing technology, and business management practices. Students are prepared to pursue careers in reporting, editing, technical and production supervision, and publication management. Table 3 lists the graphic arts courses within this major.
### TABLE 3.

**RIT: COURSE LISTING IN THE JOURNALISM-PRINTING MAJOR**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Quarter Hours of Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imposition and Stripping</td>
<td>4</td>
</tr>
<tr>
<td>Journalism</td>
<td>6</td>
</tr>
<tr>
<td>Newspaper Production</td>
<td>6</td>
</tr>
<tr>
<td>Science Option</td>
<td>12</td>
</tr>
<tr>
<td>Technical Electives</td>
<td>16</td>
</tr>
<tr>
<td>News Photography</td>
<td>3</td>
</tr>
<tr>
<td>Editorial &amp; Feature Writing</td>
<td>4</td>
</tr>
<tr>
<td>Business and Industrial Writing</td>
<td>4</td>
</tr>
<tr>
<td>Integrated Approaches to Problem Analysis</td>
<td>15</td>
</tr>
<tr>
<td>Estimating</td>
<td>8</td>
</tr>
<tr>
<td>Radio-TV Writing</td>
<td>4</td>
</tr>
<tr>
<td>Newspaper Management</td>
<td>4</td>
</tr>
<tr>
<td>Laws of the Press</td>
<td>4</td>
</tr>
<tr>
<td>Community Journalism</td>
<td>4</td>
</tr>
<tr>
<td>Typographic Composition</td>
<td>3</td>
</tr>
<tr>
<td>Linotype-Intertype Composition</td>
<td>3</td>
</tr>
<tr>
<td>Monotype Composition</td>
<td>3</td>
</tr>
<tr>
<td>Layout and Lettering</td>
<td>3</td>
</tr>
<tr>
<td>Letterpress Press</td>
<td>3</td>
</tr>
<tr>
<td>Reproduction Photography</td>
<td>3</td>
</tr>
<tr>
<td>Offset Plates</td>
<td>3</td>
</tr>
<tr>
<td>Offset Press</td>
<td>3</td>
</tr>
</tbody>
</table>

Printing Technology Major -- is directed toward such employment possibilities as industrial planning, production, supervision, process development, work simplification, quality control, and so on. It includes study in selected areas of mathematics and applied science to prepare graduates to work with engineering personnel.
and to supervise engineering projects. Graphic arts related subject matter courses are presented in Table 4.

### TABLE 4.

**RIT: COURSE LISTING IN THE PRINTING TECHNOLOGY MAJOR**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Quarter Hours of Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typographic Composition</td>
<td>3</td>
</tr>
<tr>
<td>Linotype-Intertype Composition</td>
<td>3</td>
</tr>
<tr>
<td>Monotype Composition</td>
<td>3</td>
</tr>
<tr>
<td>Layout and Lettering</td>
<td>3</td>
</tr>
<tr>
<td>Letterpress Press</td>
<td>3</td>
</tr>
<tr>
<td>Reproduction Photography</td>
<td>3</td>
</tr>
<tr>
<td>Offset Plates</td>
<td>3</td>
</tr>
<tr>
<td>Offset Press</td>
<td>3</td>
</tr>
<tr>
<td>Imposition and Stripping</td>
<td>4</td>
</tr>
<tr>
<td>Technical Electives</td>
<td>24</td>
</tr>
<tr>
<td>Science or Mathematics Electives</td>
<td>20</td>
</tr>
<tr>
<td>Estimating</td>
<td>8</td>
</tr>
<tr>
<td>Integrated Approaches to Problem Analysis</td>
<td>15</td>
</tr>
<tr>
<td>Applications of Science in Printing</td>
<td>3</td>
</tr>
<tr>
<td>Elements of Production Management</td>
<td>3</td>
</tr>
<tr>
<td>Printing Management Elective</td>
<td>4</td>
</tr>
</tbody>
</table>

The electives, presented in Table 5, supplement the RIT programs required courses in the various areas. Each student elects courses to meet credit requirements in his selected major and to suit his individual objectives.
TABLE 5.

RIT: SUPPLEMENTARY ELECTIVES

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Quarter Hours of Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printing Management Electives:</td>
<td></td>
</tr>
<tr>
<td>Accounting</td>
<td>4</td>
</tr>
<tr>
<td>Management (Data Proc. &amp; Computer Prog)</td>
<td>4</td>
</tr>
<tr>
<td>Marketing</td>
<td>4</td>
</tr>
<tr>
<td>Finance</td>
<td>4</td>
</tr>
<tr>
<td>Business Statistics</td>
<td>4</td>
</tr>
<tr>
<td>Elements of Production Management</td>
<td>4</td>
</tr>
<tr>
<td>Advertising Management</td>
<td>4</td>
</tr>
<tr>
<td>Business Law</td>
<td>3</td>
</tr>
<tr>
<td>Estimating Workshop</td>
<td>4</td>
</tr>
<tr>
<td>Financial Controls</td>
<td>8</td>
</tr>
<tr>
<td>Economics of Production Management</td>
<td>4</td>
</tr>
<tr>
<td>Personnel Relations</td>
<td>4</td>
</tr>
<tr>
<td>Sales Management</td>
<td>4</td>
</tr>
<tr>
<td>Business and Industrial Writing</td>
<td>4</td>
</tr>
<tr>
<td>Statistics of Quality Control</td>
<td>4</td>
</tr>
<tr>
<td>Newspaper Management</td>
<td>4</td>
</tr>
<tr>
<td>Laws of the Press</td>
<td>4</td>
</tr>
<tr>
<td>Technical Electives:</td>
<td></td>
</tr>
<tr>
<td>Typographic Composition</td>
<td>7</td>
</tr>
<tr>
<td>Advanced Machine Composition</td>
<td>7</td>
</tr>
<tr>
<td>Monotype Composition</td>
<td>7</td>
</tr>
<tr>
<td>Layout and Printing Design</td>
<td>4</td>
</tr>
<tr>
<td>Copy Preparation</td>
<td>7</td>
</tr>
<tr>
<td>Cylinder Press Problems</td>
<td>7</td>
</tr>
<tr>
<td>Flexography</td>
<td>4</td>
</tr>
<tr>
<td>Gravure</td>
<td>3</td>
</tr>
<tr>
<td>Reproduction Photography</td>
<td>7</td>
</tr>
<tr>
<td>Offset Plates</td>
<td>7</td>
</tr>
<tr>
<td>Offset Press Problems</td>
<td>7</td>
</tr>
<tr>
<td>Letterpress Plates</td>
<td>7</td>
</tr>
</tbody>
</table>
TABLE 5 (continued)

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Quarter Hours of Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ink and Color</td>
<td>4</td>
</tr>
<tr>
<td>Printing Projects Workshop</td>
<td>5</td>
</tr>
<tr>
<td>Typographic Workshop</td>
<td>4</td>
</tr>
<tr>
<td>Development of Printing</td>
<td>3</td>
</tr>
<tr>
<td>Research Problems</td>
<td>4</td>
</tr>
</tbody>
</table>

Science and Mathematics Electives:

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Quarter Hours of Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Densitometry</td>
<td>3</td>
</tr>
<tr>
<td>Applications of Science in Printing</td>
<td>3</td>
</tr>
<tr>
<td>Chemistry for the Graphic Arts</td>
<td>3</td>
</tr>
</tbody>
</table>

Approved selections from courses in basic and applied sciences

The printing education program of CSPC. The second printing education program to be reported in the review is that of California State Polytechnic College, San Luis Obispo, California. The program is offered through the Printing Technology and Management Department of the College of Applied Arts. The four year program leads to a B.S Degree in Applied Arts with a major in Printing Technology and Management. The curriculum is designed to prepare students for many positions in the allied trades of the printing and graphic arts industry. The graduate has sufficient skills in all phases of printing, management, and production processes to accept a position of responsibility in production control, management, and sales and service.
Table 6 lists the curriculum component offering, excluding general education subjects, as found in the 1969 catalog. (CSPC, 1969, pp. 235-236)

TABLE 6.
CSPC: PRINTING EDUCATION COURSE OFFERINGS

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of Printing</td>
<td>2</td>
</tr>
<tr>
<td>Proofreading</td>
<td>2</td>
</tr>
<tr>
<td>Graphic Design and Display</td>
<td>3</td>
</tr>
<tr>
<td>Elementary Typography</td>
<td>4</td>
</tr>
<tr>
<td>Stereotyping</td>
<td>1</td>
</tr>
<tr>
<td>Elementary Presswork</td>
<td>3</td>
</tr>
<tr>
<td>Intermediate Presswork</td>
<td>3</td>
</tr>
<tr>
<td>Bindery Operations</td>
<td>3</td>
</tr>
<tr>
<td>Editing and Copy Desk</td>
<td>3</td>
</tr>
<tr>
<td>Manufacturing Processes</td>
<td>3</td>
</tr>
<tr>
<td>Theory of Color</td>
<td>3</td>
</tr>
<tr>
<td>Intermediate Typography</td>
<td>4</td>
</tr>
<tr>
<td>Advanced Presswork</td>
<td>3</td>
</tr>
<tr>
<td>Composing Machine Operation</td>
<td>3</td>
</tr>
<tr>
<td>Composing Machine Operation &amp; Maintenance</td>
<td>6</td>
</tr>
<tr>
<td>Automated Typesetting</td>
<td>3</td>
</tr>
<tr>
<td>News Writing</td>
<td>3</td>
</tr>
<tr>
<td>Cold Type Processes</td>
<td>6</td>
</tr>
<tr>
<td>Offset Camera Work</td>
<td>3</td>
</tr>
<tr>
<td>Offset Platemaking</td>
<td>3</td>
</tr>
<tr>
<td>Offset Presswork</td>
<td>3</td>
</tr>
<tr>
<td>Publication Makeup and Markup</td>
<td>3</td>
</tr>
<tr>
<td>Composing Machine Maintenance</td>
<td>2</td>
</tr>
<tr>
<td>Printing Management</td>
<td>3</td>
</tr>
<tr>
<td>Estimating</td>
<td>5</td>
</tr>
<tr>
<td>Production Problems</td>
<td>5</td>
</tr>
<tr>
<td>Advanced Typography</td>
<td>3</td>
</tr>
</tbody>
</table>
TABLE 6 (continued)

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant Organization and Layout</td>
<td>3</td>
</tr>
<tr>
<td>Advanced Offset</td>
<td>6</td>
</tr>
<tr>
<td>Senior Project</td>
<td>4</td>
</tr>
<tr>
<td>Undergraduate Seminar</td>
<td>2</td>
</tr>
<tr>
<td>Marketing Principles</td>
<td>4</td>
</tr>
<tr>
<td>Industrial Management</td>
<td>3</td>
</tr>
<tr>
<td>Industrial Relations</td>
<td>3</td>
</tr>
</tbody>
</table>

Graphic Arts Education

Graphic arts education includes as subject matter, all methods of reproduction and their respective allied industries. Since it is industrial arts-oriented, emphasis is placed on overviewing the total field for general education purposes, rather than on the development of a particular skill through a narrow trade-oriented program. Areas of emphasis generally are (1) planning, (2) art and copy, (3) process photography, (4) platemaking, (5) presswork, (6) bindery, and (7) related fields. (Nieminen, 1969, p. 33)

The definition given above would be thought to be too limiting by some graphic arts educators. Another viewpoint is now presented. According to Schwalm (1962), the graphic arts program can be organized and presented at six levels of education:

1. The general education level, in the junior and senior high school, as a part of the industrial arts program. The objective of this program is to develop an understanding of the word in which
they live through the design and manufacture of useful products.

2. The vocational education level, in the secondary school, as a pre-employment education in a specific graphic arts occupation. It may also be used as a retraining program to supplement or advance a person's present knowledge level by (a) the study of related technical subjects, and (b) the obtainment of advanced manipulative skills.

3. The teacher education level, at the college level of graphic arts education, should develop: (a) teacher orientation to the graphic arts industry, (b) the obtainment of industrial knowledges and skills, (c) the understanding of occupational and avocational abilities, and (d) develop teaching skills for various types of graphic arts school programs.

4. The two-year college level program in graphic arts education should lead to four possible subroutes: (a) technical training to enter a trade, (b) technical training to advance in a trade, (c) transfer training to a four-year college with a trade in sight, and (d) introduction to the graphic arts area as employed in such related fields as journalism, commercial and fine arts, and business administration.

5. The four-year liberal arts program level, leading to degrees in the areas of graphic arts management and graphic design.
6. Other types of education program levels outside of the normal college-prep schools and universities. These are such programs as: (a) cooperative plant programs, (b) in-plant training programs, (c) industrial sponsored school programs, and (d) apprenticeship programs.

As can be seen from the two preceding explanations of "graphic arts education," there are definite differences as to program levels and also as to the scope and objectives, within the levels. Some programs seem to resemble the printing education programs, but generally in less depth, while others emphasize the acquisition of skills for craft applications. A general synthesized definition of "graphic arts education" could be stated as follows: a form of exploration into the allied areas of the graphic arts industry. Its subject matter is concerned with the materials, processes, skills, and techniques employed by the industry to produce printed matter. Related subject matter may be such things as sales and service, production and manufacture, management and personnel, and the like. The curriculum organization seems to depend upon the expected outcomes and, therefore, may run the gamut from avocational and recreational to technical and vocational, to semi-professional and professional in nature. Now that a general definition has been given, the program content can be reviewed.

Program content classification. Several studies have been
pursued to categorize and classify the curriculum content for graphic arts education. Of the most noteworthy studies are those by Kemp (1969), Frantz (1969), Carlsen (1961), Storey (1958), Fecik (1970), and that of Strandberg (1966), which will now be presented.

The purpose of Strandberg's study was to ascertain the degree of unity between industrial arts teacher educators and industrial arts - graphic arts teachers in regards to selected concepts of graphic arts education. The sample groups contacted consisted of 104 graphic arts teacher educators, representing 86 colleges in 33 states, and 109 graphic arts high school teachers in nine Mid-west metropolitan centers. (1966, p. 53) Comparison between the two groups involved the priority ranking of basic graphic arts concepts. Activities and learning levels of experience were also sought.

The result of the research established a high degree of unity between both groups regarding basic concepts. Each group ranked the concepts that were descriptive of design as being the most important. The concepts descriptive of semi-manufactured materials and bookbinding were ranked as least important. An exception should be noted in the ranking of the concept of "history" and "technological developments." In both cases, the teacher educators ranked these concepts as having great importance
for graphic arts education, while the graphic arts teachers ranked them significantly lower. This seems to indicate a discrepancy between the teacher education program and the secondary school program objectives.

The rank value assigned to each of the twelve concepts, and a brief description is reported below.

* The first number in parentheses indicates the rank assigned by the teacher educator, and the second number shows the rank given by the high school teacher. The rank of one (1) designates major importance and the rank of twelve (12) designates least importance.

The Concept of History — Included in this area are the development of man, speech, and the phonetic alphabet, and the development of modern day methods of producing, storing, and using information. (2, 7*)

The Concept of Technological Developments — This includes scientific development and achievements in communication which relate to the advancement of the culture and its effect upon society. (3, 8*)

The Concept of Design — This concerns the interrelationships among the principles, properties, and elements of design with application to graphics, printing, etc. (1, 1*).

The Concept of Layout — This is the organization of design
elements into a graphic form of communication on a two-dimensional surface. (4, 3*)

The Concept of Copy Preparation -- The assembly of symbols and pictures into meaningful thoughts. (7, 10*)

The Concept of Photographic Techniques -- This involves the recording of latent images onto light-sensitive materials which then produce permanent records for future reference. (9, 9*)

The Concept of Stripping and Preparing Flats -- This concerns the assembly of film negatives to form composites for platemaking. (10, 6*)

The Concept of Platemaking -- Involving the preparation of the media that will produce multiple copies of the desired image, regardless of the reproduction process. (8, 5*)

The Concept of Ink Transfer -- This includes the distribution and transfer of ink substances from printing plates to the material. (5, 2*)

The Concept of Binding and Finishing -- This is the application of numerous assembly techniques to complete the product. (12, 11*)

The Concept of Raw and Semi-manufactured Materials -- This represents an understanding of the kinds and sources of materials used in the graphic arts industry. (11, 12*)

The Concept of the Business of Printing -- This concerns the
role and the function of the graphic arts industry in relation to social order, and also the environment of the business enterprise. (6, 4*) (pp. 54-55)

Sample program descriptions. Even though graphic arts education programs are thought to be similar in nature, their differences vary to a degree that makes it nearly impossible to establish a single typical subject matter content description. Therefore, two programs will now be briefly presented to show the range of difference. The programs selected were from the Department of Industrial Technology at Stout State University, Menomonie, Wisconsin, and the Department of Industrial Arts and Technology at Fresno State College, Fresno, California.

The graphic arts program at Stout State University. The graphic arts program of the Department of Industrial Technology at Stout State University is a four-year program that is organized on a dual track system. One track leads to a B.S. Degree in industrial technology, and the other track leads to a B.S. Degree in industrial arts teacher education. Students majoring in either track have a core of required courses to complete in industrial technology in addition to the general education requirements. The students may also elect a concentration in a particular technical area, such as graphic arts.

The graphic arts education program is organized around a
grouping or cluster of concepts which are divided into the seven major areas of (1) design and layout, (2) composition, (3) photocomversion, (4) image carriers, (5) image transfer, (6) finishing, and (7) economics, according to Thomas (1969).

Table 7 provides a listing of both the graphic arts and core courses composing the graphic arts program of Stout State University (SSU, 1968-70, pp. 50-53, 68-69).
TABLE 7.

SSU: LISTING OF COURSE OFFERINGS FOR THE GRAPHIC ARTS MAJOR

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Course Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graphic Arts Teacher Education:</td>
<td></td>
</tr>
<tr>
<td>Drafting</td>
<td>2</td>
</tr>
<tr>
<td>Metals</td>
<td>2</td>
</tr>
<tr>
<td>Woodworking</td>
<td>2</td>
</tr>
<tr>
<td>Power Mechanics</td>
<td>2</td>
</tr>
<tr>
<td>Plastics</td>
<td>2</td>
</tr>
<tr>
<td>Electricity</td>
<td>2</td>
</tr>
<tr>
<td>Industrial Organization</td>
<td>2</td>
</tr>
<tr>
<td>Technical Electives</td>
<td>31</td>
</tr>
</tbody>
</table>

| Graphic Arts Technologist:                |              |
| Industrial Organization                   | 2            |
| Drafting                                  | 2            |
| Metals                                    | 2            |
| Woodworking                               | 2            |
| Power Mechanics                           | 2            |
| Plastics                                  | 2            |
| Electricity                               | 2            |
| Technical Electives                       | 33           |

| Graphic Arts Electives:                  |              |
| Introduction to Graphic Arts             | 2            |
| Copy Preparation                         | 2            |
| Image Transfer                           | 2            |
| Cold Type                                | 2            |
| Hot Type                                 | 2            |
| Image Carriers                           | 2            |
| Printing Design                          | 2            |
| General Binding                          | 2            |
| Offset Lithography                       | 4            |
| Printing Economics                       | 2            |
| Color Separation                         | 2            |
| Relief and Screen Processes              | 2            |
| Independent Studies & Field Experience   | 4            |
The graphic arts program at Fresno State College. The graphic arts program of the Department of Industrial Arts and Technology of Fresno State College is a four-year program that is organized on a dual track which is similar to that of Stout State University. In this case, one track leads to a B.A. degree in industrial teacher education and the other leads to a B.S. degree in industrial technology. Table 8 provides a listing of both the graphic arts and core courses composing the program. (FSC, 1970, pp. 309-317)
TABLE 8.
FSC: LISTING OF COURSE OFFERINGS FOR THE GRAPHIC ARTS MAJOR

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Graphic Arts Teacher Education:</strong></td>
<td></td>
</tr>
<tr>
<td>Basic Automotive Systems</td>
<td>3</td>
</tr>
<tr>
<td>Applied Drawing</td>
<td>3</td>
</tr>
<tr>
<td>Basic Electricity</td>
<td>3</td>
</tr>
<tr>
<td>Basic Metalworking</td>
<td>3</td>
</tr>
<tr>
<td>Basic Woodworking</td>
<td>3</td>
</tr>
<tr>
<td>Basic Graphic Arts</td>
<td>3</td>
</tr>
<tr>
<td>Technical Electives</td>
<td>22</td>
</tr>
<tr>
<td><strong>Graphic Arts Technologist:</strong></td>
<td></td>
</tr>
<tr>
<td>Applied Drawing</td>
<td>3</td>
</tr>
<tr>
<td>Basic Electricity</td>
<td>3</td>
</tr>
<tr>
<td>Basic Machine Tool Metalworking</td>
<td>3</td>
</tr>
<tr>
<td>Energy Conversion &amp; Utilization</td>
<td>3</td>
</tr>
<tr>
<td>Industrial Processes &amp; Materials</td>
<td>3</td>
</tr>
<tr>
<td>General Building Construction</td>
<td>3</td>
</tr>
<tr>
<td>Technical Illustration</td>
<td>3</td>
</tr>
<tr>
<td>Materials of Production Design</td>
<td>3</td>
</tr>
<tr>
<td>Graphic Reproduction Techniques</td>
<td>3</td>
</tr>
<tr>
<td>Senior Problem in Industrial Technology</td>
<td>3</td>
</tr>
<tr>
<td><strong>Graphic Arts Electives:</strong></td>
<td></td>
</tr>
<tr>
<td>Basic Graphic Arts</td>
<td>3</td>
</tr>
<tr>
<td>Rendering</td>
<td>3</td>
</tr>
<tr>
<td>Advanced Photo-Offset Lithography</td>
<td>3</td>
</tr>
<tr>
<td>Advanced Letterpress &amp; Gravure Printing</td>
<td>3</td>
</tr>
<tr>
<td>Typographic Layout</td>
<td>2</td>
</tr>
<tr>
<td>Printing Economics</td>
<td>2</td>
</tr>
<tr>
<td>Graphic Arts Crafts</td>
<td>2</td>
</tr>
<tr>
<td>Bookbinding</td>
<td>2</td>
</tr>
<tr>
<td>Electives from selected courses in Journalism and Art</td>
<td>11</td>
</tr>
</tbody>
</table>
According to Nieminen (1969), graphic communications is an area that is generally considered to be an expanded graphic arts program. It includes not only printing and graphic arts, but also photography, commercial art, advertising, movie and TV production, packaging, and publication. In addition to the areas already listed, graphic communications also incorporates facets of such areas as science, economics, arts and other related technologies of the graphic field. (p. 33)

A second definition may be found in the Education Council of the Graphic Arts Industry's publication titled "Careers in Graphic Communication." (1969). It is as follows:

Graphic communications is the concept of transferring information whether it be a picture, word or number, in single or multiple copies onto paper, cloth, metal, plastic, glass or other materials.

Graphic communications is primarily concerned with sight, although sound, touch and smell are playing an increasingly important role.

So now, we can say that graphic communications are messages received by the eye...about ideas, knowledge and information...in the form of writing, drawing, photography...reproduced on many types of materials...singly or in unlimited numbers...immediately and/or on any later occasion. (p. 3)

In addition to printing and publishing, the industrial confederation called graphic communications also includes segments -- sometimes large segments -- of the following:
The paper and paper products industry.
The packaging industry.
The coatings industry.
The printing machinery manufacturing industry.
The graphic arts supply industry.
The production aspects of the journalism, public relations and advertising industries.
The bindery industry.
The newspaper industry.
The magazine publishing industry.
The book publishing industry.
The electronics industry.
The distribution industry.
The chemical industry.
The photographic industry. (p. 4)

A third definition for graphic communication is proposed by the Addressograph Multigraph Corporation (1967) when they state:

It is very difficult to give a real simple definition of graphic communications. One definition...is that graphic communications includes all methods of recording information in a visible graphic form that can be non-destructively retrieved at any time by an observer using light and his vision. (p. 2)

Graphic communication specialists prepare all printed, duplicated and copied material used to guide and control activities in industry, government and our society in general. In addition to this paperwork, graphic communications include newspapers, labels on cans, bottles, packages, billboards, greeting cards, record albums, posters, booklets, advertising, literature, magazines, comic books, the printing on cereal boxes, catalogs and just about anything we look at or read and get an understanding from. It can include producing several million copies of a magazine, or it could include just one copy of a business form from an office copier. So you see, the definition is very broad and the industry covers a large area. (p. 3)
Flack (1968) refers to the components of the graphic communication program when he states:

The program attempts to interpret and relate those technologies that contribute to the overall process of graphic communication. Hence,...the common goal of understanding both graphic communication processes and the contribution of those processes to society. (p. 3)

A final implication can be drawn from Bentley's (1970) address to the 1970 CATF General Education Meeting, wherein he states that the:

...curriculum must reflect in its course offerings the inter-relatedness found in the dynamic new directions of the graphic communications industry. New subject areas must be introduced into the program of studies. Too often courses have centered around the reproduction processes without showing the interrelatedness to communication design presentation and business management. A curriculum which puts the fractured subjects back together in an inter-related systems approach seems to be imperative. (p. 45)

A synthesized and simplified definition of graphic communication has been generated from the review given above, and that of other similar sources. For the purpose of this study, "graphic communications" has been defined as a purposefully composed message of encoded graphic symbols and images which are received through the stimulation of human optical sensors and decoded and interpreted through the process of cognition. (This definition has been expanded, and adapted to the graphic communication technology
process, industry, and educational program in Chapter III.)

The review of the literature revealed that the majority of the programs entitled "graphic communications" were nothing more than the traditional programs of "printing" or "graphic arts," with a different title probably created to add status. However, three programs or program proposals were located which seem to correlate to greater or lesser degrees with the definition stated above: (1) the AVA's 1968 revision of "A Guide to Improving Instruction in Industrial Arts," written by Kagy, Brown, Jackson, Kemp, Prust, and Thomas; (2) the 1970 course series titled "Communicating with Graphics," written by Strandberg, Olson, Bentley, and Wiper, for the A. B Dick Company, and (3) the graphic communication program area of the Department of Industrial Arts and Technology program of Kent State University, Kent, Ohio (a sub-program of a larger interdisciplinary visual communication program).

The AVA program. The reason for the selection of the report "A Guide to Improving Instruction in Industrial Arts," is that it entails, as an example for the reader, an in-depth coverage of the graphic arts, graphic communications and visual communication confederation as seen by the writers listed above. In an article discussing the AVA publication, Kagy (1970) states that:
Within the framework of this rapidly changing technology, we must put together a curriculum which will educate the future consumers and producers of graphic-communication products and at the same time prepare them to adapt to still further and probably more drastic changes in the way man will store, retrieve, and use the knowledge of his society.

I believe all persons will be consumers of graphic-communication products and can profit by an understanding of how this material is manufactured. (p. 14)

On inspection of the guide and other related literature pertinent to its content, a terminological problem seems to have been bypassed or disregarded by the writers. The terms graphic arts, graphic communications, and visual communication are interchanged and on occasion seem to be substituted for each other or intermixed. Even though this condition exists, the guide is noteworthy of review. The subject matter components of graphic communications have been organized into seven major categories or units of study. A brief review of these units will now be given in outline form to conserve the length of their presentation. Each unit will be represented by its respective title, objective, and major concepts. It should be noted that the numeration of the units was made for this presentation and is not found in the original writing.

Unit 1. Industry and Civilization

Objective: UNDERSTANDINGS (the student should) understand that the rise of man above other forms of life can, in a major sense, be attributed to the
invention and employment of devices which permitted graphic communication and which preserved facts for later references, refinements, and progress. These achievements should also be understood in relation to the advancement of culture and its effect upon society. (Kagy, 1970, p. 15)

Concepts:

1. The historical views of man and industrial technology
2. The evolution of modern industrial technology
3. The history of materials
4. The technical heritage
5. General education aspects

Unit 2. The Graphic-Arts Industry

Objective: UNDERSTANDING (the student should) understand the role and function of the graphic-arts industry as part of visual communications in the context of the social order. (Kagy, 1970, p. 16)

Concepts:

1. The relative importance of the graphic-arts industry
2. The opportunities in the graphic-arts industry
3. The allied industries of the graphic-arts industry

Unit 3. Organization of Graphic-Arts Industry

Objective: UNDERSTANDINGS (the student should) understand and be aware of the internal and external environment of the business enterprise. (Kagy, 1970, p. 17)
Concepts:
1. Enterprise
2. Administration
3. Management
4. Labor
5. Associations
6. Production Departments
7. Plant Organizations

Unit 4. Research and Development in the Graphic Arts

Objective: UNDERSTANDING (the student should) understand that research and technological development hold the key to advancement and success. Organized research and development is responsible for generation and refinement of ideas dealing with materials, products, processes, and the marketing of the end product of the graphic-arts industry. (Kagy, 1970, p. 18)

Concepts:
1. Original concept (or idea development)
2. Market evaluation
3. Product research and development
4. Materials research and development
5. Market research

Unit 5. Planning for the Production of Graphic-Communication Materials

Objective: UNDERSTANDINGS (the student should) understand idea visualization and the arrangement of symbols, design, and pictures into effective communication devices. (Kagy, 1970, p. 19)
Concepts:

1. Idea visualization
2. Design and preparation of visual information
3. Plant layout
4. Plant organization
5. Estimating and cost accounting
6. Procurement and inventory
7. Automation and numerical control
8. Quality and production control - Procedure and scheduling
9. Production flow

Unit 6. The Production of Graphic-Communication Materials

Objective: UNDERSTANDINGS (the student should) understand the production of mass media, and other visual materials by having experiences with the materials, products, and processes of the graphic-arts industry. (Kagy, 1970, p. 20)

Concepts:

1. Custom (limited production of custom pieces)
2. Continuous or mass (production)
3. Materials
4. Sources of materials

Unit 7. Distribution of Visual-Communication Materials

Objective: UNDERSTANDINGS (the student should) understand the distribution system of the products of the graphic-arts industry and the role this industry plays for all other industries in the advertising, packaging, and marketing of their
products. (Kagy, 1970, p. 21)

Concepts:
1. Advertising promotion
2. Packaging and shipping (materials handling)
3. Marketing
4. Properties of materials
5. Nature of materials
6. Production of materials
7. Use of materials
8. Processes
9. Character generation
10. Photographic technique
11. Negative assembly
12. Image-carrier making
13. Ink transfer
14. Finishing and binding

In conclusion to his discussion of this proposed program, Kagy expresses his hopes that it be used as a guide in the development of other similar programs. As an example of implementation, he points out that it is the basis for the graphic arts area of the industrial technology program at Illinois State University.

The A. B. Dick program. The second source of information concerning graphic communication programs was found in the form
of an available and purchaseable packaged instructional system. It will be only briefly mentioned, and the reader is referred to the publisher for further information. This program titled "Communicating with Graphics," was developed by Strandberg, et al., for the A. B. Dick Company, and became commercially available in 1970. The program was designed for the secondary school level of industrial arts education and is based on a systems approach to learning. The system consists of a complete package of materials including written objectives, programmed texts, testing and visual aids. Eight areas of subject matter concentration have been organized and structured. The teaching-learning activities and experiences focus around and utilize the areas of: (1) Communicating with graphics, (2) Artwork, (3) Image assembly, (4) Photo-conversion, (5) Image carrier preparation, (6) Image transfer, (7) Finishing procedures, and (8) Decision making. The basic format for each of the "Graphic Communication Series" units consists of: (1) pre-test, (2) overview of the unit by use of a formal teacher lecture, (3) introduction of prepared visual materials, (4) class discussion, (5) use of graphic communication sub-unit texts, (6) implementation and visual supplementation, (7) post-test, and (8) laboratory exercises and project.

The Kent State University program. The third source of information concerning graphic communication programs was found
in the graphic communication area of the program of the Department of Industrial Arts and Technology at Kent State University, Kent, Ohio. This program has been integrated into a larger program of visual communications, which uses a multidisciplinary approach. Supplementary disciplines are those of art, architecture, journalism, audio-visual education, and television. The curriculum is designed to provide a basis in professional education for the graphic communication occupations. The curriculum is structured around three "current trends:" (1) "the increasing use of photo-sensitive/radiation-sensitive materials and their application in typographic and illustrative techniques," (2) "the facility and curriculum for solving graphic problems in full spectrum color, as indicated by facilities for single and multiple image formation and faithful image reproduction," and (3) "a general approach to extending the student's capacity for problem solving by supporting courses in the developing technical area on a broader curriculum base than can be ordinarily accomplished."

(Bentley, 1969, p. 18)

The proposed professional program of the graphic communication curriculum is represented under the headings of (1) graphic design, (2) graphic arts, and (3) photography. The interrelatedness of these occupational areas is reflected in the three examples given in Figure 8.
### Interrelated and Combined Physical Facilities for a Graphic Communications Center

<table>
<thead>
<tr>
<th>Instructional Facilities</th>
<th>Graphic Design</th>
<th>Graphic Arts</th>
<th>Photography</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual Designer</td>
<td>Graphic Arts</td>
<td>Photo-Illustrator</td>
<td></td>
</tr>
<tr>
<td>Creative Director</td>
<td>Technical</td>
<td>Publication Photographer</td>
<td></td>
</tr>
<tr>
<td>Advertising Illustrator</td>
<td>Graphic Arts</td>
<td>Technical Photographer</td>
<td></td>
</tr>
<tr>
<td>Graphic Arts Designer</td>
<td>Teacher</td>
<td>Photo-Kinetics Specialist</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interrelated Facility</th>
<th>Common Laboratory for Basic Courses Including Research and Advanced Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needs and Degrees</td>
<td>Architecture</td>
</tr>
<tr>
<td></td>
<td>Industrial Arts</td>
</tr>
</tbody>
</table>

**FIGURE 8.**

KSU: GRAPHIC COMMUNICATIONS - MULTI-DISCIPLINARY ORGANIZATION (Bentley, 1969, p. 18)

Common to all three areas of study are courses in chemistry, computer programming, design, and a special multi-teacher seminar bringing together specialists in all pertinent fields. A further description of two of the possible program majors is given below.
Graphic Arts Technical Major -

The shortest description would be "printing plant supervisor" but this is deceptive in its simplicity. This man must know what the designer (artist) intended and must know his equipment (and processes) to accomplish it. He can advise on copy preparation and on alternate procedures while diagnosing erratic functioning equipment for needed modification or repair. (Bentley, 1969, p. 28)

Curriculum components are: (including quarter credit hours)

- fine arts - 9, English - 9, chemistry - 15, history - 9, art - 13,
- graphics - 16, industrial arts - 25, photography - 8, team-teaching seminar - 11, journalism - 10, mathematics - 10,
- philosophy - 11, physics - 10, psychology - 8, sociology - 5,
- speech - 8, and electives - 12.

Graphic Arts Teacher Major -

Designed to meet certification requirements in industrial arts while providing a broader base for developing understanding of the interrelatedness of visual communications. (Bentley, 1969, p. 28)

Curriculum components are: (including quarter credit hours)

- chemistry - 10, education - 28, English - 9, history - 9,
- graphics - 16, industrial arts - 34, art - 11, photography - 8,
- team-teaching seminar - 9, journalism - 12, mathematics - 10,
- philosophy - 5, physics - 5, psychology - 8, speech - 6, and electives - 11.
Visual Communication Education

Before beginning a discussion of this curriculum area, it must be noted that the literature shows inconsistency in its categorization and placement of this area under any one particular disciplinary domain. The majority of the literature reviewed by the writer described visual communication as an interdisciplinary program. Therefore, it will be interpreted in this light, rather than strictly as a subprogram of industrial arts education.

Several closely related definitions for visual communication have been proposed. First, according to Nieminen (1969, p. 33), visual communication begins with the concepts of graphic communication and interrelates them with information regarding the type of audience, methods of dissemination, the design and production of communications, and the use of visual materials. This approach to communication analyzes the methods of originating, reproducing, and handling information.

Second, in answer to the question "What is visual communication technology?" Flack (1969) states:

Generally, visual communications is the act of transferring understanding through the sense of sight. Visual communication technology then is a combination of art and science which produces multiple visual images. Visual communication technology is the chief means by which all men communicate information. It is essential to man's life in society.
The diverse circumstances in which visual communications technology exists suggests that educational experiences be designed to cover the common elements—those bases which are important to any visual communication technology. New educational facilities should, therefore, group all visual communication processes which have common, underlying skills and understandings (p. 4)

As a third example, Schwalm (1965) advances the following five part definition:

1. Visual communication is the process of understanding and being understood through the sensory organs.
2. Graphic arts is the recording of ideas by a means of lines, marks, symbols, characters and light images on a transport.
3. The visual communication industry would be composed of various segments of our industrial world that are directly involved in the production of tools for visual communication materials.
4. Technology is the systematic knowledge of industry.
5. Visual communication technology would be the study and understanding of various industries that would be directly involved with the production and reproduction of graphic materials. It would also include the related graphic arts manufacturing and supply industries. This then would imply a systematic study of the knowledge of these industries, their problems, (human and mechanical) and their dependence upon scientific and socioeconomic knowledge and its application (p. 43)

He further suggests the following classifications might serve to identify subject matter for visual communications: (1) graphic design and symbology, which includes the interpretation of ideas, concepts, sounds, and objects in visual form and the arrange-
ment of these symbols into effective visual communication entities,
(2) the presentation and dissemination of visual communication
material organized within one of the following groups: (a) dis-
plays, posters, slides, projection materials, exhibits, and others,
and (b) the so-called mass media of books, magazines, news-
papers, movies, and television, (3) the reproduction of visual
communication materials by conventional printing, copying, or
duplicating, and (4) the management of visual communication
materials by what he terms the "RRR" system - namely, record-
ing, retrieval, and reproduction of visual material. (p. 43)

In an article titled "A Suggested Articulated Program of
Visual Communication Education from Grade School Through
Technical Institutes," the International Graphic Arts Education
Association (1965) suggests that the overall visual communication
program should include several levels. The monumental diversi-
fication of this proposal and its various end products makes it
noteworthy of mention. Some of the suggested programs are as
follows: (pp. 44-45)

Visual communications for the elementary school -- should
be taught at approximately the third grade level and should be
for all students. Emphasis should be placed upon an experimental
program in reading and writing, utilizing simple printing and type-
setting techniques.
Visual communications for the junior high school -- should be a part of the industrial arts curriculum offering and be required for all industrial arts students and those electing the course. The course material should integrate materials and subject matter from art, English, social studies, science, mathematics, and journalism.

Visual communications for the senior high school - should be a one-year course that extends and intensifies the junior high program.

Visual communication for the college-oriented student -- should be a one-year course at either the 11th or 12th grade level which emphasizes the development of basic skills in the techniques of producing visual communication materials, and be heavily oriented toward the science and technology of industry.

Visual communication for the potential dropout -- should be a one-year course that emphasizes the development of a low level of skill for immediate employment in some facet of the visual communication industry.

Visual communication for the vocational-technical program -- should be a two to four year program that will prepare the student for employment in the visual communication industry as an advanced learner or apprentice.
Visual communication for the cooperative program -- should be a program for 16 year old or older youth and place him on a half-time school and half-time work basis. The area of study should relate to the occupation in which he is working.

Visual communication for the college program -- should relate to the college program of graphic arts administration, graphic design, journalism, commercial design, or teacher education.

The preceding article provided helpful direction to the writer in the investigation of visual communication programs. Surprisingly, the review of the literature illustrated that several of the programs proposed above are actually in existence. Examples will now be cited to more fully describe two of the major program areas of the visual communication field. One source of information was derived from the visual communication programs of the "behavioral sciences" and the "manipulative arts." A second source of information was provided by the Visual Communication Education Program (VICOED) at Western Washington State College, Bellingham, Washington.

Communication study in the manipulative arts. Of the interdisciplinary, interrelated, and incorporated visual communication programs found to exist in the behavioral sciences and
the manipulative arts, those of the "art school" disciplines proved to be most informative. This grouping consisted of areas with such titles as art, design, advertising art, graphic design, and even graphic or visual communication. The area of educational media (audio-visual) was excluded from the investigation because of its major emphasis on the use and manipulation of audio-visual aids and equipment. In addition to a review of the general literature, descriptive brochures, and catalogs of course offerings, a questionnaire was developed and administered to obtain descriptive information about program classification and curriculum, subject matter, student end product, and so forth.

The questionnaire was developed under the direction and guidance of Professor Charles Wallschlaeger, Chairman of the Division of Design at The Ohio State University. A selection of fifty institutions appropriate to the area of investigation was made with a major concern for their program reputation and established standard of excellence. Twenty-four of these institutions (colleges, universities, and technical institutes) responded and of these, six reported their program titles as that of visual communication exclusively. The titles of the other respondents grouped into the categories of graphic design, or art and design (including advertising art). Appendix A
provides a listing of the respondents, a copy of the questionnaire, and the tabulation of the responses.

Through the use of the technique of frequency ranking, and by commonality of agreement, general information was established about these visual communication programs. This provided some useful background data for the writer. Due to sample size and the limitations of the instrument, this information is in no way meant to be universally generalized. Instead, it provides information about these specific programs, which can be seen to be similar to several of the other sources reported in the review. The following statements can be made about the sample programs of visual communication:

1. An emphasis seems to be placed upon orienting the student to the graphic communication industry through the subject matter areas of materials, processes, production and managerial functions.

2. An emphasis seems to be placed on the student gaining an understanding of the communication process in general, and in particular the social, cultural, political and economic relationships of visual communications.

3. As in the industrial arts education subprogram of graphic communication, a terminological problem exists as to
the programs classification, i.e., the respondents considered their program to be a part of design, art, graphics, etc., all at the same time.

4. The behavioral sciences and the communication media areas seemed to be emphasized as that of the programs allied fields of information.

5. The student end product seemed to be entirely dependent upon the aims and goals of each individual program with little if any real unanimity between programs.

**Communication study in VICOED.** The VICOED program, Visual Communication Education, under the project title of "To Develop and Implement a New Program in Visual Communication Education," was initiated in 1965 by the Department of Technology, at Western Washington State College in cooperation with Seattle Community College, and Milwaukee Institute of Technology. The project staff was directed by Ray A. Schwalm and consisted of interdisciplinary members. Major funding for the pilot programs (1965-1968) was made available through the Ford Foundation, with several companies donating equipment, supplies, services, etc.

The project established its theoretical base for the program development by first defining the visual communication industry.
The visual communication industry was defined as:

This vast industry, combining all aspects of the production of visual communication materials, is not only concerned with printing and publishing, per se, but also includes all phases of photography, communication design (commercial art), advertising, motion picture and television graphics and production, packaging, industrial graphics, visual aid materials production, cartography, storage, and retrieval of graphic and document information, and other related fields of visual communication materials production, techniques, and processes. (VICOED, 1970)

With this as the guiding definition for the industrial federation to be served, the inputs, outputs, and boundaries of the visual communication education program were proposed as:

Visual communication education starts with how ideas and concepts are communicated with the visual media; identify necessary decisions relative to the type of audience; method of dissemination; procedures of visualizing and designing effective communication materials; considerations necessary for the production of the visual materials; dissemination at various levels, speeds, and distances; decisions relative to feedback; and concepts concerning information handling, abstracting, imaging, coding, indexing, storage, retrieval, hard printouts and reproduction of retrieved information. (VICOED, 1970)

Six major concepts were established as being representative of the knowledge contained within visual communication technology. These concepts were then used to guide and structure the curriculum development. The six "key concepts" were divided and subdivided to provide a system of subconcepts and
components, but a true taxonomy structure, per se, was not formed. The concepts of the VICOED program are:

**First concept.** The process of understanding and being understood through the sense organs of sight is the key to efficient and artistic communication and serves as an instrument of cultural penetration and assimilation. (VICOED, 1970)

This major concept is termed "Communicating With Visual Materials," and is divided into four subconcept areas dealing with: (1) the communication process in general, (2) the historical evolution of visual communications, (3) the role contemporary visual communication technology, and (4) research and evaluation within visual communications.

**Second concept.** Symbols are the means by which ideas are translated into visual images, and the arrangement of these symbols and the design elements are important in creating an effective visual communication entity. (VICOED, 1970)

This major concept title is termed "Information Design," and is organized around eight subconcepts. The subconcepts are concerned with: (1) symbology, (2) translating ideas and concepts into visual images, (3) investigating communication design concepts, (4) manipulating communication design concepts, (5) applying communication design concepts, (6) the effects of technology on communication, (7) creative planning, and (8) research and evaluation within information design.
Third concept. The criteria used in selecting a reproduction system and the basic steps common to all reproduction systems are important for efficient reproduction and dissemination of visual information to meet the ever increasing demands upon the industry. (VICOED, 1970)

"Information Presentation and Display Systems," is the major concept title of this category of knowledge. The five subconcept areas are as follow: (1) presentation and display media, (2) methods and techniques for presentation and display, (3) evaluation of systems, (4) research, and (5) new developments.

