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There are some things that cannot be learned quickly, and time, which is all we have, must be paid heavily for their acquiring. They are the very simplest things and because it takes a man's life to know them the little that each man gets from life is very costly and the only heritage he has to leave.

HEMINGWAY

AN INVESTIGATION OF DISSEMINATION OF SCIENTIFIC  
MANAGEMENT INTO SELECTED AREAS OF THE  
COMMERCIAL PRINTING INDUSTRY

BY  
DONALD E. HILL

A thesis submitted  
in partial fulfillment of the requirements for the  
degree Master of Science, Department of  
Printing and Journalism, South Dakota  
State College of Agriculture  
and Mechanic Arts

August, 1962

**AN INVESTIGATION OF DISSEMINATION OF SCIENTIFIC  
MANAGEMENT INTO SELECTED AREAS OF THE  
COMMERCIAL PRINTING INDUSTRY**

This thesis is approved as a creditable, independent investigation by a candidate for the degree, Master of Science, and is acceptable as meeting the thesis requirements for this degree, but without implying that the conclusions reached by the candidate are necessarily the conclusions of the major department.

**Thesis Adviser**

**Head of the Major Department**

2661 m

## ACKNOWLEDGMENTS

Down through recorded history there have been those who have desired to serve in an advisory capacity. This is as it should be and is certainly not an evil in itself, because there are men who by their very presence repel passive acquiescence and encourage disquisition. These men are the old silent types with their taciturn faiths, and a philosophy that the partition is thin that separates perfectionism as a virtue from perfectionism as disease.

This may sound to some like a conclusion, and a generalization to others, but it is not. Nor is it a solution to a sociological or ethical problem. It is not even the answer to anything. It is nothing more than ingenuous advice which I have received down through the years from my Father, a man who does not often believe in rigid predetermined systems, in dignity rather than dogmatic disciplines, and in content and results rather than techniques. I have been told that in many endeavors, to seek is frequently more important than to obtain.

I have not lived a long or adroit life by the most lithe of standards, but I treasure the counsel of those far wiser than I could ever hope to be:

He has achieved success who has lived well, loved much and laughed often; who has gained the respect of intelligent people and the love of little children; who has made the world a better place in which to live, either by an improved poppy or a perfected rhyme; and who has sought perfection during a lifetime of work, yet knowing in his heart that it could never be attained.

A man is required, through economic pressures, to acquire and be familiar with many utilitarian techniques during a lifetime. It might be

well for each of us to remember some things that will aid us in the future, help us to live life more abundantly, rather than understand it; some like to understand what they believe in, others like to believe in what they understand: (1) A man is poor only when he desires many things, (2) a journey of a thousand miles begins with a single step, (3) position and attainment do not necessarily go together, and (4) a man should desire only to do his work well--and to die well.

It is quite evident that there is an arsenal of maturity in middle-age, and that pigeonholes are for pigeons--the sky for eagles. There is a slight possibility that guts, after all, have not gone completely out of style.

And for my Mother--small and sophisticated--elegance is her way of life, a way of living and thinking and looking at the world. Such an attribute comes from within, and transcends all boundaries of time and place and age. It is, above all, the enhancement of simplicity.

And they too serve who only stand and wait.<sup>1</sup>

DEH

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<sup>1</sup>Portions of this Acknowledgment, I am quite sure, are not original. I would prefer, however, to attribute most of it to my Father.

## PREFACE

It should be quite obvious that I have received considerable assistance in preparing this thesis. Without it this would be just another of my ineffectual attempts at something original.

I would like to express my appreciation to the men in the Department of Printing and Journalism for their support and countenance during the preparation of this paper, although for the most part it was somewhat restricted by scholastic regulations and requirements.

As long as I can remember I have required assistance in my work, and I trust that there will always be those with altruistic motives who will come forward for no other than eleemosynary reasons.

Occasionally individuals come along who are difficult to forget and cannot be satisfactorily explained. Such was a man I met some years ago during the Korean War--Harry M. Mabreys--an idealist and innovator of the first order whose ingenious schemes made washing machines from oil drums, originated the useful technique of heating water in a steel helmet, and in general, was a master at the original idea.

More than ten years have passed since the "Police Action," and I do not know what has happened to Mr. Mabreys, but I do know this--it was a pleasure to work and be associated with him. With his support I would have no difficulty in defense of this paper.

Certainly it is anything but a privilege to be engrossed in the enigma of a proud and placid trade in which supposedly mature and experienced men seek refuge in mediocrity, and are unconcerned for the impending economic destruction that is inevitably before them unless their

dogmatic attitudes and obsolete methods of conducting business are drastically changed. They will not be able to solve tomorrow's problems with techniques that worked only moderately well yesterday.

The economic consequence is undoubtedly extinction, and they must surely realize that the chance for financial and entrepreneur glory has gone down with the sinking sun.

With this rather unproductive beginning I go on--the time for rancorous rhetoric is passed. And this thesis was never meant to be more than an attempt to tell the story, if there is a story, of the evolution and dissemination of scientific management methods into the printing industry. Its audacity, however, is beyond question.

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## CHAPTER I

## INTRODUCTION

A Philosophy

Except for a possible few this will undoubtedly be a dull and pedestrian essay. There will be no epigrams, no prophecies or startling revelations, and a minimum of scholastic supposition. The time for all that is gone. There is no point in another historical symposium of what has already been said. The history should be left to the diligent historians. The student therefore gives notice that there will be no footnote collecting and a ma puissance, no subterfuge.

If I were capable of such scholastic proportions, this paper would be more of a polemic discussion concerning existentialism or "whether Galileo should have been permitted to drop the balls,"<sup>2</sup> but there are circumstances which frequently compel a more academic approach. This often requires a disinterested and objective attitude, a most difficult task, which lends itself to conformity--becoming what is known as an organizational man--a predicament one must constantly guard against.

Nor do I advocate being a "progressive," which could easily be defined as one who cares more that his ideas should be advanced than that they should be realistic and workable.

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<sup>2</sup>From a lecture by Paul H. Jess, Department of Printing and Journalism, South Dakota State College, September 1961.

This also is as good time as any to inform the reader that the words author, student, and investigator are synonymous when used in this study to refer to the writer. I personally prefer the word "student," since I am far from being either of the other two.

What the student will support and defend against all comers, is a position which recognizes the value of a sound and/or original idea, and that every man must decide once-and-for-all whether to act on his own volition or merely react to situations. Such a position often requires one to come to conclusions upon matters that cannot be proven, and to argue from premises which are frequently difficult to defend. At the same time, however, it enables one to adjust to technological advancement --the enemy of turbulent revolution--and to bear the unavoidable with a certain amount of dignity.

From the council of many comes wisdom, has long been recognized. A man is somewhat fatuous who will not solicit into his service those more capable than himself.

A man also has the right to have his opinions criticized at the level of opinion by valid critics, and any constructive criticism in reference to this paper, regardless of how diminutive, is solicited from all concerned.

One need not have the gift of prophecy to predict that the economic destiny of the printing industry depends upon the managerial class, and no amount of sophomoric fulmination or mental squirming, regardless of how judiciously applied, can abrogate the situation.<sup>3</sup>

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<sup>3</sup>For this information I have drawn heavily on Peter F. Drucker, "The Manager of Tomorrow," The Practice of Management (New York: Harper & Brothers, 1954), pp. 370-78. Several of Mr. Drucker's comments are common knowledge, but for their interpretation here I alone bear the responsibility.

See also Howard R. Bowen, Social Responsibilities of the Businessman (New York: Harper & Brothers, 1953), pp. 3, 93-94, et passim.



This is, of course, problematical, and perhaps it would be more appropriate to state that the functions of management are the last strongholds in which the machine has not reduced the individual proficiency and dexterity involved in the work to a point of mere machine-tending. In an ocean of economic servitude in which the assembly-line psychoanalysts tell us that in the end it is inevitable that the machine win, the entire problem reduces to a difference of opinion as to why men work well.<sup>4</sup>

The status of the industry and self-development of the individual cannot be increased by printing names in a catalog, expounding complicated methods and procedures, or devising elaborate titles for our occupations.