Fourth concept. The medium or media selection, the methods and procedures for preparing the information materials, and the techniques for presenting or displaying the information to small or large audiences are important in encouraging extensive literacy. (VICOED, 1970)

The major concept title of "Information Reproduction Systems," is given to this area. Subconcepts emphasize (1) the criteria for selecting a reproduction system, (2) the basic steps common to all reproduction systems, and (3) new developments.

Fifth concept. The computerization of document and graphic information by abstracting, imaging, index coding, and storing for rapid retrieval, viewing, manipulation, and reproduction is essential for the systematic subdivision and analysis of knowledge. (VICOED, 1970)
This major concept title is termed "Information Storage and Retrieval Systems." Subconcepts deal with the system components of (1) abstracting, (2) preparing materials for imaging, (3) recording, (4) mounting, (5) index coding, (6) storage and filing, (7) duplicating, (8) retrieving, (9) viewing, (10) hard printing, and (11) rapid reproduction.

Sixth concept. An understanding of the industry and an awareness of the internal and external environment of the business enterprise are essential for interpreting the role and function of the visual communication industry within the context of the social order. (VICOED, 1970)

"The Communication Industry," is the title of this major concept. This area is composed of a conglomerate of industry-related subjects. Subconcepts deal with such areas as: (1) structure of the industry, (2) industrial growth and change, (3) forms of business organization, (4) internal organization, (5) products, (6) research and development, (7) industry-related associations, (8) industry's social responsibilities, (9) demands of the technology upon human skills and creativity, (10) human and mechanical problems, and (11) career opportunities.

To guide the selection of subject matter, the development of teaching-learning materials, etc., a set of twelve objectives were developed. The VICOED objectives are as follows: (VICOED, 1970)
1. To develop an awareness of visual communication and the need for effective visual communication.

2. To understand the various visual communication media.

3. To understand the social, economic and political importance of visual communication.

4. To develop an awareness of the realm of the visual communication industry, including both commercial and in-plant operations.

5. To develop an understanding of the concepts of visual communication and to apply these concepts to the best of his or her ability in the production and dissemination of effective visual communication materials.

6. To prepare for entry into the visual communication industry.

7. To keep informed of current research and development in the industry.

8. To understand, develop, and use systems for the storage and retrieval of visual information.

9. To develop perceptual awareness and aesthetic judgment.

10. To develop an awareness of the responsibility of the originator, producer, and disseminator of visual communication in influencing human behavior.

11. To develop an understanding of the language employed in the various visual communication media.

12. To understand the interrelationship of visual communication, the arts, the humanities, the sciences, and technology.
The model presented in Figure 9 shows the organization of the curriculum components within the visual communication educational program. It illustrates the systems approach to the production of visual communication materials.

Upon completion of the developmental stage, the program was implemented into pilot or test programs. Later K.G. Schied and Associates were employed for a program evaluation. Three pilot programs were implemented: a four-year program at Western Washington State College; two-year programs at Seattle Community College and the Milwaukee Institute of Technology; and two-year programs at ten high schools, with approximately 9,500 students and 80 teachers participating directly and/or indirectly. (VICOED, 1970)

Each of the three pilot programs included study in the areas of twelve separate disciplines: art, anthropology, economics, business, mathematics, chemistry, journalism, English, speech, sociology, physics, psychology, and industrial arts (graphic arts, industrial graphics, photography, and electronics). Computer graphics was added at a later date.

The first of the three programs was designed for the 11th and 12th grade level of the high school program. It served the dual function of a terminal and/or college preparatory program. Emphasis was placed upon the acquisition of
FIGURE 9

ORGANIZATION OF THE VICOED PROGRAM FOR THE PRODUCTION OF VISUAL COMMUNICATION MATERIALS (VICOED, 1970)
the basic skills and knowledges as employed in the communication industry. A heavy orientation to the science and technology of the industry was used to prepare the student with skills for a low entry level into the industry.

The second program was a two-year college program for students that would either enter the industry after two years of training, or continue on to complete a bachelor's degree. This program stressed the broad approach to communications including subject matter related areas of the natural sciences, economics, photography, and graphic arts. It emphasized the acquisition of knowledges and skills in planning and the preparation and production of graphic information materials. The two-year student was prepared as a technician or for low level management, for such fields as advertising production, graphic design, commercial and industrial photography, cinema and television graphics, and printing and publishing.

The third program was a four-year teacher education program. Initially it consisted of a major of 80 quarter credit hours in visual communication education, and later was increased to 110 credit hours. Its purpose was to provide prospective secondary school teachers with a broad background in the economics, social, political, and cultural forces which
shape the environment of visual communication. A strong practicing knowledge of the science and technology of the visual communication industry was also to be acquired by the student.

Information and data by which to assess the accomplishments of the entire project have not been made publicly available. Therefore, the only conclusion that may be drawn is that the VICOED program seems to be a new and interesting approach to the study of selective aspects of communication on an interdisciplinary basis. However, in the writer's opinion it also seems to be a program that is heavily oriented toward technical training (skill procurement and/or professional preparation). This indicates a trade and industry approach rather than the general education emphasis of the industrial arts program.

This concludes the selective discussion of some of the most pertinent literature that was reviewed. The final section of this chapter presents a synthesis of the reported information and also draws implications from that information for this study.

**Summary and Implications for Industrial Arts Education and Its Subprogram of Graphic Communication Education**

Two major reviews of the literature have been accomplished
within this chapter. The first review has provided an overview of contemporary industrial arts education programs; and the second has both illustrated the scope and nature of, and clarified the role of graphic communication programs in relationship to the larger field of industrial arts.

Through this review of the industrial arts and graphic communication programs, it has been possible to derive information concerning the areas of: (1) the definition of program philosophical and practical aims and goals, (2) the program terminal objectives, and (3) the commonly accepted program subject matter components.

Program Definition

As the first major result of the review of the literature, the total industrial arts program and its subprogram of graphic communication has been defined.

The philosophical aims and goals for industrial arts education may be given the necessary practical application through their incorporation into a statement of the program purpose. For the purpose of this study, industrial arts education is defined and interpreted as: an organized study of the body of knowledge contained within those industrial practices which
affect humans and materials. This body of knowledge, termed industrial technology, is derived from that subcategory of the economic institution which is known as industry. In order to instructionalize the body of industrial knowledge in an efficient and effective manner, it has been conceptualized, codified, and structured.

Industrial arts education is a form of general education which aids in preparing the individual for purposeful and productive participation in society. It is liberating in nature, in that it orients the individual to the technology of the industrialized society which forms his environment. Also, it provides the means by which the relationships between the "world of work," industry, and society can be realized. Therefore, industrial arts education may be said to be an essential part of an individual's total education and should be within his repertoire of knowledge.

The acceptance of this definition and interpretation for the larger field of industrial arts education necessitates the development of a similar definition for the graphic communication education subprogram.

The review of the literature has indicated that the ambiguously titled, poorly defined, and inadequately specified or structured subject matter areas of: printing arts and printing
education, graphic arts, and graphic communication are attempts to represent this major subprogram area. The review has been instrumental in determining that three prerequisite conditions must be incorporated within the graphic communication subprogram area: (1) a consistency with the overall program goals and purposes is mandatory; (2) there must be a concern for the functions of the graphics portion of the communication process, industry, etc.; and (3) all appropriate technological practices of the industry must be represented. Therefore, it may be stated that, "graphic communication technology education" is a structured body of knowledge pertaining to the industrial practices which affect materials and humans in the production of graphic forms of communication. Its knowledge base is derived from that subcategory of industry which is known as the graphic communication industry. When these knowledges (practices) are conceptualized, codified, and structured they form the discipline of graphic communication technology. The structural elements of graphic communication technology are then drawn upon to derive the subject matter components for graphic communication technology education, just as the overall curriculum for industrial arts subject matter is derived from the structural elements of industrial technology. In this manner then, graphic communication
technology education becomes an integral part of the industrial arts program offering.

The aims, goals, and purposes of graphic communication technology education are identical to those of industrial arts education with the exception that they are delegated to the subsidiary level of emphasis that is appropriate to a subprogram. This is to imply that their scope and range is narrower and specifically applied to only the knowledge of the graphic communication segment of industry.

In Chapter III, the graphic communication industry is critically defined, but at this time in the discussion it is thought to be useful to reiterate a definitive point: (a) that the graphic communication industry is that subcategory of industry that substantially changes materials through industrial practices to create and reproduce graphic messages for the satisfaction of man's wants and needs; (b) that two major categories seem to exist within the industry, and these may be classified as the print media (printing and publishing) and the nonprint media (cinema, video, and computer graphic systems); and (c) that the major areas of knowledges employed within the industry seem to be categorized as those of industrial praxiology, communication information, and graphic production and reproduction processes.
and techniques. The review of the literature has shown that the application of these three components can produce a viable curriculum for graphic communication technology education.

Program Objectives

As a second major result of the information collected within the review of the literature, a listing of overall program objectives for industrial arts education has been derived.

These objectives are commonly applicable to both the larger educational field of industrial arts and graphic communication, since the later is a subprogram of the former. The program objectives represent the guidelines, limitations, and constraints by which to determine the approach to, and the context of the domain of knowledge to be contained within the discipline. The following objectives are of major importance:

1. The structured body of knowledge within industrial arts and graphic communication technology education should contain and relate to: (a) information from the formal, descriptive, prescriptive, and praxiological domains of knowledge with the appropriate amount of emphasis in each, (b) information about the natural and man-made world, and (c) information concerning the interrelationships that exist between man, industry,
society, and the total environmental setting.

2. The structured body of knowledge within industrial arts and graphic communication technology education should emphasize an understanding and appreciation for: (a) how man manages industrial production, (b) the practices employed by man to change materials into goods, and (c) the knowledge of how to efficiently and effectively use and service these goods.

3. The structured body of knowledge within industrial arts and graphic communication technology education should demonstrate: (a) the concepts and principles of industrial technology; (b) the utilization of its subject matter in real life applications of occupational, recreational, economic, and social-cultural value; and (c) the application of such universal processes as the systematic approach to problem solution, the processes of research and development, and the dynamics of individual and group (human) interaction.

The review has also displayed that at a higher level of specificity, additional objectives were found to exist. These objectives, which may be termed terminal performance objectives, would be used to guide the selection and organization of subject matter within a specific program level. In this manner, the programs input and procedures can be determined by the desired
terminal performance. The following terminal performance objectives are proposed (in addition to the overall program objectives) for graphic communication technology education, as a result of the review of the literature:

1. The graphic communication technology education program should demonstrate the relationship between graphic communication technology and the progressively larger fields of industrial technology and all technology.

2. The graphic communication technology education program should illustrate the evolutionary history of the graphic communication-technology, process, and industry and project into their future developments.

3. The graphic communication technology education program should provide knowledges and experiences in the selected managed-production practices employed within the graphic communication industry to produce graphic communication products.

4. The graphic communication technology education program should provide knowledges and experiences in the selected graphic communication processes employed within the graphic communication industry to produce graphic communication products.

5. The graphic communication technology education program should provide knowledges and experiences necessary to understand and appreciate the interrelationships between persons
(i.e., management-production-personnel, communicator-audience, etc.), things (i.e., message formation-production and reproduction, source-message-channel-receiver, feedback-interference, etc.), and interaction combinations of such.

6. The graphic communication technology education program should instill a level of professional knowledge and technical skill competency in the processes, techniques, etc. of the graphic communication industry.

Program Components

As a third major result of the information collected by the review, some striking results in regards to the subject matter components of the existing graphic communication programs were discovered.

First, an abundance of information (from antiquated to the most technologically advanced) relating to the technical processes of graphic reproduction was uncovered. This information is reported in Chapter IV, wherein it has been utilized to develop the taxonomic subject matter outlines for graphic communication technology.

Second, of the literature reviewed and reported, only one subject matter organization and structure seemed to meet the
requirements of a true discipline-centered body of knowledge. This structure and outline of subject matter was found in the program organization proposed by the Industrial Arts Curriculum Project. The IACP structure has been employed for the development of the industrial arts subprogram area of graphic communication technology education within this study. This was accomplished by substantially detailing the structural elements for industrial technology in Chapter III, in order to establish a base or frame of reference. In Chapter IV, the structural elements of industrial technology were adapted and adjusted to form the structural elements of graphic communication technology.

A third aspect concerning the subject matter of the existing graphic communication programs was discovered with disappointment.

Even though most graphic communication programs emphasize, relate to, or are proponents of the communication design link of graphic communication technology, their subject matter does not seem to be based upon or representative of this program component. Several programs implied the need for the communication design link, but there appeared to be little if any evidence of this in their subject matter organization. In most cases, the majority of emphasis was placed upon reproduction practices rather than production (creation) of the
graphic communication product. Conversely, it would seem to the writer that if the product fails to communicate effectively and efficiently, the reproduction expertise is of no real value. The writer is not alone in this opinion, for many individuals associated with the existing programs reviewed have also agreed to this point, but unfortunately little has been done to realize the solution of the problem. Therefore, an analysis of the related literature suggests that other sources must be sought in order to structure the body of knowledge for graphic communication technology.
CHAPTER III

SELECTION OF THE DEFINITIONAL CRITERIA
UPON WHICH TO BASE THE STUDY'S DEVELOPMENT

As one of the results of the review of the literature reported in Chapter II, the major components of the graphic communication education program and henceforth its larger domain of graphic communication technology were identified. To reiterate in slightly different terms, these components were found to be as follows: (1) industrial practices common to all of industry, (2) communication processes, and (3) specific graphic processes used in production and reproduction practices as employed in the graphic communications industry.

The review also showed a discrepancy, inconsistency, and a lack of commonality of agreement as to the context of the areas of the industrial practices and the communication processes. The purpose of the present chapter was to retrieve, analyze, and synthesize the information and data within these areas. When this had been accomplished, the necessary definitional criteria was established to develop the rationale and structure for graphic communication technology. The development and structure of this rationale is reported in Chapter IV.
A Descriptive Review of the Industrial Arts Curriculum Project (IACP) Rationale and Structure For Industrial Technology to Establish Its Context in the Study

The IACP expended large amounts of time, effort, and funds to establish a body of knowledge whose structure represented the industrial practices common to all industry. The related research and investigations were carried out and assessed by a task force of distinguished expertise from all phases of industry, government, and the learned community. After the collection and compilation of information and data, a rationale and structure was developed. By the use of the principles of discipline formation, taxonometric classification and matrice analytical devices the data were conceptualized, codified, and ordered. Through this developmental effort, the structural elements for the industrial technology discipline were derived.

Upon critical examination of the rationale and the structured body of knowledge, the writer has concluded that it appears to be a thorough and adequate approach for the categorization of industrial practices. For this reason it has been employed (with minor modification) as the basic structure around which the graphic communication technology components were organized.
The Structure and Content of Society and Knowledge

As previously stated, on pages 38 through 41 of Chapter II, man's knowledge can be categorized into four major domains, and these domains may then be applied to and utilized by the five basic institutions of human society. To clarify this relationship the IACP has structured the model shown in Figure 10.

![Diagram](image)

**FIGURE 10**

**THE RELATIONSHIP OF PRAXIOLOGY (TECHNOLOGY) TO MAN'S KNOWLEDGE AND TO THE BASIC SOCIETAL INSTITUTIONS**

(Towers, et al., 1966, p. 79)

Of the five basic societal institutions, the economic institution was selected as appropriate for further delineation. To further clarify the elements of the economic institution, a flow diagram was developed and is shown in Figure 11. The IACP explanation of this model is as follows:

The cycle commences with an act of initiation in which a human want or need is identified or anticipated. Resources--consisting of energy, natural, human, finance, capital (tools and facilities), and
knowledge—are selected as inputs to the productive system. These resources are processed in accordance with practices appropriate to the particular field of economic activity. The outputs of this productive system are the distributed economic goods, containing added form, place, possession, and/or time utility. To complete the economic continuum, these distributed goods are the means by which human wants are satisfied. While the orientation of this total process is linear—from initiation to the satisfaction of want—extensive recirculation or feedback is represented in the diagram by broken lines connecting all of the major stages. (Towers, et al., 1966, pp. 150 & 153)

FIGURE 11.

A PARADIGM OF THE ECONOMIC INSTITUTION
(Towers, et al., 1966, p. 151)

Derivation of Economic Practices

As can be seen, the scope and range of the model is of sufficient size and nature to make it applicable to most establishments within the economic institution. In order to delimit the model to higher levels of specification, the major groups of economic practices were estab-
lished and expanded as shown in Figure 12.

A brief inspection of this expansion of practices indicated that resource inputs (human, natural, etc.) are given additional economic value through changes brought about by two major groups
of practices. The resulting output was produced in terms of distributed economic goods. One grouping (production practices) involved pre-processing, processing, and post-processing practices which affected humans and things, while the other grouping (management practices) involved planning, organizing, and controlling practices which interacted with the production practices to lead to a similar end product. These two major groups of practices were separated for the purpose of categorization and further independent specification. In an operational system they interacted and utilized feedback data for self-perpetuation, correction, and maintenance and indicated by the flow pattern of the model.

**Derivation of Industrial Technology Matrix**

In order to obtain even higher levels of specification and to conceptualize the body of knowledge to be contained within industrial technology, a matrix system was devised. By utilizing all three axes of a three-dimensional matrix a large number of combinations could be derived from the matrix content. To illustrate this device graphically, Figure 13 is presented to show the "First Order Matrix of Industrial Technology," and Figure 14 is a "Sample Third Order Matrix of Industrial Technology Affecting Materials."
FIGURE 13.
THE FIRST ORDER MATRIX OF INDUSTRIAL TECHNOLOGY
(Towers, et al., 1966, p. 158)

FIGURE 14.
SAMPLE THIRD ORDER MATRIX OF INDUSTRIAL TECHNOLOGY AFFECTING MATERIALS
(Towers, et al., 1966, p. 161)
A great advantage of the matrix system is that any particular block can be withdrawn for an examination of its own three individual components, independently of the other components.

Through this systematic approach, utilizing the exacting methods just discussed, the structural elements of industrial technology were derived, established, and ordered one to another. To summarize, the structural elements of industrial production technology, industrial management technology, and industrial personnel technology interact through practices affecting humans and materials to produce industrial (manufactured or constructed) material goods for the satisfaction of man's wants and needs for economic goods. These three elements then form an adequate body of knowledge for the study of industrial practices common to all industry.

Two aspects of this structure need further mention to dispel any misgivings or false assumptions. First, the management and personnel functions were separated for the purpose of structure and specification, while operationally they seem to combine. Also, most sources on management include staffing and directing along with the components of planning, organizing, and controlling. The components have not been overlooked or ignored within the structure, but instead they have been incorporated.
Second, the servicing and repairing functions of economic activity were incorporated into the post-processing practices of production technology. The rationale for this is based on the premise that the practices necessary to repair a product are no more than a repetition of a portion of those original "processing" practices which were used in the initial production. In addition, the knowledge necessary to carry out repair processes is generally provided by the original production.

**Preliminary Adaptation of the Industrial Technology Model**

For a graphic representation of the original IACP "Major Structural Elements in Industrial Technology," the reader is referred back to Figure 6, on page 43. By utilizing that model, the first of this study's modifications to the IACP proposed structure will now be presented. The modification is given to inform the reader of the beginning level of adaptation. This was accomplished by an extension of the structural element organization to a higher level of specification.

In order to perform this modification, the graphic communication industry and its body of knowledge, graphic communication technology must be defined. A synthesis of the writings and pro-
posals of such prominent graphic communicators as Bentley, Kagy, Kemp, Prust, Simich, Strandberg, and others (as reported in Chapter II) provides that information.

The following definitions have been developed for use in this study:

**Graphic communication industry.** That subcategory of industry which substantially changes materials through industrial practices to produce (create) and reproduce graphic messages for the satisfaction of man's wants and needs. Two major categories exist within the industry and these may be classified as the print media (printing and publishing), and the non-print media (cinema, video, and computer graphics).

**Graphic communication technology.** A body of knowledge within the manufacturing subcategory of the industrial technology discipline. It is composed of technological (praxiological) knowledge which is derived from the study of the principles of industrial practices and communication as found to exist within the graphic communication industry.

Figure 15. illustrates the relationship of industrial technology and graphic communication technology at the first level of adaptation.
FIGURE 15.
A DIAGRAM OF THE RELATIONSHIP OF INDUSTRIAL TECHNOLOGY AND GRAPHIC COMMUNICATION TECHNOLOGY AT THE FIRST LEVEL OF ADAPTATION
The IACP Structural Elements of Industrial Technology

The structural elements of industrial technology as developed by the IACP, are presented in outline form. The outlines are detailed to only the third or fourth level of specification, even though many areas have been carried out to the seventh level in the original document. As stated before, an adaptation of these elements formed the basic structure for the body of knowledge around which the graphic communication technology content was organized.

I. INDUSTRIAL MANAGEMENT TECHNOLOGY (Towers, et al., 1966, pp. 174-175)

1. Planning

1.1 Formulating
   1.1.1 Determining Goals
   1.1.2 Establishing Specific Objectives
   1.1.3 Setting Policies
   1.1.4 Forecasting
   1.1.5 Programming

1.2 Researching
   1.2.1 Retrieving
   1.2.2 Describing
   1.2.3 Experimenting

1.3 Designing
   1.3.1 Determining Function
   1.3.2 Preparing Performance Specification
   1.3.3 Postulating a Solution-in-Principle
   1.3.4 Making Simple Models
   1.3.5 Postulating Alternate Solutions
   1.3.6 Making Working or Scale Models
   1.3.7 Selecting Solution
   1.3.8 Communicating Design Solution
   1.3.9 Making Prototype
1.4 Engineering
1.4.1 Detailing Design Communication
1.4.2 Detailing Specifications and Standards
1.4.3 Work Design (methods, standards, processes)
1.4.4 Estimating
1.4.5 Scheduling

2. Organizing

2.1 Structuring
2.1.1 Analyzing Work Tasks
2.1.2 Determining Worker Functions
2.1.3 Establishing Roles
2.1.4 Settle Work Conditions

2.2 Supplying
2.2.1 Requisitioning
2.2.2 Procuring and Subcontracting
2.2.3 Routing
2.2.4 Storing

3. Controlling

3.1 Directing
3.1.1 Supervising
3.1.2 Coordinating

3.2 Monitoring
3.2.1 Inspecting
3.2.2 Inventorying
3.2.3 Timekeeping

3.3 Reporting
3.3.1 Compiling
3.3.2 Appraising
3.3.3 Notifying

3.4 Correcting
3.4.1 Adjusting
3.4.2 Expediting
3.4.3 Restraining
3.4.4 Replanning
3.4.5 Redirecting
3.4.6 Retraining
II. INDUSTRIAL PRODUCTION TECHNOLOGY (Towers, et al., 1966, pp. 176-190)

1. Pre-processing

1.1 Receiving

1.2 Unpackaging

1.3 Handling*
   1.3.1 Pumping and Compressing
   1.3.2 Elevating
   1.3.3 Carrying
   1.3.4 Filling
   1.3.5 Evacuating
   1.3.6 Attaching
   1.3.7 Operating
   1.3.8 Skidding

1.4 Storing*

1.5 Protecting

2. Processing

2.1 Separating
   2.1.1 Classifying
      2.1.1.1 Screening
      2.1.1.2 Floating
      2.1.1.3 Sedimenting
      2.1.1.4 Filtering-Clarifying
      2.1.1.5 Magnetizing
      2.1.1.6 Distilling
      2.1.1.7 Evaporating
      2.1.1.8 Centrifuging
      2.1.1.9 Drying
      2.1.1.10 Adsorbing
      2.1.1.11 Absorbing
      2.1.1.12 Crushing
      2.1.1.13 Milling
      2.1.1.14 Leaching
      2.1.1.15 Stripping
      2.1.1.16 Electrostatic Separating
2.1.2 Material Removing
  2.1.2.1 Turning
  2.1.2.2 Shaping
  2.1.2.3 Planing
  2.1.2.4 Drilling
  2.1.2.5 Boring
  2.1.2.6 Milling
  2.1.2.7 Broaching
  2.1.2.8 Sawing
  2.1.2.9 Abrading
  2.1.2.10 Shearing
  2.1.2.11 Etching
  2.1.2.12 Burning
  2.1.2.13 Clearing

2.2 Combining
  2.2.1 Mixing
    2.2.1.1 Beating
    2.2.1.2 Blending
    2.2.1.3 Kneading
    2.2.1.4 Masticating
    2.2.1.5 Impregnating
  2.2.2 Coating
    2.2.2.1 Spraying (and Vaporizing)
    2.2.2.2 Brushing
    2.2.2.3 Rolling
    2.2.2.4 Dipping
    2.2.2.5 Printing
    2.2.2.6 Dyeing
    2.2.2.7 Calendar Coating
    2.2.2.8 Electrodeposition
    2.2.2.9 Oxide Coating
    2.2.2.10 Enamelling
    2.2.2.11 Spreading
    2.2.2.12 Sodding
  2.2.3 Assembling
    2.2.3.1 Positioning
    2.2.3.2 Fastening

2.3 Forming
  2.3.1 Working
    2.3.1.1 Peening
    2.3.1.2 Rolling
2.3.1.3 Drawing
2.3.1.4 Pressing
2.3.1.5 Forging
2.3.1.6 Stamping
2.3.1.7 Bending
2.3.1.8 Extruding
2.3.1.9 Metal Spinning
2.3.1.10 Molding (plastics)
2.3.1.11 Vacuum Forming (plastics)
2.3.1.12 Pounding

2.3.2 Thermal Conditioning
2.3.2.1 Curing
2.3.2.2 Crystallizing
2.3.2.3 Casting
2.3.2.4 Vacuum Depositing (See metal vapor plating)
2.3.2.5 Heat Treating
2.3.2.6 Melting
2.3.2.7 Freezing (See heat transfer)
2.3.2.8 Chilling

2.3.3 Combing
2.3.4 Winding
2.3.5 Knitting

2.3.6 Displacing
2.3.6.1 Bulldozing
2.3.6.2 Disassembling
2.3.6.3 Grading
2.3.6.4 Plowing
2.3.6.5 Ripping
2.3.6.6 Scarifying
2.3.6.7 Wrecking

3. Post-Processing

3.1 Altering
3.2 Installing
3.3 Maintaining
3.4 Repairing

*Handling and Storing practices, while listed under Pre-Processing, are utilized throughout the production cycle.
III. INDUSTRIAL PERSONNEL TECHNOLOGY (Towers, et al., 1966, pp. 194-196)

1. Hiring

1.1 Recruiting
   1.1.1 Disseminating vacancy notices
   1.1.2 Contacting employment agencies
   1.1.3 Making personal contacts
   1.1.4 Reimbursing interview costs
   1.1.5 Communicating advantages

1.2 Selecting
   1.2.1 Testing
   1.2.2 Interviewing
   1.2.3 Obtaining and checking references
   1.2.4 Matching qualifications with work requirements
   1.2.5 Communicating advantages

1.3 Inducting
   1.3.1 Appointing
   1.3.2 Reimbursing moving costs
   1.3.3 Establishing personnel record
   1.3.4 Distributing records to appropriate departments
   1.3.5 Orienting to work
   1.3.6 Answering employee questions

2. Training

2.1 On the job training
   2.1.1 Apprenticing
   2.1.2 Interning
   2.1.3 Coaching

2.2 Other training
   2.2.1 Conducting conferences and workshops
   2.2.2 Providing instructional materials
   2.2.3 Classroom instructing
   2.2.4 Sending to outside programs
3. Working

3.1 Providing economic rewards
   3.1.1 Paying wages and salaries
   3.1.2 Providing fringe benefits

3.2 Providing physical setting
   3.2.1 Housekeeping
   3.2.2 Lighting
   3.2.3 Heating, cooling, and ventilating
   3.2.4 Controlling sound, vibration and rhythm
   3.2.5 Coloring
   3.2.6 Posturing
   3.2.7 Protecting
   3.2.8 Meeting personal needs

3.3 Providing social environment
   3.3.1 Providing recreational activities
   3.3.2 Providing social programs
   3.3.3 Providing communication channels
   3.3.4 Structuring the work group
   3.3.5 Acting on surveys
   3.3.6 Disciplining
   3.3.7 Merit Rating
   3.3.8 Giving Service awards

4. Advancing

4.1 Promoting
   4.1.1 Reassigning upward
   4.1.2 Reclassifying upward

4.2 Demoting
   4.2.1 Reassigning downward
   4.2.2 Reclassifying downward

4.3 Discharging
   4.3.1 Separating
   4.3.2 Relocating
   4.3.3 Laying off
A Descriptive Review of the Communication Process and Theory to Establish the Context of Graphic Communication for the Study

As reported in the summary of Chapter II, an insufficient amount of information concerning the communication process and its components was contained within the descriptive literature of the graphic communication education programs. However, the same review of the literature established the importance of this subject matter area. In an attempt to locate this information, this section of the chapter was concerned with the literature of communication theory and practice. After the major communication components were located, they
were delimited and applied to the area of the graphic communication industry.

A major limitation employed by the writer should be pointed out before beginning the discussion of the communication literature. The communication process in general could be applied to many situations, e.g., man to man, man to machine, machine to machine, etc. The review of the content of existing graphic arts and communication education programs indicated that the man to man, or human communication process was most appropriate for inclusion within the industrial arts education program. Therefore, this study was directed towards human communications rather than forms of communication for computer programming, numerical control, and so on.

In order to gain an understanding of the human communication process some of the major communication theories and concepts are discussed through their respective communication models. It must be noted that a model is an abstraction or generalization of a theory and that it has been organized, ordered, and structured in a manner to facilitate overall understanding. Therefore, certain aspects of the original theory have been simplified, sharpened, or eliminated within the model.
It may be said that the first communication theory model was formed as early as in the writings of Aristotle. He proposed that public speaking was composed of three major parts, i.e., the speaker, the subject, and the audience. To Aristotle the audience was the most important.

The Lasswell Model of Communication

Lasswell elaborated on Aristotle's model through his research in the area of political communication and propaganda. He proposed the model in Figure 16.

![Diagram of Lasswell's Communication Model]

**FIGURE 16.**

THE LASSWELL COMMUNICATION MODEL
(Lasswell, 1960, p. 17)
To Lasswell each of the process components could be an individual area of scientific study in communication. The "WHO" factor refers to the communicator and is concerned with the factors that initiate and guide the communication act. This area is studied by "control analysis". The "SAYS WHAT" factor is the message and is concerned with "content analysis." The "CHANNEL" is the transmission means and is "media analysis," while the "EFFECT" is a study of "effect analysis." (1960, p. 18)

Lasswell's study of communication theory was furthered by the additional theorizing of others. Of importance is the Shannon and Weaver Model of Communication.

The Shannon and Weaver Model of Communication

Shannon was mainly concerned with electrical telecommunications and developed elaborate and detailed mathematical formulas that solved such problems as coding, and channel capacity.

Weaver took the work of Shannon and applied it to the area of information theory. He was interested in three levels of communication problems: (1) The technical level - the accuracy with which a signal could be transmitted, (2) The semantic level - the accuracy of the signal to convey the desired message, and (3) the effect level -
the effectiveness of the received signal to change activity. The model resulting from this work served as an impetus for further model visualization in the fields of sociology, psychology, physiology, biology, etc. The six key components of the Shannon-Weaver model are as follows:

1. The Information Source - the source initiating the message
2. The Transmitter - the object that transforms the message into a suitable signal
3. The Channel - the means by which the signal travels
4. The Noise - any form of interference that leads towards deterioration of the signal
5. The Receiver - the object that received the signal and transforms it into a message
6. The Destination - the user of the message

FIGURE 17.
THE SHANNON AND WEAVER COMMUNICATION MODEL (Shannon, 1949, p. 5)
The Schramm Model of Communication

Schramm (1965) took a generalized model for communication and developed it in terms of the human receiver and communication system. His revision emphasized the accumulated experiences of the individuals trying to communicate. The source could encode and transmit a message which the destination could receive and decode as long as the symbols used and the fields of experience were common to both parties. This process is represented in Figure 18.1.

At this point in the development, Schramm concluded that each communicator is both an encoder and a decoder, or receiver and transmitter; therefore, a new form of the model was derived as shown in Figure 18.2.

In addition to the dual roles of each communicator another element was added to the model. This was the element of feedback which was used by both communicators to constantly modify their messages in light of what is observed from the reaction of the other. An example of this is given in Figure 18.3.

Finally, an organization was developed for mass communications. The emphasis was placed on averages and classes in a mass group rather than on the interaction of two communicators dealing
FIGURE 18.

THE SCHRAMM COMMUNICATION MODEL
(1955, pp. 3-10, 18-22)
with the singular modifications of a message. This concept is presented in the model in Figure 18.4.

The Hovland Model of Communication

Hovland (Harrison, 1969) a psychologist, was commissioned by the armed services to carry out attitude research. From this study, Hovland entered into the field of study in communication and persuasion. His communication model focused on the attitudinal output in human communication. The primary application of the model was in the prediction of attitude change, including the factors of opinion, affect, and action change. The variables needed to predict human behavior have been divided into four groups and are presented horizontally in the model in Figure 19. The "Observeable Communication Stimuli" are arranged by their characteristics into the categories of: content, communicator, media, and situation. It is suggested that individuals may be influenced by one area more than another, i.e. some may be media bound - graphic or non-graphic predispositions. The observable communication stimuli interact with the "Predispositional Factors" to elicit the "Internal Mediating Processes" of attention, comprehension, and acceptance. The results of the interactions of the three categories lead to the "Observeable Communication Effects."
FIGURE 19.

THE HOVLAND COMMUNICATION MODEL
(Harrison, 1969, p. 64)
The Berlo Model of Communication

While Hovland's model focused on attitudinal change, another area of study is that of the behavioral approach as emphasized in Berlo's (1960) communication model. This model is quite simple and versatile and therefore has been adapted to many areas of research. The model is composed of five major components: (1) the source, (2) the message, (3) the channel, (4) the receiver, and (5) the feedback. Figure 20 is a graphic portrayal of this model.

The source and the receiver have communication skills, attitudes, knowledge, a social system of governing components, and a cultural background of experiences. If these factors are similar in content, then communications are facilitated. Otherwise, the source must be aware of the differences in his receiver and adjust to them. The process of adjustment or modification may take place before communication begins or during the process using feedback as a guide.

The content of the message is composed of elements that are structured through the use of the communication code in a manner (treatment) that is selected by the source in conjunction with his intended end purpose. The purpose of the message may be persuasive, informative, entertaining, and so on.
The channel is the means by which the message is transmitted to the receiver. It is suggested that at least one of the five sense receptors is used; i.e., seeing, hearing, touching, smelling, and tasting. Furthermore, channels are divided into natural and artificial. The natural channels are those which rely upon the direct use of the senses while artificial channels are such things as television, radio, newspapers, etc. The selection and organization of these channels may influence the reception of the message.

Feedback is the term applied to the behavior elicited from the receiver as a result of receiving the message. Feedback may be of a formal nature as in the act of carrying out directions that have been given, or they may be of an informal nature as in a conversation between communicators. The most dynamic form of feedback lies in a conversation where the receiver and source roles are constantly changing and feedback is used to modify and tone responses. (Berlo, 1960, p. 65-72)

A General Synthesized Model

By synthesizing the components of the reported models and that of the other similar models reviewed, a general purpose model for human communications was derived. This has been accomplished
in Figure 21. For the purpose of the study this model was used to represent the basic structure for human communication.

With the acceptance of this model, definitions are given for the terms communication (human) and the communication process.

A communication (human). A form of message wherein information, data, knowledge, etc. is conveyed from a source to a receiver in a meaningful manner through any of the five human sense receptor
FIGURE 21.

A GENERALIZED MODEL FOR HUMAN COMMUNICATION
channels. The communication may be purposefully designed as in a structured message, or nonpurposeful as an incidental by product (such as the psychological or physical effect of a setting sun).

The communication process. The process by which a purposefully designed message is produced and utilized. The major components of the process may be classified as that of the source, message, channel, receiver, and in appropriate cases, feedback and interference.

Specification of Generalized Model Components

In order to clarify the two terms presented above, the component parts of the model have been further specified. This was necessary to establish an in-depth understanding of the subcomponents within these major areas of focus.

The source. According to Schramm (1955) the source may be "An individual (speaking, writing, drawing, gesturing) or a communication organization (a newspaper, publishing house, television station ... (p. 3)." The main difference between the individual
and the organization lies in the amount of input information as compared to the amount of output information, with the individual generally receiving less of the input. Regardless of which type, the source (communicator) is involved in initiating the message to be communicated. The source relies on his information knowledges, communication skills, attitudes, social and cultural values, etc. to develop a message through a mediation process. In addition, the source must know how to structure and encode the message in a manner to facilitate decoding and interpretation by the receiver in the desired manner. The source must have knowledges about the information level, the predispositions, the social and cultural values, etc. of the receiver (individual or audience). This point is especially true in the event that he desires to inform, influence, persuade, or entertain the receiver. He must be able to evaluate feedback in order to observe attitude, opinion, perception, and affect change in the receiver.

Berlo suggests that to predict the sources effectiveness we must know:

First, is he literate? Does he have the skills to create pictures? to manipulate language? Next, what are his attitudes towards the receiver? towards his subject? towards himself? Third, what is his knowledge level? Does he know the subject matter? his receiver? himself? Finally, what are the roles and norms that shape
his communication behavior? Does he speak as a member of a political group? a religious group? a professional group? Does he start from certain cultural assumptions? (Harrison, 1969, p. 66)

If these questions were changed to positive statements and asked about the receiver, then some of the source’s necessary knowledges about the receiver can be seen. In essence, this is what Hovland has done when he talks about the "observable communication stimuli" and the "predispositional factors."

The message. The message is an arrangement of signs, signals, and codes (graphic and non-graphic or both) that are used to transmit an idea, thought, concept, or bit of information from the source to the receiver. Signs are communication stimuli that are classified as (1) a signal which is a stimulus that stands for something or some event such as smoke stands for fire, or (2) a symbol which is an encoded stimulus that stands in place of its referrent such as the word fire, or the picture of a fire for the actual flames. Codes are a grouping of patterned stimuli which are used to convey information through a variation of the patterned stimuli (signs, symbols, and signals) with reference to something outside of the code.
The message is the "Says What" factor of Lasswell's model and is concerned with content analysis. The message then can be said to be composed of content, elements, treatment, structure, and a code. (Berlo, 1969) The message may be classified as communication-, content-, topic-, appeal-, argument-, style-, media-, or situation-bound (Harrison, 1969, p. 64).

Many studies of message systems have been made. Only one study will be briefly mentioned at this time. The structure and elements of message systems will be presented in-depth in the discussion of graphic communications.

Charles Morris (Harrison, 1969, pp. 69-70) developed the system of Semiotics (the study of signs). He proposed three areas of study which are: (1) Syntactics - the study of sign to sign relationships, (2) Semantics - the study of sign to referent relationships, and (3) Pragmatics - the study of sign to interpreter relationships. Each of these three areas are subdivided into: (a) Pure semantics, which is the metalanguage to talk about signs, (b) Descriptive semantics, which is the analysis of signs, and (c) Applied semantics, which is the use of signs.
The channel. The channel is the means by which the message travels from the source (transmitter) to the destination (receiver). The channel delivers the message (in code form) to the receiver by the use of one or several sensory stimuli such as seeing, hearing, touching, tasting, and smelling. (Berlo) The selection and use of these channels can affect the desired communication results.

According to Klapper (1955, pp. 88-105) channels may be differentiated by several scales:

1. Space-time channels: Space-time channels may be divided into three parts. First, the space organized channel which can be such things as printed material, pictures, and art objects. This channel is particularly suited to difficult concepts, masses of detail, discrimination, and selectivity on the part of the receiver. Second, the time organized channel which can be such a thing as a telephone conversation. These channels are of an advantage for learning and encouraging suggestions from the receiver. Third, the time and space organized channel which can be such things as face to face communications, sound films, or television. These channels reinforce the message by using the senses of sight and hearing.

2. Participation Channels: Participation channels provide maximum feedback with the receiver experiencing involvement, a group bond, and a circular pattern of influence and decision making.
3. Speed Channels: Speed channels are concerned with the timeliness of the message. These channels can be divided into three levels: (a) The high speed channels are good for communicating information about the environment, as exemplified by the news media, (b) Moderate speed channels are the most effective in correlating society's responses, and (c) Slow speed channels lend themselves to study and reflective purposes.

4. Permanence Channels: The more permanent the channel the more useful it is to transmit principles and structured content, while the less permanent channels are more useful for report or persuasion. A scale from great to little permanency would include respectively books, magazines, motion pictures, newspapers, radio and television.

Five mass communication media channels are suggested by writers such as Lazarfield, Doob, Wapler, and Berelson (Schramm, 1955) with advantages being listed as such:

PRINT permits the reader to govern the pace and occasion of exposure, permits successive re-exposure, and allows for treatment at any length ...

RADIO reaches an audience not as often reached by the other mass media, and tending to be more poor cultured and more suggestible than the audience of other media. Radio affords the spectator some degree of participation in the actual event being broadcasted and thus approaches face-to-face contact ...
The SCREEN is believed to enjoy unique persuasive and pedagogical advantages by virtue of its presenting concrete visual material. These concrete settings and other factors are believed by some investigators to render the films capable of taking emotional possession...

FACE-TO-FACE discourse is generally regarded as the most effective instrument of pedagogy and persuasion by virtue of such capabilities as flexibility, immediate provision of reward or punishment and other characteristics deriving directly from the personal relationships involved...

The use of one or more mass media supplemented by face-to-face contact has characterized several highly successful propaganda campaigns and is believed by some observers to be in itself a superior persuasive device. But this is conjecture rather than proven fact... (pp. 104-105)

Interference. The term interference applies to any stimuli that interferes, disrupts, deteriorates, or even modifies the signal being transmitted through the communication channel(s). This interference may be a form of internal or external noxious stimuli, or a form of internal or external pleasant stimuli. Wittich and Schuller (1962) identify three groups of elements that can interfere with the communication process.

Group one is labeled External Variables and includes those stimuli outside of the communication system that are contributed to the physical characteristics found in the receiver. Examples of these variables are as follows: (1) Disinterest, (2) Daydreaming, and (3) Discomfort.
Group two is termed Internal Variables which are stimuli related to the source and his mode of message presentation. Some of these examples are as follows: (1) Referent confusion, (2) Imperception, and (3) Verbalism.

Group three is represented by the Intervening Variables that relate to the behavior of the source and the receiver. Examples are as follows: (1) Prejudice, (2) Experience, and (3) Cognitive knowledge. (1962, p. 6-12)

The receiver. The receiver is the individual or audience that is the destination of the message. Much of the same criteria and information given about the source would also apply to the receiver. (Refer to the section on the source.) The receiver gets the message in part or whole, in some manner or other, as it enters into his sensory field in stimulus form. The message is then decoded and interpreted through the mediation process.

Feedback. The process of feedback may be thought of in two ways. First, as the receiver's reaction to a stimulus, and second, as a generated stimulus (as a result of receiver reaction) which allows the source to evaluate the effectiveness of his message to elicit the desired results. Feedback may also be employed in modifying or adapting further communications.
In essence, feedback involves an action-reaction interdependence. The source performs an action which elicits a reaction from the receiver, the reaction of receiver affects subsequent reactions of the source, and the process continues with the source and the receiver utilizing the reactions of the other.

A rewarding form of feedback tends to reinforce the production of the same kind of message, while a non-rewarding form suggests change. Therefore, feedback is a method whereby a receiver can influence the source.

Feedback media can be classified as to its ease of operation. Person-to-person communications permits a maximum level of feedback. Reinforcement (positive and negative) is immediate and the roles of the source and the receiver are dynamic with frequent and speedy change. Newspapers, books, television, etc. (mass media) have a minimum level of feedback. The receiver and the source are separated by time and space with little opportunity for responding with the other.

After defining the term communication, communication process, and the components of communication, the next task of the study appeared to be one of further delineation. This was accomplished by extracting from the overall field of communication,
those portions or aspects dealing specifically with graphic forms. A review of the literature indicated that before this problem could be solved, the differences between verbal and nonverbal communication must be clarified.

**Classification of Verbal and Nonverbal Communication**

Many writers have proposed systems to establish boundaries between verbal and nonverbal communication. Harrison (1969, p. 161-162) mentioned three of these: (1) a system that terms everything except the written and spoken work as nonverbal. In this scheme anything received by the senses of touching, tasting, and smelling is a form of a nonverbal communication. Thus, the use of perfume is a means of nonverbal communication; (2) another system has been developed to select the size and style of type to be used in forming a composition, e.g., large vs. small, italic vs. bold, Helevetica vs. Univers. The only form of verbal communications in this system is that of the assembly of letters to make words, and words to make sentences; (3) a third system is developed around the boundary of visual communications - optical stimuli and sensors. This scheme would leave out the use of perfume (smell) but retain the selection of type composition material. The result would be
that a majority of emphasis is placed on the seeing and hearing of the word with little emphasis on the printed word itself.

Birdwhistell (1955) classified nonverbal communication in his study of "Kinesics," which is communication through bodily movements. He developed a system to record and analyze second-by-second movements in the areas of kine and kinemorph. In gestural language very minute shifts of the body can make a great difference, i.e., 23 positions for the eyebrows. Birdwhistell notes that speakers can sometimes make contradictory gestures to what they are saying and that this type of interband conflict can lead to tragedy. The code for this type of nonverbal action has been developed through pictograms, utilizing such categories as the pict, the pictoform, the pictomorph, the pictophrase, and so on. (pp. 10-18)

The system of classifying verbal and nonverbal communication that has been accepted for this study is that which has been proposed by Ruesch and Kees (1956, pp. 1-12). They suggest that one way to draw boundary lines between verbal and nonverbal communication is to apply the concept of analogic and digital codification. The analogic code consists of elements that are similar (in proportion or relation) to the type of thing, idea, or event in the real world for which they stand. Examples are that of pictures, maps, and models.
The *digital code* consists of code elements that differ sharply from the things which they represent, with a lack of a gradual transition between the elements. Two examples of the digital code are that of the Arabic numerical system and the phonetic alphabet system. A gradual transition between the letters of the alphabet or the numbers of the numerical system does not exist. Therefore, the digital code elements are composed of discrete step intervals as compared to the continuous functions of the analogic code elements.

Ruesch and Kees further divide the nonverbal communications into three levels, which are (1) sign language – wherein a gesture replaces words, numbers, and punctuation for the purpose of communication. An example is the use of the arm to indicate a turn signal while driving a motor vehicle; (2) action language – wherein all bodily movements purposively or nonpurposively communicate information. An example is that of a person unconsciously tapping his finger and indicating nervousness, anticipation, etc.; and (3) object language – wherein all display materials and things are used to communicate. An example is the communicative power of an engagement ring on a woman's hand, the type of furniture in a house, and the type of clothing that one wears (loud, bold, bright, colorful, etc.).
Specification of Nonverbal Communication

The writer has selected the object language area to represent the nonverbal communication area of this study. This area has been limited to include only those forms of communicative materials that are commonly used to produce, store, and disseminate information in graphic form, as produced by the graphic communication industry.

It is assumed that a study of "verbal communication" would be composed of the principles, rules, and laws as found in the areas of linguistics, composition and grammar, journalistic and writing practices, and so on. This body of knowledge has been traditionally placed by presidence in the general education realm of study, within the formal areas of English, speech, journalism, etc. Therefore, this study does not propose a duplication of these knowledges within graphic communication technology. However, these knowledges are employed as a part of the supportive information which is necessary when designing and producing graphic communication products. A major emphasis has been placed on an indepth investigation of nonverbal communication systems.

Nonverbal communications are capable of disseminating knowledge more effectively than almost any other form of communications. Facts, ideas, and concepts can be related in a wider and deeper range
in order to reinforce static verbal concepts. This is not said to slight the importance of verbal communication, for it is one of the basic components of the social and cultural system. However, unlike verbal communication, nonverbal communication is not limited by language, vocabulary, or grammar, but can be perceived by the illiterate as well as the literate. (Kepes, 1966, p. 13)

The elements of "nonverbal communication" are that of the sign, signal, symbol, and image. When these elements are compiled (structured and treated) to form codes they produce interpretable messages. As mentioned before, the receiver must be able to understand the intended objective of the message, and therefore becomes an integral part of the entire system. Through the process of feedback the roles of the source and the receiver interchange. Therefore, it is important for the source to be able to structure these elements to give understanding and meaning to an otherwise chaotic formless configuration. A discussion of the elements will begin by the derivation of a definition for each element.

Intensive controversy has ranged between such writers as Whitehed, Cassiner, Lanzer, and others over the definitions of the elements. Each of the elements had been attributed various meanings in different contexts. Lawrence Frank (1966, pp. 1-15) had attempted to correlate
and form a single definition by a review and synthesis of the work of these writers. He developed working definitions for the elements of the signal and the sign, which have been adapted for this study.

**Signals.** These are messages for which inherited sensory capacities have been developed. Response to some signals is instinctive, such as closing one's eyes to a strong light, or reacting to degrees of heat, cold, or sound. Reaction to other signals is voluntary. An example would be ignoring annoying sounds like that of irritating noise.

**Signs.** These are messages that occur so regularly in conjunction with important signals that after a number of occurrences they bring about the same response as that of a signal. Some examples would include a cloud covered sky which suggests rain, the smell of smoke to signify fire, or a voice being raised to imply anger.

Modley (1966) described the term symbol from a physiological viewpoint as: a message created by man to communicate with others and himself. "A symbol becomes meaningful and evokes response when, and only when, a perceiver of the symbol projects meaning into it and responds to it in terms of the meaning which he has learned as appropriate for that symbol (p. 114)." Therefore, a symbol must
be recognized by an individual as that of having a commonly accepted meaning.

Stevenson (1968, p. 36) defined symbol as: a character, letter, or drawn configuration which serves to explain the meaning of something. It must be universally understood, or have a key or legend attached to explain its intent.

From the two definitions of "symbol" listed above and others reviewed, a definition has been formed for the purpose of the study.

Symbols. These are some sort of configuration that may be used by themselves or in an organization with others to transmit a message. They have a specified intent or meaning that must be understood by the perceiver to have value.

Burchard (1966) adapted the definition given in Webster's Unabridged Dictionary and proposed the following explanation for the element termed "image." Images are messages that are perceived as imitations, or representations of any object, person, or thing. Therefore, it is possible to have visual, tactile, olfactory, or auditory images. Furthermore, an image may be a mental representation, such as that of an experience in one's mind (memory or imagination). He contrasted an image and a symbol by stating "the image
is the explicit reminder of a specific thing, and the symbol is the extrapolation of the image to suggest something different." (p. 237)

A somewhat different definition for the image is proposed by Stevenson (1968, p. 173) as any representation of a concept or object that intentionally communicates a message. It may be a symbol, photograph, type mass or text, a drawing, and so on.

For the purpose of this study, a synthesized definition has been developed for the term "image".

**Images.** These are configurations of elements, possibly symbols, that portray the message to be interpreted by the receiver. The image can not generally be composed or structured by analogic codification and in this manner differs from the symbol.

**Classification of Graphic Communication Components**

The review of the literature has also supported the point that the two most vital elements of graphic communication design are that of the symbol and the image. A study of these two elements may be used to derive many of the commonly accepted components of graphic communication.

The following definition has been generated for the purpose of the study. A **graphic symbol** is any character, letter, or graphic
form that is used by itself or in combination with others to transmit a message containing information, data, or knowledge. It has a specified intent or meaning which is understood to have value and is capable of evoking a response within the perceiver. Graphic symbols may be classified into the categories of phonograms and logograms, and are structured by analogic and digital codification.

Writers such as Modley, Ulm, and Krampen have literally spent years detailing the contents of the graphic symbol. The writer has synthesized their work and generated the model in Figure 22 to show the classification of and the relationship between phonograms and logograms. The model is based on a similar model for graphic signs as developed by Krampen (1965, p. 12).

**Phonograms.** These are arbitrary graphic symbols that compose an alphabet of written and/or spoken phonetic characters. These symbols have to be learned and once this is accomplished they tend to become permanent. Each language is composed of its own set of phonetic characters, but in some cultures specific phonetic sounds have not been attached to the individual written characters, e.g., hieroglyphics and some African languages. The points to be discussed under arbitrarily-related logograms also apply to the phonograms.
FIGURE 22.

CLASSIFICATION OF GRAPHIC SYMBOLS

Logograms. These are graphic symbols that may be classified as (1) image-related, (2) concept-related, and (3) arbitrarily-related. To contrast these three types of symbols it may be said that the image-related symbols resemble real objects, while the concept-related symbols portray the perceptual content of an object or concept, and the arbitrarily-related symbols have their shape assigned without relationship to a real object or concept. In the hierarchy of learning, a pro-
gression of difficulty exists from high to low in the order of arbitrarily-related, concept-related, and image-related symbols. As mentioned before, learned arbitrarily-related symbols tend to remain constant. This is also true for concept-related symbols, but the image-related symbols must change with the cultural and technological evolution.

**Image-related graphic symbols.** These forms of graphic symbols, are generally stylized silhouettes or drawings of the real object they are to represent. In Figure 23.1, the pedestrian is an example of an image-related symbol that could be used on a road sign to alert a driver of a motor vehicle in the Western culture. A problem can arise when these particular symbols are applied to a different culture or when extended over a period of time. The image of the pedestrian in Western clothes may mean very little to someone in the Chinese culture. Also in Figure 23.2, the drawing of the locomotive once represented a railroad crossing, but may not communicate the same message in today's culture due to technological changes that have helped modify one's image of the railroad. Therefore, these types of symbols must be redeveloped as time and technological change bring about new situations.
Concept-related graphic symbols. These forms of graphic symbols are generally harder to recognize than the image-related symbols because they refer to perceptual concepts rather than to real objects. However, since its graphic form portrays perceptual content, it is not difficult to learn. An advantage to these types of symbols is that concepts usually do not change and therefore, the symbols may remain constant. A large application and usage of concept-related graphic symbols may be found in many of the professional and technical fields. Some examples are given in Figure 24.
Typographical Proofreading Symbols
(Stevenson, 1968, p.239)

Continuous wave
100% modulation
Under modulation
Over modulation

Electricity/Electronic Symbols
(Gerish, 1968, p.228)

One direction
Both directions
Rotation one direction, clockwise
Rotation both directions

Mechanical Motion Symbols
(Kepes, 1966, p.111)

FIGURE 24.
CONCEPT-RELATED GRAPHIC SYMBOLS
Arbitrarily-related symbols. These forms of graphic symbols do not resemble the objects or concepts that they represent. Regardless of their possible origin as image-, or concept-related symbols, the arbitrarily-related graphic symbols are used to facilitate transitional communication in the transmission and reception of messages. This symbol system is of great value to scientists, researchers, technicians, and laymen for both manual and machine computational work. The best known logogram forms of arbitrarily-related symbols are those of numerals, punctuation marks, mathematical operators, and so on. Some examples of these are given in Figure 25. It should be noted that technological developments have a modifying influence on these types of symbols.
The study of graphic symbols or symbology must also include the effects of background shape and color on the graphic configuration. This becomes evident when one realizes that almost all graphic communications are carried out on a two-dimensional plane. This area of information was found to be well established in the existing graphic communication education programs. The reason for the inclusion of shape and color information, even though symbology has been noticeably excluded, is that of its common application to aesthetic design, artwork preparation, imagery, printing per se, and so on. This information is presented in the appropriate subject matter outlines of Chapter V.

For the purpose of this study, a graphic image has been defined and interpreted as a means of transmitting visual information through graphic configurations that are perceived as an imitation or representation of any object, person, thing, or event. In contrast to a symbol, an image is an explicit reminder of a specific thing, while a symbol is an extrapolation of the image which suggests something different. A graphic image can be structured in a codified manner, only through digital coding. If one wished to isolate specific examples of an image, in accordance to the definition given above, such things as drawings, photographs, entire sections of textual matter, and the like would be appropriate selections.
A discussion of the classification and components of the graphic image can be presented by describing the concept of visual organization. Visual organization is the underlying basis for the formation of visual images, whether achieved by sketching, drawing, typographical means, photography, or other means of creation. In order to make this discussion most efficient, a general summary will be presented of the writings of Modley (1966), McFee (1961 and 1969), Kepes (1966), and Krampen (1965). These individuals have been chosen for their recognized expertise in this field and also because of their similarity of philosophical position. Also, Appendix B, provides an outline of the subject matter components that the writer has adapted and revised during the past seven years for instruction in this area of graphic communication education.

The concept of visual organization can be divided into the three subconcept areas of: (1) plastic organization, (2) visual representation, and (3) dynamic iconography. (Kepes, 1964, p. 15) It should be pointed out that many of the principles and components of visual organization apply equally well to both the image and the symbol.

Figure 26 has been developed by the writer to illustrate the relationship of the elements of visual organization as they apply to either graphic symbols or graphic images.
A brief explanation of the model is given by discussing each of its elements.

**Plastic organization.** Is a process of integration which is employed to designate the formative quality and/or the shaping of sensory impressions into a unified organic whole. (Kepes, 1964, p. 15) Plastic organization may be further subdivided into three fields: (1) the visual field which is composed of optical and retinal units which interact and permit an object or thing to be focused by referring it to its surroundings; (2) the physiological field where defects in the human optical receptor create or activate an averaging process which strives to measure the qualities (direction, weight, intensity, etc.) of a perceived object or thing; and (3) the psychological field where visual experiences are generalized to a wide range of responses, thoughts, and feelings which are not directly connected with the actual perceived object. (Kepes, 1966, p. 44) Conceptual components within this area of organization includes those perceptual processes of proximity, similarity, continuity, closure, and familiarity. (McFee, 1969, pp. 202-212)

**Visual representation.** This is the means by which sign systems operate and is based upon a correspondence between sensory stimula-
tions and the visible structure of the physical world. (Kepes, 1964, p. 67) Three major functions are attributed to visual representation. The first function is to approximate a three-dimensional spatial scene through a two-dimensional image. Second, the two-dimensional image must function in a manner that precisely records the object in a space-time order, i.e., as if frozen by stop action. And finally, the third function is that of ensuring that the image represents the intended feelings, emotions, etc. of the object. The two major conceptual components within this area are the principles of: (1) the relationship of size, and (2) the relationship of depth by (a) vertical location, (b) overlapping figures, (c) transparency, and (d) perspective. These principles are realized by the systematic application of aesthetic design principles.

**Dynamic iconography.** This is the formative quality of sensory impression which links the components of visual organization together. It functions as the means by which past experience, knowledge, etc., interacts with emotional and conscious responses to create visual configurations that contain meaning. (Kepes, 1964, p. 209)
Summary and Implications

Through the review of industrial practices as structured by the IACP rationale, and communication theory and process, it was possible to establish some of the major definitional criteria for the study of both graphic communication technology and graphic communication education.
A first major accomplishment of the study undertaken in this chapter, was the identification of those industrial practices common to all of industry within the content and structure of the IACP industrial technology matrix system. These industrial practices were accepted as being appropriate and adequate for structuring this study, and are listed on pages 127-134. Also, a first level adaptation of the "Major Structural Elements of the Industrial Technology Matrix" to graphic communication technology was accomplished, and is shown in Figure 15, on page 126. Further adaptation is presented in Chapter IV.

As a second major result of the study undertaken in this chapter, a generalized model for human communication was derived. This was accomplished through a synthesis of the reviewed communication models. The generalized model is presented in Figure 21, on page 146. After the model was established its components were defined and this led in turn to the establishment and description of several graphic communication components.

As a third major result of the development (analysis and synthesis) within this chapter, the following terms were defined to provide a meaningful referent in the study:
As a final result of the information reported and analyzed in this chapter, four additional organizational models were generated and will now be presented. In the process of generating these models it was felt necessary to further delimit the scope and range of the communication components and their application to this study.

To this stage in the study, both the communication process and the communication product (message) had been investigated. Therefore, either of two possible directions of emphasis had been identified as being appropriate for structuring purposes. The first direction concerned the application of communication knowledge and data to the production (formation) and reproduction of the graphic communication industry's material product. The second direction concerned the process by which the workers in the industry communicated in order to produce the product. Obviously, both of these interact in the operational practices.

For the purpose of delineation and structure, a decision was made to place the major emphasis on the communicative aspect of the graphic communication process and its respective product. The worker (management through labor levels) communication aspect was considered as being incorporated into the function of management and personnel practices. The graphic communication process was defined as
the process by which a purposeful message, in the form of graphic
symbols and images, is produced and reproduced. The process is
similar to that described under "communication process," with the
exception that the message was limited to graphic forms (elements)
and the channel was restricted to the use of only visual (optical)
stimulation and reception. The message (product) may be produced
by an individual graphic communicator or an entire industry com­
posed of individuals in many differing capacities, i.e., designer,
layout artist, photographer, printer, etc.

As mentioned previously, the graphic communication industry
may be classified into the areas of print media (printing and pub­
lishing) and non-print media (cinema, video, and computer graphics).
A common core of knowledge is utilized by both categories, but the
actual processes employed in producing a cinema film and a book
are different. This study has been structured around those general
knowledges common to both, but emphasized only those particular
processes and techniques that are employed within the print media
category.

The following sequence of models, Figures 27 through 30, was
generated by the writer to summarize and to present graphically the
information and data already established in this chapter. Also, the
researcher's emphasis and direction of developmental activities may be seen through the progression of the models from general to more specific.

In Figure 27, the model graphically portrays the sequence of activities from the initiation to the completion of a communication task. The elements of the "message" and the "channel" are subdivided to illustrate their component parts.

The SOURCE through a process of mediation formulates, selects, organizes, and abstracts information. He then produces (Encodes) the MESSAGE through a codification process which produces codes in the form of:

- Verbal communications
- Nonverbal communications
- Both forms of communication

He then transmits the message on a selected CHANNEL in the form of:

- Graphic Communications
- Nongraphic Communications
- Both forms of communication

The message is received, decoded, and interpreted by the RECEIVER, who may be either a Mass audience, or an Individual.

FIGURE 27.
THE GENERALIZED COMPONENTS OF THE COMMUNICATION PROCESS
Figure 28 is a modification of Figure 27, in that it applies directly to the communication industry. It is also an expansion in that it details the communication process major elements and components. Furthermore, this model applies to either the print media or the non-print media categories of the graphic communication industry.

**FIGURE 28.**
AN ILLUSTRATION OF THE COMPONENTS AND ELEMENTS WITHIN THE GRAPHIC COMMUNICATION INDUSTRY
Figure 29 represents a higher level of specificity than given in Figure 28. It graphically illustrates the proposed application of the graphic communication process within the print media category of the graphic communication industry.

Finally in Figure 30, the relationship between the components of the graphic communication process and the graphic communication industry (print media) are detailed at the first order or level of specificity. The major change between this model and the last is in the message component area. In the present model a division is shown between message production (creation) and reproduction (single or multiple copies of the original). The body of knowledge necessary for message production is derived from graphic communication study, and the body of knowledge necessary for reproduction is derived from the industrial practices of the graphic communication industry.

The next chapter presents the subject matter content and structure for the graphic communication technology body of knowledge.
FIGURE 29.

The application of the graphic communication process to the print media category of the graphic communication industry.
FIGURE 30.
FIRST LEVEL EXPANSION OF THE GRAPHIC COMMUNICATION INDUSTRY COMPONENTS
CHAPTER IV

DEVELOPMENT OF THE RATIONALE AND STRUCTURE
FOR GRAPHIC COMMUNICATION TECHNOLOGY

The purpose of this chapter was to establish the rationale and
structure for the body of knowledge to be contained (conceptualized,
categorized, and ordered) within graphic communication technology.
Previous chapters have isolated, interrelated and tentatively clas-
sified the major components and other supplementary information
that have been utilized by the study. The preliminary delineation
and structure for the graphic communication technology process,
industry, product classification, and major structural elements was
accomplished through an analysis and synthesis of: (1) industrial
practices, (2) communication theory and process, and (3) graphic
arts technical components.

The Structure for the Conceptual Components

As a result of the total research development, and assessment
effort, the model in Figure 31 has been derived. It represents a
structural model showing the subject matter content and organization
for the graphic communication technology discipline.
Industrial Technology

Manufacturing Technology
- Management Technology
- Production Technology
- Personnel Technology

Construction Technology

Human Communication Process
- Structural Elements
  - Source
  - Message
  - Channel
  - Receiver
  - Feedback
  - Interference

Graphic Communication Technology
- Structural Elements
  - Aesthetic Design
  - Codification
  - Perception
  - Symbology
  - Visual Ordering

Graphic Communication Technology Management
- Planning
- Organizing

Graphic Communication Technology Production
- Pre-Processing
- Processing

Graphic Communication Technology Personnel
- Hiring
- Training
- Working

Non-Graphic Communication Major Components

Graphic Communication Major Components

Input Data & Knowledge (Formal, Descriptive, Prescriptive, and Praxiological Domains)
FIGURE 31
THE PROPOSED STRUCTURAL MODEL AND SUBJECT MATTER CONTENT FOR GRAPHIC COMMUNICATION TECHNOLOGY
A brief overview of the entire model is now presented prior to the in-depth discussion of its specific parts. The two major inputs of graphic communication technology may be classified as: (1) the communication practices in general, with their graphic communication components in particular, and (2) the industrial technology practices. It should be noted that both sets of inputs (bodies of information and data) emphasize the praxiological domain of knowledge along with appropriate inclusions and integrations from the formal, descriptive, and prescriptive domains. (See supra, pp. 39-40)

The body of knowledge composing the structural elements of the communication process (source, message, etc.) and the major components of graphic communication (aesthetic design, codification, etc.) are linked with the structural elements of manufacturing technology. Through their interface the structural elements of a graphic communication technology are formed.

When operationalized, the practices of graphic communication technology—management, production, and personnel initiate the graphic communication technology process components to produce the output.

The final output is the produced material good in the form of a
reproduced graphic communication product. To facilitate ordering and specification, the graphic communication technology process components have been structured into the five concepts of: (1) administration, (2) creation, (3) generation, (4) reproduction, and (5) distribution. Before turning to a discussion of these concepts, the proposed structure for graphic communication technology will be explained by detailing its three structural elements.

The Development of the Taxonometric Subject Matter Outlines

As discussed in Chapters II and III, three categories of industrial practices were proposed by the IACP. The practices were derived through a systematic analysis of the practices common to all material production industries within the economic institution (see supra, pp. 41-42). These common practices were utilized to form the structural elements of "industrial technology." They were generalized to the two major industrial categories of construction and manufacture and henceforth their bodies of knowledge, titled "construction technology" and "manufacturing technology."

Furthermore, the structural elements in construction and manufacturing technology are organized in a manner which is identical
is that of the overall structure for industrial technology (see supra, p. 43). Logically then, since the graphic communication industry and its body of knowledge, graphic communication technology, is a subcategory of manufacturing technology, it, therefore, has an almost identical structure. However, as higher levels of specification are derived, slight differences become evident.

Manufacturing technology includes a much broader range of processes, materials, and products, than does graphic communication technology. This is particularly true when considering that the graphic communication industry has been limited to the print media (printing and publishing) institutions in this study. With this delimitation, an adaptation of the practices within management, production, and personnel was performed. This was accomplished by examining each of the original IACP industrial practices individually in relationship to any possible application they might have to the process of producing a print media product.

The methods of task and functional analysis were also employed, and as a result of these analytical procedures, the following outlines have been derived and adapted for graphic communication technology.
Graphic Communication Technology Management

1. Planning

1.1 Formulating project and product
   1.1.1 Determining overall goals
   1.1.2 Establishing specific objectives
   1.1.3 Setting rules and policies
   1.1.4 Forecasting and extrapolating
   1.1.5 Programming

1.2 Researching Data
   1.2.1 Retrieving data
   1.2.2 Describing data
   1.2.3 Analyzing data
   1.2.4 Synthesizing data
   1.2.5 Manipulating data

1.3 Designing product
   1.3.1 Determining functions
   1.3.2 Preparing performance specifications
   1.3.3 Postulating solutions
   1.3.4 Developing rough layouts
   1.3.5 Postulating alternate solutions
   1.3.6 Developing finished layouts
   1.3.7 Selecting solution
   1.3.8 Communicating design solution
   1.3.9 Developing artwork and/or typographical mechanical

1.4 Designing project
   1.4.1 Detailing design communication
   1.4.2 Detailing specifications and standards
   1.4.3 Work design (methods, standards, processes)
   1.4.4 Estimating
   1.4.5 Scheduling

2. Organizing

2.1 Structuring
   2.1.1 Analyzing work tasks
   2.1.2 Determining worker functions
   2.1.3 Establishing roles
   2.1.4 Settling work conditions
2.2 Supplying
   2.2.1 Requisitioning
   2.2.2 Procuring and subcontracting
   2.2.3 Routing and scheduling
   2.2.4 Storing

3. Controlling

3.1 Directing
   3.1.1 Supervising
   3.1.2 Coordinating
   3.1.3 Authorizing

3.2 Monitoring
   3.2.1 Inspecting
   3.2.2 Inventorying
   3.2.3 Timekeeping

3.3 Reporting
   3.3.1 Compiling
   3.3.2 Appraising
   3.3.3 Notifying
   3.3.4 Storing and retrieving

3.4 Correcting
   3.4.1 Adjusting
   3.4.2 Expediting
   3.4.3 Restraining
   3.4.4 Replanning
   3.4.5 Redirecting
   3.4.6 Reorganizing
   3.4.7 Retraining
   3.4.8 Recycling and reevaluating

Graphic Communication Technology Production Practices

1. Pre-processing

1.1 Receiving

1.2 Unpacking
1.3 Handling
   1.3.1 Pumping and compressing
   1.3.2 Elevating
   1.3.3 Carrying
   1.3.4 Filling
   1.3.5 Attaching
   1.3.6 Operating
   1.3.7 Skidding

1.4 Storing
   1.4.1 Storing of materials
   1.4.2 Storing of information
      1.4.2.1 Photo-recording
      1.4.2.2 Microfilming
      1.4.2.3 Videotaping
      1.4.2.4 Computerizing

1.5 Protecting

2. Processing

2.1 Separating
   2.1.1 Classifying
      2.1.1.1 Screening
      2.1.1.2 Floating
      2.1.1.3 Filtering
      2.1.1.4 Distilling
      2.1.1.5 Evaporating
      2.1.1.6 Drying
      2.1.1.7 Adsorbing
      2.1.1.8 Absorbing
      2.1.1.9 Crushing
      2.1.1.10 Milling
      2.1.1.11 Stripping
      2.1.1.12 Electrostatic separating
   2.1.2 Material removing
      2.1.2.1 Turning
      2.1.2.2 Shaping
      2.1.2.3 Boring
      2.1.2.4 Abrading
      2.1.2.5 Slotting
      2.1.2.6 Shearing
      2.1.2.7 Etching
      2.1.2.8 Engraving
2.2 Combining
   2.2.1 Mixing
      2.2.1.1 Beating
      2.2.1.2 Blending
      2.2.1.3 Kneading
      2.2.1.4 Impregnating
   2.2.2 Coating
      2.2.2.1 Spraying
      2.2.2.2 Brushing
      2.2.2.3 Rolling
      2.2.2.4 Dipping
      2.2.2.5 Non-impact printing
      2.2.2.6 Impact printing
      2.2.2.7 Dyeing
      2.2.2.8 Calendaring
      2.2.2.9 Electroplating
      2.2.2.10 Oxide coating
      2.2.2.11 Spreading
      2.2.2.12 Laminating
   2.2.3 Assembling
      2.2.3.1 Gathering
      2.2.3.2 Positioning
      2.2.3.3 Collating
      2.2.3.4 Binding
      2.2.3.5 Typesetting

2.3 Forming
   2.3.1 Working
      2.3.1.1 Rolling
      2.3.1.2 Pressing
      2.3.1.3 Stamping and embossing
      2.3.1.4 Folding-creasing-bending
      2.3.1.5 Molding
      2.3.1.6 Hammering
   2.3.2 Thermal conducting
      2.3.2.1 Curing
      2.3.2.2 Casting
      2.3.2.3 Melting
   2.3.3 Combining
   2.3.4 Winding
   2.3.5 Knitting
   2.3.6 Displacing
2.3.7 Photographing
  2.3.7.1 Framing
  2.3.7.2 Exposing
  2.3.7.3 Developing and fixing
  2.3.7.4 Contacting
  2.3.7.5 Projecting
  2.3.7.6 Retouching
  2.3.7.7 Color correcting
  2.3.7.8 Bleeding
  2.3.7.9 Solarizing and posturizing
  2.3.7.10 Vignetting
  2.3.7.11 Reversing
  2.3.7.12 Cropping
  2.3.7.13 Registering
  2.3.7.14 Collaging
  2.3.7.15 Reducing
  2.3.7.16 Intensifying
  2.3.7.17 Machine processing
  2.3.7.18 Stabilizing
  2.3.7.19 Screening
  2.3.7.20 Special effect processing

2.3.8 Illustrating
  2.3.8.1 Sketching
  2.3.8.2 Mechanical drawing
  2.3.8.3 Rendering
  Others

3. Post-Processing

  3.1 Altering

  3.2 Installing

  3.3 Maintaining

  3.4 Repairing

  3.5 Storing/Retrieving (see 1.4.2)

  3.6 Packaging, Labeling, and Shipping
Graphic Communication Technology Personnel

1. Hiring

1.1 Recruiting
   1.1.1 Advertising vacancies
   1.1.2 Communicating information

1.2 Selecting
   1.2.1 Interviewing
   1.2.2 Testing and evaluating
   1.2.3 Making decisions
   1.2.4 Reporting results

1.3 Inducting
   1.3.1 Appointing
   1.3.2 Contracting
   1.3.3 Recording personnel information
   1.3.4 Orienting employees

2. Training

2.1 On-the-job training
   2.1.1 Apprenticing
   2.1.2 Interning
   2.1.3 Coaching

2.2 Other training
   2.2.1 Training through in-shop classes, seminars, workshops
   2.2.2 Training through outside classes
   2.2.3 Providing self-instructing materials

3. Working

3.1 Providing economic rewards
   3.1.1 Paying wages and salaries
   3.1.2 Providing fringe benefits

3.2 Providing physical setting
   3.2.1 Controlling environmental conditions (light, heat, etc.)
   3.2.2 Meeting physical and mental needs
   3.2.3 Protecting
3.3 Providing social environment
   3.3.1 Providing recreational and social activities
   3.3.2 Providing communication channels
   3.3.3 Disciplining
   3.3.4 Honoring performances

4. Advancing

4.1 Promoting
   4.1.1 Moving upwards

4.2 Demoting
   4.2.1 Moving downwards

4.3 Discharging
   4.3.1 Separating
   4.3.2 Relocating
   4.3.3 Laying off

5. Retiring

5.1 Counseling
   5.1.1 Planning retirement
   5.1.2 Serving after retirement

5.2 Pre-retirement job engineering
   5.2.1 Changing worker function

5.3 Recognizing service
   5.3.1 Recognizing and publicizing service
   5.3.2 Presenting mementos

5.4 Awarding retirement benefits
   5.4.1 Making payments
   5.4.2 Providing fringe benefits
The Development of the Conceptual Process Components

With the establishment of the structural elements for graphic communication technology, the next task performed was that of their application to the operational process. As stated before, the operational process has been conceptualized to ensure maximum generalization to many differing situations and products. The model in Figure 32 illustrates a general level of relationship between the structural elements and the major process components in an operational setting. The five major concepts have had the suffix "ing" added to them to denote "action or doing." A general explanation of the five major processes is as follows:
when operationalized yield:

Process Planning with Implications for Preliminary Product Planning

Product Planning with Implications for Processing

Production and Product Implementation

through the processes of:

ADMINISTRATING — CREATING — GENERATING — REPRODUCING — DISTRIBUTING

Graphic Communication Manufactured Economic Good

FIGURE 32.

THE RELATIONSHIP BETWEEN THE PRACTICES AND PROCESSES OF GRAPHIC COMMUNICATION TECHNOLOGY.

Administrating is the beginning stage wherein the project is planned along with implications for product planning. The output of administrating is input into every succeeding stage. In the creating stage, only the product is planned and designed. A finished layout
with complete specifications is the resultant output of creating and this then is input into the generating stage. In the generating stage the product's elements are generated, assembled, and pasted-up to form the "artwork/typographical mechanical." The mechanical is then input into the reproducing stage for conversion into an image carrier. An exception to this flow pattern may take place at this point. In particular cases such as in letterpress printing, where only type matter (letter composition) is reproduced, the specifications from "creation" are input into "generation" and the type is set. It is then sent directly to "reproduction" where the type is locked-up into an imposition form and printed. In this case, several steps of the generating process are bypassed and the "conversion to an image carrier intermediate" (plate preparation in the reproducing stage) is omitted. Generally though, in the reproducing stage the image carrier is formed, the image is transferred (printed), and the final finishing processes are applied to the product. The product (the output) then proceeds to distributing where it may be shipped immediately or stored for later retrieval and use. The dotted lines of the model indicate the operation of continuous feedback for control and correction of the production process.
Specification of the Graphic Communication Technology Processes

Now that the necessary preliminary background information has been presented, the graphic communication technology process components are expanded and detailed. To accomplish this task, the individual components have been ordered at a higher level of specification as represented graphically in Figure 33.

It is recognized that each individual unit within the model could be further specified and detailed. An example of a further specification of a unit has been provided in Chapter V through the generation of a sample course subject matter outline. For the purpose of this study, the level of specification within the present model has been accepted as being an adequate initial representation of the process employed in most graphic communication industries. Further specification to higher levels would narrow the structure and eliminate its universal application. Each of the model's five conceptual components are detailed below.

The concept of administration. Administering involves problem conceptualization, delineation, and specification wherein the wants and needs of the client are established, a systematic plan of problem solution is devised, and specifications are developed for both the product and its production. In addition to being a major conceptual
FIGURE 33.

THE CONCEPTS AND MAJOR PROCESSES
OF GRAPHIC COMMUNICATION TECHNOLOGY
component, administrating may also reoccur continuously throughout the entire operationalized process. It may have literally hundreds of macro- and micro- applications.

Dependent upon the complexity of the total production project, some or all of the following practices may be included (and recycled) within the administrating concept of the graphic communication technology process.

1. Formulating the project

1.1 Determining project objectives (multi-level)
   1.1.1 Stating goals
   1.1.2 Establishing project criteria
   1.1.3 Setting policies
   1.1.4 Evaluating
   1.1.5 Describing objectives

1.2 Collecting data
   1.2.1 Locating data
   1.2.2 Retrieving data
   1.2.3 Describing data

1.3 Analyzing data
   1.3.1 Performing functional analysis
   1.3.2 Performing task analysis
   1.3.3 Performing methods analysis
   1.3.4 Performing means analysis

1.4 Synthesizing data
   1.4.1 Evaluating data
   1.4.2 Forecasting
   1.4.3 Deriving preliminary strategy

2. Administering the project

2.1 Directing
   2.1.1 Coordinating
2.1.2 Assigning
2.1.3 Supervising
2.1.4 Inspecting

2.2 Authorizing
2.2.1 Allocating functions and tasks
2.2.2 Verifying
2.2.3 Certifying
2.2.4 Redefining

3. Programming the project

3.1 Evaluating
3.1.1 Analyzing data
3.1.2 Comparing
3.1.3 Contrasting
3.1.4 Correlating

3.2 Selecting
3.2.1 Examining
3.2.2 Eliminating
3.2.3 Adapting
3.2.4 Adopting

3.3 Presenting
3.3.1 Scheduling
3.3.2 Diagraming (functional relationship over time)

4. Financing the project

4.1 Appraising
4.1.1 Describing
4.1.2 Analyzing
4.1.3 Correlating
4.1.4 Reporting

4.2 Estimating probable cost
4.2.1 Pricing
4.2.2 Calculating
4.2.3 Projecting
4.2.4 Accounting
4.3 Funding
   4.3.1 Crediting
   4.3.2 Purchasing
   4.3.3 Selling
   4.3.4 Capitalizing

4.4 Documenting
   4.4.1 Contracting
   4.4.2 Legalizing
   4.4.3 Copyrighting

4.5 Budgeting
   4.5.1 Allocating
   4.5.2 Timing

The concept of creation. Creating is characterized by idea and design formation wherein the product design solution is created in a manner which fulfills the needs of both the client and the prospective consumer.

In order to create the product design solution three basic sets of information design questions must be answered. First, what necessary information and data describes the prospective consumer? Will the consumer's communication and perception skills allow him to interpret symbols, pictures, images, and to manipulate different levels of language? What is the consumer's attitude towards the content information contained in the product, in its implications and ramifications? What are the norms that shape the consumer's particular socio-economic, cultural-educational, professional, political, and environmental surround-
ings? Are there certain cultural assumptions, stigmas, stereotypes, biases, and beliefs that can be employed within the content and presentation of the product?

Second, what kinds of codes, structures, and treatments may be used for efficient and effective communication? Can efficiency and effectiveness be insured, assessed, and improved?

Third, what other constraints are imposed upon the product's development by such considerations as time, cost, availability of facilities, materials, expertise, and such limitations as production process and processing, etc.?

The body of knowledge composing the concept of creation can be selected (as discussed and detailed in earlier chapters) from the principles and practices of: (1) aesthetic design, (2) visual organization, (3) perception, (4) communication theory and process, (5) codification and symbology, and (6) linguistics and other related information.

Through a systematic approach to problem solving, the body of knowledge can be operationalized and applied to the designing of a product. For convenience, two major categories of practices are proposed: (1) information designing, and (2) engineering and detailing. Each of these categories may be further subdivided into the following practices:
1. Designing product information

1.1 Researching product design variables
   1.1.1 Gathering specific data pertinent to the product, client and consumer
   1.1.2 Analyzing data
   1.1.3 Synthesizing data
   1.1.4 Proposing major concepts

1.2 Evaluating concepts
   1.2.1 Evaluating total product
   1.2.2 Determining functional relationships
   1.2.3 Quantifying and qualifying

1.3 Postulating graphic solutions
   1.3.1 Scaling functional relationships
   1.3.2 Presenting graphic solutions
      1.3.2.1 Verbal analogue modeling
      1.3.2.2 Symbolic analogue modeling
      1.3.2.3 Diagramatic analogue modeling
      1.3.2.4 Simple sketching

1.4 Selecting a graphic solution
   1.4.1 Analyzing alternative solutions
   1.4.2 Appraising alternative solutions
   1.4.3 Evaluating alternative solutions

2. Engineering and detailing

2.1 Establishing sketches and specifications
   2.1.1 Experimenting
   2.1.2 Rough sketching
   2.1.3 Griding
   2.1.4 Copyfitting
   2.1.5 Selecting symbols, images, type styles, etc.

2.2 Establishing detail design criteria and standards
   2.2.1 Analyzing subprograms
   2.2.2 Estimating sizes and capacities
2.3 Detail designing
   2.3.1 Selecting components and elements
   2.3.2 Referencing, relating
   2.3.3 Preparing final layout
   2.3.4 Securing approval

2.4 Specifying
   2.4.1 Preparing outline specifications
   2.4.2 Drafting final specifications
      2.4.2.1 Product specifications
      2.4.2.2 Process specifications
      2.4.2.3 Securing approval

The concept of generation. Generating entails the translation of the product design solution and its specifications (as derived through creating) into the finished product prototype. The subprocess within generation may consist of only the generation of graphic elements, or as in a majority of cases also include assembly and paste-up.

Three subdivisions compose this major concept area, including (1) generating alpha-numeric characters in the form of textual, display, or tabular compositions, (2) generating pictorial illustrations and images by the use of various artwork techniques and photography, and (3) the assembly of the alpha-numeric compositions and the pictorial illustrations and images to form the artwork/typographical mechanical.

As noted previously (see supra, p. 198), an exception to the
statements above could exist in relationship to lead type composition. The lines of lead type would be generated and proofed in the process of generation, but assembled into an imposition lock-up during the image carrier formation subprocess of reproduction. Also, dependent upon the complexity of the product design solution, the available facilities, and the intended means of reproduction, a tailored selection of specific practices and processes would be made from each of the three areas.

The practices represented within the concept of generation are selected from the pre-processing, processing, and post-processing practices of the graphic communication technology structural elements. A similar selection would also be made for the practices within the concepts of reproduction and distribution. In fact, any subprocess may be defined or detailed by selecting the appropriate practices from the overall taxonometric listing. The following general listing of practices could apply to generating characters and images.

1. Initiating the process
   1.1 Interpreting specifications
      1.1.1 Reading
      1.1.2 Contrasting and comparing
      1.1.3 Measuring
      1.1.4 Calculating
      1.1.5 Marking
      1.1.6 Noting
      1.1.7 Understanding
1.2 Preparing materials
   1.2.1 Separating
   1.2.2 Combining
   1.2.3 Forming

1.3 Preparing equipment
   1.3.1 Selecting
   1.3.2 Supplying
   1.3.3 Computing and calibrating
   1.3.4 Adjusting

1.4 Operating equipment
   1.4.1 Working
   1.4.2 Producing

1.5 Checking and testing
   1.5.1 Proofing and correcting
   1.5.2 Comparing against specifications
   1.5.3 Accepting or rejecting

2. Completing the process

   2.1 Evaluating

   2.2 Securing approval

The processes presently employed within the graphic communication industry to generate alpha-numeric characters have been classified into three categories. These categories may be used separately or in combination.

Character Generation Processes

1. Hot typesetting systems

   1.1 Hand composition
1.1.1 Single character assembly - moveable metal, wood, etc.
1.1.2 Line assembly (slug) - Ludlow system

1.2 Machine composition
1.2.1 Single character assembly - Monotype system (tape, computer, teletype)
1.2.2 Line assembly (slug) Linotype and Intertype systems (tape, computer, teletype)

2. Cold typesetting systems

2.1 Hand composition
2.1.1 Hand calligraphy
2.1.2 Hand mechanical (lettering templates and devices)
2.1.3 Dry transfer (pre-printed transfer type)
2.1.4 Strike-on machine setters (IBM, Varityper systems)
2.1.5 Photographic (hand operated single character photosetters e.g. Headliner, Strip printer systems)

3. Machine photocompositions

3.1 Page and display setters (e.g. Fototronic, Linofilm AFT phototypesetter systems)
3.2 Facsimile systems
3.3 RCA Cathode Ray Generation
3.4 LDX Long Distance Transmission
3.5 OCR - Optical Character Recognition
3.6 Computer CRT systems
3.7 Teletypesetter
4. Conversion Systems (also see image carrier formation)

4.1 Brightype
4.2 Converkal
4.3 Cronopress
4.4 Instant negative
4.5 Scotchprint
4.6 Vertaflex

The current processes by which pictorial images and illustrations are generated may be classified into the categories of: (1) artwork techniques, e.g., drawings, rendering, painting, and special effects, and (2) photographic techniques and special effects. As with character generation, these processes may be employed separately or in combinations.

**Pictoral Illustration and Image Generation**

1. Artwork techniques
   1.1 Continuous line drawings
   1.2 Contour line drawings
   1.3 Pantagraphing
   1.4 Chinese brush drawing and rendering
   1.5 Dry brush drawing and rendering
1.6 Wash rendering and shading

1.7 Pencil, chalk, charcoal, pastel, etc., drawing and rendering

1.8 Tempera and oil painting

1.9 Pen and ink drawing and rendering

1.10 Ink and brush -- wash shading

1.11 Felt tip pen and crayon rendering and drawing

1.12 Scratch board

1.13 Air brush rendering

1.14 Screening and shading (tinting and texture screens)

1.15 Bendaying

1.16 Repro proofing (wood engraving, lithographs, etching)

1.17 Commercially pre-printed clip materials

1.18 Silhouetting

1.19 Color key composing (major application for color proofing)

1.20 . . .

2. Photographic techniques

2.1 Velox printing

2.2 Halftone printing

2.3 Texture screening

2.4 Surprinting

2.5 Overprinting and superimposing
2.6 Reverse printing
2.7 Overlaying
2.8 Solorizing
2.9 Vignetting
2.10 Posterizing
2.11 Collaging
2.12...

The processes presently employed to assemble graphic elements onto a finished layout or artwork-typographical mechanical are compiled below. Not all processes are always used on a particular product; therefore, appropriate selections would be made.