Instead of assuming the attitude of "expert on everything" or "critic of the status quo," it might be well for each of us to examine his own position in relation to the industrial society; in which case, it is highly probable that we would find ourselves somewhat less adroit than we would desire to be.

Students of the subject, and some academic printers,<sup>5</sup> are aware of the fact that in the last analysis, the only thing we have to sell is our labor, and we should go about the business of improving it with

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<sup>4</sup>James F. Lincoln, Incentive Management (Cleveland: The Lincoln Electric Company, 1951), p. 78.

<sup>5</sup>A semantic problem of no small importance is to find a term that will describe the present-day first-class printer that will distinguish him from the more common and vociferous back-shop philosopher. Most of the usual terms carry various connotations and are not adequately descriptive. I therefore prefer to coin and use the colorless term "academic printer."



creative thinking, imagination, and every other way possible.<sup>6</sup> For in the end, if an economic system is to survive in which men are willing to back a commercial venture at their own risk, the economic logic of the situation will probably be decisive.<sup>7</sup>

### Reasons For the Study

It is now some 60 years since scientific management came to light in this country.<sup>8</sup> To some the time may seem long, considering all the disappointments that have been crowded into those years. To others, including Peter F. Drucker and Kenneth G. Scheid, a technological revolution has been in progress, and the basic concepts of management have undergone fundamental changes.<sup>9</sup>

The student is not at the present time, and has never been a

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<sup>6</sup>Eugene L. Grant and W. Grant Ireson, Principles of Engineering Economy (New York: The Ronald Press Company, 1960), p. 9.

See also Dan Lacy, Freedom and Communications (Urbana: University of Illinois Press, 1961), p. 15, for an excellent and objective discussion of some of the technological and obsolescence of knowledge problems that will confront the individual in the years to come.

<sup>7</sup>Donald E. Hill, "Six Rules For Improving Your Offset Imposition," Modern Lithography, Vol. XX, No. 3 (March 1962), pp. 54-55.

<sup>8</sup>Frederick W. Taylor, Scientific Management (New York: Harper & Brothers, 1947), p. vi. Taylor's original publication on the subject was Principles of Scientific Management (New York: Harper & Brothers, 1917).

<sup>9</sup>Peter F. Drucker, "Is Personnel Management Bankrupt?", The Practice of Management (New York: Harper & Brothers, 1954), pp. 273-288. This is one of the more prominent books in the field and is "must" reading for students of management.

Mr. K. G. Scheid is head of the Department of Graphic Arts, Carnegie Institute of Technology. His latest writing on the subject is an article in the February 1962 issue of Printing Magazine, "Is Scientific Management a Possibility?", p. 64.

thinker of great things. The great thinking should be left to persons far more competent and qualified. The student has been connected with the printing industry in one way or another for most of a decade, not an extended time by any means but time enough to become a journeyman pressman, and has become cognizant of various maladroit trade practices and procedures.

For practically six years of that time the student was content to operate other men's machines, try their unscientific schemes, and listen to their feeble excuses for what amounted to incompetency. Finally the time came to try several of his own schemes for a change.

The span of a man's life and work can teach him many utilitarian techniques. After years of working from inadequate work orders (job tickets), receiving inaccurate "oral" instructions, and adjusting press plate cylinders (offset) because management could not even perform the sophomoric task of establishing a definitive paper line, the student became firmly convinced that there must be more efficient and economical methods of performing these operations. This rather maladroit inquisitive examination into the nature of some of these observations is the first reason for undertaking this study.

All who study this thesis and any of my other works when the student is no longer present or able to defend them, will realize without much difficulty that he never was successful at advocating creativity--to create rather than conform--satisfy events which should be looked for in the history of every man, yet are experienced by so few. It seems to me that down through our euphemistic past, of all the 'isms' that have

been expounded, there is one which should have emerged to a greater extent in management but has not--"createism."

It has been said that persons with creative ability do not usually make good students, which requires, among other things, an acceptance and accumulation of facts based purely on authority; and that the most remunerative and utilitarian tool of the student is a good memory.<sup>10</sup> This is not to imply that the writer-student possesses any degree of creative ability, but he would prefer to determine for himself whether such a significant generalization is true or not. Although rather personal, this could well be another reason for this study.

The primary reasons for this study are obviously academic. Neither will this be the first time in which I have combined scholastic requirements with an enjoyable work. Many logical reasons could be enumerated for expending the mental and physical effort necessary to produce a thesis. Rationalization in these matters is relatively

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<sup>10</sup> This is far from being a sophomoric statement, and I must confess that I cannot contribute it specifically to anyone, nor can I remember where I read or heard it, but this is not important.

While I do not necessarily adhere to the philosophy entirely, I do hold to the guiding bias that listening to wise statements or sound advice does little for anyone. And no amount of accumulation, whether of theory or fact, in itself provides insight and judgment. This is a polite way of saying that many college courses, especially at the higher levels, taught purely by the lecture method are probably in dire need of analysis. See The Case Method at the Harvard Business School, edited by Malcolm P. McNair (New York: McGraw-Hill Book Co., Inc., 1954) for further discussion of a matter of extreme importance.

There is also a good discussion of creative ability in Manley H. Jones, Executive Decision Making (Homewood, Illinois: Richard D. Irwin, Inc., 1957), pp. 48-49.

simple.<sup>11</sup>

This is not, however, a very capacious study, and the purpose of it must be confined primarily to specific areas of management techniques, communications, and an examination of various printing control forms utilized in these areas. From this the following generalizations concerning the purpose and reasons for the study can be made: (1) To determine the extent, if any, of dissemination of scientific management principles into the commercial printing industry; (2) to determine whether basic management practices can be applied to commercial printing firms regardless of size;<sup>12</sup> (3) to analyze major instructional and communications devices, such as work orders, job tickets, and paper stock requisitions, in an effort to determine whether or not these forms are

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<sup>11</sup>A good first-class student, often referred to as a professional scholar, is frequently a master when it comes to academic vagueness and rationalization. For an example of realistic fiction concerning the college student, see "The Big Bar B-Q and the Union Card," by Donald E. Hill, in the April issue of The Dakotan, a magazine published by students in the Department of Printing and Journalism, South Dakota State College.

See also Peter F. Drucker, Landmarks of Tomorrow (New York: Harper & Brothers, 1957), pp. 17-59. Drucker calls this action of the student "innovation," a process of the imagination, a method of organizing ignorance rather than known facts which frequently teaches the student more effectively than the classroom.

<sup>12</sup>The size aspect is important and emphasized because the printing industry is composed of a large number of small units. For a detailed numerical breakdown of the printing industry see Bulletin MC58 (2)-27B, U.S. Bureau of the Census, 1958 Census of Manufactures, which is available from the Department of Commerce or the Government Printing Office, both of Washington, D.C.

Also for a lucid description of the printing industry refer to Walter H. Carpenter, Jr., "The Philadelphia Typographical Strike of 1948," Case Studies in Collective Bargaining (Englewood Cliffs, New Jersey: Prentice-Hall, 1953), p. 134.



adequate under the conditions in which they are being used; and (4) to investigate the possibility of applying the principles of operations research to various trade aspects of the printing industry. From a strictly scientific point of view, offset stripping and imposition are two areas of particular interest because they involve numerical relationships in conjunction with a high degree of individual skill and dexterity.<sup>13</sup>

To a lesser degree, another reason why the subject of the study was selected, was to afford an opportunity to examine more thoroughly certain other matters of particular interest. One of these is terminology.

For some time now the student has been interested in printing and graphic arts terminology, which is far from being standardized. Nor does there seem to be any reason to assume or hope that the condition will improve.<sup>14</sup>

Porte has published a dictionary of printing terms, but it is far

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<sup>13</sup>In the printing industry the process rather than the product must be controlled. In offset stripping and imposition, where a high degree of individual skill and dexterity are involved in the work, control of the process becomes more difficult and important. These two areas seem to offer the best possibility for the application of operations research.