Assembly of Graphic Elements

1. Signaturing
2. Scaling and griding
   2.1 Creating band grids
   2.2 Creating axial grids
   2.3 Creating grouping grids
   2.4 Creating path grids
3. Dividing, categorizing and structuring inner space
   3.1 Developing solid arrangements
3.2 Developing vertical 2/2 arrangements
3.3 Developing horizontal 2/2 arrangements
3.4 Developing vertical with horizontal 2/2
3.5 Developing vertical 3/3 arrangements
3.6 Developing vertical with horizontal 3/3
3.7 Developing other arrangements

4. Positioning elements
   4.1 Registering
   4.2 Balancing
   4.3 Bleeding
   4.4 Cropping
   4.5 Overprinting or overlaying
   4.6 Surprinting or reversing
   4.7 Other

5. Trimming and cleaning

6. Mounting and pasting up
   6.1 Rubber cementing
   6.2 Waxing
   6.3 Dry mounting
   6.4 Laminating
   6.5 Spraying adhesives
6.6 Taping (single and double coated)

7. Dimensioning and noting

8. Referencing and titling

9. Preserving

10. Evaluating and proof checking

The concept of reproduction. Reproducing is the method/means by which multiple copies are formed from the original design solution prototype (e.g., mechanical). The processing begins with the conversion of the mechanical to produce the image carrier intermediate (e.g., negatives, positives, facsimile stencils, etc.). The intermediate is then used to produce the image carrier (printing plate). The image carrier is employed in an impact or non-impact coating process (printing) to transfer the graphic configuration to the intended product (printing stock). Finally, the intended product receives an application of appropriate finishing processes and is completed in the form of a print media product (graphic communication product).

A majority of the practices of graphic communication technology management, production, and personnel are employed within the operationalized process. At a general level, an overview of the entire reproduction process structure should include the following minimum of components.
1. Production programming

1.1 Scheduling
   1.1.1 Grouping
   1.1.2 Allocating time

1.2 Routing
   1.2.1 Establishing departure and arrival times
   1.2.2 Establishing path to be followed

1.3 Procuring
   1.3.1 Subcontracting
   1.3.2 Employing
   1.3.3 Purchasing and Supplying
   1.3.4 Leasing
   1.3.5 Obtaining licenses, permits, copyrights, etc.

2. Production supervising

2.1 Directing
   2.1.1 Coordinating
   2.1.2 Assigning
   2.1.3 Administering
   2.1.4 Inspecting

2.2 Authorizing
   2.2.1 Verifying
   2.2.2 Certifying
   2.2.3 Approving
   2.2.4 Disapproving
   2.2.5 Redefining

3. Production implementing

3.1 Converting mechanical to image carrier intermediate
   3.1.1 Line photographing
   3.1.2 Halftone photographing
   3.1.3 Special effects photographing
   3.1.4 Facsimile scanning
   3.1.5 Mechanize and processing
3.2 Forming the image carrier
   3.2.1 Assemblying (negatives, positives, facsimile stencils, etc.)
   3.2.2 Forming mechanically (as in locking-up an imposition form of lead type and engraved illustrations)
   3.2.3 Forming photographically
   3.2.4 Forming photo-mechanically
   3.2.5 Forming by engraving (including scan engraving)
   3.2.6 Forming by combinations of above

3.3 Transfering image to product surface through coating action by:
   3.3.1 Impact printing
   3.3.2 Non-impact printing

3.4 Applying finishing process to product
   3.4.1 Gathering and collating
   3.4.2 Folding
   3.4.3 Binding
   3.4.4 Trimming
   3.4.5 Applying special finishes

3.5 Packaging
   3.5.1 Protecting and preserving
   3.5.2 Labeling and coding
   3.5.3 Inventorying

The following outlines are presented to illustrate the commonly used subprocesses which may be categorized under the concept of reproduction. These compilations are general in nature in order to relate to all graphic communication industries (print media industries).

Image Carrier Intermediate Conversion Processes

1. Categorization by type of formative process
1.1 Photographic conversion of image by use of film or paper negative or positive
   1.1.1 Line photography of image
   1.1.2 Halftone photography of image

1.2 Imposition and lock-up conversion of image (e.g., metal, rubber, wood etc. type.) (Type forms image carrier itself)

1.3 Image conversion by engraving (hand or machine)

1.4 Image conversion by etching (hand scribing or photetching)

1.5 Image conversion by molding (e.g., stereotype)

1.6 Image conversion by electroplating (e.g., electrotypes)

1.7 Image conversion by electronic scanning (e.g., facsimile engraving)

1.8 Image conversion by electrostatics (e.g., electrofax)

1.9 Image conversion by heat transfer (e.g. thermofax)

1.10 Image conversion by photopolymers

1.11 Image conversion by other commercial processes;
   1.11.1 Brighttype
   1.11.2 Converkral
   1.11.3 Cronapress
   1.11.4 Instant Negative
   1.11.5 Scotchprint
   1.11.6 Vertaflex

2. Classification by application and use

2.1 Relief transfer image carriers
   2.1.1 Lead type imposition and lock-up
   2.1.2 Etched and engraved plates
   2.1.3 Facsimile plates
   2.1.4 Stereotypes and electrotype plates
2.2 Intaglio transfer image carriers
   2.2.1 Copperplate and steelplate engraving
   2.2.2 Dry-point plates
   2.2.3 Mezzotint and aquatint plates
   2.2.4 Photogravure
   2.2.5 Rotogravure

2.3 Screen process transfer
   2.3.1 Silhouette and die cut stencils
   2.3.2 Hand cut film stencils
   2.3.3 Liquid tusche stencils
   2.3.4 Photographically formed stencils and screens
       (direct and indirect)

2.4 Planographic transfer image carriers
   2.4.1 Direct image plates (i.e., grease-tusche application by hand
drawing, typing, etc.)
   2.4.2 Camera direct plates
   2.4.3 Photographically formed plates (normal and
       etched)
   2.4.4 Collotype plates (photo sensitive gelatin)

Image Transfer Processes

1. Image transfer by impact printing

   1.1 Relief transfer
      1.1.1 Letterpress (platen, cylinder rotary)
      1.1.2 Letterset
      1.1.3 Flexography

   1.2 Intaglio transfer
      1.2.1 Steel-die engraving
      1.2.2 Banknote printing
      1.2.3 Sheet fed gravure
      1.2.4 Rotogravure
1.3 Planographic transfer
   1.3.1 Lithography
   1.3.2 Offset lithography
   1.3.3 Collotype
   1.3.4 Letterset

1.4 Screen process transfer
   1.4.1 Hand operation
   1.4.2 Mechanical operation

1.5 Office duplication transfer
   1.5.1 Spirit
   1.5.2 Mimeographic
   1.5.3 Gelatin

2. Image Transfer by Non-impact Printing

2.1 Electrostatic transfer
   2.1.1 Xerography
   2.1.2 Electrofax

2.2 Light absorbency transfer
   2.2.1 Diazo
   2.2.2 Silver image transfer
   2.2.3 Verifax
   2.2.4 Stabilization (wet and dry processes)

2.3 Heat absorbency transfer
   2.3.1 Copymite
   2.3.2 Ektafax
   2.3.3 Thermographic
   2.3.4 Dual spectrum (3M dry photo copier)

2.4 Photographic transfer
   2.4.1 Photostating
   2.4.2 Contact printing
   2.4.3 Projection printing
Assembling and Finishing Processes

1. Collating
   1.1 Gathering signatures
   1.2 Inserting signatures
   1.3 Inspecting

2. Folding (e.g. 2, 4, 6, 8, 16, 32 page signature)
   2.1 Parallel folding
   2.2 Angle folding, right
   2.3 Accordian folding
   2.4 Combination of above

3. Binding
   3.1 Edition binding
      3.1.1 Soft sewn binding
      3.1.2 Case bound binding
   3.2 Perfect binding
   3.3 Mechanical binding - permanent
      3.3.1 Side stitching
      3.3.2 Saddle stitching
      3.3.3 Plastic binding (comb)
      3.3.4 Spiral wise binding
      3.3.5 Concentric wire binding
   3.4 Mechanical binding - non-permanent
      3.4.1 Padding
      3.4.2 Loose leaf binding
      3.4.3 Technical report binding
      3.4.4 Screw post binding
3.4.5 Simple staple binding
3.4.6 "K" nail binding
3.4.7 Friction binding
3.4.8 Base and prong binding

3.5 Sizing and pre-assembly process
3.5.1 Scoring and creasing
3.5.2 Drilling and slotting (punching)
3.5.3 Cutting and trimming
3.5.4 Nicking and rounding
3.5.5 Perforating and slitting
3.5.6 . . .

3.6 Special finishing processes
3.6.1 Die cutting
3.6.2 Easeling
3.6.3 Embossing and hot stamping
3.6.4 Gumming
3.6.5 Indexing
3.6.6 Pebbling and texturizing
3.6.7 Overlaying laminates
3.6.8 Gold leafing
3.6.9 Deckling
3.6.10 Mounting

3.7 Packaging
3.7.1 Wrapping
3.7.2 Labeling

The concept of distribution. Distributing is the final subprocess within the overall graphic communication process. In this stage the graphic communication product is received from reproduction and acted upon in any of three ways. First, the product may be immediately inventoried (including billing and sales processing), packaged-addressed-labeled, and distributed by shipping to the consumer. Second, the
product may be protectively wrapped, coded-indexed-labeled, and stored for distribution and shipping in the future. Finally, a copy of the product may be permanently stored as part of the records of the industry's documentation and filing system for later referral, reprocessing, security, or for a variety of other reasons.

Some readers may not agree with the placement of the "storage and retrieval system" within the distribution stage, but the reason for its placement within the distribution concept of this study is three-fold in nature. First, the process of storage and retrieval is composed of the production practices of pre-processing, processing, and post-processing, and is of sufficient range and scope to be considered independently of other production processes.

Second, the process of storage and retrieval is in essence a highly sophisticated form of distribution, wherein parts or portions of the whole product are processed, mounted, preserved, coded and indexed, filed and so on. Furthermore, just the practice of filing and storing itself can be considered to be a form of distribution processing. Also, a search, compilation, and selection of appropriate data is processed when the retrieval command is initiated. In actuality, the processes employed in retrieval are nothing more than an adaptation of or a reversal of the sequence employed in the storage
(distributing) of the original data processing.

Third, it would appear to be logical to locate the storage and retrieval processing within the last step of the flow pattern for the entire process sequence. It would not seem to be practical or possible to record, distribute, file, or retrieve data before it has been originally generated, assembled, or reproduced. This follows a similar logic pattern as that of one in which the image cannot be reproduced until it has been first generated (produced). To carry this a step further, it would seem quite difficult to generate before one has created, and this generally requires simultaneous planning and designing.

The following outline lists the major components to be contained within the concept of distribution. As with previous outlines, it has been specified at only a general level to insure generalization to the total graphic communication industry.

**Distributing Processes and Procedures**

1. Warehousing and storing
   1.1 Receiving
   1.2 Inventorying and recording
   1.3 Packaging and labeling (for storage not shipping)
   1.4 Indexing and coding
1.5 Moving, stacking, etc.

1.6 Storing

1.7 Protecting

1.8 Retrieving (common with 2.1 below)

1.9 Preparing for shipping (common with 2.2 below)

2. Shipping and Distributing

2.1 Retrieving or receiving

2.2 Preparing for shipping (handling techniques for bound and unbound materials)

2.3 Wrapping, boxing, and special containers

2.4 Labeling and addressing

2.5 Billing and sales processing

2.6 Documenting and noting

2.7 Inventorying remaining stock and reporting

2.8 Moving, loading, shipping

3. Storehousing - (storing and retrieving systems)

3.1 Recording

3.1.1 Processing

3.1.1.1 Photographing and photostating (enlargement and reduction)

3.1.1.2 Electrostatting (enlargement and reduction)

3.1.1.3 Microfilming (16 mm, 35 mm, 70 mm, 105 mm)

3.1.1.4 Microfiching

3.1.1.5 Video recording (limited application)

3.1.1.6 Optical scanning and computer CRT recording
3.1.1.7 Punching and embossing cards
3.1.2 Mounting (by use of image carriers)
   3.1.2.1 Aperature cards
   3.1.2.2 Cartridges (rolls)
   3.1.2.3 Strip holders
   3.1.2.4 Microfiche cards
   3.1.2.5 Microtapes (video and magnetic)
   3.1.2.6 Key sort cards
   3.1.2.7 Punched cards
   3.1.2.8 Embossed plates
   3.1.2.9 Magnetically printed image cards
3.1.3 Duplicating (sets for protection form loss, fire, damage)

3.2 Storing
3.2.1 Filing - (sequential or random)
3.2.2 Indexing (through the simple hand techniques of organization by:)
   3.2.2.1 Subject matter systems
   3.2.2.2 Alphabetical systems
   3.2.2.3 Chronological systems
   3.2.2.4 Numerical systems
   3.2.2.5 Color coding systems
   3.2.2.6 Dewey decimal systems
   3.2.2.7 Library of congress systems
   3.2.2.8 Multiple cross filing systems
   3.2.2.9 Other

3.2.3 Indexing (through machine process)
   3.2.3.1 Mechanical device systems
   3.2.3.2 Micro-code systems
   3.2.3.3 Filesearch systems
   3.2.3.4 Minicard systems
   3.2.3.5 Keysort systems
   3.2.3.6 Magnetic coding systems
   3.2.3.7 Video storage systems
   3.2.3.8 Flash card systems
   3.2.3.9 Numeric systems
   3.2.3.10 Indexer line systems
   3.2.3.11 Image control systems
   3.2.3.12 Descriptor systems
   3.2.3.13 Microstrip systems
3.2.3.14 Computer disc memory band systems
3.2.3.15 Magnetic tape for computer systems

3.3 Retrieving

3.3.1 Locating (by use of filing system)
  3.3.1.1 File cabinets systems
  3.3.1.2 Semi-automated keysort systems
  3.3.1.3 Library retrieval systems
  3.3.1.4 Magnetic edge locators
  3.3.1.5 Color locators
  3.3.1.6 Multiple access with logic program computer systems
  3.3.1.7 Punch card systems
  3.3.1.8 Punched tape systems
  3.3.1.9 Magnetic tape systems
  3.3.1.10 Video tape systems
  3.3.1.11...

3.3.2 Viewing
  3.3.2.1 Microfilm and microfiche projectors
  3.3.2.2 Roll film projectors
  3.3.2.3 Punched tape and card translator/printers
  3.3.2.4 Video receivers
  3.3.2.5 Computer translator/printers
  3.3.2.6 Computer CRT display systems (cathode ray tube)

3.3.3 Procuring printouts (hard print and rapid reproduction)
  3.3.3.1 CRT printer systems
  3.3.3.2 Photocopier systems
  3.3.3.3 Xerographers
  3.3.3.4 Direct plate photo offset

Summary and Implications

As a part of the developmental activity of this chapter, a rationale and structure for the body of knowledge to be contained in
the subject matter of graphic communication technology has been proposed. This has been accomplished by placing primary emphasis on categorizing and ordering the information and data descriptive of the graphic communication industry.

The structured body of knowledge was classified into the major graphic communication technology practices of management, production, and personnel. These practices were then operationalized and their interactions used to derive the subject matter components of the graphic communication technology process. The process components were conceptualized and ordered to form the major process concepts of administration, creation, generation, reproduction, and distribution. It was proposed that a study of graphic communication technology would entail an investigation of these major concepts and their corresponding practices and processes as applied by humans through materials to produce graphic communication products.

A selective study of portions of the structured body of knowledge should be appropriate at various program levels and for numerous purposes. It may be possible to select and structure specific components of graphic communication technology for either general education or technical - vocational training. Furthermore, it should be possible to develop a sequence of study applicable from elementary school through the technical institute or college level program. In a particu-
lar case such as in industrial arts education in the secondary school, a general overview of the entire body of knowledge may be desired. In another application, a particular component may be identified and detailed for indepth training as part of one's vocational training in a post high school technical institute. As an example, the concept of "generation" may be delimited to the generation of alpha-numeric characters by hot typesetting machine systems. By providing students with highly specialized training in this single area, they could be trained for a position as a Linotype, Intertype operator.

In the next chapter, an instructional systems approach has been used as a referent to develop an instructional program by which graphic communication technology can be adapted to industrial arts education. This has been accomplished at the college level of instruction through an industrial arts education subprogram titled "Graphic Communication Technology Education."
CHAPTER V

THE ADAPTATION OF THE RATIONALE AND STRUCTURE FOR GRAPHIC COMMUNICATION TECHNOLOGY TO THE GRAPHIC COMMUNICATION TECHNOLOGY EDUCATION PROGRAM AREA OF INDUSTRIAL ARTS EDUCATION

This chapter was concerned with the development and presentation of a solution to the second problem undertaken in the study. This problem involved the adaptation of the structured body of knowledge for graphic communication technology to the industrial arts education program (see supra., pp. 6 and 7). The purpose of the adaptation was to provide an example of one possible organization and application for the subject matter contained in the proposed rationale and structure. Of major importance to the adaptation was the development of an educational program that would be appropriate for inclusion at the college level of instruction and capable of implementation into the existing college programs and facilities.

The proposed graphic communication technology education program was developed by the use of an instructional systems approach. Three stages were involved in the adaptation -- development process. The first stage entailed the derivation systematic planning criteria to
guide the development of the instructional program. The writings of Briggs (1968), Brown (1969), Carpenter (1968), Kaufman and Corrigan (1967), Knirk and Childs (1968), Thorten (1968), Tucker (1967), and Towers, et al. (1966) provided the information and data for the development of the necessary criteria to establish the instructional system.

The second stage involved the development of the graphic communication technology education instructional program. This was accomplished by proposing three plans (levels) for the subject matter organization.

The use of three levels provided the opportunity of adapting the proposed instructional program to the overall industrial arts program through the choice of a three, five, or eight course sequence of study.

The structure of the three level program proposal was derived as a result of an examination of the course of study organization within the existing graphic communication programs of industrial arts education (as determined through the review of the literature contained in Chapter II). Also, the writer's professional experience in organizing and teaching graphic communication and industrial arts education was utilized for the purpose of making structuring decisions.
The third stage of adaptation involved the proposal of an exemplary course of study titled "Graphic Communication Typographical Design and Layout." This course was developed to further illustrate one of the many possible selections and organizations of subject matter for the graphic communication technology education program. The exemplary course of study included the following components: (1) course objectives, (2) subject matter outline, (3) course syllabus, (4) activity briefs, and (5) a list of selected references and sources for instructional materials.

Each of the three mentioned stages of the adaptation of graphic communication technology to graphic communication technology education are now detailed.

Derivation of the Graphic Communication Technology Education Instructional System Criteria

Prior to beginning the discussion of the derivation of the graphic communication technology education instructional system criteria, the writer's intention should be established. The purpose of this presentation was to relate to the reader the criteria within the systematic plan that was utilized to develop the instructional system. Therefore, a review of the literature concerning curriculum development, objective writing, and other educational planning and admin-
istrating processes is not presented. For such a review the reader is referred to the numerous writings of such educational theorists and practitioners as Alberty, Alexander, Combs, Frymier, Goodlad, VanTil, and Smith, Stanley, and Shores.

**The Instructional System Plan**

An extensive review of general systems theory, instructional systems theory, and curriculum development and evaluation theory was accomplished through graduate course work and independent studies (see supra., pp.17 and 18). As a result of the review an eight-step procedural plan was developed to guide the formation of the graphic communication technology education instructional program.

The format and content of the proposed plan represents a synthesis of the "instructional systems" literature listed previously on page 229, and is reported at a general level. Nevertheless, it is felt that the plan provides a logically structured sequence for the selection and organization of subject matter through learning experiences and activities.

The criteria presented in the eight step plan illustrates those areas which were of greatest concern to the development of the instructional program. It is also hoped that this plan will provide useful in-
formation for the development of other instructional programs. The criteria of the plan are not considered to be totally inclusive, nor have the procedural steps been fixed in a permanent order, for each specific situation of usage would demand adaptation and readjustment.

The eight step plan is as follows:

1. Formulate the program scope (range or extent), nature (character or quality), purpose and goals in relationship to such variables as the educational environment, the body of knowledge, and the intended audience. These tasks may be accomplished by the use of such techniques as: (1) functional analysis, (2) task analysis, (3) method-means analysis, (4) cost analysis, and (5) other techniques and devices. The reader is referred to the writings of Kaufman and Corrigan (1967), and Tucker (1967, pp. 6-17) for an excellent discussion of these techniques.

2. Clearly define the instructional objectives and goals in operational and measurable terms. Begin with the program objectives and work towards specific situation or application objectives.

2.1 Select and define the instructional objectives and goals in terms of the expected student behavioral outcomes.
2.2 Sequence the objectives so that prerequisite knowledges are acquired prior to more complex learning.

2.3 Identify the type of learning represented by each objective.

2.4 Determine the sequence of instructional events which is necessary to bring about the general conditions for the type of learning that is required for a specific objective.

2.5 Identify the nature of the stimuli for each instructional event in terms of intensity and duration.

2.6 Identify the optimum type of medium for presenting each stimulus.

2.7 Review the overall sequence of objectives to make media choices that permit the use of one media for a reasonable length of time before changing to another during the same instruction period.

2.8 Write specifications and instructions for the production of each medium.

3. Specify efficient activities and experiences which are necessary to obtain the program goals in relationship to the interactions of the available human, machine, and media capacities.
3.1 Select content or stimulus materials.

3.2 Organize the content.

3.3 Arrange the content in a detailed order and sequence for learning.

3.4 Select the modes of communication and presentation.

3.5 Produce, transform, and pattern the content into the selected modes of presentation.

3.6 Provide suitable forms of access to the instructional materials.

4. Determine the functions related to the economical and efficient achievement of the goals by the use of instruments alone (e.g., electrical and mechanical devices), non-technical materials alone (e.g., programmed texts, and manuals), human beings alone (e.g., teachers and students), and combinations of any or all three. Furthermore, distinguish those functions which are performed by (1) one student working alone, (2) several students and an instructor in a tutorial or dialogue situation, (3) small groups of students with or without an instructor, (4) large group instruction, and (5) other groupings and instructive formats.
5. Determine available teacher, paraprofessional, and technical assistance for the efficient placement and use of talent.

6. Determine student capability and capacity to insure optimum operational effectiveness of facilities and media.
   6.1 Test the effectiveness of the instructional materials.
   6.2 Design prototype and make presentations to learners.
   6.3 Regulate the interactions of students with the instructional materials and media.
   6.4 Measure and assess student reaction, performance, and learning activities.
   6.5 Evaluate the students' general achievement.
   6.6 Collect data to revise and improve instruction.

7. Survey the technical and non-technical resources, the physical and support services and facilities, and so on, to improve or expand and to meet the requirements of the system.

8. Recycle and utilize the generated feedback data to evaluate and revise subject matter selection and organization, objectives, activities and experiences, instructional materials and methods, measurement devices, and or any other necessary program components.
In order to both summarize and to show an application of the proposed instructional system plan, Figure 34 has been developed.

The Instructional System Model

The model in Figure 34 graphically portrays the proposed structure for the graphic communication technology education instructional program. A brief examination of the model indicates that three phases or types of activity are to be performed in the program. The first phase involves program development. The activities in this phase are primarily concerned with the selection and organization of subject matter, and the statement of overall program and terminal behavior objectives.

The second phase involves the formation and application of the instructional materials and methodology. In addition to the planning and development of all instructional methods and means, this phase also includes their implementation into a teaching-learning situation.

The third phase includes the assessment of both student performance and the instructional program. The activities involve the creation and administration of assessment devices to measure output performance. The results of an evaluation of the obtained data would then be recycled through the system to the appropriate area for adoption, adaptation, or rejection. Through this process of feedback, continuous
revision and readjustment take place.

FIGURE 34.
THE INSTRUCTIONAL SYSTEM FOR GRAPHIC COMMUNICATION TECHNOLOGY EDUCATION

With the establishment of the model and the criteria for the instructional system, the next stage of adaptation and development was undertaken. The second stage involved the development of the graphic communication technology education instructional program.
The Development of the Graphic Communication Technology Education Instructional Program

The review of the industrial arts education literature and the writer's past experience with various program organizations and structures indicated that a single or typical program structure was not common throughout the field. Therefore, the major concern of this instructional program development was that of formulating a program which would be appropriate for, and capable of implementation into the existing structure of the industrial arts programs. This would seem to imply that the framework and content of the proposed instructional program should be flexible in nature to allow many forms of adaptation. In accordance with these limitations the proposed instructional program for graphic communication technology education is now presented.

The discussion of the instructional program has been organized into three areas: (1) program objectives, (2) selection of subject matter, and (3) organization of subject matter into courses of study.

Program Objectives

The objectives for the proposed instructional program are those which have been derived in Chapter II of this study. The reader is referred to pages 110 through 113 for a review of these objectives.
The objectives were developed as a result of an examination of the goals and purpose of the presently existing graphic communication and industrial arts programs. The rationale behind their adoption was that: (1) they represent the philosophy and direction of emphasis within the field, which would facilitate adaptation of the proposed program; and (2) they establish the context, scope, nature, and responsibilities of the graphic communication technology education area of the industrial arts program.

The objectives were used as the guidelines, limits, and constraints by which to determine the approach to and the context of the subject matter to be contained in the instructional program. (In the third stage of the adaption, as part of the exemplary course of study, higher levels of objective specification have been derived through the development of terminal behavior objectives.)

Selection of Subject Matter

In Chapter IV the rationale and structure for the body of knowledge to be contained in the graphic communication technology category of manufacturing technology (a subcategory of industrial technology) was established and detailed. This was accomplished by first adapting the practices of industrial management technology, industrial produc-
tion technology, and industrial personnel technology to the graphic communication industry and its body of knowledge, i.e. graphic communication technology. Next, taxonomic subject matter classifications were derived and detailed. Finally, the graphic communication practices (derived from industrial practices and communication practices) were placed in an operational setting to derive the major processes of administration, creation, generation, reproduction, and distribution. These processes were structured, codified, and conceptualized to produce the major concepts of graphic communication technology.

It was proposed that a study of graphic communication technology would entail an in-depth examination of the major concepts of administering, creating, generating, reproducing, and distributing. Therefore, the source of subject matter for the study of graphic communication technology education is composed of the practices and processes within the major concepts.

The following outline is presented to review the major concepts of graphic communication technology and, henceforth, the subject matter content of the proposed instructional program.

1. Administering
   1.1 Formulating
   1.2 Administering
1.3 Programming

1.4 Specifying

2. Creating

2.1 Information designing

2.2 Postulating graphic solutions

2.3 Engineering and detailing

3. Generating

3.1 Generating alpha-numeric characters

3.2 Generating pictorial illustrations and images

3.3 Assemblying elements

3.4 Forming mechanicals or imposition layouts

4. Reproducing

4.1 Converting mechanicals to image carrier intermediates

4.2 Forming image carriers

4.3 Transferring the image

4.4 Applying assembly and finishing processes

5. Distributing

5.1 Warehousing and storing

5.2 Shipping and distributing

5.3 Storehousing (storage and retrieval)
To this stage of the instructional program development the program objectives have been established and the subject matter has been selected. The remaining task to complete the development involved the organization of the subject matter into courses of study. This is now presented.

Organization of Subject Matter

The subject matter of graphic communication technology education has been organized in a manner which produces three alternative programs. This provides for the implementation of the proposed program into many of the existing industrial arts program structures (as determined by the review of the literature and professional experience). A selection can be made of a three, five, or eight course sequence of study, depending upon the overall industrial arts program structure and organization.

Each of the three alternative instructional programs is presented by briefly outlining their course of study content and organization. The first program proposal consists of a three course sequence, wherein all three courses must be included to achieve total subject matter coverage. The second and their alternative proposals both have two optional courses which may or may not be elected for inclusion. The
instructional program proposals are as follows:

**Alternative One: A Three Course Sequence for Graphic Communication Technology Education**

1.1 Proposed Course Title: Graphic Communication Process and Product Development (3 quarter hours)

Course Content Description: Graphic Communication Process and Product Design is concerned with introducing the students to the administrating and creating concepts of graphic communication technology. The major emphasis should be placed on: (1) formulating, (2) administering, (3) programming, (4) specifying. Additional emphasis should be placed on: (1) information designing, (2) postulating graphic solutions, and (3) engineering and detailing the product.

Activities and experiences are to be selected and organized in a manner which produces a representative sampling of the major practices and processes within the project and product planning stages of the graphic communication industry. The subject matter and activities of the course provide prerequisite knowledges and skills for the second course in the sequence, i.e., Graphic Communication Production.
1.2 Proposed Course Title: Graphic Communication Production  
(3 quarter hours)  

Course Content Description: Graphic Communication Production is designed to acquaint the students with the generating concept of graphic communication technology. The major emphasis should be placed on: (1) generating alphanumeric characters, (2) generating pictorial illustrations and images, (3) assembling elements, and (4) forming mechanicals or imposition layouts. Activities and experiences are to be selected and organized to represent the major practices within prototype production (artwork/typographical mechanical) as employed by the graphic communication industry. Prerequisite knowledge and skills are acquired for the final course in the sequence, i.e., Graphic Communication Reproduction.

1.3 Proposed Course Title: Graphic Communication Reproduction  
(3 quarter hours)  

Course Content Description: Graphic Communication Reproduction orient the students to the reproducing and distributing concepts of graphic communication technology. The major emphasis should be placed on: (1) converting the mechanical to an image carrier intermediate,
(2) forming the image carrier, (3) transferring the image, and (4) applying assembly and finishing processes. Emphasis should also be placed on: (1) warehousing and storing, (2) shipping and distributing, and (3) storing.

Activities and experiences are to be selected and organized to represent the major practices and processes within project implementation and product reproduction and distribution as employed by the graphic communication industry. The course should also summarize and synthesize all previous knowledge and skills through a practical problem solving application.

Alternative Two: A Five Course Sequence for Graphic Communication Technology Education

2.1 Proposed Course Title: Introduction to Graphic Communication Technology (2-3 quarter hours, optional)

Course Content Description: Introduction to Graphic Communication Technology is an overview course, designed to acquaint the students with the five major concepts of graphic communication technology, as employed in the gra-
phic communication industry. In addition to overviewing the entire graphic communication technology discipline, it must also show its relationship to manufacturing technology, industrial technology, and all technology. The course is organized at an introductory and terminal level, and as such must emphasize those practices and processes which affect humans and materials in the formation of a graphic communication product.

Activities and experiences are to be selected and organized to be representative of those found in the industry at a general level.

The course is considered to be terminal for those industrial arts students who would not elect to pursue further study in the graphic communication technology education program. It would be considered introductory for those industrial arts students majoring in graphic communication technology.

2.2 Proposed Course Title: Graphic Communication Administration (3 quarter hours)

Course Content Description: Graphic Communication Administration would provide an indepth study of the processes and practices which are employed in the administering concept of graphic communication technology, i.e., formulating,
administering, programming, and specifying.

Activities and experiences are to be selected and organized in a manner which provides the students with the opportunity to actually formulate, administer, etc., project planning through simulation and class work. Field trips to industry, along with the utilization of guest lecturers from management, sales, labor, and so on are to be employed quite heavily.

2.3 Proposed Course Title: Graphic Communication Creation and Generation (GCCG) (3-6 quarter hours)

Course Content Description: Graphic Communication Creation and Generation provides an indepth study of the processes and practices which are employed in the creating and generating concepts of graphic communication technology (refer to pages 203-214 for a description of subconcepts).

The activities and experiences are to be selected and organized in a manner that allows the students to actually develop a product. The process should be complete, beginning with information design and carrying through to either the formation of an artwork/typographical mechanical or an imposition layout.

As just one example, copy may be written, cast-off, proofed, and pasted-up to form a mechanical by whatever means
are available through the existing facilities, equipment and materials.

2.4 Proposed Course Title: Graphic Communication Reproduction and Distribution (3-6 quarter hours)

Course Content Description: Graphic Communication Reproduction and Distribution provides an in-depth study of the processes and practices which are employed in the reproducing and distributing concepts of graphic communication technology. (Refer back to pages 214-226 for a description of subconcepts).

The activities and experiences are to be selected and organized in a manner that provides the student with the opportunity to explore, experiment, and manipulate the differing materials, techniques, etc., used to reproduce and distribute graphic communication products.

As an example, images and mechanicals (from previous course work or other sources) are converted by process photography, facsimile scanning, or whatever, to form image carrier intermediates. From the intermediates, image carriers are formed through such techniques as photo-etching, or engraving, or whatever. Next, the image is transferred by a coating action through any of the processes a relief, intaglio, litho-
graphy, or screen process printing. The printing piece then receives an application of finishing processes such as folding, binding, etc. Finally, the completed product is packaged for distribution, and storehoused through any of several standard storage and retrieval techniques.

2.5 Proposed Course Title: Graphic Communication Manufacturing Technology (2-3 quarter hours)

Course Content Description: Graphic Communication Manufacturing Technology provides a synthesis of all previous course work and subject matter. Its purpose is that of providing the students with the opportunity to apply their knowledge, skills, etc., through a problem solving situation. In this manner all five of the major concepts of graphic communication technology could be reviewed, and any necessary remedial instruction may be included.

The activities and experiences are to be selected and organized in a manner which significantly simulates the working process of the graphic communication industry. To accomplish this, a problem is selected by the students (or assigned by the instructor), which utilizes the entire graphic communication process. The project is carried through from initiation to completion by an individual or group action.
Whenever possible a "real world" problem (project) should be used.

Alternative Three: An Eight Course Sequence for Graphic Communication Technology Education (Two Courses Optional)

3.1 Proposed Course Title: Introduction to Graphic Communication Technology (2-3 quarter hours, optional)

Subject Matter Description: Refer to the proposed course of study designated as 2.1, on page 246, for a description of content and components.

3.2 Proposed Course Title: Graphic Communication Administration (3 quarter hours)

Subject Matter Description: Refer to the proposed course of study designated as 2.2, on page 247, for a description of content and components.

3.3 Proposed Course Title: Graphic Communication Typographical Design and Layout (3 quarter hours)

Course Content Description: Graphic Communication Typographical Design and Layout is the first of two courses to be devoted to the graphic communication technology concepts of creating and generating. In addition to its own highly specialized information and skill development areas, it provides prerequisite knowledges and skills to be built upon in
the second course. The second course, Graphic
Communication Image Design and Layout, reinforces,
supplements, and extends the first course through their
(both courses) mutual application to mechanicals, imposi-
tion layouts, and image carrier intermediates.

The subject matter selection and organization of the
typographical design course provides three functions: (1) in-
troducing the creating and generating concepts of graphic
communication industry, (2) establishing the processes and
practices for designing and detailing graphic communication
products (with special emphasis on verbal message system),
and (3) an indeptly study of the methods and techniques of
generating alpha-numerical compositions.

The activities and experiences are to be selected and
organized in a manner which provides the students with the
opportunity to: (1) design, detail, and generate alpha-
umerical compositions by the use of any or all of the exist-
ing facilities, (2) assemble elements, (3) form typographic
mechanicals and impositions, and (4) evaluate the completed
problem solution.
The course also provides minor review of the administrating concept, and a preview of the reproducing and distributing concepts.

3.4 Proposed Course Title: Graphic Communication Image Design and Layout (3 quarter hours)

Course Content Description: Graphic Communication Image Design and Layout correlates and supplements the typographical design and layout course. Its function and areas of emphasis would be quite similar to that of the previous course with the exception that they are at a higher level of sophistication. The course is also directed towards the generation of pictorial illustrations and image rather than typographical compositions.

The subject matter selection and organization of the image design course would provide three functions:

(1) detailing the creating and generating concepts of graphic communication technology as employed in the graphic communication industry, (2) extending the application of the processes and practices for designing and detailing graphic communication products (with special emphasis on photographic and artwork formation techniques), and (3) an indepth study of the methods and techniques of generating
pictorial illustrations and images.

The activities and experiences are to be selected and organized in a manner which provides the students with the opportunity to: (1) design, detail, and generate pictorial illustrations and images by the use of any or all of the existing facilities, (2) assemble elements, (3) form photographic and artwork mechanicals, and (4) evaluate the completed problem solution.

3.5 Proposed Course Title: Graphic Communication Image Conversion and Image Carrier Formation (3 quarter hours)

Course Content Description: Graphic Communication Image Conversion and Image Carrier Formation provides an in-depth study of the subconcepts of: (1) converting the artwork or typographical mechanicals into image carrier intermediates, and (2) forming the image carrier. These subconcepts are classified under the graphic communication technology concept of reproducing and are to be examined in relationship to the processes and practices of the graphic communication industry.

The activities and experiences are to be selected and organized to provide the students with the widest range of dif-
fering applications that could be available through the
existing facilities. Ideally, this should include such pro-
cesses as direct photography, reproduction (process) photo-
graphy, facsimile scanning, electrostatic-, mechanical-, 
chemical-, and other forms of conversion and image carrier
formation.

This course also reviews the concept of generating and
previews the remaining reproducing subconcepts of: (1) image
transfer and (2) assembling and finishing.

3.6 Proposed Course Title: Graphic Communication Image Transfer, 
Assembly, and Finishing (3 quarter 
hours)

Course Content Description: Graphic Communication Image
Transfer, Assembly, and Finishing provides an indepth
study of the graphic communication technology reproduction
subconcepts of: (1) image transfer, and (2) assembly and
finishing (Refer to pages 214-221 for a description of contents).

Activities and experiences are to be selected and organized
in a manner which provides the students with a representative
sample of those practices and processes employed in the gra-
phic communication industry to reproduce a graphic commun-
ication product.
The course of study should reinforce previously covered reproduction concepts and unify their total application towards the following sequential course of graphic communication distribution. One possible way of obtaining this goal could be through the use of a course concord project which entails the application and utilization of all previous learned knowledge and skills.

3.7 Proposed Course Title: Graphic Communication Distribution (3 quarter hours)

Course Content Description: Graphic Communication Distribution provides an indepth study of the practices and processes employed in the distributing concept of graphic communication technology. (Refer back to pages 221-226 for a description of content).

As in the previous courses, a major concern should be placed on both the practices affecting humans and materials. A broad overview approach to the subject matter organization should be used to provide the students with a representative sampling of the many various methods of preparing graphic communication products for: (1) warehousing and/or storing, (2) shipping and distributing, and (3) storehousing (storage and retrieval).
Activities and experiences are to be selected and organized in a manner which provides the students with the opportunity to actually (1) develop, apply, and utilize schema and systems for the distribution, storing, inventorizing, etc. of graphic communication products, and (2) storehouse materials by the use of commercially available storage and retrieval systems. Field trips to industry, along with the utilization of guest lecturers are an essential part of the course.

3.8 Proposed Course Title: Graphic Communication Manufacturing Technology (3 quarter hours, optional)

Course Content Description: Refer the proposed course of study designated as 2.5, on page 250, for a description of content and components.

The three alternative programs just presented should provide the possibility of a wide range of program adaptation. However, other combinations may also be possible and desirable. If, for example, only a single course of study would be desired, the course titled "Introduction to Graphic Communication Technology" would be considered appropriate. The reader is encouraged to adopt or adapt any of the three alternatives in relationship to his specific program needs.
To further illustrate the proposed instructional program for graphic communication technology education, one course of study has been selected for additional detailing. The course will be presented as an exemplary model (sample) to provide a practical application of the instructional program and its content.

An Exemplary Course of Study for Graphic Communication Technology Education

The course of study which has been selected for expansion and further development is titled "Graphic Communication. Typographical Design and Layout." The course was taken from the third alternative instructional program proposal.

The typographical design area of subject matter organization was selected because in the writer's opinion it seemed to be the weakest link in most of the industrial arts programs of graphic communication. It is hoped that the development and presentation of this course of study would: (1) illustrate an expansion and practical application of the graphic communication technology body of knowledge and instructional program, and (2) provide the graphic communication educator with a useful compilation and organization for the information and data within this subject matter area.

The discussion of the exemplary course of study has been organ-
ized into the five categories of: (1) course description and objectives, 
(2) subject matter outline, (3) course syllabus, (4) course activity 
b Briefs, and (5) references and sources of instructional materials.

For the purpose of presentation the course description, objectives, 
and subject matter outline have been included as a portion of this chap­
ter. The remaining materials may be found in Appendix C. Since the 
body of knowledge and the instructional system plan have previously 
been reported, only the actual developed course materials are presented.

The Course Description

"Graphic Communication Typographical Design and Layout" is an
introductory course which was designed to acquaint the student with an
overview of the concepts of administrating, creating, and generating
with a minor emphasis on reproducing and distributing. This was accom­
plished by concentrating upon the corresponding aesthetic, functional,
and technological applications and utilizations of these concepts in the
graphic communication industry. (For the remainder of the discussion,
rather than repeating the titles of each concept continuously, the term
typographical design and its derivatives have been substituted in their
place).

The areas which have been emphasized are that of the historical
evolution and present day status of typographical design; the cultural
socio-economic, and technological aspects of typographical design; the functions of typography in relationship to the designer, the message, and the audience (consumer), and the perception—communication aesthetic design connection; and the development and application of graphic communication practices and processes through such means as: (1) generating alpha-numeric characters, (2) generating pictorial illustrations and images, (3) assembling elements, and (4) forming mechanicals and imposition layouts.

Statement of Purpose. Two major purposes are proposed for the course.

First, the course should acquaint the student with the disciplinary areas basic concepts, functions and interrelationships, subject matter, and processes and techniques. The subject matter, activities, and related experiences must be correlated for maximum efficiency and effectiveness. Whenever possible, the student pre-entry level of experiences, abilities, knowledges, and other course work should be utilized.

Second the course should provide prerequisite knowledge and data for the advanced courses in graphic communication technology education. This may be accomplished by carefully studying and plan-
ning objectives, subject matter content, and the sequence of course work within the overall program and its subprograms (where appropriate).

**Subject matter and course content objectives.** The following objectives are correlated, through the use of unit headings, with the organization of the "course subject matter outline," and the "course syllabus."

**Unit 1. The Developmental History of Typography:**

1.1 To acquaint the student with the developmental relationships that formed the basis for the present day typographical design discipline.

1.2 To emphasize to the student the important influences (events, inventions, conventions, etc.) of the past, present, and future on present day typographical design.

1.3 To illustrate the variety of materials, techniques, etc., which are available for use by the typographical designer.

1.4 To overview the present-day technology and "the state-of-the-art" to establish the role of typography and the typographer in the larger field of graphic communication technology.
1.5 To investigate the present day technological processes and procedures employed by the "print-media industry."

Unit 2. Introduction to Typographical Design:

2.1 To make the student aware of the multitude of variables and factors that must be considered when administrating, creating, generating, and reproducing typographical messages.

2.2 To emphasize the relationship between typographical design solutions and such functional aspects as the communication theory, perception theory, and the aesthetic design linkage.

2.3 To acquaint the student with the formal aspects (principles, properties, and elements) of typographical design.

2.4 To introduce the student to the techniques of the systematic approach to problem solution (through his daily course work relative to typographical design).

Unit 3. The Mechanics of Typographical Design—Visual Aspects:

3.1 To introduce the student to the visual and functional aspects of typographical design and their interrelationships.

3.2 To acquaint the student with the mechanics and techniques employed by typographical designers.
3.3 To provide the student with the opportunity for experimentation, manipulation, etc., with the tools and materials of typographical design.

3.4 To allow the student to develop an understanding for and appreciation of differing typographical design solutions.

3.5 To illustrate some of the principles and conventions common to all typographical design. This includes the processes of analysis and synthesis in order that the student may be able to make intelligent comparisons and decisions as to appropriate application and use.

Unit 4. The Mechanics of Typographical Design—Functional Aspects:

The objectives of Unit 3 also apply to this situation.

Unit 5. The Principles of Typographical Grid Formation:

5.1 To introduce the student to the available differing methods of systematic planning as employed in typographical design.

5.2 To make the student aware of the process of orderly development through grid formation and of element selection, placement, etc. in relationship to typographical message formation and reproduction.
5.3 To emphasize the importance of the use of the typographical matrix and its relationship and utilization with the placement of grid elements.

5.4 To provide the student with the opportunity to develop the habit of using the methods of systematic planning, orderly development, grid utilization, etc., in his course work involving typographical message formation and production.

Unit 6. Summary/Synthesis and Extension; Introduction to the Typographical Mechanical:

6.1 To allow the student to analyze and synthesize the knowledges presented throughout the course.

6.2 To summarize and reinforce the past activity and to illustrate its utilization in the real world.

6.3 To expand the application of the subject matter by projecting to higher levels of specificity (as found in the example of the typographical mechanical).

6.4 To re-emphasize to the student the importance of the new information as a contributing and integral portion of the knowledge in the larger field of graphic communication technology.
6.5 To provide the student with the opportunity of applying the newly acquired knowledge through a problem solving situation.

6.6 To relate graphic communication technology to industrial technology and all technology.

Student terminal behavior objectives. In addition to the "subject matter and course content objectives," a second set of objectives was deemed necessary to measure the expected output of the course of study. This expected output may be measured in terms of student behavior change. The following four categories of terminal objectives have been derived for that purpose.

As a first result of instruction, the student should be able to perform the following tasks at a skill level of competency necessary to meet actual real world requirements (as determined primarily through the evaluation of laboratory activities):

1. Construct and manipulate letter forms (serif and san serif) by both freehand sketching and exacting mechanical techniques.