See also Wilfred Brown, Exploration in Management (New York: John Wiley & Sons, 1960), p. 103

<sup>14</sup>An excellent example of the confusion is the term "paperline," which is frequently referred to as the dead-line in some plants, and as the lead-line in many others.

from complete.<sup>15</sup> It contains newspaper and letterpress definitions primarily, and not many of the photo-offset and lithographic terms frequently used in the trade. What is needed, both from an educational and trade standpoint, is a comprehensive graphic arts dictionary containing most of the terminology now used in the graphic arts and allied industries, including provisions for the addition of new words as they come into acceptance.

Such a dictionary would be a useful tool, especially to educational institutions, and to compile and publish such a book would be a noble project for any organization.<sup>16</sup>

This study is concerned with terminology only to a limited degree. Each of three questionnaires mailed contained a question concerning terminology. These questions were designed to test the craftsman's trade knowledge as well as his understanding of terminology.<sup>17</sup> The student believes that terminology and its proper use are important and deserve a more prominent position than presently occupied, and the study was

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<sup>15</sup>Rhoda A. Porte, Dictionary of Printing Terms (Salt Lake City: Porte Publishing Company, 1950). This small book of some 2,500 definitions is an excellent beginning but not very comprehensive.

<sup>16</sup>There are many educational institutions that not only have the necessary mechanical facilities for publishing, but other factors as well; not the least of which is inexpensive student labor. I am well aware that the project would require an extended period of time, but it seems to me to lend itself to their so-called "captive audience," and succeeding classes could be organized to participate in the work.

Individual students could receive recognition for their part in the work by a method similar to that used in Dictionary of American Politics, edited by Edward C. Smith and Arnold J. Zurcher (New York: Barnes & Noble, Inc., 1960).

<sup>17</sup>The methodology of the study is discussed in detail on pages 21-27.

partially designed to investigate some of the problems of trade semantics. Another subject of particular interest is offset stripping and imposition --neglected for years by educational institutions, textbook writers, and printing managers alike.<sup>18</sup> It is a general disposition in the industry at the middle-management level that stripping and offset imposition are not difficult, and thus unimportant. This is another erroneous conception of printing managers which will be fulminated.

The subject of offset stripping and imposition will be discussed in detail in Chapter III, and suffice it to say that the matter will be treated in an original form, not the traditional sheet lay, imposition book, or folding dummy method.

#### Objectives and Hypotheses of the Study

It is a common conviction that the printing industry is primarily composed of a large number of small units.<sup>19</sup> It is a service industry

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<sup>18</sup>Bernard R. Halpern, Offset Stripping Black and White (New York: Lithographic Technical Foundation, Inc., 1958). This is supposedly one of the leading textbooks in the field, but not once does it mention, let alone explain, "the companion page rule." This is certainly a rule of no small importance in the areas of stripping and imposition.

Although John E. Cogoli's Photo-Offset Fundamentals (Bloomington, Illinois: McKnight & McKnight Publishing Co., 1960) is primarily a high school textbook, it also ignores the subject of offset stripping and imposition. Another high school textbook, Arithmetic For Printers, by Woodard Auble (Peoria, Illinois: Charles A. Bennett, 1954), pp. 161-169, however, discusses the subjects in somewhat more detail. Probably the best textbook in the entire field of imposition and lockup is the International Typographical Union's apprentice textbook number 7, Imposition and Lockup (Indianapolis: I.T.U. Educational Council, 1957), but this book is not available to the general public or to educational institutions.

<sup>19</sup>Carpenter, op. cit., pp. 134-38.

with ubiquitous customers, and a considerable number of these customers have printing requirements that can frequently be performed by small firms consisting of three or four persons. Under such conditions it is relatively easy to enter the market, therefore the industry is highly competitive. As the size of a printing firm decreases, competition tends to increase, and it generally becomes more difficult for a single firm to secure a competitive advantage.

It has been observed that to a large extent a majority of small printing firms are basically the same insofar as processes, methods and procedures, raw materials, equipment, and customers are concerned.<sup>20</sup> In a free and competitive society, this is as it should be. Competition should be the sole determinant as to who will operate in a market. This places a premium on competency and efficiency rather than on incompetency, and diminishes the possibility of substituting regulation for skill.

Such a condition gives rise to the question as to why the printing industry, and more especially the smaller firm, has not adopted and utilized more scientific management methods. This is a phase of operation which seems to offer the optimum possibility of improving competitive position.

People have worked for thousands of years, and for almost as long

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<sup>20</sup>William Voris, Production Control, Text and Cases (Homewood, Illinois: Richard D. Irwin, Inc., 1961), p. 262.

A small printing plant is generally considered as one with less than 20 employees. A plant of medium size may have as many as 100 employees, and a plant is generally considered as large if it has more than 100 employees. These classifications, however, are arbitrary, for there are several methods of classifying printing plants.



there has been talk of improving work. But until Taylor began not much had been done other than verbose humanitarian rhetoric.<sup>21</sup> Even today, much of what passes as management could probably be dispensed by mail with more efficiency.<sup>22</sup> There is a considerable difference in the management of work and workers for peak economic and optimum performance than in routine administrative scorekeeping.

It is a well recognizable fact that management has learned to analyze and study the elements that comprise a specific job, but the "efficiency experts" and time study men have gone far beyond the dreams of Taylor. The problem in the modern industrial community is the integration of elements, to determine the optimum number of elements a worker is capable of performing with the greatest productivity, and put the job together again. Man does not work in a single element. Any task that can be reduced to a single element can be performed more economically by a machine than by a man.

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<sup>21</sup>Taylor, op. cit., p. 41. Taylor first became interested in the scientific approach to the management of work and workers in 1887 at the Bethlehem Steel Company. The period is well known for various incentive systems devised by what then passed as management. Taylor's first writing was a paper, "A Piece Rate System," presented before the American Society of Mechanical Engineers in 1895.

<sup>22</sup>E. H. Mac Niece, Production Forecasting, Planning, and Control (New York: John Wiley & Sons, Inc., 1961), p. 149. The interpretation of Mr. Mac Niece's statements is my own for it is difficult to locate even material of this mild a nature. I admire writers of such material and there should be more of it.

Peter F. Drucker, The New Society (New York: Harper & Brothers, 1950), devotes an entire chapter to the shortcomings and deficiencies of today's management (Chapter 22, pp. 213-219).

Men work at jobs comprised of elements, and it is in the integration of elements that man excels because integration requires insight and judgment. It must be realized that while job classification and the reduction of a task to a series of elements is frequently necessary, it does not tell anything about the nature of the things being classified, it merely categorizes them.

One of the more vociferous complaints of printing managers in the present-day industrial economy is the contention that "we're different." That is to say, the printing industry is unique and exceptional, and that it is not only difficult but next to impossible to adapt fundamental management techniques that have proven successful in other industries to the commercial printing industry.<sup>23</sup>

This belief in the exceptional nature of the printing industry is a highly erroneous misconception, a fallacy which verges on absurdity. Therefore, in an effort to clarify the matter, the first hypothesis of

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<sup>23</sup>Thomas M. Landy, Production Planning and Control (New York: McGraw-Hill Book Co., Inc., 1950), p. 49. According to Landy, there are only two types of manufacturing processes. In which case, printing (a form of manufacturing) is not unique at all as considered here.

This belief in the exceptional nature of the printing industry was also found by Donald N. Rollo in his unpublished Master's thesis, "An Investigation of Production Control Systems and Methods Used in Selected Small Commercial Printing Plants," Department of Printing and Journalism, South Dakota State College, 1960, p. 7.

the study is set forth:<sup>24</sup>

(1) Hypothesis 1. Fundamental management principles, based on objective, scientific analysis, are essential to the economic performance of management functions regardless of the size of the firm.

In process industries the manufacturing layout is usually according to function. In a process-type layout, communications becomes more important because of the increased quantity of information and instructions that must pass between departments in the plant.<sup>25</sup> Such a process-integrated organization increases the necessity for co-operation, co-ordination, and communications between levels of management. At the same time, control functions such as scheduling and follow-up become more difficult because the process rather than the product must be controlled.

Of the two major types of manufacturing control, (1) order, and (2) flow, order control is more frequently used in job-lot industries.<sup>26</sup> But control of the process per se is not the primary problem of a

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<sup>24</sup>Drucker, The Practice of Management, op. cit., p. 228. There is a wealth of supporting evidence to the effect that size is not a primary factor in the application of management techniques. Size is always a problem of quality as well as quantity, and this is not to imply that management problems will not increase with size because they generally do. The fundamental principles of management, however, remain the same.

See supra, footnote 12, and the U.S. Department of Commerce, "Economic Summary, Printing and Publishing and Allied Industries," Vol. 2, No. 12 (May 1961), p. 5.

<sup>25</sup>Ruddell Reed, Jr., Plant Layout, Factors, Principles and Techniques (Homewood, Illinois: Richard D. Irwin, Inc., 1961), pp. 34 and 183.

<sup>26</sup>Voris, op. cit., p. 64.

production control department in process industries. Augmented by several other conditions, not the least of which is that printing is generally performed on a job-lot or order basis,<sup>27</sup> production control becomes the most important and difficult of all staff functions.<sup>28</sup>

The job-order nature of printing limits planning to the short-run, complicates the production control functions of routing, scheduling, and dispatching to a point where they become more difficult than with line production, requires craftsmen with higher skills, increases the need for quality supervision, and not only requires but is dependent on effective communications.<sup>29</sup>

The importance of communications to the printing industry cannot be over-emphasized. It is felt that the matter should be examined much further than an analysis of communications forms. Communications is a bilateral process, and the student believes that bilateral communications is in need of study from the employee aspect.

Communication from the employee up through the organization is frequently much more difficult than is communications from management down to the employee. Frequently, management will not be aware of actual plant conditions because of ineffectual "upward" communications. There tends to be a filter effect in upward communications. A person tends to

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<sup>27</sup>Robert H. Roy, Management of Printing Production (Washington, D.C.: Printing Industry of America, Inc., 1958), p. 5.

<sup>28</sup>Landy, op. cit., p. 44

<sup>29</sup>Ralph C. Davis, Industrial Organization and Management (New York: Harper & Brothers, 1957), p. 460.

tell his superior only what he feels the superior wants to hear. Management therefore obtains only one aspect of actual plant conditions.

Levels of authority in an organization should be kept to a minimum, possibly four or five in most printing plants. A chain of command obstructs upward communications. At the same time, there is usually an elaborate system for downward communications. A communications system can be evaluated according to the balance of direction. When direction is balanced in an effective communications system, it is just as easy for the employee to communicate upward as it is for management to communicate downward.

Ease of communications, however, is a by-product of an effective system. The important thing is what is communicated and the reasons for it, not quantity or balance. This is not to imply that a balanced system will be an effective system, but balance is an excellent indication of effectiveness.

There appears to be prima facie evidence that an analysis of some printing communications forms would determine the minimum necessary information which would make the forms effective and adequate regardless of the conditions under which they are used.

This study will contain an analysis of the following communications and control forms in order to accept or reject a hypothesis concerning them: (1) work order, (2) paper stock requisition, and (3) special instructional forms. To serve as a guide in the analysis, the following premise is stated in the form of a hypothesis:

(2) Hypothesis 2. The essential and minimum necessary information for a work order or stock requisition is not



affected by size of firm or operating conditions.

There is a natural tendency of a worker to resist change, and this resistance increases with age, skill, and experience. This is especially true in the printing industry, an old and somewhat static industry heavy with tradition and obsolete practices.<sup>30</sup> There are typographical practices in use today that have not changed since the time of Stephen Daye.<sup>31</sup> Down through the years typographers have acquired experience and habit rather than knowledge and understanding. Practice may be a more appropriate word to use than experience, since experience tends to imply the acquisition of insight and judgment as well as practice.

The traditional human relations techniques (such as "people do not want to work" or "productivity is an attitude") are not the answer. What is needed is an entirely new approach, a new technology to extend beyond the border of orthodox tradition, an awareness that the prime objective of a business is economic performance, and not the creation of satisfied and contented employees.<sup>32</sup>

The traditional approach to human relations is "worker satisfaction," and there is no denial that it has definite, unmistakable

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<sup>30</sup>Robert H. Roy, "Operations Research in the Printing Industry," Operations Research For Management, ed. Joseph F. McCloskey and Florence N. Trefethen (Baltimore: The Johns Hopkins Press, 1954), pp. 327-337.

See also Elliot D. Smith, Technology and Labor (New York: Yale University Press, 1939), pp. 176-81.

<sup>31</sup>An excellent history of Stephen Daye and printing in colonial America is Zoltan Haraszti's The Enigma of the Bay Psalm Book (Chicago: University of Chicago Press, 1951).

<sup>32</sup>Saul W. Gellerman, People, Problems and Profit (New York: McGraw-Hill Book Co., Inc., 1960), pp. 165 and 243. See also Drucker, The Practice of Management, op. cit., p. 302

advantages. Its chief defect, however, is a disregard for several fundamental concepts of the willingness of men to work at optimum performance. The general notion that a person's willingness to work depends on his ability to perform is a break with tradition, and places the entire problem on an individual basis.

There are numerous sociological and psychological factors which underlie an individual's willingness to perform, but on the basis of business economics, some of the more significant factors are, (1) selection and placement, (2) high performance standards, and (3) necessary information for the individual (worker) to control himself.<sup>33</sup>

The realization that there is a difference in planning and performance is a contribution to the history of ideas. The more we plan before we perform, the more effective and economical the performance, should be a manifesto. This, then, is the fundamental concept of the new technology--advanced planning, participation, and the ability of the individual to perform.

In conjunction with any growth in a worker's ability to perform, invariably comes training and co-ordination. The apparent closeness of performance and training and co-ordination, further extends the scope and functions of management.

Participation is essential in planning, especially when changes

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<sup>33</sup>Donald E. Hill, "S.O.P. For Stripping: Positioning the Negatives," Modern Lithography, Vol. XXIX, No. 10 (October 1961), p. 24. See also Drucker, The Practice of Management, op. cit., p. 304.

in production methods and procedures are involved.<sup>34</sup> Moreover, changes in instructional or communicational forms as well as in production procedures, are more easily implemented when comments and opinions are sincerely solicited from those craftsmen who will eventually be affected by such changes. This is a somewhat prolonged way of stating that opposition to change can be minimized by a maximization of participation of those persons involved in the change.

On the basis of the foregoing rather over-simplified generalizations concerning planning and participation, the third hypothesis is stated:<sup>35</sup>

(3) Hypothesis 3. At the plant level, the fundamental concept of planning is employee (craftsmen) participation. And planning can be improved by maximization of participation of those persons involved in the plans.

Regardless of where a discussion of printing begins, it invariably ends with methods and procedures. Again (to reiterate) the entire problem returns to an individual basis. The concept of ability of craftsmen to perform is ever-present in the printing industry.

Of all the methods and procedures of printing, in the student's opinion, none are more challenging, and not many require the individual

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<sup>34</sup>Harold Koontz and Cyril O'Donnell, Principles of Management (New York: McGraw-Hill Book Co., Inc., 1959), p. 569.

For an excellent description of how employee participation is beneficial to a firm, see Paul Pigors and Charles A. Myers, Personnel Administration (New York: Harper & Brothers, 1947), p. 292.

See also George D. Halsey, Handbook of Personnel Management (New York: Harper & Brothers, 1947), p. 262, for various methods of securing suggestions from employees.

<sup>35</sup>Both Landy, op. cit., p. 23, and Pigors and Myers, op. cit., p. 293, agree that there will be occasions when the employee will know as much or more about a department or operation as the foreman.



skill and dexterity of offset stripping. As of yet, the machine has not reduced this work to a point of mere machine-tending.

Related to stripping is imposition.<sup>36</sup> To a certain degree, the two are synonymous. Stripping is merely an extension of imposition in order to prepare a flat. Both not only require high degrees of skill, but a comprehensive knowledge of trade techniques.