2. Hand letter using upper case, lower case, and small capitals which will be formed to the specifications of previously determined lettering grids.
3. Hand set foundry types, including such techniques as
   (a) letter-word-line spacing; (b) justification; (c) composition of display headlines, titles, etc.; and (d) composing, proofing, and distributing type matter.

4. Sketch and mechanically draw lettering grids and layout grids, e.g., solid, vertical 2/2, vertical with horizontal 3/3, etc.

5. Employ the necessary techniques for casting-off, selecting spacing arrangements, and the paste-up of elements onto a grid.

6. Efficiently manipulate and operate graphic arts instruments and equipment including proof press, paper cutter, slug cutter, corner miter, composing stick, line gauge, and type-fitting gauge.

7. Calculate sizes and measurements using the type system of units, i.e., points, picas, agates, nonpariel, column-inch, etc.

8. Effectively mix and match colored inks singly and in combinations to obtain composites.

As a second result of instruction, the student should be able to understand (make discernable selections, decisions, and choices
about) the following subject matter information (as determined primarily through written and oral testing):

1. The differences among relief, gravure, lithographic, and screen process printing. This includes process concept image carrier production, production processes, industrial and commercial application and utilizations.

2. The difference between line and halftone material. This also includes implications for full color printing by overlays and color separation and correction.

3. The differences between hot and cold type setting systems and techniques; their applications, limitations, and use in regards to designer function.

4. The stages of typographical mechanical production and its component parts.

5. The balance between aesthetic enhancement and the legibility function in regards to the selection of design components.

As a third result of instruction, the student should be able to appreciate (make value judgements about) the following:

1. The importance of the systematic approach to problem solving as applied to the solution of typographical problems.

2. The aesthetic--perception--communication linkage with typographical design.
3. The contributions of typographical design to the larger field of graphic communication technology (and its corresponding industry).

4. The realization of the multitude of possible alternative design solutions to the same problem as a result of the many variables (audience, message, designer) that must be considered.

As a fourth result of instruction, the student should become aware (be informed) and have a general conversational knowledge of the following (as determined primarily through written and oral testing):

1. The Incunabula Era of typographical design (1450-1550).*
2. The Consolidation Era of typographical design (1550-1800).*
3. The 19th Century Era of typographical design (1800-1900).*
4. The 20th Century Era of typographical design (1900-present).*

*Including (a) influential persons, (b) inventions, events, and developments, (c) type style developments, and (d) typographical practices, processes, and materials.

5. The managed production system as employed in the graphic communication production industry.
With the establishment of the above stated objectives as the referent criteria, the selection and organization for the subject matter of the course of study is now presented.

The Subject Matter Outline

The proposed subject matter outline represents a first attempt in the process of structuring the body of knowledge for the "typographical design" course of study. It is realized that the proposed categories are not totally developed and that differing levels of specificity exist. Even though sought after, these divisions are not considered to be totally inclusive or exclusive, nor have their sequential order been permanently fixed. Further revision and readjustment (based upon the feedback data from a pilot trial) would be expected for refinement. The testing and revision procedure are beyond the limitation of this study; therefore, this subject matter outline represents a beginning point for the writer in the development of comprehensive curricular materials for graphic communication technology education.

Due to the complexity of some topic areas in the outline, portions of the organization are reported in textual form. The reader is reminded that the objectives, subject matter outline, course syllabus, and the activity briefs have been correlated by the use of organizational units.
The outline for Graphic Communication Typographical Design

and Layout is as follows:

1. The Developmental History of Typography

   1.1 The evolution of the graphic message
      1.1.1 Writing and alphabet development
          1.1.1.1 Sign and gesture language
          1.1.1.2 Mnemonic devices
          1.1.1.3 Pictographs
          1.1.1.4 Emblematic substitution
          1.1.1.5 Ideographs
          1.1.1.6 Cuniform: Early attempt at a written alphabet
          1.1.1.7 Hieroglyphic Alphabet
             1.1.1.7.1 Hieroglyphic
             1.1.1.7.2 Hieratic
             1.1.1.7.3 Demotic (consonants)
          1.1.1.8 Phonetic alphabet development
             1.1.1.8.1 Semitic link
             1.1.1.8.2 Phoenicians attempt
          1.1.1.9 Greek alphabet development
             1.1.1.9.1 Eastern version
             1.1.1.9.2 Western version (vowels)
          1.1.1.10 Roman alphabet development
             1.1.1.10.1 Etruscans - Latini - Romans
             1.1.1.10.2 Roman numerals
             1.1.1.10.3 Majuscules
             1.1.1.10.4 Minuscules
             1.1.1.10.5 Unicals and half-unicals
          1.1.1.11 Anglo-Saxon alphabet development
             1.1.1.11.1 Arabic numerals - Moors
          1.1.1.12 English alphabetical adaption and standardization

1.1.2 Materials, processes, and technique development

   1.1.2.1 Developments and inventions in the orient
      1.1.2.1.1 Woven silk paper - 2000 B.C.
      1.1.2.1.2 Paper pulp - 105 A.D.
      1.1.2.1.3 Era of Seals - 200 B.C.
      1.1.2.1.4 Relief and Gravure Printing, i.e., rub-offs, and squeezes - 868 A.D.-"Diamond Sutra"
1.1.2.1.5 Moveable clay type 11th. century
1.1.2.1.6 Moveable wooden type 13th. century
1.1.2.1.7 Moveable bronze type 14th. century
1.1.2.1.8 Decline of moveable type print due to alphabetical problems - 40,000 characters

1.1.2.2 Developments and inventions in the Middle Eastern and Western Hemispheres
1.1.2.2.1 Papyrus paper - 300 B.C.
  1.1.2.2.1.1 Book of "the Dead" 1350 B.C.
1.1.2.2.2 Parchment paper - 200 B.C.
1.1.2.2.3 Transition from scrolls to Codex
1.1.2.2.4 Transition from scriptium to Xylographica

1.2 The Development of Typographical Design
1.2.1 Incunabula Era - 1450-1550 - term denotes the individual items emanated from the press; the era of the invention and beginning of practically every single feature that characterizes the modern printing piece.
1.2.1.1 Influential persons (some)
  1.2.1.1.1 Johann Gutenberg - 1394-1469 - Bible - "Catholicon"
  1.2.1.1.2 Johann Fust
  1.2.1.1.3 Peter Schoffer
  1.2.1.1.4 Anton Koberger - 1445-1513
  1.2.1.1.5 Nicholas Jenson - 1420-
  1.2.1.1.6 Aluds Manutius - 1450-1515
  1.2.1.1.7 Francesco Griffo
  1.2.1.1.8 Anthoine Verard - d. 1512
  1.2.1.1.9 Johannes Froben - 1460-1520
  1.2.1.1.10 Geofroy Troy - 1480-1533
  1.2.1.1.11 Henri Estienne - 1460-1520
  1.2.1.1.12 Johann Neudorffer - 1497-1563
  1.2.1.1.13 ...

1.2.1.2 Inventions, events, and developments
1.2.1.2.1 Printing from moveable type, i.e., punch cutting, matrix-fitting, typecasting, Rhenish vinter's winepress, etc.
1.2.1.2.2 Printing piece development
  1.2.1.2.2.1 Colophon
  1.2.1.2.2.2 Title page
  1.2.1.2.2.3 Pagination
1.2.1.2.2.4 Printer's mark, trade mark, copyright
1.2.1.2.2.5 Pocket edition
1.2.1.2.2.6 Cross referencing; division by numbered verse
1.2.1.2.2.7 Page format - decoration by type case ornament and rule
1.2.1.2.2.8 Tory's principles
1.2.1.2.2.9 First national dictionary
1.2.1.2.2.10 Early families of printer/publishers - Amberbock and Froben, Petri, Oporinus, Koberger, etc.

1.2.1.3 Type style design developments
1.2.1.2.1 Contemporary hand written manuscript type styles; Fraktur, Cyrillic, Arabic
1.2.1.3.2 Textura
1.2.1.3.3 Bastarda
1.2.1.3.4 Fere-humanistic
1.2.1.3.5 Rotunda
1.2.1.3.6 "Antiqua" founts of Roman and italic
1.2.1.3.7 "Gothic" founts of Fraktur and Schwabacher
1.2.1.3.8 Civilite (first display font)

1.2.2 The Era of Consolidation - 1550-1800 - the development and refinement of the achievements conservative spirit.

1.2.2.1 Influential persons (some)
1.2.2.1.1 Philippe Grandjean - 1666-1714
1.2.2.1.2 Robert Granjon
1.2.2.1.3 Christopher Van Dyck - 1601-1670
1.2.2.1.4 Pierre-Simon Fournier - 1712-1768
1.2.2.1.5 William Caslon - 1692-1766
1.2.2.1.6 John Baskerville - 1707-1775
1.2.2.1.7 Giambattista Bodoni - 1740-1813
1.2.2.1.8 Claude Garamond - d. 1651
1.2.2.1.9 Robert Estienne - d. 1559

1.2.2.2 Inventions, events, developments
1.2.2.2.1 Growth of type houses and foundries, i.e., Luther foundry, Ehrhardt foundry, etc.
1.2.2.2.2 Development of publishing houses, i.e., House of Plantin, House of Elzevir, etc.
1.2.2.2.3 Establishment of new families of printer/
publishers (since Incunabula) - Didot's, Fournier's, Estienne's, etc.

1.2.2.2.4 Venacular printing surpasses printing in Latin

1.2.2.2.5 Division of the functions of publisher, bookseller, printer, editor, typographer, proofreader and so on.

1.2.2.2.6 Birth of newspaper and periodical typography

1.2.2.2.7 Establishment of the concept of authorship for renumeration

1.2.2.3 Type style design developments
   1.2.2.3.1 16th. Century - Grajon, Robert Estienne, Simon de Colines
   1.2.2.3.2 17th. Century - Van dyck, Grandjean
   1.2.2.3.3 18th. Century - Caslon, Baskerville, Fournier, Bodoni, (Didot and Goudy)

1.2.3 19th. Century Era - 1800-1900's - a period of tremendous technical advances which has radically changed the methods of production and distribution as well as the habits of producers and readers.

1.2.3.1 Influential Persons (some)
   1.2.3.1.1 William Morris
   1.2.3.1.2 Jan Tschichold
   1.2.3.1.3 Adrian Fruitzer
   1.2.3.1.4 Herbert Bayer
   1.2.3.1.5 Carl Poeschel
   1.2.3.1.6 Bruce Rogers
   1.2.3.1.7 Paul Renner
   1.2.3.1.8 Frederick Goudy
   1.2.3.1.9 Eric Gill
   1.2.3.1.10...

1.2.3.2 Inventions and developments - to be discussed under section "20th. Century Technology."

1.2.3.3 Important Movements
   1.2.3.3.1 Arts and Crafts Movement - England and USA
   1.2.3.3.2 Deutschir Werkbund Movement - Germany
   1.2.3.3.3 Futureism Movement - Italy
   1.2.3.3.4 Constructivism - Russia, Holland
   1.2.3.3.5 Cubism - France
   1.2.3.3.6 Expressionism and Dadism - No. Europe
1.2.3.3.7 Bauhaus Movement
1.2.3.3.8 The New Typography
1.2.3.4 Influential firms (some)
  1.2.3.4.1 Blackwood, Chambers, MacMillian, Cassell - England
  1.2.3.4.2 Harper and Brothers, Appleton, Little, Brown and Company - U.S.A.
  1.2.3.4.3 Garnier, Plon - France
  1.2.3.4.4 Vandenhoeck and Ruprecht, F.A. Brockhaus
  1.2.3.4.5...
1.2.3.5 Type style design developments
  1.2.3.5.1 Recreation and adaption of classical faces such as Baskerville, Bell, Bembo, Fournier, Garamond, Platin and Wambum
  1.2.3.5.2 Introduction of Times New Roman, Centaur, Goudy Modern, Perpetua, Gill Sans, Univers, Helvetica, etc.

1.3 20th. Century Technology
1.3.1 Major Production Printing Processes
  1.3.1.1 Letterpress Printing (Relief)
    1.3.1.1.1 Concept: Image transfer by coating action in relief
    1.3.1.1.1.1 Nomenclature
    1.3.1.1.1.2 Basic principles
    1.3.1.1.1.3 Mechanical considerations
    1.3.1.1.1.4 Operational procedures
    1.3.1.1.2 Image carrier surface:
      1.3.1.1.2.1 Hot and cold type; single letter and line cast
      1.3.1.1.2.2 Etched and engraved plates
      1.3.1.1.2.3 Facsimile plates
      1.3.1.1.2.4 Stereotypes and electrotypes
    1.3.1.1.3 Types of printing presses
      1.3.1.1.3.1 Platen press (sheet fed)
      1.3.1.1.3.2 Flat bed press
      1.3.1.1.3.3 Rotary press (web fed) (color heads)
    1.3.1.1.4 Limitations: Advantages and disadvantages
    1.3.1.1.5 Industrial utilization and application
    1.3.1.1.6 Design implications and constraints
  1.3.1.2 Gravure Printing (Intaglio)
    1.3.1.2.1 Concept: image transfer by coating action
using pressure and capillary action principle.

1.3.1.2.1.1 Nomenclature
1.3.1.2.1.2 Basic principles
1.3.1.2.1.3 Mechanical considerations
1.3.1.2.1.4 Operational procedures

1.3.1.2.2 Image carrier surface:
1.3.1.2.2.1 Copperplate and steelplate
1.3.1.2.2.2 Dry-point
1.3.1.2.2.3 Mezzotint and Aquatint
1.3.1.2.2.4 Photogravure
1.3.1.2.2.5 Rotogravure - Scan Engraving

1.3.1.2.3 Types of printing presses
1.3.1.2.3.1 Flat bed - hand process
1.3.1.2.3.2 Rotary - automatic, mass production

1.3.1.2.4 Limitations: Advantages and disadvantages

1.3.1.2.5 Industrial utilization and application

1.3.1.2.6 Design implications (fine printing, vs. mass production)

1.3.1.3 Photo-Offset Lithographic Printing

1.3.1.3.1 Concept: image transfer by coating action using lithographic principle and transfer medium other than plate surface for actual printing.

1.3.1.3.1.1 Nomenclature
1.3.1.3.1.2 Basic principles
1.3.1.3.1.3 Mechanical considerations
1.3.1.3.1.4 Operational procedures

1.3.1.3.2 Image carrier surface:
1.3.1.3.2.1 Direct image plates
1.3.1.3.2.2 Photographic plates

1.3.1.3.3 Types of printing presses
1.3.1.3.3.1 Flat bed lithographic
1.3.1.3.3.2 Two cylinder rotary
1.3.1.3.3.3 Three cylinder rotary
1.3.1.3.3.4 Limitations: Advantages and disadvantages
1.3.1.3.3.5 Industrial utilization and application
1.3.1.3.3.6 Design implications and constraints
1.3.1.4 Screen Process Printing
1.3.1.4.1 Concept: Image transfer by coating action using a screen and mask
   1.3.1.4.1.1 Nomenclature
   1.3.1.4.1.2 Basic principles
   1.3.1.4.1.3 Mechanical considerations
   1.3.1.4.1.4 Operational procedures
1.3.1.4.2 Image carrier surface:
   1.3.1.4.2.1 Silhouette
   1.3.1.4.2.2 Hand cut film
   1.3.1.4.2.3 Liquid tusche
   1.3.1.4.2.4 Photographic (direct and indirect)
1.3.1.4.3 Types of printing presses
   1.3.1.4.3.1 Flat bed (hand and auto)
   1.3.1.4.3.2 Rotary web fed
1.3.1.4.4 Limitations: Advantages and disadvantages
1.3.1.4.5 Industrial utilization and application
1.3.1.4.6 Design implications

1.3.2 Typesetting Systems for Composition
1.3.2.1 Hot typesetting systems (hand and machine)
   1.3.2.1.1 Foundry type
   1.3.2.1.2 Linotype and Intertype
   1.3.2.1.3 Monotype
   1.3.2.1.4 Ludlow type
1.3.2.3 Cold typesetting systems (hand and machine)
   1.3.2.2.1 Hand and mechanical calligraphy
      1.3.2.2.1.1 Dry transfer type (ex.: press type)
      1.3.2.2.1.2 Lettering devices (ex.: Leroy Ltr.)
      1.3.2.2.1.3 Varityper and Justiwriter
      1.3.2.2.1.4 IBM Selectric typewriter
   1.3.2.2.2 Photo Composition
      1.3.2.2.2.1 Fotomatic and Fototronic
      1.3.2.2.2.2 Linoquick and Linofilm
      1.3.2.2.2.3 Monophoto and Phototon
      1.3.2.2.2.4 AFT Photo Typesetter and Tele-typestr.
      1.3.2.2.2.5 RCA Cathode Ray Generation
      1.3.2.2.2.6 Varityper Headliner and Strip
   1.3.2.2.3 Conversion systems
      1.3.2.2.3.1 Brightype
      1.3.2.2.3.2 Converkal
1.3.2.2.3.3 Cronapress
1.3.2.2.3.4 Instant Negative
1.3.2.2.3.5 Vertaflex

1.3.2.2.4 Mechanical composition - sophistication level
1.3.2.2.4.1 Hand operation
1.3.2.2.4.2 Tape assist
1.3.2.2.4.3 Computer assist
1.3.2.2.4.4 Computer generation

1.3.2.2.5 Selected information for consideration
1.3.2.2.5.1 Nomenclature
1.3.2.2.5.2 Basic principles
1.3.2.2.5.3 Mechanical considerations
1.3.2.2.5.4 Operational procedures
1.3.2.2.5.5 Advantages and disadvantages
1.3.2.2.5.6 Design implications and constraints

1.3.3 The production system - a generalized overview of the procedures and techniques within the functioning system, with implications for the designer's role.

1.3.3.1 Problem Initiation Stage (Client)
1.3.3.1.1 Economic needs and wants

1.3.3.2 Problem Administration Stage
1.3.3.2.1 Formulating the project
1.3.3.2.1.1 Determining objectives
   1.3.3.2.1.1.1 Stating goals
   1.3.3.2.1.1.2 Consulting
   1.3.3.2.1.1.3 Establishing project criteria
   1.3.3.2.1.1.4 Evaluating
   1.3.3.2.1.1.5 Describing objectives

1.3.3.2.1.2 Researching
   1.3.3.2.1.2.1 Locating data
   1.3.3.2.1.2.2 Retrieving data
   1.3.3.2.1.2.3 Describing data
   1.3.3.2.1.2.4 Evaluating data
   1.3.3.2.1.2.5 Forecasting

1.3.3.2.2 Administering the project
1.3.3.2.2.1 Directing
   1.3.3.2.2.1.1 Coordinating
   1.3.3.2.2.1.2 Assigning
   1.3.3.2.2.1.3 Supervising
   1.3.3.2.2.1.4 Inspecting
1.3.3.2.2 Authorizing
1.3.3.2.2.1 Verifying
1.3.3.2.2.2 Certifying
1.3.3.2.2.3 Approving
1.3.3.2.2.4 Redefining
1.3.3.2.3 Programming the project
1.3.3.2.3.1 Evaluating
1.3.3.2.3.1.1 Analyzing data
1.3.3.2.3.1.2 Comparing
1.3.3.2.3.1.3 Contrasting
1.3.3.2.3.2 Selecting
1.3.3.2.3.2.1 Examining
1.3.3.2.3.2.2 Eliminating
1.3.3.2.3.2.3 Adapting
1.3.3.2.3.2.4 Adopting
1.3.3.2.3.3 Presenting
1.3.3.2.3.3.1 Scheduling
1.3.3.2.3.3.2 Diagraming
1.3.3.2.4 Financing the project
1.3.3.2.4.1 Appraising
1.3.3.2.4.1.1 Describing
1.3.3.2.4.1.2 Analyzing
1.3.3.2.4.1.3 Correlating
1.3.3.2.4.2 Estimating
1.3.3.2.4.2.1 Pricing
1.3.3.2.4.2.2 Calculating
1.3.3.2.4.2.3 Projecting
1.3.3.2.4.2.4 Accounting
1.3.3.2.4.3 Funding
1.3.3.2.4.3.1 Capitalizing
1.3.3.2.4.3.2 Amortising
1.3.3.2.4.3.3 Purchasing
1.3.3.2.4.3.4 Selling
1.3.3.2.4.4 Documenting
1.3.3.2.4.4.1 Contracting
1.3.3.2.4.4.2 Floating
1.3.3.2.4.4.3 Legalizing
1.3.3.2.4.5 Budgeting
1.3.3.2.4.5.1 Allocating
1.3.3.2.4.5.2 Timing
1.3.3.3 Solution Creation Stage
1.3.3.3.1 Designing
   1.3.3.3.1.1 Evaluating concepts
      1.3.3.3.1.1.1 Total program evaluation
      1.3.3.3.1.1.2 Determining functional relationships
   1.3.3.3.1.2 Postulating graphic solutions
      1.3.3.3.1.2.1 Scaling functional relationships
      1.3.3.3.1.2.2 Presenting graphic relationships
   1.3.3.3.1.3 Selecting a graphic solution
      1.3.3.3.1.3.1 Analyzing alternative solutions
      1.3.3.3.1.3.2 Appraising alternative solutions
      1.3.3.3.1.3.3 Evaluating alternative solutions
1.3.3.3.2 Engineering
   1.3.3.3.2.1 Establishing sketches and specifications
   1.3.3.3.2.2 Establishing detail design criteria and standards
   1.3.3.3.2.3 Analyzing problems - graphic proposals
      1.3.3.3.2.3.1 Grouping
      1.3.3.3.2.3.2 Classifying
      1.3.3.3.2.3.3 Identifying
   1.3.3.3.2.4 Estimating sizes and capacities
      1.3.3.3.2.4.1 Referring
      1.3.3.3.2.4.2 Comparing
      1.3.3.3.2.4.3 Approximating
1.3.3.4 Solution Generation Stage
1.3.3.4.1 Detail design assembly
   1.3.3.4.1.1 Standardizing elements and components
   1.3.3.4.1.2 Computing
      1.3.3.4.1.2.1 Calculating
      1.3.3.4.1.2.2 Calibrating
      1.3.3.4.1.2.3 Appraising
1.3.3.4.2 Preparing the mechanical
   1.3.3.4.2.1 Scaling and grid formation
   1.3.3.4.2.2 Dimensioning
1.3.3.4.2.3 Referencing and titling
1.3.3.4.2.4 Element placement and assembly
   1.3.3.4.2.4.1 Bleeding
   1.3.3.4.2.4.2 Registering
   1.3.3.4.2.4.3 Balancing
   1.3.3.4.2.4.4 Cropping
   1.3.3.4.2.4.5 Paste-up
   1.3.3.4.2.4.6...
1.3.3.4.3 Specifying
   1.3.3.4.3.1 Preparing outline specifications
      1.3.3.4.3.1.1 Sectioning
      1.3.3.4.3.1.2 Itemizing
      1.3.3.4.3.1.3 Describing
      1.3.3.4.3.1.4 Selecting
      1.3.3.4.3.1.5 Scheduling
   1.3.3.4.3.2 Developing final specifications
      1.3.3.4.3.2.1 Referencing - titling
      1.3.3.4.3.2.2 Itemizing
      1.3.3.4.3.2.3 Describing

1.3.3.5 Solution Reproduction Stage
1.3.3.5.1 Production programming
   1.3.3.5.1.1 Scheduling
      1.3.3.5.1.1.1 Grouping
      1.3.3.5.1.1.2 Allocating time
   1.3.3.5.1.2 Routing
      1.3.3.5.1.2.1 Establishing departures and arrival time
      1.3.3.5.1.2.2 Establishing path to be followed
   1.3.3.5.1.3 Procuring
      1.3.3.5.1.3.1 Subcontracting
      1.3.3.5.1.3.2 Employing
      1.3.3.5.1.3.3 Purchasing
      1.3.3.5.1.3.4 Leasing
      1.3.3.5.1.3.5 Obtaining licenses, permits, copyrights, etc.
1.3.3.5.2 Production supervising
   1.3.3.5.2.1 Directing
      1.3.3.5.2.1.1 Coordinating
      1.3.3.5.2.1.2 Assigning
      1.3.3.5.2.1.3 Administrating
      1.3.3.5.2.1.4 Inspecting
1.3.3.5.2.2 Authorizing
   1.3.3.5.2.2.1 Verifying
   1.3.3.5.2.2.2 Certifying
   1.3.3.5.2.2.3 Approving
   1.3.3.5.2.2.4 Disapproving
   1.3.3.5.2.2.5 Redefining

1.3.3.5.3 Production implementing
   1.3.3.5.3.1 Image carrier production
       1.3.3.5.3.1.1 Photo/mechanical
       1.3.3.5.3.1.2 Photographic
       1.3.3.5.3.1.3 Engraving
       1.3.3.5.3.1.4 Etching - chemical
       1.3.3.5.3.1.5 Screen process
   1.3.3.5.3.3 Finishing production
       1.3.3.5.3.3.1 Folding and trimming
       1.3.3.5.3.3.2 Assembling
       1.3.3.5.3.3.3 Special - finishing
       1.3.3.5.3.3.4 Binding
       1.3.3.5.3.3.5 Packaging
       1.3.3.5.3.3.6 Distributing
       1.3.3.5.3.3.7 Storage, retrieval, etc.

2. Introduction to Typographical Design: The purpose of this unit is to demonstrate the interrelationships between several bodies of knowledge that produce the form and function aspects of typographical design. Therefore, communication, perception, etc. are explored to only the depth of their application to typography. Emphasis is placed upon the acquisition of those knowledges which are necessary to produce meaningful typographical messages.

2.1 The communication theory link with typography
   2.1.1 The Sources - designer(s)
       2.1.1.1 Information and knowledge of the subject
       2.1.1.2 Intent and purpose
       2.1.1.3 Communication skills
       2.1.1.4 Social and cultural values
       2.1.1.5 Affiliations
       2.1.1.6 Attitudes and prejudices
       2.1.1.7 Predisposition to message and receiver

Above material is information necessary for consideration - additional needed
2.1.2 The message - codification of signs, symbols, images and (signals)
  2.1.2.1 Content
  2.1.2.2 Structure
  2.1.2.3 Treatment
  2.1.2.4 Elements

2.1.3 The channel - medium applicable to primary or secondary reception
  2.1.3.1 Primary - sight, touch (sound, smell, taste)
  2.1.3.2 Secondary - printed medium, (cinema and films), TV, and radio

2.1.4 The receiver - individual or multiple audience (similar characteristics to those of source - see 2.1.1)

2.1.5 Feedback - present or nonexistent (action-reaction interdependence)

2.1.6 Interference - identifiable or non-identifiable
  2.1.6.1 Natural tendency of deterioration
  2.1.6.2 Internal and external noxious stimulus
  2.1.6.3 Internal and external pleasant stimulus
  2.1.6.4 Predispositions
  2.1.6.5 Physical aspects of the message (visual or functional) and conditions of use

2.2 The aesthetic design like with typography

2.2.1 Selected design principles
  2.2.1.1 Repetition
  2.2.1.2 Alternation
  2.2.1.3 Gradation
  2.2.1.4 Radiation
  2.2.1.5 Contrast
  2.2.1.6 Variation
  2.2.1.7 Harmony
  2.2.1.8 Unity
  2.2.1.9 Balance
    2.2.1.9.1 Formal
    2.2.1.9.2 Informal
  2.2.1.10 Emphasis
    2.2.1.10.1 Visual dominance
    2.2.1.10.2 Functional purpose

2.2.2 Selected design elements
  2.2.2.1 Plane
2.2.2.1.1 Restrictive
2.2.2.1.2 Liberal
2.2.2.1.3 Functional capacities
   2.2.2.1.3.1 Informative
      2.2.2.1.3.1.1 Literary
      2.2.2.1.3.1.2 Decorative
      2.2.2.1.3.1.3 Illustrative
   2.2.2.1.3.2 Expressive
      2.2.2.1.3.2.1 Literary
      2.2.2.1.3.2.2 Illustrative
      2.2.2.1.3.2.3 Realistic
      2.2.2.1.3.2.4 Stylized
      2.2.2.1.3.2.5 Abstract
   2.2.2.1.3.2.6 Non-objective

2.2.2.2 Simulated 3-Dimensional elements
   2.2.2.2.1 Space - figure ground relationships
      2.2.2.2.1.1 Foreground
      2.2.2.2.1.2 Middle ground
      2.2.2.2.1.3 Background
      2.2.2.2.1.4 Aesthetic center
   2.2.2.2.2 Volume - classification of simulated space
      2.2.2.2.2.1 Positive
      2.2.2.2.2.2 Negative
      2.2.2.2.2.3 Form
         2.2.2.2.2.3.1 Linear
         2.2.2.2.2.3.2 Planar
         2.2.2.2.2.3.3 Biomorphic
         2.2.2.2.2.3.4 Closed
         2.2.2.2.2.3.5 Open
         2.2.2.2.2.3.6 Articulated

2.2.3 Selected design properties
   2.2.3.1 Size and proportion
   2.2.3.2 Shape and form
   2.2.3.3 Direction and position
      2.2.3.3.1 Horizontal
      2.2.3.3.2 Vertical
      2.2.3.3.3 Oblique or diagonal
   2.2.3.4 Texture and pattern
      2.2.3.4.1 Natural
2.2.3.4.2 Applied
2.2.3.4.3 Formal
2.2.3.4.4 Informal
2.2.3.5 Hue
  2.2.3.5.1 Application to type and layout
  2.2.3.5.2 Psychological aspects
    2.2.3.5.2.1 Advancing
    2.2.3.5.2.2 Receding
2.2.3.6 Value Keys
  2.2.3.6.1 High major
  2.2.3.6.2 High minor
  2.2.3.6.3 Intermediate major and minor
  2.2.3.6.4 Low major and minor
2.2.3.7 Color Specification
  2.2.3.7.1 Hue
  2.2.3.7.2 Chroma
  2.2.3.7.3 Value
2.2.3.8 Color symbolism
2.2.3.9 Color schemes
  2.2.3.9.1 Monochromatic
  2.2.3.9.2 Complementary
  2.2.3.9.3 Supplementary

2.3 The perception theory link with typography
  2.3.1 Figure-ground relationships (fields, borders, space
color, texture, illusions, etc., as applied to type
forms)
  2.3.2 Pragnanz (good figure, simplicity, symmetry, balance,
etc., as applied to type forms)
    2.3.2.1 Closure
    2.3.2.2 Familiarity
  2.3.3 Grouping
    2.3.3.1 Proximity
    2.3.3.2 Similarity
    2.3.3.3 Good continuation
  2.3.4 Principles of organization in opposition
    2.3.4.1 Closure vs. proximity
    2.3.4.2 Proximity vs. similarity
    2.3.4.3 Similarity vs. closure
  2.3.5 Type form utilization and application, Implication for
2.4 The formal aspects of typographical design: Special considerations. (Through the use of the conceptual and visual ordering processes of perception the elements of aesthetic design will be interpreted in light of their typographical application. Emphasis will be placed upon the interaction effects of single letters, words, etc.)

2.4.1 Rhythm
   2.4.1.1 Movement
   2.4.1.2 Repetition

2.4.2 Variation
   2.4.2.1 Identity (symmetry)
   2.4.2.2 Translation
   2.4.2.3 Reflection
   2.4.2.4 Inversion
   2.4.2.5 Rotation

2.4.3 Contrast
   2.4.3.1 Size
   2.4.3.2 Weight
   2.4.3.3 Direction
   2.4.3.4 Style (form and structure)
   2.4.3.5 Interactions (contrast of form, weight, structure, etc.)

2.4.4 Value
   2.4.4.1 Positive and negative space
   2.4.4.2 Reiteration to 2.2.3.6

2.4.5 Color
   2.4.5.1 Reiteration to 2.2.3.7-9.

3. The Mechanics of Typographical Design: Visual and Functional Aspects and their Interactions: In order to facilitate instructional implementation this section is divided into more specific units in the course syllabus. (Unit 3 and 4) However, artificial separations are not made now due to the amount of subject matter overlap and interrelationship.

3.1 Visual and functional considerations of letter and type form
   3.1.1 Identification and classification
      3.1.1.1 Display faces
         3.1.1.1.1 Roman display types
         3.1.1.1.2 Decorated and shaded letters
         3.1.1.1.3 San serif and Egyptian letters
         3.1.1.1.4 Script and black letters
3.1.1.3 Special purpose faces (some only)
   3.1.1.3.1 Epps Evans
   3.1.1.3.2 Crowwel
   3.1.1.3.3 E13B
   3.1.1.3.4 CMC7 and OGRA
   3.1.1.3.5 OCRB

3.1.2 Construction and manipulation
   3.1.2.1 Hand estimation and mechanical generation
   3.1.2.2 Serif to san serif continuum
   3.1.2.3 Letter construction
      3.1.2.3.1 Proportional development
      3.1.2.3.2 Nonproportional development
      3.1.2.3.3 Geometric development
      3.1.2.3.4 Optical development
   3.1.2.4 Letter manipulation
      3.1.2.4.1 Enlargement
      3.1.2.4.2 Reduction
      3.1.2.4.3 Distortion
      3.1.2.4.4 Special effects
   3.1.2.5 Interaction of 3.1.2.3 and 3.1.2.4

3.1.3 Application and utilization
   3.1.3.1 Introduction to lettering and layout grids
   3.1.3.2 Techniques of generation and reproduction
   3.1.3.3 Appropriate use and special applications
   3.1.3.4 Design limitations and constraints

3.2 Mechanical considerations of the type system of measurement
   3.2.1 Units of measurement
      3.2.1.1 Point system measures (pts. and picas)
      3.2.1.2 Advertising measures (agates and column inch)
      3.2.1.3 Printer measures (nonpareil and didot pts.)
   3.2.2 Blind materials
      3.2.2.1 Spacing materials
         3.2.2.1.1 Em quad system (Em quad, En quad, 3-3m, 4-3m, 5-3m)
      3.2.2.2 Leading materials
         3.2.2.2.1 Leads
         3.2.2.2.2 Slugs
         3.2.2.2.3 Furniture
   3.2.3 Line materials
      3.2.3.1 Rules
      3.2.3.2 Borders
      3.2.3.3 Bearers
3.2.4 Type and letter form nomenclature
   3.2.4.1 Foundry type (face counter, beard, body, nick, x-height, type high, height of type, ...)
   3.2.4.2 u.c., l.c., small caps, ligatures, kerned letters, mortised letters, etc.
   3.2.4.3 Type face – type style
   3.2.4.4 Type series
   3.2.4.5 Type family
   3.2.4.6 Type programs
   3.2.4.7 Fount and foundry lines
   3.2.4.8 Logotypes, trademarks, etc.
   3.2.4.9 Ornaments and florets
   3.2.4.10 . . .

3.3 Mechanics of composition
   3.3.1 Typesetting procedures and conventions
      3.3.1.1 Composition
      3.3.1.2 Proofing, repro proofing, progressive color proofing, etc.
      3.3.1.3 Distribution
   3.3.2 Proofreading and marking copy
   3.3.3 Copyfitting and copycasting
      3.3.3.1 Word count method
      3.3.3.2 Square inch method
      3.3.3.3 Line count method
      3.3.3.4 Character count method
   3.3.4 Lock-up and imposition
   3.3.5 Practical application of typographical means to:
      3.3.5.1 Setting straight matter
         3.3.5.1.1 Spreading type to ends
         3.3.5.1.2 Letter, word, line spacing
         3.3.5.1.3 . . .
         3.3.5.1.3.1 . . .
      3.3.5.2 Justification and multiple justification
         3.3.5.2.1 . . .
      3.3.5.3 . . .
      3.3.5.3.1 . . .

3.4 Functional considerations of legibility and readability
   3.4.1 Legibility nomenclature and descriptive testing procedures
   3.4.2 Commonly accepted conventions
3.4.3 The selection of appropriateness of;

3.4.4 The aesthetic and functional purpose of;

3.4.5 Reproduction process considerations of;

3.4.6 General audience reaction;

*.1 Type style selection
  .2 Type size selection
  .3 Inter-letter, inter-word, inter-linear spacing
  .4 Spacing between lines
  .5 Line length, justification, and arrangements effects
  .6 Margin and border size, placement, etc.
  .7 Color selection
  .8 Type form and illustrative matter relationships
  .9 Interaction of all factors listed above, i.e., the effect of type size, on type style, on word spacing, on line length, on ...

3.5 The influence of process and material on design considerations

3.5.1 Paper
  3.5.1.1 Characteristics (grain, strength, and stretch, color and opacity, basic weight, etc.)
  3.5.1.2 Classifications (coated, rough, book, etc.)
  3.5.1.3 Cost and application
  3.5.1.4 Design limitation and constraints

3.5.2 Inks
  3.5.2.1 Ingredients (pigment, vehicle, driers)
  3.5.2.2 Classifications (Lp., Litho., Grvr., Scrn. Proc)
  3.5.2.3 Characteristics (opaque, translucent, magnetic, special purpose and effect)
  3.5.2.4 Process color mixing, matching overlaying
  3.5.2.5 Design limitations and constraints
  3.5.2.6 Reproduction process application

3.5.3 Finishing processes in relation to designing
  3.5.3.1 Die stamping (cutting, creasing, slotting, embossing, perforating, etc.)
  3.5.3.2 Folding (French, parallel, etc.)
  3.5.3.3 Binding (side and saddle stitch, case bound sewn, loose leaf, spiral bound, etc.)
  3.5.3.4 ...
3.6 Type form composition analysis

3.6.1 The single letter
   3.6.1.1 Construction and proportions
   3.6.1.2 Negative and positive space and form
   3.6.1.3 Type program within one and multiple typeface(s)
   3.6.1.4 Size program within one and multiple typeface(s)
   3.6.1.5...

3.6.2 The word
   3.6.2.1 Mechanical spacing- spacing within and between words
   3.6.2.2 Visual and optical spacing- spacing within and between words
   3.6.2.3 Positive and negative space and form
   3.6.2.4 Direction and position
   3.6.2.5...

3.6.3 The line
   3.6.3.1 Mechanical spacing- between lines
   3.6.3.2 Visual and optical spacing- between lines
   3.6.3.3 Positive and negative space
   3.6.3.4 Direction and position of lines
   3.6.3.5 Number of words, line length, legibility
   3.6.3.6 Justified vs. unjustified lines
   3.6.3.7...

3.6.4 The column
   3.6.4.1 Leading and column width
   3.6.4.2 Justified vs. unjustified columns
   3.6.4.3 Column arrangements and relationships to positive and negative space, direction and position, tables and rows, margins, etc.
   3.6.4.4...

4. The Principles of Typographic Grid Formation: (Syllabus Unit 5)

4.1 Review of Classical typographic layout
   4.1.1 Symmetrical design principles
   4.1.2 Traditional arrangements
      4.1.2.1 Entire plate arrangements
      4.1.2.2 Standard block arrangements
4.1.2.2.1 Block - fully justified
4.1.2.2.2 Flush right
4.1.2.2.3 Flush left
4.1.2.2.4 Centered
4.1.2.2.5 Standard indentation
4.1.2.2.6 Hanging indentation
4.1.2.2.7 Full diamond and half diamond
4.1.2.2.8 Inverted pyramid
4.1.2.2.9 ...

4.1.3 Applications and appropriateness

4.2 Review of contemporary typographic layout
4.2.1 Asymmetrical design principles
   4.2.1.1 Formal
   4.2.1.2 Informal
4.2.2 Free form space vs. structured space
4.2.3 Applications and appropriateness

4.3 Review of the typographic division of space (planar area)
4.3.1 Mechanical vs. optical and visual
4.3.2 Centered axis arrangements
4.3.3 Off-centered axis arrangements
4.3.4 Utilization of space and element placement
   4.3.4.1 Horizontal, vertical, and staggered divisions
          and arrangements
   4.3.4.2 Aesthetic center placement(s)
   4.3.4.3 Major and minor interdependence
   4.3.4.4 Progressional relationship of element placement

4.4 The application of textual arrangements to illustrative material and images

This body of knowledge involves the majority of layout work in typographical design. It becomes necessary whenever any form of illustrative material is used along with textual matter. The basic concepts, principles, and rules presented in relationship to textual matter are also applicable, with minor re-adjustment, to illustrative matter. Therefore, reiteration should be made at the appropriate time during the actual presentation of the course work. The following organization is felt to be useful:
4.5 The grid system of layout
   4.5.1 The network concept of modular units
   4.5.2 Adaptability and variation within the grid system
       (letter construction guides to total layout)
   4.5.3 The grid system in book work
       4.5.3.1 Traditional aspects
       4.5.3.2 Contemporary aspects
   4.5.4 The grid system in magazines and catalogues
       4.5.4.1 Traditional aspects
       4.5.4.2 Contemporary aspects
   4.5.5 The grid system in newspapers

4.6 The mechanics of grid formation and layout
   4.6.1 The grid as a planning and structuring device
   4.6.2 The line grid and the basic units of type
   4.6.3 The adaptability of type size variations to line grids
   4.6.4 Grid developments
       4.6.4.1 Solid
       4.6.4.2 Vertical 2/2
       4.6.4.3 Horizontal 2/2
       4.6.4.4 Vertical with horizontal 2/2
       4.6.4.5 Vertical 3/3
       4.6.4.6 Vertical with horizontal 3/3
       4.6.4.7 Others ...
   4.6.5 Element placement and interdependence
       4.6.5.1 Column width and depth
       4.6.5.2 Area balance and imbalance (Sym., Asymmetrical)
       4.6.5.3 Space between columns and margin areas

4.7 The typographical matrix and its application to grids
   4.7.1 Utilization as an analytical planning device
   4.7.2 Matrix structural components: Content
4.7.2.1 Title (1st., 2nd., 3rd., order)
4.7.2.2 Text (Major, minor, captions, footnotes, legends, etc.)
4.7.2.3 Table (charts, graphs, etc.)
4.7.2.4 Orientation numbers (pagination, enumeration, reference, illustration)
4.7.2.5 Illustration (line, halftone, special effect)
4.7.2.6 . . .

2.7.3 Matrix structural components: Means
4.7.3.1 Type face (major combinations)
4.7.3.2 Type size (point size, x-height)
4.7.3.3 Type weight (light, regular, bold, etc.)
4.7.3.4 Type width (condensed, reg., extended, etc.)
4.7.3.5 Type case (upper, lower, small caps)
4.7.3.6 Type angle (regular, italic)
4.7.3.7 Type color (black, color, reverse print)
4.7.3.8 Letterspacing (normal, cond., expanded, special- optical, overlap)
4.7.3.9 Leading (solid, normal, line spacing)
4.7.3.10 Column width and length
4.7.3.11 Line position (flush right and left, centered)
4.7.3.12 Indentation (standard, hanging, none)
4.7.3.13 Direction (vertical, horizontal, other)
4.7.3.14 Underline (contour line, underscore, etc.)
4.7.3.15 Fixed position
4.7.3.16 . . .

4.7.4 Practical application and use of the matrix

5. Summary/Synthesis and Extension: Introduction to the Typographical Mechanical (Syllabus Unit 6)

This category of information is used to both summarize and extend the course structure and content. Emphasis is placed on the application and utilization of previous knowledge to produce a 'real life' color dummy (pseudo-mechanical).

5.1 Review of the stages of information design (as presented throughout the course)
5.1.1 Administration, conceptualization, and specification of the problem. State 1.
5.1.1.1 Guiding definition: This stage involves problem conceptualization, delineation, and specifica-
tion wherein the wants and needs of the client, project, and audience are detailed.

5.1.1.2 Interpretation: The following are (only) some of the questions which may be used to guide the problem definition:

What information and data is necessary for an understanding of the intended audience? To predict message effectiveness you will want to know about (a) their communication and perception skills, (b) their attitudes, (c) their knowledge level, (d) their social and cultural context, and so forth.

First, are they literate? Do they have the skills to interpret symbols, pictures, images, and to manipulate language? Next, what are their attitudes towards the area of information from which the message is drawn? towards the message? towards themselves? Third, what is their knowledge level? Are they familiar with the message subject and its implications and magnifications? Finally, what are the norms that shape their communication behavior? Do they belong to particular socio-economic, cultural-educational, political, religious, professional, or age groups? Do they possess certain cultural assumptions, stigmas, stereotypes and beliefs that can be used or guarded against?

What information and data is necessary for the design of the form and content of the message? Is the purpose of the message for entertainment? decoration? Illustration? propoganda? persuasion? or information dissemination? How critical is its understanding? How can the message be best conveyed? Under what circumstances will it be viewed? What is it about? How is the content organized? What kind of codes, structures, and treatments may be used for effective and efficient communication?
What other constraints will be imposed upon you as the designer? the message? the audience? What are the considerations of time, cost, production limitations, and so on?

5.1.2 Creation and specification of alternative solutions.

Stage 2.

5.1.2.1 Guiding definition: This stage is characterized by idea and design formation, with the selection of type faces, illustrations, copy writing, format, and so on.

5.1.2.2 Interpretation: This stage of project development involves a search for possible design solutions. It includes thumbnails and rough sketches to locate the given elements in relationship to each other or roughly constructed grids. Specification sheets may be generated in the form (a. typographical matrices - for the selection of type face, weight, width, size, color, etc., (b. exacting grids - for logical placement of elements, (c. copyfitted copy - to determine exact amount of area for textual matter and so on.

This should be carried out while keeping in mind the visual and functional purposes of individual parts and their combinations upon the total effect of the design solution.

5.1.3 Generation and reproduction of the selected problem solution, i.e. the mechanical. Stages 3 and 4.

5.1.3.1 Guiding definition: Production - In this stage all of the design elements are gathered, the mechanical is pasted-up, and the specifications for the production areas and routing are determined.

Reproduction - This stage may consist of such processes as typesetting, process photography, image carrier production, printing, binding and distributions.

5.1.3.2 Interpretation: As a result of this combination of stages, two pieces of hard copy evolve: (1) the finished layout with all of its necessary specifications for reproduction; and (2) a full
5.2 Introduction to the methods and techniques of typographical mechanism formation.

5.2.1 Preparation procedures
   5.2.1.1 Written specifications (process and product)
   5.2.1.2 Thumbnail sketches
   5.2.1.3 Rough layouts - elements and grids
   5.2.1.4 Typographic matrix and detailed grid
   5.2.1.5 Copy preparation
   5.2.1.6 Special markings
   5.2.1.7 Finished layout
   5.2.1.8 Proofing dummy (by hot or cold type)
   5.2.1.9 The mechanical (photostat, color key, etc.)

5.2.2 Media and materials
5.2.3 Processes (typesetting to imposition or paste-up)
5.2.4 Evaluation and quality control
5.2.5 . . .

Summary and Implications

Through the use of developmental procedures this chapter has produced an adaptation of the graphic communication technology body of knowledge to the industrial arts program at the college level of instruction.

The adaptation was reported in the form of an instructional program development titled "Graphic Communication Technology Education."

Three phases of development were utilized to accomplish the adaptation task. As a result of the first developmental phase an instructional systems plan and model were derived by a synthesis of...
the instructional systems literature. It is felt by the writer that both of these instructional planning devices can be useful for the development of many forms of instructional programs.

The second developmental phase of this chapter resulted in the formation of the graphic communication technology education instructional program. During the process of developing the instructional program its objectives were established and a selection and organization of appropriate subject matter was performed. By employing the derived objectives and subject matter as referent criteria, the instructional program was structured in a manner which produced three alternate levels or plans. This facilitated the selections of a program with a three, five, or eight course sequence of study, which increased the programs adaptability into existing industrial arts programs.

The writer realizes that other organizations may be derived from the proposed instructional program. Therefore the reader is encouraged to adapt the program to his own specific needs.

The third phase of the development in this chapter produced a structured course of study titled "Graphic Communication Typographical Design and Layout." The purpose of the development of the
course of study was to further illustrate the application of the
graphic communication technology body of knowledge (subject
matter) to the industrial arts program at a higher level of speci-
fication.

The course represents one of the many possible adaptations
within the graphic communication technology education program.
Hopefully it will serve as an example or a model for the devel-
opment of new courses, or for the revision of the presently existing
courses in the graphic communication area of the industrial arts
program.

This completes the discussion of the research and development
aspect of the study. The next chapter involves the assessment of the
structured body of knowledge.
CHAPTER VI

ASSESSMENT AND REVISION OF THE PROPOSED
RATIONALE AND STRUCTURE FOR GRAPHIC
COMMUNICATION TECHNOLOGY

As a result of the research and development phases of this study, solutions have been proposed for two of the three original problems identified. The solution to the first problem involved the development of a rationale and structure for the body of knowledge to be contained in graphic communication technology. The information and data originating from an analysis and synthesis of (1) the existing programs of study in graphic communication, (2) communication theory, and (3) the graphic communication industry, were applied to the IACP structural elements for industrial technology. In this manner, the IACP structure was adapted to develop the graphic communication technology structure. The major concepts of graphic communication technology were then identified and detailed through such procedures as conceptualizing, codifying, and ordering. These concepts and their components were utilized to form the subject matter for the study of graphic communication technology.
The solution to the second problem, resulting from the research and development phase of this study, concerned the adaptation of the graphic communication technology subject matter to industrial arts education. The purpose of this adaptation was to present (suggest to the reader) an exemplary model program that would be appropriate for inclusion into the existing college level programs and facilities of industrial arts education. In the process of accomplishing this task, the following program components were developed: (1) a list of instructional program criteria and a systematic instructional program model; (2) a sample instructional program including a three, five, and eight course sequence of study; and (3) a detailed sample course of study to serve as an illustrative example of an actual application of an expansion of the graphic communication technology body of knowledge.

At this stage in the study, the investigator was now concerned with the assessment of the developed structured body of knowledge. Therefore, the development strategy for the product assessment was undertaken.

Purpose of the Assessment
The purpose of the assessment was to determine the relevancy and adequacy of the rationale and structure for the graphic communication technology body of knowledge as it related to both the graphic communication industry and industrial arts education.

The assessment of the proposed graphic communication technology education program, even though desirable, was not considered to be a major phase of the study. However, it was recognized that an assessment of the developed program could reinforce the total assessment of this study. Therefore, a minor amount of emphasis was placed on assessing this area of the total development. The rationale behind that decision was two-fold in nature.

First, the instructional program was developed as a sample of only one possible form of adaptation. It was presented to the reader to illustrate the method and means by which the graphic communication technology body of knowledge could be adapted for instruction at the college level. The reader was then encouraged to develop or adapt an instructional program which would be appropriate to the specific structure, organization, and needs of
a particular college or university program of industrial arts education.

Second, in the writer's opinion, an assessment of the proposed instructional program would entail the implementation and testing of a prototype. This form of evaluative procedure was beyond the practical limits of time and cost within the context and purpose of the present study. However, the value of such an evaluation study is realized, and therefore, recommended (as a means of validation) for consideration as an extension of the present study.

Methodology of the Assessment

To introduce the methodology employed in the assessment phase of this study, a brief overview is presented prior to an in depth explanation of its components and procedures. The method of assessment that was decided upon for the study was that of an evaluation by a jury of experts from within the graphic communication field. The jurists were selected for their acknowledged expertise and contributions to the graphic communication education profession.
After the initial contact, the jury members were provided with the necessary descriptive materials to be evaluated and an assessment instrument. (See letter in Appendix E) In addition to responding to the instrument, the jurists were asked to make comments, suggestions, and any appropriate recommendations for readjustment or revision of the structured body of knowledge.

Upon receipt of the jury's response and recommendations, a summation and interpretation of the information and data were completed. Conclusions were then drawn as to the adequacy and relevancy of the structured body of knowledge for its stated purposes.

As a result of the jury's suggestions and recommendations, the subject matter within the taxonometric structure of the body of knowledge was revised and modified. The adjusted taxonomies and other revisions to the rationale and structure were then substituted for the original developments at the appropriate places within Chapter IV (see infra. p. 312).

The Selection of the Jurists

The length, complexity, and philosophical nature of the developed rationale and structure materials necessitated a limited
selection of highly knowledgeable individuals to serve as the assessment jurists. The writer selected the jury members from those individuals who have repeatedly contributed to the literature of the field and who were generally acknowledged as innovators and experts within the field. The seven jurists participating in the assessment task are listed below:

Richard G. Bentley  
Professor  
Department of Industrial Arts and Technology  
Kent State University  
Kent, Ohio

Ervin A. Dennis  
Professor  
Department of Graphic Arts  
Stout State University  
Menomonie, Wisconsin

William F. Flack  
Educational Specialist  
Professional, Commerical, and Industrial Markets Division  
Eastman Kodak Company  
Rochester, New York

Frederick D. Kagy  
Professor  
Department of Industrial Technology  
Illinois State University  
Normal, Illinois
The jury members were contacted prior to the distribution of the assessment materials and instrument. At the time of the initial contact they were informed of the scope and nature of the study, the complexity and length of the proposed assessment materials, the requirements of the task, and the time limitation involved (see Appendix D).

The Assessment Materials and Instrument

The jurists were provided with a four component packet of materials to aid them in the assessment of the developed rationale and structure. These components were (1) a letter of intro-
duction and instruction, (2) the formal assessment instrument, (3) the primary, assessment materials (Chapter IV of the study), and (4) supplementary assessment materials (the detailed course of study titled "Graphic Communication Typographical Design and Layout"). Each of the components will be discussed individually.

The letter of introduction and instruction. The letter included within the packet served both the purpose of relating information concerning the study and also that of charging the jury with the task at hand (see Appendix E). The jury was informed of several of the procedures that were followed in the study's development and also of the results of those procedures and developments as reported in the individual chapters. In addition, the terms graphic communication—industry, technology, and education were defined to show the direction and emphasis of the study.

The instructions for accomplishing the assessment task directed the jury members to include three types of responses in their evaluation of the provided materials. First, the jurist was asked to respond to the assessment instrument by assigning a rank value to each of the provided statements. This area of assessment will be discussed in the following section of this chapter.
Second, the jurist was asked to note discrepancies, inconsistencies, and omissions in the taxonomic listings. It was suggested that the jurist mark directly onto the copy that was being reviewed. In that manner, emphasis would be given to particular aspects or points, which needed to be reexamined by the writer.

Third, the jurist was asked to provide the writer with comments, suggestions, and recommendations which they believed to be necessary and pertinent for revision and modification. As reported later, the jury members did provide all three forms of response.

The formal assessment instrument. The formal assessment instrument (in addition to the other assessment forms listed above) was a brief but definitive questionnaire consisting of nine statements (see Appendix F). The statements were constructed in a manner which would assess (1) the total structure of the graphic communication technology body of knowledge and (2) individual portions of the body of knowledges, e.g., concepts, processes, and practices.

The purpose of the assessment was to obtain a judgement from the jurists concerning the relevancy and adequacy of the
structured body of knowledge as applied to either (or both) the graphic communication industry or to industrial arts education.

To obtain each judgement the respondent was asked to assign a rank of one (1) which designated the lowest value, through five (5) which designated the highest value in his opinion.

Through a comparison of the rank values assigned by all jury members, conclusions could be drawn concerning the adequacy and relevancy of the total structure and its component parts.

The primary assessment materials. To obtain the stated purpose of the assessment, an appropriate and adequate selection of the study's primary descriptive materials had to be made. The selected materials would necessarily include at least a representative sample of the developed conceptual framework, structural model, taxonometric classification, and subject matter organization.

A decision was made to provide the jury with a preliminary draft of Chapter IV of the study. In this manner, a complete description of the rationale and structure for graphic communication technology and the components for the body of knowledge were made possible. This permitted an examination of the developments individualparts along with their inter-
relationships and context within the total structure.
(See Appendix 5.)

The supplementary materials. In addition to the primary assessment materials, it was thought to be desirable and helpful to illustrate an example of their use at a higher order or level of specification. For this purpose the detailed course of study titled "Graphic Communication Typographical Design and Layout" was also included in the assessment packet of materials. The jury was instructed to review these materials and to provide pertinent comments and suggestions. The supplementary materials were to be used primarily as an aid in the assessment rather than as a product to be assessed. However, the favorable comments received from several of the jurists indicated that the course seemed to be adequate and appropriate for inclusion into the industrial arts program.

The assessment packet of materials was "created", "generated", "reproduced", and "distributed" to the jury members. Upon receipt of the jury's response, an analysis of their respective recommendations and suggestions was performed and applied to the appropriate aspects of the study. A report of the jury's response is now presented.
The Record of the Jury's Response

This section of the chapter presents a report of the jury's response to the formal assessment instrument. The recommendations and suggestions which were also provided by the jury are included (reported) later, during the discussion of the revision of Chapter IV.

Table 9 presents the statements which were submitted to the jury members in the formal assessment instrument. The original order of the statements, as found in the instrument, has been retained, and the wording is also identical.

The actual rank value assigned by each jurist is reported, respectively, for each statement in the table. The reader is reminded that the statements concern the relevancy and adequacy of the graphic communication technology body of knowledge in relationship to the graphic communication industry and/or industrial arts education. The rank of one (1) designated the lowest value, and the rank of five (5) designated the highest value in the opinion of the respondent.
TABLE 9
THE JURY'S RESPONSE: ASSESSMENT OF THE RATIONALE & STRUCTURE OF THE BODY OF KNOWLEDGE CONTAINED WITHIN GRAPHIC COMMUNICATION TECHNOLOGY

<table>
<thead>
<tr>
<th>Bentley</th>
<th>Dennis</th>
<th>Flack</th>
<th>Kagy</th>
<th>Simich and Smith</th>
<th>Strandberg</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

The processes contained within the content of graphic communication technology are representative of those found in the graphic communication industry (print media).

| 4   | 4   | 5   | 5   | 5    | 4          |

The practices contained within the content of graphic communication technology are representative of those found in the graphic communication industry.

| 5   | 4   | 5   | 5   | 4    | 4          |

The techniques, methods, procedures, contained within the content of graphic communication technology are representative of those found in the graphic communication industry.

| 5   | 5   | 5   | 5   | 5    | 5          |

The organization of subject matter into the major concepts of administrating, creating, generating, reproducing, and distributing represent a logical and viable structure for graphic communication technology.
The structured body of knowledge within graphic communication technology is adequate for instructional purposes.

The structured body of knowledge within graphic communication technology is appropriate for inclusion as a sub-program of industrial arts education.

The proposed body of knowledge for graphic communication technology could be implemented into an existing industrial arts education program.

The conceptual base (practices and processes) of graphic communication technology is adaptable to technological and social change and therefore could be continuously updated and revised.

The structured body of knowledge for graphic communication technology is adaptable to differing levels and programs, i.e., junior high school through college and technical institutes, and general education to technical-vocational education.
Results of the Assessment

The assessment procedures employed within this study produced two major results. One major result provided the writer with the opportunity of evaluating the development in relationship to the opinion of the jury of experts. This in turn allowed several conclusions to be drawn. The other major result was the obtainment of information and data which could then be employed to revise the structured body of knowledge. Both of these areas are now detailed.

Conclusions Based Upon the Results of the Assessment

Upon an examination of the rank values assigned to the assessment instrument statements by the respondents, several conclusions have been drawn. (These conclusions are further substantiated by the respondent's comments included in Appendix H.)

A first conclusion would be that the jury seemed to be in general agreement that the graphic communication technology rationale and structure was adequate and relevant in relationship to the graphic communication industry and industrial arts education. This was demonstrated by the respondent's assignments
of a majority of the rank values in the four and five category.
The lowest rank value assigned to any statement was that of a
three, with this occurring only three times out of the total number
of responses.

In support of the conclusion above, three additional
conclusions have been derived from those statements which re­
ceived a unanimous value rating of five from all respondents.
These conclusions would be that:

1. The processes contained within the content of
graphic communication technology are representative of those
found in the graphic communication industry (print media).

2. The organization of subject matter into the major
concepts of administrating, creating, generating, reproducing,
and distributing represent a logical and viable structure for
graphic communication technology.

3. The conceptual base (practices and processes) of
graphic communication technology is adaptable to technological
and social change and therefore could be continuously updated
and revised.

One last conclusion noteworthy of special mention con­
cerns the statement to which six of the respondents assigned
a rank value of five, and the remaining respondent assigned a rank value of four. This conclusion was that the structured body of knowledge within graphic communication technology was appropriate for inclusion as a sub-program of industrial arts education.

Revision of the Body of Knowledge Based Upon the Results of the Assessment

As mentioned earlier, in addition to responding to the formal assessment instrument, the jury members also critiqued the subject matter content and structure of the body of knowledge. This was accomplished by noting inconsistencies, exclusions, and errors within the actual assessment materials (Chapter IV). The jury's recommendations and suggestions were also used for revision and readjustment, and are reported in Appendix H.

The overall jury's response indicated that there were no serious structural revisions needed to the development of the rationale and structure. Furthermore, even a few of the minor issues identified were later dismissed by the jurists as being insignificant in light of the total rationale and structure development. For example, the classification of "Training" did not
specifically mention training through correspondence courses, but could be expanded for their inclusion. Therefore, a major revision to the rationale and structure was not deemed necessary by the writer.

In regards to the subject matter content and organization, within the body of knowledge, all but one of the jurists responded by noting what they felt to be necessary deletions, additions, or rearrangements. In many of these instances, the jurists wrote in the desired change. The items necessary for revision were then compiled by the writer and used to modify and readjust the subject matter outlines, wherever appropriate. The revised content was then examined by the writer to insure its consistency with the total developmental effort.

In summary, the revisions which were suggested as a result of the assessment phase of the study were completed. They were incorporated in Chapter IV of the study, in place of the original components of the preliminary draft. The original draft used in the assessment has been included in Appendix G to provide the reader with a comparison of the two manuscripts.
CHAPTER VII

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents a brief reiteration of the procedures and results of the study. The first section of the chapter summarizes the results of the research, development, and assessment activities which were undertaken by the writer in the study's development. The second section of the chapter presents several conclusions that have been derived as a result of the completed product. The third section of the chapter proposes recommendations for additional study.

Summary of the Study

The impetus of this study originated as a result of the writer's professional involvement as an instructor (and as a student) of graphic communication, in industrial arts and technology education, at the college level. In the processes of reformulating, revising, and restructuring his philosophical basis as to the role, scope, and nature of the graphic communication program curriculum, the writer began to examine the existing college programs and curriculums. The major criteria
employed in the examination process were that of the feasibility, adequacy, and appropriateness of the graphic communication curriculums to meet the needs and goals of industrial arts education.

A continuous search of the literature, examination of individual university and technical institute graphic communication program curriculums, and discussion with professional colleagues gave direction to the endeavor. However, the chaotic "state-of-the-art" within the area of graphic communication also became evident. The lack of even a commonality of agreement among graphic communication educators and professionals as to the field's scope, nature, and structure frustrated the writer, but also increased his determination to seek the problem's solution.

A review of the graphic communication literature also indicated that other educators and professionals were concerned with the problem area. Several innovative projects had been established to seek partial solutions to the overall problem of developing graphic communication curriculum materials. This further reinforced the need for additional research and development. As a result of this recognized need, the writer decided to approach his graduate study with the pursual of the problem
area as one of his goals.

The Problem Undertaken

The problem undertaken by the study consisted of three inter-related but sequential parts (problems). The first part (problem) of the study involved a research and development effort to locate and retrieve information and data to formulate a theoretical structure for the study. This was accomplished by the analysis and synthesis of information and data which were located through an extensive review of the literature in the industrial arts and graphic communication fields. The derived knowledges were then structured into a conceptual framework by the use of, and within the limits and constraints of, the IACP structure for the body of knowledge known as industrial technology. When developed, the conceptual framework became the basis for the rationale and structure of the graphic communication technology body of knowledge.

The second part (problem) of the study concerned the development of an instructional program by which the graphic communication technology body of knowledge could be implemented into the industrial arts program at the collegiate level. This was developed to provide an example of one possible adaptation for the
structured body of knowledge. To accomplish this task, an instructional systems approach was employed.

The third part (problem) of the study involved the assessment of the developed rationale and structure for the body of knowledge contained in graphic communication technology. The purpose of the assessment was to evaluate the ability of the graphic communication technology body of knowledge to: (1) be representative of the practices and processes of the graphic communication industry, (2) be an appropriate source of subject matter for the graphic communication technology education area of industrial arts education, (3) be instructionally feasible and implementable into existing programs and facilities, and (4) form a logically ordered, codified, and conceptualized structure. This was accomplished in part by the use of a selected jury of graphic communication educators and professionals who were considered to be experts in the field.

The Problem Solution

As a result of the research and development phase of the study, two products have been produced. The first product, being of major importance, was the graphic communication technology structured body of knowledge; and the second product was the
graphic communication technology education program. The second product was developed in support of and as an exemplary practical application of the first product.

The graphic communication technology structured body of knowledge. The structured body of knowledge, as reported in Chapter IV, represents the area of greatest concern within this study. It has been developed by performing an adaptation to the IACP structure for industrial technology. The adaptation was accomplished by extending the industrial technology structure to a higher level of specification, where in graphic communication technology was classified as a subcategory of manufacturing technology.

The structural elements of graphic communication technology management, production, and personnel, as derived from industrial technology through manufacturing technology, became the focal point upon which the conceptual and structural framework was built. As derived from the review of the literature, the descriptive information and data of the graphic communication field (education and industry) were employed to delineate, codify, and categorize the subject matter content of the structural elements. In this manner, the practices of graphic communication technology were established.
The practices, contained within the structural elements, were placed into an operational setting to derive the major graphic communication processes. Finally, the processes were conceptualized and structured to form the major concepts of graphic communication technology.

The major concepts of administration, creation, generation, reproduction, and distribution, and their corresponding practices and processes (as applied by humans through materials to produce graphic communication products) constitute the subject matter components of graphic communication technology.

The graphic communication technology education program. The educational program, as reported in Chapter V, represents an adaptation of the graphic communication technology body of knowledge to the industrial arts program at the college level of instruction. The program was developed to illustrate one possible organization and structure for the subject matter of graphic communication technology. The reader was then encouraged to adapt, adopt, or derive a similar program for his own situational needs. To guide the reader in such a development, three aspects of the program were detailed.
First, by the use of the reviewed instructional systems literature as a referent, an instructional system plan and model were formulated to guide the development of the graphic communication technology education program.

Second, three alternate instructional programs were developed by applying the previously derived objectives and subject matter content. These alternatives provided the reader with the possibility of selecting a three, five, or eight course sequence of study. This was accomplished to facilitate and increase adaptability into the existing industrial arts programs.

Third, a detailed course of study, titled "Graphic Communication Typographical Design and Layout", was developed as a further example to illustrate the derivation and application of higher orders (or levels) of objectives, subject matter selection and organization, and the development of learning experiences and activities. This course represented one of the many possible adaptations within the graphic communication technology education program.

The Program Assessment

The product assessment was brought about by the desire to
evaluate the proposed rationale and structure for the graphic communication technology body of knowledge. To accomplish this task, a jury of seven experts were selected from the graphic communication field and education profession. The jury was provided with the assessment materials, consisting of the first draft of Chapter IV and the typographical design course materials and an assessment instrument.

The jury members responded by (1) assigning rank values to the assessment instrument statements, (2) writing suggestions and recommendations, and (3) providing corrections (additions and deletions) to the taxonometric lists of the rough drafts. These responses were used to make revisions and to draw conclusions about the product.

As a result of the assessment procedures, the subject matter organization of Chapter IV was revised and readjusted. However, no major structural changes were indicated by the jury members, therefore, the structure remained as originally proposed.

The findings which were drawn are now presented.
Findings of the Study

The findings of the study have been derived by an analysis of the information and data collected through the review of the literature and the recommendations and suggestions of the assessment jury. These findings have been organized for presentation into three sets.

The first set of findings are stated with a large degree of certainty. They received a unanimous rating of five from all jury members. (The rank of five designated the highest value and the rank of one designated the lowest value in terms of relevancy and/or adequacy in the jurist opinion.) These are the findings within the context of the original assessment statements:

1. The organization of the proposed graphic communication technology body of knowledge into the major concepts of administering, creating, generating, reproducing, and distributing represent a logical and viable structure.

2. The practices and processes of the conceptual framework of the proposed graphic communication technology body of knowledge may be continuously revised by their adaptability to technological and social change.
3. The processes contained in the subject matter of the proposed graphic communication technology body of knowledge, as organized under the major concepts, are representative of those found in the print media portion of the graphic communication industry.

The second set of findings are stated with a little less certainty than the first set, but they still indicate a high value rating in the jury's opinion. The original assessment statements received either a four or five value rating from the jurists. These conclusions are as follows:

4. The practices (of management, production, and personnel) contained in the proposed graphic communication technology body of knowledge are representative of those found in the graphic communication industry.

5. The techniques, methods, and procedures contained in the proposed graphic communication technology body of knowledge are representative of those found in the graphic communication industry.

6. The structured body of knowledge within the proposed rationale and structure for graphic communication technology is appropriate for inclusion as a subprogram of industrial arts
education.

The third set of findings are stated with less certainty than the prior findings. However, the overall value rating attained by the original statements would qualify them well within the range of adequate acceptability. In this case, each statement received a four or a five value rating from all but one respondent, with that remaining rating being a three. These findings are as follows:

7. The structured body of knowledge in the proposed rationale and structure for graphic communication technology is adequate for instructional purposes.

The respondent rating this statement at a value of three questioned the division of the material production industry, for instructional purposes, into the categories of manufacturing and construction technology. In the same manner, he disagreed with the definition and classification, for instructional purposes, of graphic communication technology as a subcategory of manufacturing technology.

This would seem to indicate a philosophical difference between that posed in the study and that of the respondent. The position presented by the structural model in the study expresses the writer's belief and is based upon the adaption of the IACP
structure for industrial technology (see supra, pp. 8, 43, and 126).

8. The proposed body of knowledge for graphic communication technology can be implemented into the existing industrial arts education programs.

The writer was informed, by the respondent rating this statement at a value of three, that the proposed program might necessitate an interdisciplinary of interdepartmental approach. The writer is in agreement with that reasoning and would hope that experts from many disciplines and fields would be utilized in the program implementation and instructional processes. On the other hand, with the development of adequate instructional materials and aids a properly trained classroom teacher could accomplish the tasks.

9. The proposed graphic communication technology body of knowledge is adaptable to differing levels (junior high school through college) and programs (general education to technical -- vocational education).

The respondent assigning the rank value of three stated that the subject matter outlines were not detailed sufficiently at extreme levels of sophistication. It was indicated that further detailing would be necessary for the development of subject matter outlines for highly specialized trade training. The writer is in agreement
with that observation and would recommend that type of detailing as an appropriate task for a team of experts from within the graphic communication industry.

In summary, it appears that as a result of this study, a substantial conceptual structure has been established for the further development of graphic communication technology curriculum materials.

Conclusions of the Study

The writer has drawn the following conclusions, based upon the findings of the study.

1. The relationship between industrial technology, manufacturing technology, and graphic communication technology can be established, delineated, and defined.

2. Graphic communication technology can be delineated, and detailed in terms of its context, i.e., inputs, outputs, and boundaries.

3. The body of knowledge for graphic communication technology can be structured, ordered, and codified.
4. The structured body of knowledge for graphic communication technology can be conceptualized for instructional purposes, and thereby represent the current major processes and practices of the graphic communication industry.

5. The graphic communication technology structured body of knowledge can be used as a referent for the development of instructional packages.

6. The graphic communication technology structured body of knowledge can be employed for differing purposes, i.e., general education at the elementary, secondary, and collegiate level; or vocational education at the post-high school and technical institute level.

7. Graphic communication technology is an appropriate subject matter area for inclusion as part of industrial technology (arts) education.

**Recommendations of the Study**

As a result of the total research, development, and assessment activity employed by the writer in this study, several recommendations are suggested as follows:

1. The rationale and structure for graphic communication
technology represents an adequate initial organization for the
body of knowledge contained in the industrial practices and
processes of the graphic communication subcategory of manufacturing
technology, and, henceforth, industrial technology. However, it
should not be considered to be an ultimate structure for the body
of knowledge. Additional research and development should be
conducted to reevaluate, redefine, and reorganize the present
development.

2. The organization of the graphic communication technol-
ogy body of knowledge into the identified concepts of administration,
creation, generation, reproduction, and distribution represent an
adequate initial system for the structuring and ordering of the
processes and practices of the print media portion of the graphic
communication industry. Nevertheless, these concepts and their
subject matter content organization should be reexamined, redefined,
and possibly restructured for further refinement.

3. This study has been limited to only the print media
portion of graphic communication technology and its industry. This
was decided upon as a delimiting device and also to facilitate
implementation into the existing graphic communication area of the
industrial arts education program. However, there is an apparent
need to extend the scope and nature of this study to the non-print media (cinema, video, and computer graphics) portion of graphic communication technology. It is suggested that this form of curriculum development may be attempted in terms of interdisciplinary study.

4. The purpose of the proposed graphic communication technology education program was that of providing an exemplary model to guide in the adaption, adoption, and/or implementation of the graphic communication technology body of knowledge into the college level of industrial arts education. It was realized that the program proposal could have benefited from a trial and evaluation, but this was beyond the practical limitations of the study. It is therefore suggested as an appropriate extension of this study and worthy of further investigation.

Other suggestions concerning the proposed educational program are (a) adaptation to other levels of the industrial arts program, e.g., junior high and senior high school; (b) redevelopment, refinement, and possibly restructure; and (c) incorporation into an interdisciplinary approach (within and outside of industrial education).
5. A further recommendation as a result of this study would concern the development of alternate strategies for the design of the overall structure of the body of knowledge identified as graphic communication technology.
APPENDIX A

A SURVEY TO DETERMINE THE CLASSIFICATION OF
GRAPHIC/VISUAL COMMUNICATION PROGRAMS
I am a doctoral candidate at The Ohio State University and presently gathering data for a research study funded by the Graphic Arts Technical Foundation. A preliminary study involving the classification of graphic/visual communications is being formulated under the auspices of the graduate design faculty. The results of this study are felt to be of great value to many areas of graphic/visual communication study, and will be made available at a later date.

Professor Charles Wallischaeger, Chairman of the Design Division, has suggested that your program be included as one of those to be examined. I am writing to ask you for any descriptive literature that you might have available. Of particular interest are the areas of (1) Program description, i.e., contents, organization, philosophy, etc., (2) Course offerings and descriptions, and (3) Areas of specialization within the general program.

Included with this letter is a brief questionnaire. Its purpose will be that of structuring and formulating areas of description about graphic/visual communication programs. Obviously, conclusions drawn from such a questionnaire will be general in nature. These conclusions when combined with supplemental information should form an adequate basis for a general description.

I realize that your time is at a premium, but your help will make it possible to continue the research. Please accept our sincere thanks in advance for your consideration, time and help.

Sincerely yours,

R. Louis Gysler
Teaching Associate

Charles Wallischaeger
Chairman, Division of Design
A Questionnaire to Determine the Classification of Graphic/Visual Communication Programs

I. Would you please give the following information about your program.

Program Title: ______________________________________________________________.

Program Training Time: 2-year__ 3-year__ 4-year__ 5-year__ 6-year__.

Degree Granted: Assoc.____ B.A.____ B.S.____ M.A.____ M.S.____ M.F.A.____ Ph.D.____.

II. Would you please check the following statements in relationship to your program.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Other</th>
<th>Program Major Direction and Emphasis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Technical/Vocational</strong> - a 2-year degree program in preparation for a specific job task in the graphic communication industry, ie. illustrator, typographer.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Professional Training</strong> - a 4-or-more year degree program in preparation for a higher level position in the graphic communication industry, ie. planning and managerial level, research, development, and production level.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>General/Liberal Education</strong> - a 2-to-4-year liberal arts degree program with an overview of many fields in the graphic communication industry.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Design Practice</strong> - The product of this area is a creative team member who will be directly involved with the process of taking a problem statement and translating it into a solution in his own particular area of specialization. Emphasis on materials, process and production.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Design Planning and Management</strong> - The product will be a person who will be well acquainted with all areas of design and possess planning and managerial abilities. Emphasis on the total systems concept of producing solutions and alternatives to communication problems.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Design Research and Theory</strong> - Emphasis on analysis and testing of communication theory to provide research material in such areas as advertising information, public information, and education.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Design Education</strong> - This person is a generalist with an overall degree of technical expertise and knowledge, but is not a specialist in any one area of the field. Emphasis on all aspects of design communication with the addition of educational methodology.</td>
</tr>
</tbody>
</table>

Please Specify: ______________________________________________________________.
<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Other</th>
<th>Curriculum Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Emphasis placed on the social, cultural, political and economic relationships of graphic/visual communication.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Emphasis placed on the form and effects rather than the technological processes of communication.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Emphasis on the more or less practical aspects of graphic/visual communications.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Emphasis on the technical design aspects of the communication process.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Emphasis on the hardware rather than on the software of communication, i.e. machine system design.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Emphasis on the quality, effects, and regulation of human communications.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Emphasis on the design and production of mass media communications, i.e. newspaper, magazine, radio, t.v., and films.</td>
</tr>
</tbody>
</table>

Please Specify: __________________________

______________________________

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Other</th>
<th>Allied Fields of Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Public Information; including journalism, publishing production, broadcasting, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Public Persuasion; including advertising, public relations, propaganda, public opinion, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Professional and Technical Engineering and Science.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Business, Public and Institutional Administration; including direction, motivation, and control of human organizations.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Behavioral Sciences; including sociology, psychology, physiology, anthropology, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Communication Media; including cinema photography, photography, graphic media aspects, etc.</td>
</tr>
</tbody>
</table>

Any Others Not Included: __________________________
<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Other</th>
<th>Program Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>( ) ( ) ( )</td>
<td>Identified as part of Communication Education (teacher training)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Identified as part of Professional Engineering and Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Identified as part of Design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Identified as part of Art</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Identified as part of Advertising Design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Identified as part of Graphic Design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Identified as part of Graphic Communications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Identified as part of Visual Communications</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please Specify:

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Other</th>
<th>Student End Product (The educating/training of:</th>
</tr>
</thead>
<tbody>
<tr>
<td>( ) ( ) ( )</td>
<td>Artists</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Artist Illustrator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Advertising Artist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Artist Educator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Commercial Artist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Graphic Artist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>None of these</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Communicators</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Communication Educator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Graphic Communicator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Visual Communicator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>None of these</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Designers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Designer Educator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Graphic Designer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Graphic Arts Designer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Technical Illustrator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>None of these</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Photographers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Photographer Educator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Commercial Photographer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Journalist Photographer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>Free Lance Photographer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) ( ) ( )</td>
<td>None of these</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please Specify:
Frequency Tabulation of the Answers given by the Respondent's with the Program Title of Visual Communication:

1. **Description of Program Major Direction & Emphasis**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

**Technical/Vocational** - a 2-year degree program in preparation for a specific job task in the graphic communication industry, i.e. illustrator, typographer.

**Professional Training** - a 4-or-more year degree program in preparation for a higher level position in the graphic communication industry, i.e. planning and managerial level, research, development, and production level.

**General/Liberal Education** - a 2-to-4-year liberal arts degree program with an overview of many fields in the graphic communication industry.

**Design Practice** - The product of this area is a creative team member who will be directly involved with the process of taking a problem statement and translating it into a solution in his own particular area of specialization. Emphasis on materials, process and production.

**Design Planning and Management** - The product will be a person who will be well acquainted with all areas of design and possess planning and managerial abilities. Emphasis on the total systems concept of producing solutions and alternatives to communication problems.

**Design Research and Theory** - Emphasis on analysis and testing of communication theory to provide research material in such areas as advertising information, public information, and education.
Design Education - This person is a generalist with an overall degree of technical expertise and knowledge, but is not a specialist in any one area of the field. Emphasis on all aspects of design communication with the addition of education methodology.

2. Classification of Curriculum Base

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

Emphasis placed on the social, cultural, political and economic relationships of graphic/visual communications.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

Emphasis placed on the form and effects rather than the technological processes of communication.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

Emphasis on the more or less practical aspects of graphic/visual communications.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Emphasis on the technical design aspects of the communication process.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

Emphasis on the hardware rather than on the software of communication, i.e. machine system design.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

Emphasis on the quality, effects, and regulation of human communications.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

Emphasis on the design and production of mass media communications, i.e. newspaper, magazine, radio, t.v., and films.

3. Utilization of Supportive and Allied Fields of Information

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

Public Information; including journalism, publishing production, broadcasting, etc.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Public Persuasion; including advertising, public relations, propaganda, public opinion, etc.
<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
<th>Professional and Technical Engineering and Science.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
<th>Business, Public and Institutional Administration; including direction, motivation, and control of human organizations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
<th>Behavioral Sciences; including sociology, psychology, physiology, anthropology, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
<th>Communication Media; including cinema photography, photography, graphic media aspects, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

4. **Program Classification with Relationship to Other Disciplines**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Identified as part of Communication Education (teacher training)</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
<th>Identified as part of Professional Engineering and Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
<th>Identified as part of Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
<th>Identified as part of Art</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
<th>Identified as part of Advertising Design.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
<th>Identified as part of Graphic Design.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
<th>Identified as part of Graphic Communications</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
<th>Identified as part of Visual Communications</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

5. **Classification of Graduates (Student End Product)**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No Responses</th>
<th>Artists</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Artist Illustrator</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Advertising Artist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Artist Educator</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Commercial Artist</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Graphic Artist</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>No Responses</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Communicators</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Communication Educator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Graphic Communicator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visual Communicator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Designers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Designer Educator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Graphic Designer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Graphic Arts Designer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Technical Illustrator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Photographers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Photographer Educator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commercial Photographer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Journalist Photographer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Free Lance Photographer</td>
</tr>
</tbody>
</table>

**Listing of Respondents:**

Professor Etherington  
Department of Art  
University of Hawaii  
Honolulu, Hawaii

Professor Sterkel  
Department of Art  
University of Illinois  
DeKalb, Illinois

Professor Schmalm  
Visual Communication Education Project  
Western Washington State College  
Bellingham, Washington

Professor Doblin  
Institute of Design  
Illinois Institute of Technology  
Chicago, Illinois

Professor Manson  
Department of Fine Arts  
University of Southern California  
Los Angeles, California

Professor Paulsen  
Cranbrook Academy of Art  
Department of Design  
Bloomfield, Michigan
APPENDIX B

SOME SELECTED PRINCIPLES, PROPERTIES AND ELEMENTS
OF AESTHETIC DESIGN AS APPLIED TO GRAPHIC COMMUNICATION
Some Selected Principles, Properties, & Elements of Aesthetic Design as Applied to Graphic Communications

1. Design Principles

1.1 Repetition (rhythm)
1.2 Alternation
1.3 Gradation
1.4 Radiation (-and irradiation)
1.5 Contrast (-or difference)
1.6 Variation (-or contrasts)
1.7 Harmony (relates to parts)
1.8 Unity (relates to those aspects or qualities which makes a thing whole)
1.9 Balance
   1.9.1 Formal (symmetrical, static)- includes also axial and radial balance
   1.9.2 Informal (asymmetrical, dynamic, occult)
1.10 Emphasis
    1.10.1 Visual dominance
    1.10.2 Functional purpose (Aesthetic & Objective)

2. Design Elements

2.1 Point
   2.1.1 Psychological and traditional aspects of the design element, point:
      2.1.1.1 The essence of a thing
      2.1.1.2 The beginning or end of a thing
      2.1.1.3 Completeness
2.1.2 Visual determinants of a point:
2.1.2.1 The source and/or the end of a visual element or property
2.1.2.2 The center of a real or suggested enclosure
2.1.2.3 A real or suggested intersection or lines
2.1.2.4 A non-dimensional interruption of real or simulated space (Validity of this condition is determined by the size relationship of the "dot" to the surrounding space and shapes.)

2.1.3 Design properties applicable to the design element, point:

None

2.2 Line
2.2.1 Descriptive aspect of a line:
2.2.1.1 Line can be defined as a point in movement whose path may be
     --Free and/or
     --Geometric (mathematically controlled)
2.2.1.2 A line can be a junction between
     --Two areas
     --An area and an adjacent space
     --Two volumes
     --A volume and an adjacent space
2.2.1.3 A line can be an element in establishing
     --A surface (planar, curved and/or compound)
     --A volume
2.2.1.4 Lines and their arrangements can be described by the following words, used singly or in appropriate combinations:
     --Static
     --Dynamic
     --Rhythmic
     --Directional
     --Psychologically Expressive
2.3 Plane

2.3.1 Concept of the plane

2.3.1.1 Restrictive - a flat surface having only two dimensions

2.3.1.2 Liberal - any surface area

2.3.2 Functional capacities of the planar surface: (Singly or in appropriate combinations)

2.3.2.1 Informative

2.3.2.1.1 Literary
2.3.2.1.2 Illustrative
2.3.2.1.3 Decorative

2.3.2.2 Expressive

2.3.2.2.1 Literary
2.3.2.2.2 Decorative
2.3.2.2.3 Realistic (Involves the simulation of three dimensional form and space upon two dimensional surface)

2.3.2.2.4 Stylized (Involves the exaggeration or emphasis of one or more visual aspects of a real object)

2.3.2.2.5 Abstract (Involves the selective use of certain aspects of the subject matter, which may be freely manipulated)

2.3.2.2.6 Non-objective (Involves the graphic presentation of concepts without visual utilization of existing object or geometric form.)

2.4 Simulated Three-dimensional Elements

2.4.1 Space (depth and plastic illusion) and Volume (plastic form) Conditions which assist in establish simulated space and volume:

2.4.1.1 Intervals between other elements
2.4.1.2 Closures formed by other elements
2.4.1.3 Figure-ground relationships:

2.4.1.3.1 Foreground
2.4.1.3.2 Middleground
2.4.1.3.3 Background
2.4.1.3.4 Reversible figure

2.4.2 Depth and the picture plane can be achieved by:

2.4.2.1 Penetration of the picture plane
2.4.2.2 Emphasis upon planes parallel to the picture plane
2.4.2.3 Denial of planes not parallel to the picture plane

2.4.2.4 Perspective

2.4.2.4.1 Atmospheric or aerial perspective can be achieved through:
   -- Solid and gradated shading of lines
   -- Simulated forms and areas
   -- Overlapping of forms
   -- Appropriate use of advancing and receding color
   -- Positioning

2.4.2.4.2 Linear perspective can be achieved through the use of:
   -- "Covering parallels" (lines, simulated surfaces, etc.)
   -- Diagonal movement
   -- Gradation and contrast of elements and properties

2.4.3 Classification of simulated space

2.4.3.1 Positive space: encircles a shape or encloses a simulated volume

2.4.3.2 Negative space: enclosed by a shape or a simulated volume

2.4.4 Classification of simulated volume (simulated plastic form) (The following descriptions may be used singly or in appropriate combinations)

2.4.4.1 Linear - composed with lines which simulate volume

2.4.4.2 Planar - composed of simulated planes so organized to suggest volume

2.4.4.3 Biomorphic - composed of simulated curved surfaces

2.4.4.4 Exterior or Postive - refers to those volumes or parts of volumes surrounded by space

2.4.4.5 Interior or Negative - refers to those volumes or parts of volume containing space within

2.4.4.6 Closed - refers to exterior or positive volumes which form an envelope or an enclosure which contains parts of the same volume (Sometimes referred to as a Virtual volume)

2.4.4.7 Open - refers to exterior or positive volumes which reach out and extend into surrounding space
2.4.4.8 Articulated - refers to the three-dimensional pattern development (simulated, of course in a two-dimensional context) of a volume or planar surface.

3. Design Properties

(In this section design properties will be introduced through their applicability to the design element and line. However, their use is just as valid in planar and three dimensional design.)

3.1 Size and Proportion

3.1.1 Size (of the line and/or its interval)
   3.1.1.1 Length
   3.1.1.2 Thickness
   3.1.1.3 Depth (three-dimensional aspect)

3.1.2 Classical Proportion: Demonstrated through the Grecian "Golden Mean" - 1 to 1.618 and/or 1 to 1.83, also graphically developed in "whirling square" rectangle (the Golden rectangle).

3.1.3 Subjective Proportion
   - used in all the visual arts almost exclusively at present.

3.2 Shape or Form
   (-little application to the design element, line, except to a small degree in those cases where a calligraphic thick and thin line is considered)

3.3 Direction and Position (or placement)

3.3.1 Directional implications
   3.3.1.1 Horizontal direction
      - passive, clam
   3.3.1.2 Vertical direction
      - strength, balance
   3.3.1.3 Oblique or Diagonal directions
      - restless, dynamic, moving

3.3.2 Positions can be established which:
   3.3.2.1 Can develop attractions (spatial; tensions) between or among things
   3.3.2.2 Can develop strong patterns in grouping
   3.3.2.3 Emphasize "Likeness" as a basis for grouping

3.4 Texture and Pattern

3.4.1 Types of real or tactile (actual or implied quality of an object which appeals to the sense of touch) and simulated textures and patterns.
- (Descriptions may be combined when appropriate)

3.4.1.1 Natural - reveals the structure of the object or material in the realms of nature and technology

3.4.1.2 Applied - reveals little or nothing of the object's structure

3.4.1.3 Formal - mathematic or geometric form and repetition of parts

3.4.1.4 Informal or Organic - free and irregular, bimorphic (relating to living organisms or to life itself)

3.4.2 Differences between texture and pattern

3.4.2.1 Texture: The surface quality of an object resulting from one or more materials and/or processes physical acting upon that object.