The traditional method of imposition for years has been the folding dummy or the standard imposition book. These two methods work reasonably well but tend to encourage passive individual performance. This complacency undermines the basic concept expressed in the foundation of the willingness of individuals to work--the ability to perform. For anything more advanced than a small-shop operation, however, a system involving the folding dummy or imposition book technique is generally considered inadequate.

For some time the belief has prevailed among the more prudent practitioners of printing that more scientific methods could be applied to stripping and imposition. In this respect the reasoning of the practitioners has been far in advance of that of most operating managers.

Stripping and imposition involve several not readily perceptible numerical relationships which are constant and can be predetermined. There are also several equivocal trade practices, which if clarified would be useful in the work. A purely scientific approach to offset

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<sup>36</sup>The strippers or make-up men are frequently the planners in small plants, and it is not unusual for them to make their own folding dummy or plan their own sheet lays. Whether the work involves preparing flats, making up forms, or planning press sheet impositions, the principles are the same.

stripping and imposition, involving the development of mathematical formulas, is discussed in detail in Chapter III.

In conclusion it is desirable to express as a hypothesis a proposition of the student concerning the application of scientific methods to offset stripping and imposition:

(4) Hypothesis 4. The fundamental principles of operations research can be utilized to improve the operations of offset stripping and imposition.

If management is ever to become a science, a theoretical framework must be developed from which logical, pragmatical premises can be formulated. The basic fundamental principles of a management discipline must be derived from scientific studies in which hypotheses have been stated, analyzed, and accepted or rejected. Only then shall we be able to ascertain the probability of application of scientific principles to printing management. It is hoped that this study will be a diminutive part of the beginning of construction of that theoretical framework.

#### Methodology of the Study

This thesis is intended to be qualitative rather than quantitative. It will be somewhat limited in superfluous description, and the student aspires to exercise considerable care in order to present an objective and systematic investigation. It is apparent from the responses in the tables that there is no danger of a statistical illusion, but the student would like to elucidate at this early stage that he is predisposed to scientific management and analytical methods. Moreover, at this stage of the thesis, it will not come as a great surprise to some

that the student is biased concerning several other disciplines of which his knowledge is exceedingly limited.

This does not necessarily mean, however, that the presentation or any of the conclusions will be influenced by personal bias. The student is also sufficiently aware that there will be many persons who will take a general exception to a considerable number of his injections, especially those in some of the footnotes.

What is unequivocal, however, is that the paper is not extremely abstract, although special effort has been attempted in documentation so as to make the paper scholarly. While it is easily within the comprehension of supposedly experienced printing managers, it is far from plebeian or sophomoric.

This study is an intensive investigation, insofar as possible, into management techniques, methods of communications, employee participation, and control forms used in the commercial printing industry in thirteen selected Standard Metropolitan Statistical Areas in the Southeastern United States.<sup>37</sup> These areas were selected arbitrarily for several reasons: (1) The student is personally familiar with the printing industry in several of the areas, (2) the proximity of many of the areas to Huntsville, Alabama,<sup>38</sup> and (3) the student is to be

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<sup>37</sup>U.S. Bureau of the Census, U.S. Census of Population, 1960 (Washington, D.C.: U.S. Government Printing Office, 1960). The Bureau of the Census has devised an elaborate definition for a Standard Metropolitan Statistical Area, but in brief it is a county or group of counties which contain at least one city of 50,000 population or more, and at least 75 per cent of the labor force must be classified as non-agricultural.

<sup>38</sup>Huntsville, Alabama, is the domicile of the student.

employed in this region of the United States upon completion of his studies.

The thirteen SMSA selected for the study are shown in Figure 1, and are circled in red for ease of identification.<sup>39</sup>

To obtain the necessary data and control forms on which the study is based, a packet containing three questionnaires was mailed to every nth commercial printing firm in each of the thirteen SMSA; the number of packets mailed into each area depended on the population of that particular area as a percentage of the total population of all thirteen areas.<sup>40</sup>

The questionnaire packet contained a covering letter, a questionnaire for management, a comment and opinion sheet for each of two production employees (back-shop craftsmen), and three stamped, self-addressed envelopes. Each packet was coded in order to compare management and craftsmen responses.

In Table I are listed the thirteen SMSA, population of each area, percentage of the total population of each area, number of printing firms in each area, and the number of packets mailed into each area.

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<sup>39</sup>A few questionnaires were solicited personally by the student from experienced craftsmen and managers.

<sup>40</sup>To secure even the addresses of printing companies in certain geographical areas of the United States is difficult. The addresses for plants located in Huntsville, Nashville, and Mobile were taken from manufacturers directories for those cities. All other addresses were taken from Printing Trades Blue Book, 1961-1962, Southeastern Edition, (New York: A.F. Lewis & Co., 1961). No specialty printers were included in this study, only commercial printers and lithographers performing printing on an order basis are included.

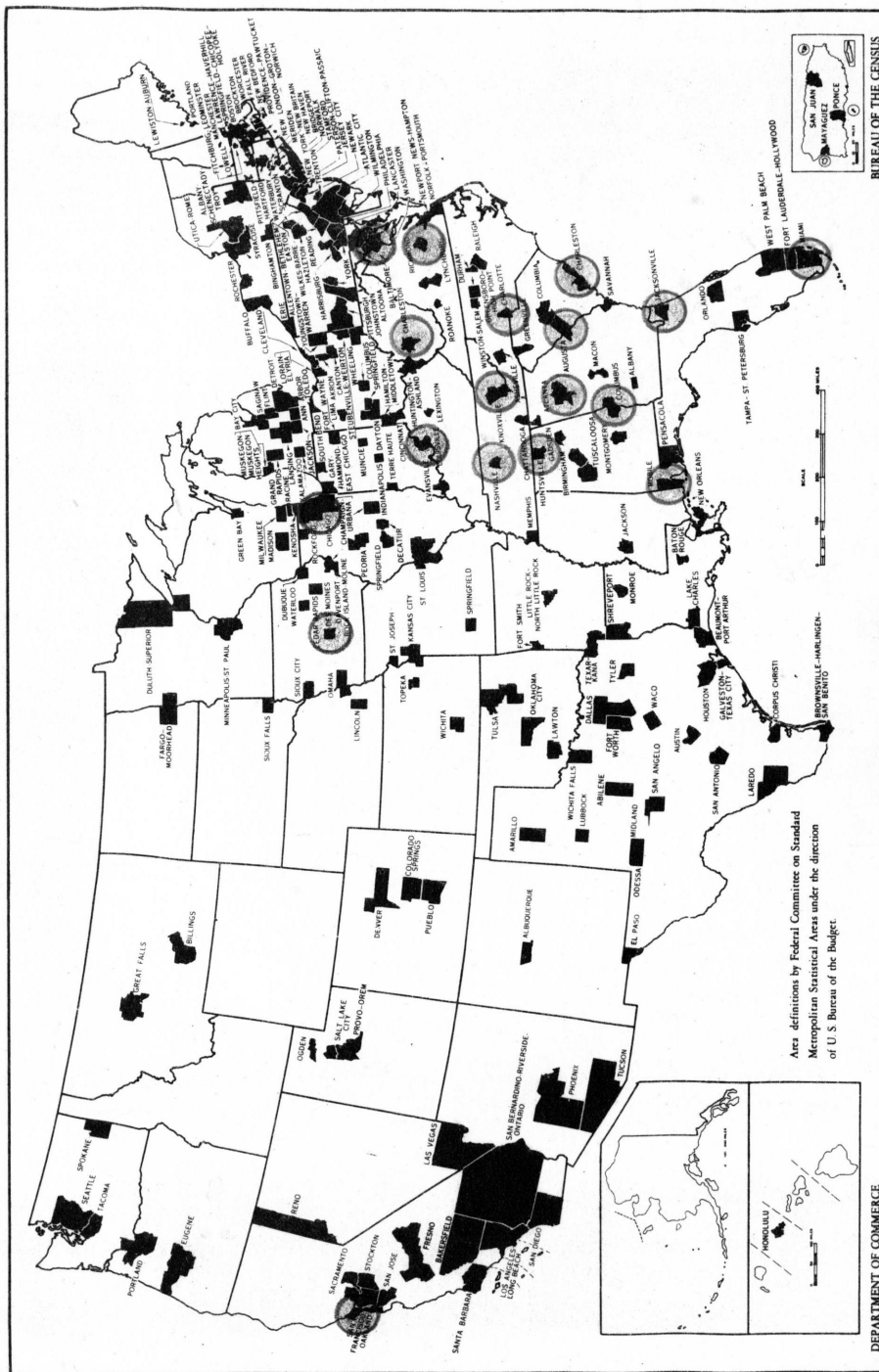




Table I. Number of Print Shops, Questionnaire Packets Mailed and Percentage of Total Population in Each Study Area