3.4.2.2 Pattern: The arrangement of surface parts.
   3.4.2.2.1 Linear or band treatment
   3.4.2.2.2 Combined linear or multiple band treatment
   3.4.2.2.3 Overall or polydirectional treatment

3.4.3 Functional Capabilities
   3.4.3.1 Establish illusionary depth
   3.4.3.2 Visually enrich surfaces

3.5 Value

3.5.1 Psychological aspects of the six value keys:
   3.5.1.1 High Major - Feminine Positive Bright
   3.5.1.2 High Minor - Youthful Delicate Innocent
   3.5.1.3 Intermediate Major - Vigorous Active Extroverted
   3.5.1.4 Intermediate Minor - Sober Introverted Reflective
3.5.1.5 Low Minor - Mysterious
    Suspicious
    Threatening
3.5.1.6 Low Major - Masculine
    Aggressive
    Stable

3.5.2 Possible functions of value:
3.5.2.1 Form
3.5.2.2 Depth
3.5.2.3 Emphasis
3.5.2.4 Mood

3.6 Hue
3.6.1 Psychological aspects of hues
3.6.1.1 Warm Hues (Advancing) - Yellow
            Orange
            Red

3.6.1.2 Cool Hues (Receding) - Violet
            Blue
            Green

3.6.2 Color Specification
3.6.2.1 Hue - that visual quality which
differentiates one hue from
another
3.6.2.2 Chroma - the brilliance of the
    hue, as compared with its
dullness or tendency toward
    neutrality
3.6.2.3 Value - the lightness and darkness
    of a hue

3.6.3 Color Symbolism
    (Be familiar with characteristics, symbol
    pleasant and unpleasant associations of
    each of these six hues and the three
    neutral values)
    -Yellow
    --Orange
    --Red
    --Violet
    --Blue
    --Green
    --White
    --Gray
    --Black

3.6.4 Optical Illusions of Color
3.6.4.1 Value difference
3.6.4.2 Vibration (illusionary)

3.6.4.3 Color alteration effected by adjacent hues:
- Neutralized
- Intensified
- Color saturation of an otherwise neutral area
- Irradiation or halo effect
- Color refraction (the focusing of various hues by the human eye in front of and behind the retina) - the basis for the "vibration" effect when two hues of equal chroma and value are juxtapositioned

3.6.5 Color Mixing (Subtractive)

3.6.5.1 Primary Colors
- Yellow
- Red
- Blue

3.6.5.2 Secondary Colors
- Orange (red and yellow)
- Green (yellow and blue)
- Violet (red and blue)

3.6.5.3 Tertiary Colors
- Yellow-green
- Blue-green
- Blue-violet
- Red-violet
- Red-orange
- Yellow-orange

3.6.5.4 Intermediate Colors
- Yellow yellow orange
- Yellow yellow green
- Green yellow green
- Green green blue
- Blue blue green
- Blue blue violet
- Violet blue violet
- Violet red violet
- Red red violet
- Red red orange
- Orange red orange
- Orange orange yellow

3.6.6. Color Schemes

3.6.6.1 Monochromatic - containing value and chromatic variations in one hue
3.6.6.2 Complementary - value and chromatic variations of two hues which are positioned directly opposite each other

3.6.6.3 Supplementary - value and chromatic variations of two hues which are positioned adjacent to each other
APPENDIX C

EXEMPLARY COURSE OF STUDY MATERIALS FOR GRAPHIC COMMUNICATION TYPOGRAPHICAL DESIGN AND LAYOUT
Course Syllabus:

Lecture/Demonstration/Discussion Laboratory Activities/Assignments

00. Introduction & Orientation 00. Overview of previous work

Unit 1. The Developmental History of Typography:

1.1 The Evolution of the Graphic Message; Language, Alphabetic, & writing development.

1.1 Information concerning the paper to be researched will be given; preliminary outline due by 3rd. week, completed paper due by 8th. week.

1.2 The Development of Materials, Instruments, & Techniques used in the Production of Graphic Messages.

1.2 The student will be assigned the name of a typographer or typographical movement and asked to prepare a 4-500 word sketch (brief paper).

2.0 The Development of Typographical Design: The Era of Incunabula, 1450-1550

2.0 Reading Assignment; Pages 7-27, in Pocket Pal

3.0 The Development of Typographical Design: The Era of Consolidation, 1550-1800

3.0 Ibid.

4.0 The Development of Typographical Design: The 19th. Century Era, 1800-present day

4.0 Paper assigned in 02., due

5.0 20th. Century Technology; The Major Printing Prod. Processes

5.0 The class will experience activities in each of the major printing processes

6.1 20th. Century Technology; Typesetting Systems for Production

6.1 Reading Assignment; Pages 29-65, in Pocket Pal

6.2 20th. Century Technology; Overview of the Planning, Organizing, & Controlling Functions of the Managed-Production System

6.2 Field Trip (Tentative)
Unit 2. *Introduction to Typographical Design:*

7.1 Message Formation Theory: The Communication Link between the Designer, Message, & Audience

7.2 The Aesthetic Design Link with Typography: Into, to Visual Organization

8.0 The Perception Theory Link with Typographical Design

9.1 The Formal Aspects of Typographical Design

9.2 The Symbology and Codification process link with Typographical Design


10.0 The Typesystem of Measurement; & An Introduction to Hand Composition

10.0 Reading Assign.: Pocket Pal, pages 67-90. The student will produce a simple composition by setting, proofing, a distributing foundry type

11.0 The Identification & Classification of Letter & Type forms

11.0 The student will compose (using the grid method) a type style specimen sheet, representative of the major type faces.

12.0 The Construction & Manipulation of Letter & Type Forms

12.0 The student will construct & manipulate serif & san serif letters by freehand & exacting mechanical techniques

12.1 Introduction to Photographic Composition

12.1 Word essays will be composed utilizing space (incl. negative & positive), & letter forms, by means of hand lettering, Presstype, foundry type, and/or photographic techniques, . . .
13.1 The Visual & Mechanical Arrangement of Space through Typographical Means as Applied to Single Letters, Words, Lines, Columns

13.1 The student will compose, manipulate, & experiment with the effects of line spacing on type size, paragraph width, length, etc.

Unit 4. The Mechanics of Typographical Design: Functional Aspects:

13.2 The Visual & Functional Aspects of Color

13.2 A corollary experimental aspect of exercise 13.1, dealing with color utilization

13.3 Reading Assignment; Pocket Pal, pages 105-113

14.0 The Legibility & Readability Factors of Typographical Design

14.0 Group Discussions

15.0 The Techniques of Copywriting, Copyfitting, Proofmarking, and Reproduction Proofing

15.0 The student will work through a series of illustrative examples as part of the lecture/discussion presentation during the lecture

16.0 Reiteration & Synthesis of Units 2, 3, and 4

16.0 Class Discussion

Unit 5. The Principles of Typographical Grid Formation:

17.1 The Mechanics of Grid Formation and Space Utilization

17.1 The student will select an advertisement and analyze it as to grid format, space usage, the relationship of elements, visual & functional aspects, and so on.

17.2 Layout Techniques and Practices

17.2 The student will experiment with the necessary exacting mechanical techniques to form grids; and then place predetermined blocks of type on these grids.
18.0 The Application of Grids in Formal & Informal Printed Pieces, i.e., Newspapers, Magazines & Journals, Books and Others

19.0 The Typographical Matrix & its Relationship & Utilization with the Placement of Grid Elements.

19.0 A continuation of 17.1, 17.2, 18.

Summary/Synthesis & Extension;

Unit 6. Introduction to the Typographical Mechanical:

20.1 Introduction to the Methods and Techniques of Typographical Mechanical Formation and Layout

20.1 Student Concord Project

20.2 Overview of the Application & Utilization of the Mechanical

20.2 Student Concord Project

20.3 Synthesis of Previous Units with Implications for Graphic Communication--Technology, Industry, Process, etc.
Tentative Schedule:

1st Week
- Topic Area 0.0, 1.1, & 1.2

2nd Week
- Topic Area 2.0, 3.0, & 4.0
- Typographical Sketch due

3rd Week
- Topic Area 5.0, 6.1, & 6.2
- Exam over 2.0, 3.0, & 4.0
- Research paper outline due

4th Week
- Topic Area 7.1, 7.2, & 8.0
- Exam over 5.0, 6.1

5th Week
- Topic Area 9.0, & 10.0
- Exam over 7.2 & 8.0

6th Week
- Topic Area 11.0 & 12.0
- Exam over 7.2 & 8.0

7th Week
- Topic Area 13.1 & 13.2, & 14.0

8th Week
- Topic Area 15.0, 16.0, & 17.0
- Research paper due

9th Week
- Topic Area 18.0, 19.0, 20.
- Exam over 11.0, 14.0, & 15.0
- Preliminary planning on Concord Project

10th Week
- Concord Project

11th Week
- Final Exam Week:
  - Oral report to be scheduled
    for presentation
  - Final Examination
  - Concord Project due
  - Student-teacher evaluation consultation
**Final Evaluation of Student**
**Course Work Performance**

The following are the minimum requirements for the course. It is not necessary to do further work to receive a top grade for the quarter, provided that the minimum requirements warrant such a grade. However, the student is encouraged to do further work in the area of particular interest to him. Credit will be given for work of this nature provided all required laboratory work and assignments have been completed.

<table>
<thead>
<tr>
<th>Area of Evaluation</th>
<th>Value of Area</th>
<th>Credit Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examinations- (Approx. 4)</td>
<td>30%</td>
<td>30 points possible</td>
</tr>
<tr>
<td>Projects-</td>
<td>40%</td>
<td>40 points possible</td>
</tr>
<tr>
<td>Research Paper- (Team effort)</td>
<td>15%</td>
<td>15 points possible</td>
</tr>
<tr>
<td>Concord Project- (Synthesis &amp; Practical Application)</td>
<td>15%</td>
<td>15 points possible</td>
</tr>
</tbody>
</table>

_______ Final Letter Grade
Laboratory Activity/Assignment Briefs:

The following is a listing of the assignments for which written briefs are provided. In addition to these written briefs, a detailed discussion will be carried out verbally by the instructor during class. Whenever questions arise about an assignment, they should be brought to the instructor's immediate attention.

The enumeration accompanying each brief is used to correlate the brief to the topic area being discussed in class. The asterisk indicates that in addition to the brief itself, other necessary information (to the task at hand) will be provided during the class activity period.

1.1 Description & Specifications for Group Research Report

5.0 Introduction to Reproduction Process Activities

7.2 Introduction to Visual Organization

8.0 The Application of Visual Organization Letter Forms

9.0 Letter Form Composition for Display

10.0 Introduction to Hand Composition

11.0 The Identification and Classification of Letter and Type Forms

12.0 The Construction and Manipulation of Letter and Type Forms

12.1 The Application and Utilization of Letter and Type Forms

13.1 & .2 Experimental Manipulation of Letter, Word, & Line Spacing and Color Utilization in Text Display Composition

17.0-19.0 An Experiment in Typographic Grid Formation and The Application of the Typographic Matrix and Copyfitting to the Grid Process

20.1 & .2 The Course Concord Project
Description & Specifications for the Group Research Report:

The purpose of the group research report is to allow the student an in-depth penetration into an area of interest that could not be fully detailed as part of the scheduled course work. The class will be divided into sub-groups consisting of 4 to 5 members each. Each group will meet individually with the instructor and discuss possible topic areas and methods of approach. One topic will be selected for concentration. A brief outline will be constructed for direction, and then individuals within the group will select particular portions of the outline for research and development. The total report (including all sections) should range from approximately 30 to 40 pages in length; therefore, each person will be writing approximately 6 to 10 pages, exclusive of illustrations and bibliography.

The topic area should form a correlation between typography and layout and an area of its application or utilization. A few sample titles are given as follows:

1. The application of typographical design and layout to:
   --computer generated & recognized type faces, or
   --advertising and/or packaging, or
   --hand lettering, or
   --the creation of charts, graphs, posters, etc, or
   --cinema and films, or
   --television and video, or
   --signage, or
   --.

2. The utilization of typographical design & layout in:
   --children's books, or
   --technical books, reports, manuals, or
   --fictional entertainment magazines & journals, or
   --scientific & professional magazines & journals, or
   --entertainment magazines & journals, or
   --newspapers, or
   --.

3. The influence and effect of symbols as substitutes for alpha-numeric characters:

4. The influence and effect of pictoral images and artwork illustrations as substitutes for alpha-numeric characters.
The following format will be used in organizing, writing, and typing the paper.

1. Paper -- opaque bond, 20 pound minimum weight, 3-hole punched, 8-1/2 x 11".

2. Margins -- 1-1/2" on left hand side with 1" on all other sides (6 x 9" image area).

3. Typing -- double spaced-standard procedures.

4. Pagination -- top right hand corner.

5. Classification & outline system -- International Decimal System.

6. Footnoting -- Western footnote method.


8. Illustrations -- full page xeroxed, not cut and paste.

Further instructions and specifications will be given by the instructor during class discussion of report requirements.
Introduction to Reproduction Process Activities:

The overall purpose of this activity is to reinforce the subject matter being presented and discussed in class. This will be accomplished through a practical application wherein the student employs the major printing processes of the graphic communication industry, i.e., Letterpress, intaglio, lithography, and screen process. Through this activity the student will have the opportunity to experience some of the pre-processing, processing, and post-processing practices which are necessary to reproduce a graphic communication product.

A secondary objective is that of acquainting the student with some of the processes to be experienced, and the subject matter to be studied in succeeding courses. Since this activity is to be at an introductory level, the image carriers and most materials will be readied beforehand.

To complete the activity you will follow the steps listed below:

1. Make ready the given image carriers.
2. Secure supplies of ink, paper, etc.
3. Run test prints and finished prints.
4. Collate and bind prints for class notebook.
5. Carry out necessary clean-up procedures.
Introduction to Visual Organization:

Through this activity you will become familiar with some of the recognized ways of organizing things for the purpose of visual affect.

With the template, you will be able to draw consistently four visual things:

An open circle

A solid circle made by filling in an open circle

A short line made against the short edge of the template

A long line made with the long edge of the template

Before starting the exercise, rule a horizontal line across the top and bottom of each sheet, 1/2 inch from the edge. Do not draw into this margin area, since you will be using masking tape to fasten all of these sheets together, vertically and in sequence (with the first sheet at the top), when you are finished.

Do each of the thirteen parts sequentially. Read all of the instructions for any particular part before doing that part of the assignment. When finished with one part, move on to the next. Be sure you have a complete understanding of what has to be done before you start to work on each part, so that you can concentrate on your decision enthusiastically without being "distracted" by the instructions. When you are finished, print an explanatory title on one of the sheets, print your name in smaller letters under it, and fasten that sheet at the top (the beginning) of the assignment. Start now.

Sheet #1: Trace all or any of the four visual things as many times as you wish and in any position so as to make an interesting arrangement. It need not be symmetrical but it should given the eye "something to play with". In other words, this composition should sustain the interest of the observer regardless of its simplicity when you are finished. Label this and all other sheets appropriately in the lower right-hand corner. In this case the number would be that of 1.
Sheet #2: Lay the second sheet over sheet #1. Using the techniques of tracing, and with the aid of your template, trace those things which make the composition very quiet but interesting, with as little variation as possible.

Sheet #3: Lay the third sheet over sheet #2. Trace everything from sheet #2 onto sheet #3. Now add another kind of visual thing in the spaces between the "traced things". Draw in as many of the new kind of things as is necessary. Do this to add interest but not excitement. Keep the composition still and calm.

Sheet #4: DO NOT TRACE ANYTHING onto sheet #4. Instead, draw each visual thing exactly as many times as it was drawn in composition #3, but re-arrange the things so that a simple change of situation (from one situation moving on into another kind) can be experienced by an observer.

Sheet #5: In the middle of sheet #5 imagine you have placed a very faint dot. Call this imaginary dot the center. Above, below, or to either side of this "center", trace everything you drew on sheet #4. Then rotate either sheet a little bit so that you can again trace the same composition from sheet #4 in the same relationship to the "dot". Continue this process of tracing and rotation until you have at least five equally spaced tracings of sheet #4's composition around the imaginary "dot" on sheet #5.

Sheet #6: Lay a new sheet over sheet #5. Through the technique of tracing with the aid of your template, re-arrange and/or take away enough visual things so that the observer's eye MUST chose between looking at two kinds of things, separated from each other but having equal importance.

Sheet #7: On a new sheet, trace everything from sheet #6. Then add any number of the assigned visual things so as to offer the observer many choices to look at.

Sheet #8: Place a new sheet over sheet #7. Without relocating any visual things from sheet #7, trace at least one of each kind used in the previous sheet in the same location. Trace only those things which share some common characteristics among themselves. Leave out those things which do not share in this quality in an obvious way.

Sheet #9: Place a new sheet over Sheet #7, not sheet #8. Look at the composition drawn on sheet #7. What parts of it seem to go together well? Seem to loose themselves in order to suggest a completed whole object, form or pattern? Trace only these things, but leave out those which do not help.

Sheet #10: Place a new sheet next to sheet #7, not sheet #9. Imagine a very faint straight line running in any direction through the center and completely across sheet #10. Count the number of each kind of
visual thing used in composition #7. Draw half the quantity of each kind of visual thing on one side of the line, and the other half on the other side of the line at exactly the same distance from the line and in a similar position. If there is one visual thing left over (of a kind) or if there is only one visual things of a kind to consider, put it squarely on the "line".

Do this for all the kinds of visual things used in sheet #7. (Remember, the imaginary line is imaginary; do not show it)

Sheet #11: Place a new sheet over sheet #10. Re-arrange the visual things on one side of the line so that they form a completely different kind of organization. Then re-arrange the visual things on the other side of the line so that they are organized differently from how they were originally and differently from those on the other side of the line. Trace the visual things which were on the line exactly where they were. Visual things may be drawn as near the line as you like, but do not draw the line which is still only imaginary.

Sheet #12: Look at sheet #11. Of all the different qualities that you can read into the composition, select the one effect it has which appeals to you the most. On sheet #12 trace only those visual things which are MOST RESPONSIBLE for the effect that you like the most.

Sheet #13: On sheet #13, print clearly a description of the effect which drawing #12 gives you. Obviously, adjectives will be important. (Do not write about, or mention any object of which the composition might remind you).

.............................................................

Fasten all the sheets in order with horizontal bands of masking tape, neatly placed and overlapping the butted bottom and top edges of adjacent sheets. Trim the tape flush with the right and left hand vertical edges.
The Application of Visual Organization to Letter Forms:

This activity has two objectives. First, it will allow you to evaluate your previous work in visual ordering and make any necessary revisions or adaptations. Secondly, you will now have the opportunity to utilize letter forms as your design element.

The major change in this corollary activity is the substitution of letter forms for the original template. You are charged with composing steps number 1, 2, 3, 4, 8, and 12 by the use of the three given letters. Please follow the directions as given in exercise 7.2.

After completion of the task mentioned above, you will search out and identify (by labeling) two (2) examples of proximity, similarity, and closure.

Attach all sheets together as was done with the first exercise. Tape an additional sheet to the first sheet and print your name and class section onto this.

The materials that you will need to have to do this work are: a stamp pad, masking tape and five sheets of 8-1/2 x 11" bond paper.
Letter Form Composition for Display:

During the past few weeks of class you have been introduced to the principles of aesthetic design, perception and visual organization, and the formal aspects of typographical design. Only the surfaces of these areas have been scratched. The knowledge uncovered have been interpreted in light of their typographical application. As a designer of visual messages you will come to rely upon this information in many ways. The purpose of the present experiment is that of giving you the chance to synthesize this knowledge through a practical application.

In this activity you are asked to clip examples of various forms and sizes of letters from magazines, newspapers, etc.

These letter forms will be used to create a complex composition, by rubber cementing them to a total display area of 9 by 12" on an 11 by 16" mounting board. The end purpose of this construction will be that of producing a display form of decoration (rather than that of illustration, propaganda, information dissemination, or so on).

The major emphasis of the composition should be placed on proximity and closure using contrast and variation of letter forms. The principles of visual ordering and the formal aspects of typographical design should be reviewed for they will provide useful guides to your work.
Introduction to Hand Composition:

The purpose of this activity is that of providing an introductory experience in both generating, and the use of the type system of measurement. This will be accomplished through the manipulation of the methods, techniques, and processes of hand setting type. Mastery of this area of activity will be necessary to other activities to be experienced throughout the course work. Where applicable this activity will be expanded and applied to hot and cold typesetting systems and machines.

The student will produce a simple composition by handsetting, proofing, and distributing foundry type.

The following information will be set by use of 10-point type, with a 2-point lead, at a 20 pica length (width), justified.

Line #1. Last name first, ..... nickname

Line #2. Course title, ........ class section

Line #3. Local phone no., .... locker number

Pull several proofs of your composition, and attach one each to the class roster, a galley, and your storage drawer.
The Identification & Classification of Letter & Type Forms:

The major purpose of this assignment is to make the student consciously aware of the six major classifications for type faces. Today's utilization and application of these face categories will be readily recognizable as examples are taken from magazines, journals, newspaper, etc.

A secondary purpose will be an introduction to the area of grids, which will be presented through the mounting technique to be used.

Step 1. Collect samples of upper and lower case letters (entire words may be used) for each of the six major categories of type faces. Trim each sample square and neat.

Step 2. Lay out a grid of 1/2" squares on an 11 x 16" sheet of illustration board. The margin area should be 1" on all sides.

Step 3. Using rubber cement mount each sample face style to the grid. Allow enough room between each sample for labeling.

Step 4. Label each sample by giving the name of its corresponding classification. Use a lettering grid to hand letter (or you may use press-type) in upper and lower case letters.

Further instructions and clarification will be given during class.
The Construction and Manipulation of Letter and Type Forms:

Calligraphy is the art of beautiful handwriting. In typographical design this art has taken the form of type face design. As you already know there is a continuum of approximately 6000 faces to choose from. The purpose of this exercise is to give you the opportunity of producing type forms from both ends of the continuum. Once the basic procedures and techniques are mastered they may be applied to many differing situations.

In this assignment you are asked to construct two upper case and two lower case serif and san serif letters. After they are completed you will modify the face weight (width) of one letter from each of the two categories. The following procedure may be used to guide your work.

Step 1. On a 11 x 16" piece of illustration board form a grid which produces a 1" margin on all sides and divides the working area into eight sections.*

Step 2. In four sections develop the appropriate serif grids, and in the remaining sections the appropriate san serif grids.* The grid lines should be accurate and exact, of even thickness, and quite light.

Step 3. Construct the serif and san serif letters. The construction lines should be very faint and the peripheral letter lines should be dark and even.*

Step 4. Overlay a sheet of tracing paper on top of all eight sections. Tape the tracing paper to the illustration board (with frosted or clear cellophane tape) by one edge only.

Step 5. Select one serif and one san serif letter and modify its shape by changing its weight. The construction lines should be faintly shown and the peripheral lines should be dark and clear.

*Further specifications to be given in class.
The Application and Utilization of Letter and Type Forms:

The purpose of this assignment is to allow you to synthesize and apply the information covered by previous work. It involves the selection of type faces and sizes and their relationships to each other when assembled in space. The end product will be several "word play" essays. Through the techniques necessary to produce these compositions, the advantages and disadvantages of the different typesetting systems will be experienced. From this, you will be able to form judgements for the appropriate selection of specific processes for particular tasks.

The first procedure will be that of developing idea sketches (thumbnails) for the word play essays. Words may be modified by adding letters, subtracting letters, repeating letters, dividing letters, and so on. Spacing may be expanded, condensed, overlapped, staggered, and so on in horizontal, vertical, and oblique directions. Letter style, size and weight may be varied. Letters may also be normal, backwards, inverted, sideways, and so on.

After the essays are developed, you will then select 4 of those which you consider to be most clever and unique. You will then decide on the necessary techniques to be used to produce these essays in print. You may use handset type, press-type, letters cut from magazines and such, and photographic generated type. (If hand drawn letters are to be used they must be constructed from grids). It is suggested that one essay be composed entirely of handset type, one of handset type and press-type, a third to be generated photographically, and the fourth by any other method(s).

After the essay is in print you are asked to mount it using the grid method onto an 11 x 16" piece of illustration board with a 1-1/2" margin on all sides.
Experimental Manipulation of Line Spacing and the Use of Color for Emphasis in Text Composition Display:

The objective of this experiment is to provide the student with the opportunity in the manipulation of line spacing; the selection of color combinations; and an introduction to some of the techniques and processes of ink mixing and color repo-proofing.

Step 1. (a) Assemble two blocks of type composed of 5 to 7 lines of linotype each. The linotype lines should be set solid (10/10, 12/12, etc.); Then lead each of the lines of type in each block. Vary the amount of leading for each of these blocks of type (2 pts., or 3 pts., etc.), but keep the leading between lines consistent within each block of type.

(b) The width of each block of type should be kept between 15 to 30 picas.

Step 2. (a) Assemble two identical lines of 24 to 36 point type at a length which correlates with the block of type.

(b) These lines will be used as headlines and the letters should be assembled together with the final aesthetic or visual value in mind.

Step 3. (a) Place the headline and the block of type together and proof. Analyze the proof and initiate any necessary adjustments.

(b) Position the headline at any or all of the four corners (8 positions) and reproof.

Step 4. (a) Select two of the proofs made in Step 3, and lock-up using wooden furniture and quoins.

(b) Proof with colored ink on colored paper.

Step 5. (a) Mount one of the best and one of the poorest combinations for each of the two color compositions proofed in Step 4.

(b) Mount on 11 x 16" paper using the grid method and label as follows;
Style & size of type, e.g., --- 12 point Helvetica

Column width & amount of leading, e.g., -- 30 pica with 2 point lead

Color of ink on paper, e.g., -- Red on green

Type of composition, e.g., -- Desirable or undesirable visually (visually desirable)
Introduction to Typographical Grids:

The purpose of this assignment is to introduce the concept of grid formation and to emphasize its use in all graphic messages containing letter forms and textual matter. In this case you will be analyzing what has already been done, and this in turn will show an application of what you will soon be doing yourself. The correct construction and use of grids will ensure that the elements within your message are related to each other and produce a logically ordered structure. Without the grid, the selection and placement of elements, visual ordering, systematic problem solution, and so on, are almost impossible.

Step 1. Select an advertisement page from a magazine or newspaper and trim it neat and square. (avoid selecting super market grocery ads)

Step 2. By use of a typographical matrix, analyze the type form used in the advertisement.

Step 3. Develop a grid on all 11 by 16" (illustration board or heavy index) paper which allows the ad to be mounted (with rubber cement) squarely with a minimum of a 1-1/2" margin on all sides. (the grid lines should be faintly visible). Mount the advertisement.

Step 4. Attach three (3) pieces of tracing paper (same size as the advertisement page) with frosted or cellophane tape. Neatly tape these sheets on one side (opposite sides) only so that they may be flipped back and forth as overlays. (see below)
Step 5. Overlay one of these sheets onto the advertisement. Using a "T" square and a triangle, trace the grid pattern that was used to position the elements of the composition, when the ad was constructed. The grid lines should be dark, of even thickness and exact in placement.

Step 6. Overlay the second sheet of tracing paper on top of the first sheet and the ad. Dimension the positions of all of the elements in points and picas. (Upon completion of the dimensioning, it should be possible to reconstruct the grid from the information that you have given).

Step 7. Fold back the dimensioning overlay and insert the third piece of tracing paper onto the grid and advertisement. On this third sheet you will specify for each block of type the face style, size, and amount of leading.

Please note: All of your lettering is to be in u.c./l.c. using a lettering grid.
Course Concord Project:

The objective of the concord project is to give the student an opportunity to synthesize all of the information, data, and techniques that have been presented in the course. The synthesis will take form through the systematic methods employed in the designing process used to create the concord project.

The student will employ the organizing processes of visual ordering and perception to interrelate the formal aspects of typographical design and thereby select the appropriate elements and their combinations. Both visual (aesthetic) and functional (legibility) purposes will be met in the final design solution.

The stages of information design and message formation will be altered somewhat from the original presentation in the course. The reason for this deviation is that of the time element, the available equipment and supplies, and the intended use of the project.

Stage/Step 1. Administration: Conceptualization, and Specification of the Problem

1.1 Guiding Definition: This stage involves problem conceptualization, delineation, and specification wherein the wants and needs of the client, project, and audience are detailed.

1.2 Concord Interpretation: The following are (only) some of the questions which may be used to guide your problem definition:

1.2.1 What information and data is necessary for an understanding of your intended audience? To predict message effectiveness you will want to know about (a) their communication and perception skills, (b) their attitudes, (c) their knowledge level, (d) their social and cultural context, and so forth.

First, are they literate? Do they have the skills to interpret symbols, pictures, images, and to manipulate language? Next, what are their attitudes towards the area of information from which your message is drawn? towards the message? towards themselves? Third, what is their knowledge level? Are they familiar
with the message subject and its implications and magnifications? Finally, what are the norms that shape their communication behavior? Do they belong to particular socio-economic, cultural-educational, political, religious, professional, or age groups? Do they possess certain cultural assumptions, stigmas, stereotypes and beliefs that can be used or guarded against?

1.2.2 What information and data is necessary for the design of the form and content of the message? Is the purpose of the message for entertainment? decoration? illustration? propaganda? persuasion? or information dissemination? How critical is its understanding? How can the message be best conveyed? Under what circumstances will it be viewed? What's it - abpit? How is the content organized? What kind of codes, structures, and treatments may be used for effective and efficient communications.

1.2.3 What other constraints will be imposed upon you as the designer? the message? the audience? What are the considerations of time, cost, production limitations, and so on?

1.2.4 ....

1.3 Project Assignment: The student will derive a list of guiding specifications and a sequence of activities to be followed throughout the project development.

Stage/Step 2. Creation and Specification of Alternative Solutions

2.1 Guiding Definition: This stage is characterized by idea and design formation, with the selection of type faces, illustrations, copy writing, format, and so on.

2.2 Concord Interpretation: This stage of your work, in the project development, involves a search for possible design solutions. It would include thumbnails and rough sketches to locate the given elements in relationship to each other on roughly constructed grids, i.e., 2/2, 3/3, vertical, horizontal, and combinations, and 2/5
aesthetic center layouts. This should be carried out while keeping in mind the visual and functional purposes of individual parts and their combinations upon the total effect of the design solution.

2.3 Project Assignment: The student will generate several alternative thumbnail sketches (each employing a grid).

Stage/Step 3.

Generation and Reproduction of the Selected Problem Solution

3.1 Guiding Definition: (Stages 3 & 4 have been combined)

3.1.1 Generation - In this stage all of the design elements are generated and gathered, the mechanical is pasted-up, and the specifications for the production areas and routing are determined.

3.1.2 Reproduction - This stage may consist of such processes as process photography, image carrier production, printing, binding, and distribution.

3.2 Concord Interpretation: As a result of this combination of stages, two (2) pieces of hard copy will evolve. First the finished layout with all of its necessary specification; and secondly, a full color, true representation of the finished product in the form of a dummy mechanical.

3.3 Project Assignment: The student will produce the final layout grid, dimension the location of elements, and describe the elements, i.e., 12/14 Helvetica, light, flush left, uc/lc, 28 pica line, purple on green mist.

The final layout will then be utilized to produce a full color dummy, which employs the actual elements described. (Further explanation to be discussed in class).

Assignment Overview/Summary:

The following is a listing of the required components to be accomplished and turned in for evaluation, as a result of the concord project work. The specifications and a discussion of such should be carried out in class before work begins.
1. A brief should be written by the student detailing the following points;

1.1 The purpose and intended use of the design solution.
1.2 A procedural listing and tentative and actual time schedule of work.
1.3 A summary/explanation of the completed project.

2. Several thumbnail sketches of possible solutions.

3. The rough layout.

4. The typographical matrix & any other analytical devices employed.

5. The copy fitting sheet with notations.

6. The finished layout.

7. The color representation (dummy).

8. All of the above mentioned segments are to be arranged in a logical manner and either bound together or contained within a manila envelop.

Evaluation of the Project: The following criteria will be used to assess the design solution.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Value of Area</th>
<th>Credit Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Project solution relevancy to established design criteria</td>
<td>4 pts.</td>
<td></td>
</tr>
<tr>
<td>2. Project solution inter-relationship of aesthetic &amp; functional design aspects.</td>
<td>4 pts.</td>
<td></td>
</tr>
<tr>
<td>3. Project solution creativity and ingenuity in use of given elements.</td>
<td>3 pts.</td>
<td></td>
</tr>
<tr>
<td>4. Project solution workmanship and expertise level</td>
<td>4 pts.</td>
<td></td>
</tr>
<tr>
<td>Total value received</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Bibliographical Listing of Books:


Dair, Carl. *Design with Type*, University of Toronto Press, 1967.


Howell, W. C. & Kraft, C. L. Size, Blur & Contrast as Variables Affecting the Legibility of Alphanumeric Symbols on Radar Displays, Columbus: The Ohio State University Research Foundation, 1959.


Paterson, Donald G. and Miles A. Tinker. How to Make Type Readable, New York: Harper and Brothers, 1940.


Bibliographical Listing of Articles and Periodicals:

"Annual Corporate Reports: A Type Face Survey," Type Talks, November-December, 1964, Pages 5-6.


Paterson, Donald G. and Tinker, Miles A. "Influence of Type Form on Speed of Reading", Journal of Applied Psychology, Vol. XII, August, 1928, Pages 359-368.


"Types for the Corporate Annual Report", Type Talks, September-October, 1965, Pages 6-7.


Tinker, Miles A. & Paterson, Donald G. "Studies of Typographical Factors Influencing Speed of Reading: Size of Type," Journal of Applied Psychology, Vol. XIII, April, 1929, Pages 120-130.

Others:

Journalism Quarterly
Publisher's Weekly
Journal of Applied Psychology
Journal of Educational Psychology
Journal of Typographic Research
Business Graphics
Printing Impressions
Journal of Visual Communications
Visual Communication Instructor
Selection of Visual Materials Appropriate to Course:

1. A set of overhead projection transparencies should be developed in correlation with the lecture materials. A xerox copy of these transparencies should be available for student independent study.

2. A set of xeroxed and mimeographed supplementary materials should be compiled in handout form and given to the student during the course.

3. Commercial Slide/Tape Presentations:
   3.1 The Wonderful World of Typography, 60 slides and tape, 10 minutes, International Typographic Composition Association.*
   3.2 The Practice of Typography, slides and tape, 45 minutes, International Typographic Composition Association.*
   3.3 Halftone Photography, Slides and tape, 35 minutes, Kodak Publications.
   3.4 Line Photography, Slides and tape, 25 minutes, Kodak Publications.

4. Commercial Film Presentations:
   4.1 Communication Primer, 16 mm, sound, B/W, 22 minutes, Charles and Rae Eames - Classroom Film Distributors.
   4.2 Craftsmanship and Automation, 16 mm, sound, color, 22 minutes, R. R. Donnelly & Sons Company, distributed by the Graphic Arts Technical Foundation.*
   4.3 Graphic Communication: They Used to Call It Printing, 16 mm, color, sound, 23 minutes, Dupont, distributed by the Graphic Arts Technical Foundation.
   4.4 How to Make a Good Impression, 16 mm, sound, color, 21 minutes, Harris-Intertype Corp., distributed by the Graphics Arts Technical Foundation.*
   4.5 Messages, 16 mm, sound, color, 7 minutes, produced and distributed by the International Typographic Composition Association.*
   4.6 Story of a Book, 16 mm, sound, B/W, 11 minutes, Churchill Films.
4.7  **Story of Printing**, 16 mm, sound, B/W, 30 minutes, Encyclopedia Britannica Films.*

* Designates those aids actually used in total length. Others are used only in portion, if time permits.
APPENDIX D

INITIAL CONTACT LETTER TO THE ASSESSMENT JURY MEMBERS
Dear Dr.

Presently I am a doctoral candidate in the Department of Industrial Technology, and an instructor of visual communications in the Division of Design, at The Ohio State University. Over the past three years I have been developing a study pertinent to the area of graphic communication education.

The developmental aspect of the study will conclude near the middle of March, 1971, with the writing of the dissertation rough draft. At that time it is desired to have an assessment of its subject matter content and structure. Through consultation with Dr. James Buffer and Dr. Willis Ray a decision has been made to select a jury of five or six prominent individuals from within the graphic arts communication profession, and to request a judgement from them.

This letter than is written to inform you about and to ask you to participate in the assessment task. The dissertation study involves the formation of a rationale and structure for the graphic communication education area of the industrial technology program. As a result of the development, a structured body of knowledge, as derived from the graphic communication industry, will be proposed. In addition to the conceptual structure, a sample course of instruction, applicable to the college level of instruction will be proposed.

The major task of the assessment would be that of determining the subject matter appropriateness and the apparent feasibility of its organization. As a member of the jury you would receive: (1) a brief summary and explanation of the study, (2) a suggested response form, and (3) the taxonometric subject matter outline. The combined length of these materials is expected to be approximately 20 to 30 pages.
Upon receipt of your response the study will be recycled to make any necessary adjustments or revisions. A problem can be foreseen with the time sequence. A rough draft of the dissertation must be filed with the Graduate School during the week of April 26th., and the Reading Committee will be in attendance of the 1971 AIAA Convention, in Florida, during the prior week. Therefore, the receipt of the jury's response and the revision must take place during the week of April 1st. I am therefore forced by the circumstances to ask a favor of you.

If it would not be of too great an imposition or inconvenience to you, would it be possible to receive the materials to be assessed on March 22nd., and have your response in the mail by March 29th. If this would not be possible, I will then, in accordance, make arrangements to stay another quarter and conclude the dissertation during the summer of 1971.

For your convenience I have enclosed a post card for your response to this letter. Please accept my thanks in advance for your consideration and help.

Sincerely yours,

R. Louis Gysler

RLG:er
APPENDIX E

ASSESSMENT LETTER OF INTRODUCTION

AND INSTRUCTION
Dear

I would like to begin by offering my sincere thanks for your agreement to serve as a jury member in the assessment of my study. Your time and effort is appreciated and your judgement and suggestions will be of great value to me.

As mentioned in my previous letter, I have attempted to develop a rationale and structure for the knowledge which could be included in a study of graphic communication. The development has been directed to remain within the confines of the existing industrial arts programs at the college level of instruction. This was done primarily to facilitate implementation and adaptation into existing programs and facilities without necessitating any major structural change. In this manner then, it is hoped that the study may be of value to prospective readers.

Before discussing the materials to be assessed, I would like to relate to you some of the procedures that I have followed in the study's development. Over the past two years, through a series of "independent studies," several information areas were reviewed. An in-depth analysis and synthesis of data
and information was made in the following areas: (1. industrial arts programs and curriculum projects, (2. industrial arts sub-programs of graphic arts and graphic communication, (3. communication programs within the (a) behavioral sciences, (b) performing and non-performing arts, and (c) design program area, (4. communication and information design theory and practice, and (5. vocational - technical programs in printing, photography, and related areas.

Three guiding definitions were developed to delimit the direction, and focus the emphasis of the study. They are:

The graphic communication industry is a subcategory of the larger field of all manufacturing industry. It may be an entity to itself or an in-plant portion of a larger industry. Its functions are to substantially change materials through industrial practices to create and reproduce graphic messages for the satisfaction of man's wants and needs. Two major categories are seen to exist within the graphic communication industry, i.e., the print media industries (printing and publishing), and the non-print media industries (cinema, video, computer graphics etc.) The print media classification has been selected for emphasis within this study.

Graphic communication technology is a body of knowledge within a subcategory of industrial technology. It is composed of praxiological knowledge (the knowledge of practice and practice per se) which is derived from the study of the principles of industrial practices and communication practices. (The IACP structure and content for industrial technology has
been utilized in the study).

Graphic communication education is a sub-program area of industrial arts education which is a structured body of knowledge pertaining to the industrial practices that affect humans and materials in the sub-category of industry known as the graphic communication industry (print media).

Chapters I, II, and III of the dissertation have been used to establish definitional criteria and to detail components for graphic communication technology. As an example, the subject matter areas of industrial management, production, and personnel, of codification and symbology, of aesthetic design and visual organization, etc., have been detailed and interrelated. Chapter IV, the area to be assessed by the jury, is used to propose a structure for the graphic communication technology body of knowledge. In Chapter V, an instructional plan is developed and one sample course is detailed as an example of possible adaptation for the reader. Finally, Chapter VI, involves the assessment, and Chapter VII is the study summary.

Two packets of information are included with this letter. The packet of major importance is that which is titled "Development of a Rationale and Structure for Graphic Communication Technology." This is the information to be assessed. The second packet, titled "An Outline and Structure for One Possible Course of Study..." is the proposed sample course which is presented later in the study. The reason for its inclusion in the assessment packet is that it is illustrative of a further delineation and detailing of several of the components found within the rationale.
and structure. It may prove useful to you to quickly skim through its content in relationship to the assessment. If you can do this, any pertinent comments would be very much appreciated. Please note that both packets represent rough drafts.

Also included within the contents of the packet is a brief questionnaire that may be used in the evaluation of the materials. It is quite general in nature for it is not my primary intention to have you respond to any predetermined, dichotomized, or biased statements. I am very much interested in your reaction to the material on the whole. I do hope that you might find time to jot down a few statements as to your opinion. The rationale paper may provide a convenient place for such note writing as you review through it.

Again, I apologize for the hurried state of affairs. If possible it would be quite helpful to me if you could have your response in the mail by March 29th or 30th. I would like to have the "rationale packet" returned, and I am not concerned with the remaining materials.

Please accept my thanks once again for your thoughtful consideration and help. If you feel that it would be necessary for me to talk with you over a phone conversation, please indicate this and I will be happy to do so.

Sincerely yours,

R. Louis Gysler
APPENDIX F

FORMAL ASSESSMENT INSTRUMENT
Evaluation Form for
Graphic Communication Technology

Assessment of the Proposed Rationale and Structure
of The Body of Knowledge to be Contained within
Graphic Communication Technology

Please rank the following statements as to their relevancy and or adequacy to either the graphic communication industry or industrial arts education. The rank of 1 (one) designates the lowest, and the rank of 5 (five) designates the highest value in your opinion.

1 2 3 4 5 The processes contained within the content of graphic communication technology are representative of those found in the graphic communication industry (print media).

1 2 3 4 5 The practices contained within the content of graphic communication technology are representative of those found in the graphic communication industry.

1 2 3 4 5 The techniques, methods, procedures contained within the content of graphic communication technology are representative of those found in the graphic communication industry.

1 2 3 4 5 The organization of subject matter into the major concepts of administrating, creating, generating, reproducing, and distributing represent a logical and viable structure for graphic communication technology.

1 2 3 4 5 The structured body of knowledge within graphic communication technology is adequate for instructional purposes.

1 2 3 4 5 The structured body of knowledge within graphic communication technology is appropriate for inclusion as a sub-program of industrial arts education.
1 2 3 4 5 The proposed body of knowledge for graphic communication technology could be implemented into an existing industrial arts education program.

1 2 3 4 5 The conceptual base (practices and processes) of graphic communication technology is adaptable to technological and social change and therefore could be continuously updated and revised.

1 2 3 4 5 The structured body of knowledge for graphic communication technology is adaptable to differing levels and programs, i.e., junior high school through college and technical institutes, and general education to technical - vocational education.
APPENDIX G

PRIMARY ASSESSMENT MATERIALS
CHAPTER IV
DEVELOPMENT OF THE RATIONALE AND STRUCTURE FOR GRAPHIC COMMUNICATION TECHNOLOGY

The purpose of this chapter is to establish the rationale and structure for the body of knowledge to be contained (conceptualized, categorized, and ordered) within graphic communication technology. Previous chapters have isolated, interrelated and tentatively classified the major components and other supplementary information to be utilized in the study. The preliminary delineation and structure for the graphic communication technology process, industry, product classification, and major structural elements was accomplished through an analysis and synthesis of: (1) industrial practices, (2) communication theory and process, and (3) graphic arts technical components.