SMSA	Per cent of total population*	Number of print shops in the area	Questionnaire packets mailed into the area
Atlanta, Ga.	19.50	105	45
Augusta, Ga.	4.17	12	10
Charleston, S.C.	4.16	15	10
Charleston, W. V.	4.87	22	11
Charlotte, N.C.	5.24	35	12
Columbus, Ga.	4.19	10	10
Huntsville, Ala.	2.26	8	5
Jacksonville, Fla.	8.77	52	20
Knoxville, Tenn.	7.08	39	16
Miami, Fla.	18.01	152	41
Mobile, Ala.	6.05	15	14
Nashville, Tenn.	7.69	42	18
Richmond, Va.	7.86	59	18
TOTALS	100.00	567	230

\*Of all thirteen SMSA, where total population is 5,191,654

There are 567 commercial printers and lithographers located within the thirteen study areas as shown in Figure 1. This is not a statistical investigation, and no effort will be made to quantify any of the results in order to make predictions or conclusions concerning the aggregate study areas involved. The tables, however, contain various totals from which the reader may draw conclusions if so inclined. Each



chapter will also contain a concise conclusion in order to clarify some particular aspect of the chapter.

Because of the nature of the information desired, and the reputation of the printing industry for withholding trade procedures, it was arbitrarily decided that an extensive sample would be necessary in order to obtain sufficient returns from which to make valid conclusions.<sup>41</sup> A forty-per cent sample of the 567 printing plants in the thirteen SMSA was chosen, or approximately 230 firms. Each questionnaire packet contained three questionnaires, the maximum possible number of returns was therefore 690.

In addition to the experience of the student and the questionnaire packet, added validity was given the study by the selection of a five-member panel of persons of known competency in the commercial printing industry.<sup>42</sup> The primary function of this panel is evaluation, particularly in the following: (1) Evaluate over-all results of the study, and make whatever personal conclusions deemed necessary, (2) evaluate

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<sup>41</sup>Dick Loken, "An Analysis of Production Control at Webb Publishing Company," (unpublished term paper, Department of Printing and Journalism, South Dakota State College, March 1962). Before Mr. Loken was permitted to perform this analysis he was requested to agree to several stipulations. Among these were: (1) none of the procedures of the system would be publicly disclosed, and (2) the report would not be published whole or in part. Mr. Loken's report was conspicuously minus printing control forms of any description. Webb Publishing Company is located in Minneapolis.

Henry H. Albers, Organized Executive Action (New York: John Wiley & Sons, Inc., 1961), p. 257, states that elaborate measures are frequently taken to prevent other companies from learning about important innovations or trade secrets.

<sup>42</sup>See Appendix D for the names and company affiliations of the panel, and the names of the organizations which recommended them.

the various printing control forms and work orders collected during the study, and select that work order which would be most adequate under circumstances as enumerated in Chapter V, (3) determine the minimum necessary information for a work order, and (4) render the final decision as to the acceptance or rejection of the hypotheses set forth in this chapter.

The panel was requested to complete all three questionnaires (which are included in the Appendix), not for their plants or themselves, but according to what they thought should be the most appropriate responses. Comments were also solicited from the panel members concerning terminology, minimum necessary information for a pressman to makeready and print a job, and whether scientific methods could be applied to offset imposition and stripping. In most of the tables, panel responses are shown for comparison purposes.

## CHAPTER II

## SCIENTIFIC MANAGEMENT IN THE PRINTING INDUSTRY

Introduction

Progressive management utilizes scientific knowledge.<sup>43</sup> The dogmatism of the 19th century concerning the application of science to industrial operations is now inadequate.<sup>44</sup> Technology is the application of science to economic performance, and although the spread of bureaucratic structures requires increasing conformity because an organization tends to become more and more disorganized over an extended period of time, and with dilatory growth, the future belongs to those who prepare for it.

There is an economic pressure for men who work to become technicians. It is no secret that one of the major problems facing industry

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<sup>43</sup>Alan A. Smith, Technology and Your New Product (Washington, D.C.: Small Business Administration, 1956), p. 1. See also William R. Spriegel and Clark E. Myers, ed., The Writings of the Gilbreths (Homewood, Illinois: Richard D. Irwin, Inc., 1960), p. 355.

<sup>44</sup>Melville Dalton, Men Who Manage (New York: John Wiley & Sons, Inc., 1959), p. 273.

today is that of its relationship with people.<sup>45</sup> The time may not be far off when our entire social system will become a technocracy--a social system controlled by scientists and engineers--and the responsibilities of management, including advancement possibilities entirely on merit, will become immense.

Our advancements in technology have far exceeded our social achievements.<sup>46</sup> The behavior of the atom is more predictable than the behavior of man.

Cybernetics, a field of knowledge that deals with the science of communications for the purpose of control, is emerging as a separate social discipline.<sup>47</sup> More and more, management is becoming a problem of cybernetics, communicating with people, more especially production

<sup>45</sup>Mason Haire, Psychology in Management (New York: McGraw-Hill Book Co., Inc., 1956), p. 10.

The fruits of leadership do not necessarily include love, but I am inclined to believe that the application of euphemism, a favorite device of businessmen, should be replaced by the fine art of listening, a psychological tool long overlooked by management. And I have discovered, as have others before me, that there is little hope of intelligent and permanent order between management and labor until there is sincere and honest understanding by each of the economic and social problems of the other.

See also William H. Whyte, The Organization Man (New York: Simon & Schuster, 1956), p. 68. Also Gellerman, op. cit., p. 165.

<sup>46</sup>Haire, op. cit., pp. 4-5.

<sup>47</sup>William H. Whyte, Is Anybody Listening (New York: Simon & Schuster, 1952), p. ix.

The evolution of employee participation in production problems is upon us. The student is biased toward cybernetics as the final solution to a technical society, which makes today's "my door is always open" comments of managers and executives seem insipid in comparison.

For an excellent discussion of cybernetics, see David W. Miller and Martin K. Starr, Executive Decisions and Operations Research (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1960), pp. 16-18.

employees. As time goes on, technicians of industry become more skilled in their work, are released from physical labor by the machine, and thus have additional time for recreational and social activities, become more informed through the mass media and read more, and eventually become better educated. This slow and possibly undiscernible evolutionary process in the technical abilities of the people, will eventually result in the technocracy previously mentioned.

In such a technocracy, the problems of bargaining with and managing highly skilled technicians will be much different and considerably more difficult than labor-management problems as we know them today.

In the beginning, just to set the record straight, the student believes that a subject does not become scientific by merely beginning with a comprehensive collection of facts, a hypothesis, or with some preferred theory, but rather begins with recognition of some particular characteristic of the subject. And from this recognition a decision is made as to whether or not a problem exists.

This chapter is merely the beginning of an attempt to uncover some of the management methods and techniques, and some trade practices presently in use in the industry. In short, to solicit comments and opinions from persons actually engaged in and earning their livelihood from the printing industry, and from these comments try to recognize the problems.

The term "scientific management," although a good one for managers, carries misleading connotations for the layman. Its use is relatively new, and frequently introduces confusion even for the most dynamic and well-read printing manager.

The kind of scientific management under discussion here is not the kind debated by Louis Adamic in his book Dynamite, a story of the class struggle in American labor-management relations.<sup>48</sup> The type of management this chapter is concerned with might be more appropriately termed "logical business operations," and it is not difficult to deduce from the questions in the tables that follow, that the information solicited was far from scientific. It may have been scientific in the early part of the 20th century, but today a good portion of it is merely fundamental to sound economic performance.

It is a difficult task to separate into chapters a thesis concerning management techniques, communications, employee participation, and methods, procedures, and instructions. These areas overlap in many aspects, and are closely related in others. Frequently a division is impossible.

#### Some Present-day Management Methods and Techniques

Every year thousands of business firms in the United States fail. The failure rate in December of 1961 was 63.7 for each 10,000 business firms in operation.<sup>49</sup> It is the contention of many leading business

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<sup>48</sup>Louis Adamic, Dynamite (New York: The Viking Press, 1956), pp. 399-404.

<sup>49</sup>U.S. Department of Commerce, Office of Business Economics, "Survey of Current Business," (Washington, D.C.: U.S. Government Printing Office, February 1962), pp. 5-7.



and management authorities that one of the major causes of business failures is inefficient management.<sup>50</sup> These authorities differ somewhat in their estimate as to what per cent of business failures can be directly traced to poor management, but they agree on one thing-- the influence of management upon the economic success of an enterprise cannot be over-emphasized.

In the tables that follow, the questions and responses from the questionnaires mailed are shown alongside the responses of the panel members. Although a considerable number of responses were not obtained, which further points up the fact that the printing industry is not enthusiastic about releasing even the most elementary information, the responses in the three tables do indicate a wide range of comments and opinions.

It may be of interest to note in Appendices A, B, and C, that the questionnaires were labeled "comment and opinion sheets," and contained many open-end questions. Seven of these open-end questions have been somewhat reworded in the tables so that the yes-no responses could be more readily compared with those of the panel.

A word of precaution is in order to the affect that the responses of the panel are those which they felt are the optimum, and are not replies according to the particular plant in which each is employed. No attempt is made or implied to compare the plants in which the panel members are employed with those from which responses were solicited.

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<sup>50</sup>Reed, op. cit., p. 33 and 324.

## Table II. Some Management Comments and Opinions

The traditional method, insofar as the student is able to determine, is to explain or interpret literally what a table explicitly presents numerically. The student is inclined to believe that the purpose of a table is to clarify that which is difficult or possibly lengthy to express literally, and no space will be used to explain in words what the reader is capable of ascertaining from examination of the tables. However, because of the nature of the questions in the tables, a certain amount of elucidating is in order.

The questions in Table II were addressed to printing plant managers, and are concerned with three basic management functions: (1) planning, (2) control, and (3) activating.

Questions 5, 6, 14, 22, and 23 pertain to control, in this case production control. The difficulties of controlling production in process industries and the importance of delivery dates have already been discussed, and further explanation is not necessary. The reader can observe the responses in Table II, question 6, and evaluate for himself the importance of delivery dates. Most managers are quick to telephone a customer to explain the reasons why a job cannot be delivered.

Questions 14, 22, and 23 (Table II) are directly connected with a printing plant's ability to meet promised delivery dates. If maintenance records are kept (question 14), management is able to determine when a machine will be interrupted for maintenance purposes, and cannot schedule that machine for production at that particular time. Preventive maintenance not only increases the productive life of equipment, but should

Table II. Questions Taken From the Management Questionnaire  
Concerning Management Methods and Techniques

No.	Question	Responses			
		Mgt.		Panel	
		yes	no	yes	no
5	Does the plant have a production control system in operation? If so, does it utilize a control board of any type?	21	22	5	0
		11	11	2	2
6	Does the company notify customers if a promised delivery date cannot be met?	33	7	5	0
7	Does the plant have a library for use by the employees?	11	32	4	1
9	Does the company have written job descriptions for each employee?	15	27	5	0
10	Does the company have any apprentices at the present time?	20	22	5	0
11	Has a time study ever been done in your plant?	9	32	4	1
13	Has the company ever issued an organizational chart of the entire company to each employee?	9	33	5	0
14	Does the plant keep maintenance records, indicating the date a piece of equipment is to be serviced?	12	30	4	1
21	Does your plant keep any kind of file on new developments in equipment, processes, or methods and procedures?	17	24	4	1
22	In your plant, is there a production control system or department, that can determine the amount of work in the shop, what jobs are actually being worked on, and which of these jobs will be delivered tomorrow?	22	19	5	0
23	In your plant, can it be determined which jobs will be run on the press, and the sequence in which these jobs will be run?	39	1	5	0

Table II. (continued)

No.	Question	Responses			
		Mgt.		Panel	
		yes	no	yes	no
24	Is there a system in your plant to provide for paper stock delivery to the pressroom when a job is ready to be printed?	20	22	5	0
25	After a job or part of a job, has been spoiled or ruined, is there a system or procedure for recording this ruined job so as to reduce future spoilage?	19	27	5	0
27	Does the plant work order inform the pressman whether the job is work-and-turn, sheetwise, work-and-tumble, etc.?	22	19	5	0

make machine load calculations and scheduling more accurate. It also tends to decrease makeready, an expensive item in job costs.

The production control questions in Table II are numbers 22 and 23. In order to control production, a production control department, whether one man or a department of twenty men, must be able to determine routing, scheduling, and dispatching. These three functions, in addition to planning and follow-up, are the major functions of any production control system.<sup>51</sup>

The authority to select the sequence in which jobs will be performed (referred to as scheduling) is not the authority of individual craftsmen, but a responsibility of production control. The scheduling function (and all other production control functions) is performed in every shop regardless of size and the name by which the function is

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<sup>51</sup>Donald E. Hill, "Small Shop Production Control," Modern Lithography; accepted and is to be published later in the year.

called.<sup>52</sup> To determine who was actually performing this function was the major reason that questions 22 and 23 (Table II) were asked.

The responses to questions 22 and 23 give some indication of the degree of centralization or decentralization of production control in those printing plants responding. In a decentralized shop there is no formal organized production control department. The department foremen perform most of the production control functions. In a small shop (less than 20 employees) this system of decentralization tends to work reasonably well, and foremen are able to utilize machines and personnel to great advantage. Its major disadvantage, however, is that it requires a rather high caliber person, possessing not only a high degree of technical skill, but human relations skills as well. It is not difficult to determine that such persons are scarce in the printing industry.

The planning questions are numbers 9, 10, 11, 13, and 21. To some extent, these are nothing more than predetermined methods of communications. In any case, such questions involve matters that require a considerable amount of planning before any actual production work should be performed.

In the student's opinion, the most important question in Table II is number 9. The most efficient employees are the best informed employees, and even the most elementary textbook on management will not

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<sup>52</sup>Examination of several textbooks, such as Landy, op. cit., Mac Niece, op. cit., and Voris, op. cit., will clarify the fact that although the primary functions of production control may be called by various names, the functions are the same.



contest this.<sup>53</sup> There is no information more basic or important to an employee than a written description of his exact duties and responsibilities. Observe in Table II the panel's unanimous yes vote in favor of written job descriptions for each employee.

### Table III. Some Craftsmen Comments and Opinions

The questions contained in Table III were asked mainly to solicit comments and opinions from a craftsman in the production division of a printing plant. The questions pertain to management methods and techniques, and tend to indicate how effectively management is communicating with production employees.

Questions 4, 10, and 11 are concerned with motivation, and to some extent, self-development. The responses seem to indicate that of those production craftsmen responding, not many are being motivated by management, nor becoming interested in company libraries and self-development activities. Observe in question 8 that only 4 of 25 have ever received an organizational chart, but 18 of 25 own books concerning printing.

Questions 6, 8, and 13 are management communications questions. To be effective, communications must involve a predetermined system, devised, it would seem, by management. Notice in question 13 the number

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<sup>53</sup>Franklin E. Folts, Introduction to Industrial Management Problems (New York: McGraw-Hill Book Co., Inc., 1954), pp. 433-40. See also John Perry, Human Relations (Washington, D.C.: Small Business Administration, 1954), pp. 51-57. Also Whyte, Is Anybody Listening, op. cit., pp. x and 44.

Although I am inclined to believe that Koontz and O'Donnell, op. cit., p. 568, is somewhat theoretical, it is, nevertheless, an interesting discussion on informed employees.



of respondents who indicated that at one time or another they had spoiled a job because of instructions on the work order. Note also in question 6, only one production employee who responded had ever received a written description of his job.