The Structure for the Conceptual Components

As a result of the total research and development effort, the model in Figure 29 has been derived. It represents a structural model showing the subject matter content and organization for the graphic communication technology discipline.
**GRAPHIC COMMUNICATION TECHNOLOGY**

**STRUCTURAL ELEMENTS**

- Source
- Message
- Channel
- Receiver
- Feedback
- Interference

**NON-GRAPHIC COMMUNICATION MAJOR COMPONENTS**
- Aesthetic Design
- Codification
- Perception
- Symbology
- Visual Ordering

**GRAPHIC COMMUNICATION MAJOR COMPONENTS**

**GRAPHIC COMMUNICATION TECHNOLOGY MANAGEMENT**

- Planning
- Organizing
- Pre-Processing
- Processing

**GRAPHIC COMMUNICATION TECHNOLOGY PRODUCTION**

- Hiring
- Training
- Working

**GRAPHIC COMMUNICATION TECHNOLOGY PERSONNEL**
FIGURE 31

THE PROPOSED STRUCTURAL MODEL AND SUBJECT MATTER CONTENT
FOR GRAPHIC COMMUNICATION TECHNOLOGY
To briefly overview the entire model, prior to the indepth discussion of specific parts, the input section seems to be a natural place to begin. The two major inputs of graphic communication technology may be classified as that of: (1) the communication practices in general, with their graphic communication components in particular, and (2) the industrial technology practices. It should be noted that both sets of inputs (bodies of information and data) emphasize the praxiological domain of knowledge along with appropriate inclusions and integrations from the formal, descriptive, and prescriptive domains. (Supra, pp.32-33)

The body of knowledge composing the structural elements of the communication process (source, message, etc.) and the major components of graphic communication (aesthetic design, codification, etc.) are linked with the structural elements of manufacturing technology. Through their interface the structural elements of graphic communication technology are formed. [practices]

When operationalized, the practices of graphic communication technology - management, production, and personnel initiate the graphic communication technology process components to produce the output. [processes]

The final output then is the produced material good in the form of a reproduced graphic communication. To facilitate ordering and specification the graphic communication technology process components have been structured into the five concepts
of: (1) administration, (2) creation, (3) generation, (4) reproduction, and (5) distribution. Before turning to a discussion of these concepts, the proposed structure for graphic communication technology will be explained by detailing its three structural elements.

The Development of the Taxonomic Subject Matter Outlines

As discussed in Chapters II and III, three categories of industrial practices were proposed by the I.A.C.P. The practices were derived through a systematic analysis of the practices common to all material production industries within the economic institution (Supra, pp. 35-36). These common practices were utilized to form the structural elements of industrial technology. They can be generalized to the two major industrial categories of construction and manufacture, and henceforth their bodies of knowledge, i.e. construction and manufacturing technology.

Furthermore, the structural elements in construction and manufacturing technology are organized in a manner which is identical to that of the overall structure for industrial technology (Supra, p. 36). Logically then, since the graphic communication industry and its body of knowledge, graphic communication technology, is a sub-category of manufacturing technology, it therefore has an almost identical structure. However, as higher levels of specification are derived, slight differences become evident.

Manufacturing technology includes a much broader range
of processes, materials, products, etc. than does graphic communication technology. This is particularly so when considering that the graphic communication industry has been limited to the print media (printing and publishing) institutions, within this study. With this realization an adaptation of the practices within management, production, and personnel was performed. This was accomplished by examining each of the original practices individually. They were examined in relationship to any possible application they might have to the process of producing a print media product. The methods of task and functional analysis were employed. As a result of this examination and adaptation process, the following outlines have been derived and adopted for graphic communication technology.

**Graphic Communication Technology Management**

1. Planning
   1.1 Formulating project and product
      1.1.1 Determining overall goals
      1.1.2 Establishing specific objectives
      1.1.3 Setting rules and policies
      1.1.4 Forecasting and extrapolating
      1.1.5 Programming
   1.2 Researching Data
      1.2.1 Retrieving data
      1.2.2 Describing data
      1.2.3 Analyzing data
      1.2.4 Synthesizing data
      1.2.5 Manipulating data
   1.3 Designing product
      1.3.1 Determining functions
      1.3.2 Preparing performance specifications
      1.3.3 Postulating solutions
      1.3.4 Developing rough layouts
      1.3.5 Postulating alternate solutions
1.3.6 Developing finished layouts  
1.3.7 Selecting solution  
1.3.8 Communicating design solution  
1.3.9 Developing artwork and/or typographical mechanical  
1.4 Designing project  
1.4.1 Detailing design communication  
1.4.2 Detailing specifications and standards  
1.4.3 Work design (methods, standards, processes)  
1.4.4 Estimating  
1.4.5 Scheduling  

2. Organizing  
2.1 Structuring  
2.1.1 Analyzing work tasks  
2.1.2 Determining worker functions  
2.1.3 Establishing roles  
2.1.4 Settling work conditions  
2.2 Supplying  
2.2.1 Requisitioning  
2.2.2 Procuring and subcontracting  
2.2.3 Routing and scheduling  
2.2.4 Storing  

3. Controlling  
3.1 Directing  
3.1.1 Supervising  
3.1.2 Coordinating  
3.1.3 Authorizing  
3.2 Monitoring  
3.2.1 Inspecting  
3.2.2 Inventorying  
3.2.3 Timekeeping  
3.3 Reporting  
3.3.1 Compiling  
3.3.2 Appraising  
3.3.3 Notifying  
3.3.4 Storing and retrieving  
3.4 Correcting  
3.4.1 Adjusting  
3.4.2 Expediting  
3.4.3 Restraining  
3.4.4 Replenishing  
3.4.5 Redirecting  
3.4.6 Reorganizing  
3.4.7 Retraining  
3.4.8 Recycling and reevaluating
Graphic Communication Technology Production Practices

1. Pre-processing
   1.1 Receiving
   1.2 Unpacking
   1.3 Handling
      1.3.1 Pumping and compressing
      1.3.2 Elevating
      1.3.3 Carrying
      1.3.4 Filling
      1.3.5 Attaching
      1.3.6 Operating
      1.3.7 Skidding
   1.4 Storing
      1.4.1 Storing of materials
      1.4.2 Storing of information
         1.4.2.1 Photo-recording
         1.4.2.2 Microfilming
         1.4.2.3 Video taping
         1.4.2.4 Computerizing
   1.5 Protecting

2. Processing
   2.1 Separating
      2.1.1 Classifying
         2.1.1.1 Screening
         2.1.1.2 Floating
         2.1.1.3 Filtering
         2.1.1.4 Distilling
         2.1.1.5 Evaporating
         2.1.1.6 Drying
         2.1.1.7 Adsorbing
         2.1.1.8 Absorbing
         2.1.1.9 Crushing
         2.1.1.10 Milling
         2.1.1.11 Stripping
         2.1.1.12 Electrostatic separating
      2.1.2 Material removing
         2.1.2.1 Turning
         2.1.2.2 Shaping
         2.1.2.3 Boring
         2.1.2.4 Abrading
         2.1.2.5 Slotting
         2.1.2.6 Shearing
         2.1.2.7 Etching
         2.1.2.8 Engraving
2.2 Combining

2.2.1 Mixing
  2.2.1.1 Beating
  2.2.1.2 Blending
  2.2.1.3 Kneading
  2.2.1.4 Impregnating

2.2.2 Coating
  2.2.2.1 Spraying
  2.2.2.2 Brushing
  2.2.2.3 Rolling
  2.2.2.4 Dipping
  2.2.2.5 Non-impact printing
  2.2.2.6 Impact printing
  2.2.2.7 Dyeing
  2.2.2.8 Calendering
  2.2.2.9 Electroplating
  2.2.2.10 Oxide coating
  2.2.2.11 Spreading
  2.2.2.12 Laminating

2.2.3 Assembling
  2.2.3.1 Gathering
  2.2.3.2 Positioning
  2.2.3.3 Collating
  2.2.3.4 Binding
  2.2.3.5 Typesetting

2.3 Forming

2.3.1 Working
  2.3.1.1 Rolling
  2.3.1.2 Pressing
  2.3.1.3 Stamping and embossing
  2.3.1.4 Folding-creasing-bending
  2.3.1.5 Molding
  2.3.1.6 Hammering

2.3.2 Thermal conducting
  2.3.2.1 Curing
  2.3.2.2 Casting
  2.3.2.3 Melting

2.3.3 Combining

2.3.4 Winding

2.3.5 Knitting

2.3.6 Displacing

2.3.7 Photographing
  2.3.7.1 Framing
  2.3.7.2 Exposing
  2.3.7.3 Developing
2.3.7.4 Contacting
2.3.7.5 Projecting
2.3.7.6 Retouching
2.3.7.7 Color correcting
2.3.7.8 Bleeding
2.3.7.9 Solorizing
2.3.7.10 Vignetting
2.3.7.11 Reversing
2.3.7.12 Cropping
2.3.7.13 Registering
2.3.7.14 Collaging
2.3.7.15 Reducing
2.3.7.16 Intensifying
2.3.7.17 ...

2.3.8 Illustrating
2.3.8.1 Sketching
2.3.8.2 Mechanical drawing
2.3.8.3 Rendering
2.3.8.4 ...

3. Post-Processing
3.1 Altering
3.2 Installing
3.3 Maintaining
3.4 Repairing
3.5 Storing/Retrieving (see 1.4.2)
3.6 Packaging, Labeling and Shipping

Graphic Communication Technology Personnel

1. Hiring
1.1 Recruiting
1.1.1 Advertising vacancies
1.1.2 Communicating information
1.2 Selecting
1.2.1 Interviewing
1.2.2 Testing and evaluating
1.2.3 Making decisions
1.2.4 Reporting results
1.3 Inducting
1.3.1 Appointing
1.3.2 Contracting
1.3.3 Recording personnel information
1.3.4 Orienting employees
2. Training
   2.1 On-the-job training
      2.1.1 Apprenticing
      2.1.2 Interning
      2.1.3 Coaching
   2.2 Other training
      2.2.1 Training through in-shop classes, seminars, workshops
      2.2.2 Training through outside classes
      2.2.3 Providing self-instructing materials

3. Working
   3.1 Providing economic rewards
      3.1.1 Paying wages and salaries
      3.1.2 Providing fringe benefits
   3.2 Providing physical setting
      3.2.1 Controlling environmental conditions (light, heat, etc.)
      3.2.2 Meeting physical and mental needs
      3.2.3 Protecting
   3.3 Providing social environment
      3.3.1 Providing recreational and social activities
      3.3.2 Providing communication channels
      3.3.3 Disciplining
      3.3.4 Honoring performances

4. Advancing
   4.1 Promoting
      4.1.1 Moving upwards
   4.2 Demoting
      4.2.1 Moving downwards
   4.3 Discharging
      4.3.1 Separating
      4.3.2 Relocating
      4.3.3 Laying off

5. Retiring
   5.1 Counseling
      5.1.1 Planning retirement
      5.1.2 Serving after retirement
   5.2 Pre-retirement job engineering
      5.2.1 Changing worker function
   5.3 Recognizing service
      5.3.1 Recognizing and publicising service
      5.3.2 Presenting mementos
5.4 Awarding retirement benefits
5.4.1 Making payments
5.4.2 Providing fringe benefits

With the establishment of the structural elements for graphic communication technology the next task performed is that of their application to the operational process. As stated before, the operational process has been conceptualized to ensure maximum generalization to many differing situations and products. The model in Figure 30 illustrates a general level of relationship between the structural elements and the major process components in an operational setting. The five major concepts have had the suffix "ing" added to them to denote "action or doing".

FIGURE 30. THE RELATIONSHIP BETWEEN THE PRACTICES AND PROCESSES OF GRAPHIC COMMUNICATION TECHNOLOGY
Administrating is the beginning stage wherein the project is planned along with implications for product planning. The output of administrating is input into every succeeding stage. In the creating stage, only the product is planned and designed. A finished layout with complete specifications is the resultant output of creating and this then is input into the generating stage. In the generating stage the product's elements are generated, assembled, and pasted-up to form the artwork/typographical mechanical. The mechanical is then input into the reproducing stage for conversion into an image carrier. An exception to this flow may take place at this point. In particular cases such as in letterpress printing, where only type matter will be reproduced, the specifications from "creation" are input into "generation" where the type is set and then sent directly to "reproduction" where the type is locked-up into an imposition form. Several steps of the generating process are bypassed and the "conversion to an image carrier intermediate" (plate preparation) of the reproducing stage is omitted. Generally though, in the reproducing stage the image carrier is formed, the image is transferred (printed), and the final finishing processes are applied to the product. The product (the output) then proceeds to distributing where it may be shipped immediately or stored for later retrieval and use. The dotted lines of the model indicate the operation of continuous feedback for control and correction.
Now that the necessary preliminary background information has been presented, the graphic communication technology process components will be expanded and detailed. To accomplish this task the individual components have been ordered at a higher level of specification, as represented graphically in Figure 31.

It is recognized that each individual unit within the model could be further specified to almost infinite levels of detail. An example of this will be given in Chapter V through the generation of a sample course syllabus. For the purpose of this study the level of specification within the present model will be accepted as being an adequate representation of the process employed in most graphic communication industries. Further specification to higher levels would narrow the structure and eliminate its universal application. Each of the models five conceptual components will now be detailed.

The Concept of Administration - (administrating) involves problem conceptualization, delineation, and specification wherein the wants and needs of the client are established, a systematic plan of problem solution is devised, and specifications are developed for both the product and its production. In addition to being a major conceptual component, administrating, may also reoccur continuously throughout the entire operationalized process. It may have literally hundreds of macro - and micro - applications.
FIGURE 31. THE CONCEPTS AND MAJOR PROCESSES OF GRAPHIC COMMUNICATION TECHNOLOGY
Dependent upon the complexity of the total project, some or all of the following practices may be included (and recycled) within the administrating concept of the graphic communication technology process.

1. Formulating the project
   1.1 Determining project objectives (multi-level)
       1.1.1 Stating goals
       1.1.2 Establishing project criteria
       1.1.3 Setting policies
       1.1.4 Evaluating
       1.1.5 Describing objectives
   1.2 Collecting data
       1.2.1 Locating data
       1.2.2 Retrieving data
       1.2.3 Describing data
   1.3 Analyzing data
       1.3.1 Performing functional analysis
       1.3.2 Performing task analysis
       1.3.3 Performing methods analysis
       1.3.4 Performing means analysis
   1.4 Synthesizing data
       1.4.1 Evaluating data
       1.4.2 Forecasting
       1.4.3 Deriving preliminary strategy

2. Administering the project
   2.1 Directing
       2.1.1 Coordinating
       2.1.2 Assigning
       2.1.3 Supervising
       2.1.4 Inspecting
   2.2 Authorizing
       2.2.1 Allocating functions and tasks
       2.2.2 Verifying
       2.2.3 Certifying
       2.2.4 Redefining

3. Programming the project
   3.1 Evaluating
       3.1.1 Analyzing data
       3.1.2 Comparing
       3.1.3 Contrasting
       3.1.4 Correlating
3.2 Selecting
   3.2.1 Examining
   3.2.2 Eliminating
   3.2.3 Adapting
   3.2.4 Adopting

3.3 Presenting
   3.3.1 Scheduling
   3.3.2 Diagraming (functional relationship over time)

4. Financing the project
   4.1 Appraising
      4.1.1 Describing
      4.1.2 Analyzing
      4.1.3 Correlating
      4.1.4 Reporting
   4.2 Estimating probable cost
      4.2.1 Pricing
      4.2.2 Calculating
      4.2.3 Projecting
      4.2.4 Accounting
   4.3 Funding
      4.3.1 Crediting
      4.3.2 Purchasing
      4.3.3 Selling
      4.3.4 Capitalizing
   4.4 Documenting
      4.4.1 Contracting
      4.4.2 Legalizing
      4.4.3 Copyrighting
   4.5 Budgeting
      4.5.1 Allocating
      4.5.2 Timing

The Concept of Creation - (creating) is characterized by idea and design formation wherein the product design solution is created in a manner which fulfills the needs of both the client and the prospective consumer.

In order to create the product design solution three basic sets of information design questions must be answered.
These are:

First, what necessary information and data describes the prospective consumer? Will the consumer's communication and perception skills allow him to interpret symbols, pictures, images, and to manipulate differing levels of language? What is the consumer's attitude towards the area of information contained within the product - its implications and ramifications? What are the norms that shape the consumer's particular socio-economic, cultural-educational, professional, political, etc., environmental surroundings? Are there certain cultural assumptions, stigmas, stereotypes, biases and beliefs that can be employed within the content and presentation of the product?

Secondly, what kinds of codes, structures, and treatments may be used for efficient and effective communication within the product? Can effectiveness be ensured, assessed, improved?

Finally, third, what other constraints will be imposed upon the product's development by such considerations as time, cost, availability of facilities, materials, expertise, and such limitations as production process and processing, etc.?

The body of knowledge composing the concept of creation can be drawn (as discussed and detailed in earlier chapters) from the principles and practices of: (1.) aesthetic design, (2.) visual organization, (3.) perception, (4.) communication
theory and process, (5.) codification and symbology, and (6.) linguistics and other related information.

Through a systematic approach to problem solving the body of knowledge can be operationalized and applied to the designing of the product. For convenience, two major categories of practices are proposed. They are: (1.) Information designing, and (2.) Engineering and detailing. Each of these categories may be further sub-divided into the following practices:

1. Designing product information
   1.1 Researching product design variables
      1.1.1 Gathering specific data pertinent to the product, client and consumer
      1.1.2 Analyzing data
      1.1.3 Synthesizing data
      1.1.4 Proposing major concepts
   1.2 Evaluating concepts
      1.2.1 Evaluating total product
      1.2.2 Determining functional relationships
      1.2.3 Quantifying and qualifying
   1.3 Postulating graphic solutions
      1.3.1 Scaling functional relationships
      1.3.2 Presenting graphic solutions
         1.3.2.1 Verbal analogue modeling
         1.3.2.2 Symbolic analogue modeling
         1.3.2.3 Diagramatic analogue modeling
         1.3.2.4 Simple sketching
   1.4 Selecting a graphic solution
      1.4.1 Analyzing alternative solutions
      1.4.2 Appraising alternative solutions
      1.4.3 Evaluating alternative solutions

2. Engineering and detailing
   2.1 Establishing sketches and specifications
      2.1.1 Experimenting
      2.1.2 Rough sketching
      2.1.3 Griding
      2.1.4 Copyfitting
      2.1.5 Selecting symbols, images, type styles, etc.
2.2 Establishing detail design criteria and standards
   2.2.1 Analyzing sub-programs
   2.2.2 Estimating sizes and capacities

2.3 Detail designing
   2.3.1 Selecting components and elements
   2.3.2 Referencing, relating
   2.3.3 Preparing final layout
   2.3.4 Securing approval

2.4 Specifying
   2.4.1 Preparing outline specifications
   2.4.2 Drafting final specifications
      2.4.2.1 Product specifications
      2.4.2.2 Process specifications
      2.4.2.3 Securing approval

The Concept of Generation—(generating) entails the translation of the product design solution and its specifications (as derived through creating) into the finished product prototype. The sub-process within generation may consist of only the generation of graphic elements, or as in a majority of cases also include assembly and past-up:

Three sub-divisions compose the major concept area, they are: (1.) generating alpha-numeric characters in the form of textual, display, or tabular compositions, (2.) generating pictorial illustrations and images by the use of various artwork techniques and photography, and (3.) the assembly of the alpha-numeric compositions and the pictorial illustrations and images to form the artwork/typographical mechanical.

As noted previously (Supra, p.176) an exception to the statements above exists in relationship to lead type composition. The lines of lead type would be generated and proofed in generation, but assembled into an imposition and lock-up
formation during the image carrier a sub-process of reproduction. Also, dependent upon the complexity of the product design solution, the available facilities, and the intended means of reproduction a tailored selection of specific practices and processes would be made from each of the three areas.

The practices represented within the concept of generation are selected from the pre-processing, processing, and post-processing practices of the graphic communication technology structural elements. This is also true for the practices within the concepts of reproduction and distribution. Any sub-process may be defined or detailed by selecting the appropriate practices from the overall taxonomic listing. The following general listing of practices could apply to generating characters and images, assembling elements, etc.

1. Initiating the process
   1.1 Interpreting specifications
      1.1.1 Reading
      1.1.2 Contrasting and comparing
      1.1.3 Measuring
      1.1.4 Calculating
      1.1.5 Marking
      1.1.6 Noting
      1.1.7 . . .
   1.2 Preparing materials
      1.2.1 Separating
      1.2.2 Combining
      1.2.3 Forming
   1.3 Preparing equipment
      1.3.1 Selecting
      1.3.2 Supplying
      1.3.3 Computing and calibrating
      1.3.4 Adjusting
   1.4 Operating equipment
      1.4.1 Working
      1.4.2 Producing
1.5 Checking and testing
   1.5.1 Proofing and correcting
   1.5.2 Comparing against specifications
   1.5.3 Accepting or rejecting

2. Completing the process
   2.1 Evaluating
   2.2 Securing approval

The processes presently employed within the graphic communication industry to generate alpha-numeric characters have been classified into three categories. These categories may be used singly or in combination.

Character Generation Processes
1. Hot typesetting systems
   1.1 Hand composition
      1.1.1 Single character assembly - moveable metal, wood, etc.
      1.1.2 Line assembly (slug) - Ludlow
   1.2 Machine composition
      1.2.1 Single character assembly - Monotype
      1.2.2 Line assembly (slug) Linotype and Intertype
      1.2.3 Tape, computer, teletype

2. Cold typesetting systems
   2.1 Hand composition
      2.1.1 Hand calligraphy
      2.1.2 Lettering templates and devices
      2.1.3 Pre-printed transfer type
      2.1.4 Strike-on machine setters (IBM, Varityper etc.)
      2.1.5 Hand operated single character phototypesetters (Headliner, Strip printer, etc.)
   2.2 Machine photocompositions
      2.2.1 Page and display setters (Fototronic, Linofilm, APT phototypesetter, etc.)

2.3 Facsimile systems
2.4 RCA Cathode Ray Generation
2.5 LDX Long Distance Transmission
2.6 OCR - Optical Character Recognition
2.7 Computer CTR systems
2.8 Teletypesetter

3. Conversion Systems (see image carrier formation)
3.1 Brightype
3.2 Converkral
3.3 Cronopress
3.4 Instant negative
3.5 Scotchprint
3.6 Vertaflex

The current processes by which pictoral images and illustrations are generated may be classified into the categories of: (1.) artwork techniques, i.e., drawings, rendering, painting, and special effects, and (2.) photographic techniques and special effects. As with character generation, these processes may be employed singly or in combinations.

Pictoral Illustration and Image Generation

1. Artwork techniques
   1.1 Continuous line drawings
   1.2 Contour line drawings
   1.3 Pantographing
   1.4 Chinese brush drawing and rendering
   1.5 Dry brush drawing and rendering
   1.6 Wash rendering and shading
   1.7 Pencil, chalk, charcoal, pastel, etc., drawing and rendering
   1.8 Tempera and oil painting
   1.9 Pen and ink drawing and rendering
   1.10 Ink and brush and wash shading
   1.11 Felt tip pen and crayon rendering and drawing
   1.12 Scratch board
   1.13 Air brush rendering
1.14 Screening and shading (shading and texture screens)
1.15 Bendaying
1.16 Repro proofing (wood engraving, lithographs, etching)
1.17 Commercially pre-printed clip materials
1.18 Silhouetting
1.19 Color Key composing
1.20 ...

2. Photographic techniques
  2.1 Velox printing
  2.2 Halftone printing
  2.3 Texture screening
  2.4 Surprinting
  2.5 Overprinting and superimposing
  2.6 Reverse printing
  2.7 Overlaying
  2.8 Solorizing
  2.9 Vignetting
  2.10 Posterizing
  2.11 Posterizing
  2.12 ...

The processes presently employed to assemble graphic elements onto a finished layout or artwork/typographical mechanical are compiled below. Not all processes are always used on a particular product, therefore appropriate selections would be made.

Assembly of Graphic Elements
1. Signaturing
2. Scaling and gridding
   2.1 Creating band grids
   2.2 Creating axial grids
2.3 Creating grouping grids
2.4 Creating path grids

3. Dividing, categorizing and structuring inner space
   3.1 Developing solid arrangements
   3.2 Developing vertical 2/2 arrangements
   3.3 Developing horizontal 2/2 arrangements
   3.4 Developing vertical with horizontal 2/2
   3.5 Developing vertical 3/3 arrangements
   3.6 Developing vertical with horizontal 3/3
   3.7 Developing other arrangements

4. Positioning elements
   4.1 Registering
   4.2 Balancing
   4.3 Bleeding
   4.4 Cropping
   4.5 Overprinting or overlaying
   4.6 Surprinting or reversing
   4.7 Other

5. Trimming and cleaning

6. Mounting and pasting up
   6.1 Rubber cementing
   6.2 Waxing
   6.3 Dry mounting
   6.4 Laminating
   6.5 Spraying adhesives
   6.6 Taping (single and double coated)

7. Dimensioning and noting

8. Referencing and titling

9. Preserving

10. Evaluating and proof checking
The Concept of Reproduction - (reproducing) is the method/means by which multiple copies are formed from the original design solution prototype (e.g., mechanical). The processing begins with the conversion of the mechanical to produce the image carrier intermediate (negatives, positives, facsimile stencils, etc.). The intermediate is then used to produce the image carrier (printing plate). The image carrier is employed in an impact or non-impact coating process (printing) to transfer the graphic configuration to the intended product (printing stock). Finally, the intended product receives an application of appropriate finishing processes and is completed in the form of a print media product (graphic communication product).

A majority of the practices of graphic communication technology management, production, and personnel are employed within the operationalized process. At a general level, an overview of the entire reproduction process structure should include the following minimum of components.

1. Production programming
   1.1 Scheduling
      1.1.1 Grouping
      1.1.2 Allocating time
   1.2 Routing
      1.2.1 Establishing departure & arrival times
      1.2.2 Establishing path to be followed
   1.3 Procuring
      1.3.1 Subcontracting
      1.3.2 Employing
      1.3.3 Purchasing & Supplying
      1.3.4 Leasing
      1.3.5 Obtaining licenses, permits, copyrights, etc.
2. Production supervising

2.1 Directing
   2.1.1 Coordinating
   2.1.2 Assigning
   2.1.3 Administering
   2.1.4 Inspecting

2.2 Authorizing
   2.2.1 Verifying
   2.2.2 Certifying
   2.2.3 Approving
   2.2.4 Disapproving
   2.2.5 Redefining

3. Production implementing

3.1 Converting mechanical to image carrier intermediate
   3.1.1 Line photographing
   3.1.2 Halftone photographing
   3.1.3 Special effects photographing
   3.1.4 Facsimile scanning

3.2 Forming the image carrier
   3.2.1 Assembling (negatives, positives, facsimile stencils, etc.)
   3.2.2 Forming mechanically (as in locking-up an imposition form of lead type and engraved illustrations)
   3.2.3 Forming photographically
   3.2.4 Forming photo-mechanically
   3.2.5 Forming by engraving (including scan engraving)
   3.2.6 Forming by combinations of above

3.3 Transferring image to product surface through coating action by:
   3.3.1 Impact printing
   3.3.2 Non-impact printing

3.4 Applying finishing process to product
   3.4.1 Gathering & Collating
   3.4.2 Folding
   3.4.3 Binding
   3.4.4 Trimming
   3.4.5 Applying special finishes

3.5 Packaging
   3.5.1 Protecting & Preserving
   3.5.2 Labeling & Coding
   3.5.3 Invoicing

The following outlines are presented to illustrate the commonly used sub-processes which may be categorized under the concept of reproduction. These compilations are general in
In order to relate to all graphic communication industries (print media industries).

**Image Carrier Intermediate Conversion Processes**

1. Categorization by type of formative process
   1.1 Photographic conversion of image by use of film and paper negative or positive
      1.1.1 Line photography of image
      1.1.2 Halftone photography of image
   1.2 Imposition and Lock-up conversion of image (e.g., metal, rubber, wood etc. type. Type forms image carrier itself)
   1.3 Image conversion by engraving (hand or machine)
   1.4 Image conversion by etching (hand scribing or photo-etching)
   1.5 Image conversion by molding (e.g., stereotype)
   1.6 Image conversion by electroplating (e.g., electrotypes)
   1.7 Image conversion by electronic scanning (e.g., facsimile engraving)
   1.8 Image conversion by electrostatics (e.g., electrofax)
   1.9 Image conversion by thermography (e.g., thermofax)
   1.10 Image conversion by photopolymers (e.g., photo-wash out as in Hi-Fi green stencils)
   1.11 Image conversion by other commercial processes;
      1.11.1 Brighttype
      1.11.2 Conv verbal
      1.11.3 Cronapress
      1.11.4 Instant Negative
      1.11.5 Scotchprint
      1.11.6 Vertaflex

2. Classification by application and use
   2.1 Relief transfer image carriers
      2.1.1 Lead type imposition and lock-up
      2.1.2 Etched and engraved plates
      2.1.3 Facsimile plates
      2.1.4 Stereotypes and electrotype plates
2.2 Intaglio transfer image carriers
   2.2.1 Copperplate and steelplate engraving
   2.2.2 Dry-point plates
   2.2.3 Mezzotint and aquatint plates
   2.2.4 Photogravure
   2.2.5 Rotogravure

2.3 Screen process transfer
   2.3.1 Silhouette and die cut stencils
   2.3.2 Hand cut film stencils
   2.3.3 Liquid tusche stencils
   2.3.4 Photographically formed stencils (direct and indirect)

2.4 Planographic transfer image carriers
   2.4.1 Direct image plates (i.e. grease tusche application by hand drawing, typing, etc.)
   2.4.2 Camera direct plates
   2.4.3 Photographically formed plates (normal and etched)
   2.4.4 Collotype plates (photo sensitive gelatin)

Image Transfer Processes

1. Image transfer by impact printing
   1.1 Relief transfer
      1.1.1 Letterpress (platen, cylinder rotary)
      1.1.2 Letterset
      1.1.3 Flexography
   1.2 Intaglio transfer
      1.2.1 Steel-die engraving
      1.2.2 Banknote printing
      1.2.3 Sheet fed gravure
      1.2.4 Rotogravure
   1.3 Planographic transfer
      1.3.1 Lithography
      1.3.2 Offset lithography
      1.3.3 Collotype
   1.4 Screen process transfer
      1.4.1 Die cut stencil
      1.4.2 Screen stencil
   1.5 Office duplication transfer
      1.5.1 Spirit
      1.5.2 Mimeographic
      1.5.3 Gelatin
2. Image Transfer by Non-impact Printing

2.1 Electostatic transfer
  2.1.1 Xerography
  2.1.2 Electrofax

2.2 Light absorbency transfer
  2.2.1 Diazo
  2.2.2 Silver image transfer
  2.2.3 Verifax
  2.2.4 Stabilization (wet and dry processes)

2.3 Heat absorbency transfer
  2.3.1 Copymite
  2.3.2 Ektafax
  2.3.3 Thermographic
  2.3.4 Dual spectrum (3M dry photo copier)

2.4 Photographic transfer
  2.4.1 Photostating
  2.4.2 Contact printing
  2.4.3 Projection printing

Assembling and Finishing Processes

1. Collating
   1.1 Gathering simple signatures
   1.2 Gathering multiple signatures and inserting

2. Folding (1,4,6,8,16,32 page signature)
   2.1 Parallel folding
   2.2 Angle folding
   2.3 Accordian folding
   2.4 Combination of above

3. Binding
   3.1 Edition binding
     3.1.1 Soft sewn binding
     3.1.2 Case bound binding
   3.2 Perfect binding
   3.3 Mechanical binding - permanent
     3.3.1 Side stitching
     3.3.2 Saddle stitching
     3.3.3 Plastic binding (comb)
     3.3.4 Spiral wise binding
     3.3.5 Concentric wire binding
3.4 Mechanical binding - non-permanent
  3.4.1 Padding
  3.4.2 Loose leaf binding
  3.4.3 Technical report binding
  3.4.4 Screw post binding
  3.4.5 Simple staple binding
  3.4.6 "K" nail binding

3.5 Sizing and pre-assembly process
  3.5.1 Scoring and creasing
  3.5.2 Drilling and slotting
  3.5.3 Cutting and trimming
  3.5.4 Nicking and rounding
  3.5.5 Perforating and slitting
  3.5.6 ...

3.6 Special finishing processes
  3.6.1 Die cutting
  3.6.2 Easiling
  3.6.3 Embossing and stamping
  3.6.4 Gumming
  3.6.5 Indexing
  3.6.6 Pebbling and texturizing
  3.6.7 Overlaying laminates
  3.6.8 Gold leafing
  3.6.9 Deckling
  3.6.10 ...

3.7 Packaging
  3.7.1 Wrapping
  3.7.2 Labelling

The Concept of Distribution - (distributing) is the final sub-process within the overall graphic communication process. In this stage the graphic communication product is received from reproduction and acted upon in any of three ways. First, the product may be immediately inventoried (including billing and sales processing), packaged-addressed-labeled, and distributed by shipping to the consumer. Secondly, the product may be protectively wrapped, coded-indexed-labeled, and stored for distribution and shipping in the future. Finally, third, a copy of the product may be permanently
stored within the records of the industry's documentation and filing system for later referral, reprocessing, security, or a variety of other reasons.

Some readers may not agree with the placement of the "storage and retrieval system" within the distribution stage. The reason for its placement within the distribution concept of this study is three-fold in nature.

First, the process of storage and retrieval is composed of the production practices of (1.) pre-processing, (2.) processing, and (3.) post-processing and is of sufficient range and scope to be considered independently of other production processes.

Second, the process of storage and retrieval is in essence a highly sophisticated form of distribution, wherein parts or portions of the whole product are processed, mounted, preserved, coded and indexed, filed, and so on. Furthermore, just the practice of filing and storing itself can be considered to be a form of distribution processing. Also, when the retrieval command is initiated a search, compilation, and selection of appropriate data is processed. In actuality, the processes employed in retrieval are nothing more than an adaptation of, or a reversal of the sequence employed in the storage (distributing) of the original data processing.

Third and finally, it would appear to be logical to locate the storage and retrieval processing within the last step of the flow pattern for entire process sequence. It would not
seem to be practical or possible to record, distribute, file or retrieve data before it has been originally generated, assembled, or reproduced. This follows a similar logic pattern as that of one in which you cannot reproduce until you have first generated (produced). To carry this a step further, it would seem quite difficult to generate before you have created, and this generally requires simultaneous planning and designing.

The following outline lists some of the major components to be contained within the concept of distribution. As with previous outlines, it will be specified at only a general level to ensure generalization to all graphic communication industry.

**Distributing Processes and Procedures**

1. Warehousing and storing  
   1.1 Receiving  
   1.2 Inventorying and recording  
   1.3 Packaging and labeling (for storage not shipping)  
   1.4 Indexing and coding  
   1.5 Moving, stacking, etc.  
   1.6 Storing  
   1.7 Protecting  
   1.8 Retrieving (common with 2.1 below)  
   1.9 Preparing for shipping (common with 2.2 below)

2. Shipping and Distributing  
   2.1 Retrieving or receiving  
   2.2 Preparing for shipping (handling techniques for bound and unbound materials)  
   2.3 Wrapping, boxing, and special containers  
   2.4 Labeling and addressing  
   2.5 Billing and sales processing  
   2.6 Documenting and noting
2.7 Inventorying remaining stock and reporting
2.8 Moving, loading, shipping

3. Storehousing - (storing and retrieving systems)
   3.1 Recording
      3.1.1 Processing
         3.1.1.1 Photographing and photostating (enlargement and reduction)
         3.1.1.2 Electrotyping (enlargement and reduction)
         3.1.1.3 Microfilming (16mm, 35mm, 70mm, 105mm)
         3.1.1.4 Microfiching
         3.1.1.5 Video recording (limited application)
         3.1.1.6 Optical scanning and computer OCR recording
         3.1.1.7 Punching and embossing cards
      3.1.2 Mounting (by use of image carriers such as)
         3.1.2.1 Aperature cards
         3.1.2.2 Cartridges (rolls)
         3.1.2.3 Strip holders
         3.1.2.4 Microfiche cards
         3.1.2.5 Microtapes (video and magnetic)
         3.1.2.6 Key sort cards
         3.1.2.7 Punched cards
         3.1.2.8 Embossed plates
         3.1.2.9 Magnetically printed image cards
      3.1.3 Duplicating (sets for protection from loss, fire, damage)
   3.2 Storing
      3.2.1 Piling - (sequential or random)
      3.2.2 Indexing (through the simple hand techniques of organization by)
         3.2.2.1 Subject matter systems
         3.2.2.2 Alphabetical systems
         3.2.2.3 Chronological systems
         3.2.2.4 Numerical systems
         3.2.2.5 Color coding systems
         3.2.2.6 Devey decimal systems
         3.2.2.7 Library of congress systems
         3.2.2.8 Multiple cross filing systems
         3.2.2.9 Other
      3.2.3 Indexing (through machine process of)
         3.2.3.1 Mechanical device systems
         3.2.3.2 Micro-code systems
         3.2.3.3 Filesearch systems
3.2.3.4 Minicard systems
3.2.3.5 Keysort systems
3.2.3.6 Magnetic coding systems
3.2.3.7 Video storage systems
3.2.3.8 Flash card systems
3.2.3.9 Numeric systems
3.2.3.10 Indexer line systems
3.2.3.11 Image control systems
3.2.3.12 Descriptor systems
3.2.3.13 Microstrip systems
3.2.3.14 Computer disc memory band systems
3.2.3.15 Magnetic tape for computer systems

3.3 Retrieving
3.3.1 Locating (by use of filing system)
   3.3.1.1 File cabinets systems
   3.3.1.2 Semi-automated keysort systems
   3.3.1.3 Library retrieval systems
   3.3.1.4 Magnetic edge locators
   3.3.1.5 Color locators
   3.3.1.6 Multiple access with logic program
          computer systems
   3.3.1.7 Punch card systems
   3.3.1.8 Punched tape systems
   3.3.1.9 Magnetic tape systems
   3.3.1.10 Video tape systems
   3.3.1.11 ...

3.3.2 Viewing
   3.3.2.1 Microfilm and microfiche projectors
   3.3.2.2 Roll film projectors
   3.3.2.3 Punched tape and card translator/printers
   3.2.3.4 Video receivers
   3.2.3.5 Computer translator/printers
   3.2.3.6 Computer CRT display systems
          (cathode ray tube)

3.3.3 Procuring printouts (hard print and rapid reproduction)
   3.3.3.1 CRT printer systems
   3.3.3.2 Photocopier systems
   3.3.3.3 Xerographers
   3.3.3.4 Direct plate photo offset
APPENDIX H

LETTERS OF RECOMMENDATION AND SUGGESTION
FROM THE ASSESSMENT JURY
March 31, 1971

Mr. R. Louis Gysler
The Ohio State University
Product Design
Visual Communication
128 North Oval Drive
Columbus, Ohio 43210

Dear Lou,

The study is exciting! Bill Smith, Assistant Education Director, and I were very much impressed by the thoroughness of the material received. We would appreciate receiving a copy of your study so that it may be included in our library.

You had asked for comments regarding Chapter IV. Based on your overall efforts, these comments would be considered minor. We have found that not any two people will come to the same conclusions and we could debate certain issues which would cause unnecessary delay. For example, on page 174 we question the category of "Advancing" which includes demoting and discharging. And, what about lateral moves which seem to take place occasionally? In "Training," found on page 174, correspondence courses may be considered. You may have this covered under 2.2.3. Under "Hiring" we tend to view career and recruitment as two different categories, career being to provide information about the industry, and recruiting the bringing of people into the industry. Too often our industry does not provide information until it is time to hire; therefore, it is necessary to have one step before the hiring and that is arousing interest. Here again, Lou, these issues are minor as the structure of Chapter IV is consistent with industrial practices, analytically approached, and in our estimation, educationally and feasibly sound.

Lou, Bill Smith, and I went through your material separately, and made comments, after which we discussed our findings. We were both impressed by the depth and breadth of the study. We have reviewed several graduate studies in graphic communications and from our observation it is the most comprehensive overview based on accepted industry practice that we have seen to date.

Sincerely,

JS/db
enc.

Jack Simich
Education Director

Organized in 1924—formerly Lithographic Technical Foundation
Mr. R. Louis Gysler  
Division of Design  
The Ohio State University  
128 North Oval Drive  
Columbus, Ohio 43210  

Dear Mr. Gysler:

Enclosed are the research materials that you requested I evaluate regarding your Doctoral research. I am hopeful that the few suggestions that I was able to make will be of some assistance to you.

Frankly, I made only a few suggestions/comments in your Chapter 4 entitled "Development of the Rationale and Structure for Graphic Communication Technology", and I must admit I feel as if I really did not do the job that you requested. Your rationale and structure is well done, and it is very obvious you have taken a considerable amount of time to assemble the material.

The outline and structure for the typography design course is also well done—only one comment is appropriate in this case and that is, may I suggest that you do not begin the course with a study of history. In my opinion, history is not too exciting and may possibly turn a few future students "off" regarding design and its importance within graphic communications. Please do not misunderstand, I do believe history has its importance, but possibly you could place it somewhere else in the course and achieve your same overall objective.

If you are not already aware with a Doctoral dissertation entitled "The Identification and Classification of Graphic Communication Technology", may I suggest that you take a close look at it as it may give you some support or direction for your particular research. The research was done by John T. Pecik.
Mr. R. Louis Gysler  
Page 2  
March 30, 1971

at the University of Maryland, and he completed his work in August of 1970. He may be contacted at the following address:

John T. Fecik  
Associate Professor  
Industrial Arts Division  
Cheyney State College  
Cheyney, Pennsylvania 19319

Enclosed is an abstract form that I am using to gather curriculum research in the area of graphic arts. You will note on the form that this abstract will appear in an issue of the International Graphic Arts Education Association Newsletter. When you complete your research, I definitely would appreciate it if you would forward this abstract to me so that we can help keep the graphic arts teachers better informed.

Another thought has occurred to me after looking at your research that I would like to explore. The material that you have assembled should be made available to the profession in some form and possibly you have already considered how this may be done, but let me suggest that you consider preparing a monograph that might be available through the International Graphic Arts Education Association. I am not sure how the details would be worked out, but certainly this is something that could be explored if you are interested. Anyway, let me say that you should plan to publicize your findings in some way.

In closing, I commend you for the fine work that you have done, and I know that you will continue your work along the same lines that you have started. Thank you for the opportunity to work even in a small way with you on this particular project. Please express my appreciation to Drs. Ray and Buffer for recommending me as one of your evaluators. Hope to have the opportunity to personally meet and visit with you in the near future.

Sincerely,

Ervin A. Dennis  
Professor  
Department of Graphic Arts

Enclosure
Mr. R. Louis Gysler  
The Ohio State University  
1712 Neil Avenue  
Columbus, Ohio 43210

Dear Mr. Gysler:

Attached is your rationale and structure and the evaluation forms. You will note my few comments on the rationale section at the clipped points.

One area which probably is assumed in the generating and reproducing phases is "process control" or "quality control." This should, of course, be an integral part of these processes as it is in industrial technology, but it is easy to overlook here if not specifically cited.

I'm sure that you regard the marketing function as outside the technology, and, therefore, outside the scope of this project. Increasingly, however, marketing requires in-depth knowledge of the technology -- be it in printing or supply sales. This simply suggests the need for integration of marketing and technological experiences in the classroom and, therefore, this may have relevance to your paper.

I hope that these few short comments are of some value. I believe that your study could be of significant value in the re-direction and reorganization of graphic arts education. Best wishes for success.

Sincerely,

William F. Flack  
Education Specialist  
Professional, Commercial, and Industrial Markets Division

Kodak
Bibliography

Addressograph Multigraph Corporation. *Graphic Communications*. . .
*Not Just A Job But a Career*. Cleveland, Ohio: Addressograph

Bateson, W. M. and Stern, J. "The Function of Industry as the
Basis for Industrial Education Programs," *Journal of
Industrial Teacher Education*. 1963, No. 1., pp. 3-16.

Bentley, R. G., and Beck, H. C. "Implementation of a Visual Communica-
Communications Journal*. I.G.A.E.A. Vol. 1, No. 3, March,
1966.

Bentley, R. G. "The Graphic Communications Teacher of Tommorrow—
From the Educator's Viewpoint". *The Seventies: Proceedings
of the General Education Meeting*. Pittsburgh, Pennsylvania:


Birdwhistle, Ray L. "Background to Kinesics," *ETC: A Review of

Briggs, Leslie J. "A Procedure for the Design of Multimedia
Instruction," *Instructional Technology: A Book of Readings,
editor, F. G. Knirk and J. W. Childs, New York: Holt,
Rinehart and Winston, 1968, pp. 61-64.

Brown, James W., and et. al. "Instructional Systems, Multimedia
and Computers: The Future," *A-V Instruction: Media and
pp. 503-525.


Buffer, J. *IACP Interim Report, Volume II*, Columbus, Ohio: The


———. *Industrial Arts Curriculum Project Rationale: A Brief Description*. The Ohio State University, Columbus, Ohio: I.A.C.P., 1968.