The responses to question 15 indicate that most of the responding craftsmen think their supervisor is performing his job well. This is not unusual in smaller shops in which the supervisor performs many control functions. He may make work assignments (dispatching), determine machine loads and quality standards. Frequently, in shops large or small, the supervisor will be the only contact the production craftsman will have with management. He is often considered by craftsmen as a part of management, and it is important that he have both technical ability and human relations skills.

A decentralized type production control system in which the foreman performs many control functions has definite advantages, especially in a small shop. It does, however, tend to interfere with the major functions of a department supervisor, which are quality, quantity, and personnel.<sup>54</sup>

#### Table IV. Pressmen Comments and Opinions

The views expressed by responding pressmen are contained in Table IV. These questions were addressed specifically to pressmen, either letterpress or offset, because of the importance of the pressroom to a

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<sup>54</sup>Landy, op. cit., p. 7.

printing plant.<sup>55</sup> One of the most difficult problems of printing plant management is co-ordination. The co-ordinating nucleus of a printing plant is generally the pressroom, for this is the location of expensive equipment which must receive optimum utilization. This department also, of course, uses paper, usually the largest item of cost in a job.

The questions in Table IV were intended to determine to what degree management was performing the planning function. For example, observe that question 15 involves the development of a system, and that only 3 pressmen out of 25 indicated that the plant had a system. Notice that the panel was unanimous in its opinion that there should be a system.

Probably the most scientific question in the table is number 16, which pertains to time study. Of the 25 responses, only 2 time studies had ever been made. The one negative reply by a panel member to question 16 does not mean that the panel member was opposed to time study, but that in an industry primarily composed of small units (the printing industry), an expensive time study would not be feasible. The panel member did, however, elaborate on the subject of time study, and if interpretations of his comments are correct, he is an enthusiastic supporter of time study in printing firms of medium size (50-100 employees).

Question 6 pertains to the work order (or job ticket) and the minimum information necessary for a pressman to print a job. The

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<sup>55</sup>Roy, Management of Printing Production, op. cit., p. 86, 201, et passim.

Table III. Questions From the Offset Stripper, Offset Platemaker, or Letterpress Stoneman Questionnaire Concerning Management Methods and Techniques

No.	Question	Responses			
		Craftsman		Panel	
		yes	no	yes	no
4.	Does the company have a library for employee use?	6	19	4	1
6	Have you ever received a written description of your job, informing you exactly what your duties and responsibilities are?	1	24	4	1
8	Have you ever received an organizational chart, showing where you and your department fit into the overall plant organization?	4	21	4	1
10	Do you happen to own any books concerning printing?	18	7	4	1
11	Do you happen to know the company policy concerning "tardiness?"	15	10	5	0
13	Have you ever spoiled or otherwise ruined a job because of inaccurate information or instructions on the work order?	21	4	2	3
15	In your opinion, do you think your supervisor is performing his job well?	12	3	5	0

emphasis in this question is another of communications. If the pressman is not receiving the minimum information necessary to print a job from the work order, then where or how is he receiving it? This aspect of communications and work orders is the subject of Chapter V, and will also be discussed to some extent in the conclusions of this chapter.

Question 17 is another production control question. The primary reason for this question was to determine the degree of control the

Table IV. Questions From the Offset Pressman or Letterpressman Questionnaire Concerning Management Methods and Techniques

No.	Question	Responses			
		Pressman		Panel	
		yes	no	yes	no
5	During a regular working day of eight hours, do you spend most of your time operating a press?	15	10	5	0
6	Does the work order or job ticket now being used tell the pressman whether the job is work-and-turn, sheetwise, work-and-tumble, etc.?	12	13	5	0
7	Did you happen to read an article in a printing trade magazine last month?	12	13	5	0
10	Do you happen to own any books concerning printing?	12	13	4	1
15	Does the plant have a system or procedure to get more stock, if you are printing a job and do not have enough stock to finish it?	3	22	5	0
16	Has your present job as a pressman ever been studied by a person with a stop watch, who observed your work for several hours, and recorded everything you did during that time?	2	23	4	1
17	Is your work planned in advance so that you know the next several jobs you are to print on your press? If not, do you select what jobs or the sequence in which they will be printed?	18	7	5	0

pressman has over the sequence of jobs to be printed. With an effective centralized production control department, the pressman's control over job sequence will decrease.

The pressmen's responses to question 17 indicate a strong degree

of decentralization. Note the panel's complete agreement on advanced job planning.

In reference to question 17, Table IV, of the 18 yes responses, 15 pressmen indicated that the foreman of the department controlled the job sequence, and 3 pressmen implied that there was some degree of production control.

The questions that might be termed motivation or self-development questions are numbers 7 and 10. The responses in Table IV indicate what the student would consider the average. There was no explanation for the one negative panel reply to question 10.

### Conclusions to Chapter II

It is the purpose of this thesis to consider and discuss fundamental principles rather than concrete practices, policies, and schemes of organization. In this chapter there has been an attempt to gather from managers and craftsmen, comments and opinions pertaining to various management techniques used in the printing industry. To some, the entire chapter may seem of little consequence, and to others (of which I trust there will be many) the chapter may be of some educational or scientific value; if not now, then possibly in the future. Where conditions permit, the student has tried to emphasize, by phrasing the questions, that many sound and reasonable business decisions are not based solely upon economic motives.<sup>56</sup>

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<sup>56</sup>Chester I. Barnard, Organization and Management (Cambridge: Harvard University Press, 1948), p. 14.

The student is well aware of the obvious fact that an organization is composed of people, and not just a collection of functions. Nor is it a difficult task to devise a system, which numerous questions in the tables refer to. The problem usually is, will the system work?

For many years the student has practiced the useful art of "keeping his eyes open and his mouth shut" (listening apparently is a lost art), and has found it a very useful concept, especially in the practice of management. No implication is intended, however, that such a disposition will produce an effective manager. Nor does the student advocate or endorse this as the single pinnacle of maturity in management philosophy, or for that matter, that it has any pragmatical value whatsoever. If the student were to advocate a philosophy it would be, "there is always a better way, let us find it." In the beginning it was stated that there would be no epigrams. For this one, which is the student's basic management philosophy, there is no apology. One does not apologize for what he believes in--he stands up for it, defends and advocates it. The student would, however, put the reader on notice of the implications of participation in the word "us" in the above stated dictum.

Management implies leadership and thus activity. Mere knowledge of a problem is often insufficient unless the problem itself is clearly understood by all concerned, and upon this understanding a reasonable agreement is reached.

Intellectual abilities are important elements of management, but are not necessarily essential. For example, in speaking of experience,



it might be well to avoid the common error of regarding it as primarily a matter of repetition of action. When experience is nothing more than repetition, it is more appropriately termed "practice." Experience implies not only practice, but the acquisition of insight and judgment.

Management and leadership are synonymous when obviously related to co-ordination of certain efforts of people. Co-ordination is a major problem in process industries such as printing, and without adequate management there can be little opportunity for leadership and co-ordination.

Observation and experience clearly indicate that nothing contributes more to differentiate between men of action and men of practice than action under responsibility. And men of action, who the student prefers to call dynamic managers, are deeply modified because of the habit of action under responsibility.

In some respects to the truth, or reality as the student understands it, it should be recognized as a matter of course, that in a concise and somewhat elementary chapter pertaining to scientific management the student has tried diligently to emphasize that the problems of management are increasing, and will continue to do so with the growth of specialization, and technical progress. The student would certainly be the first to admit that this chapter is a mere sketch of an enormous subject, but has attempted to emphasize several concepts.

First, management is certainly not a rigid, predetermined system. In fact, it may not be a system at all, but a method of thinking. At any rate, effective economic performance involves numerous factors, many of

which are unique to a given situation. A management decision is frequently a matter of suboptimization rather than optimization.<sup>57</sup>

Secondly, a theory or hypothesis is necessary to provide a framework or a basing point out of which some degree or order can be established from confusion and turmoil. It is often necessary to have a theoretical framework as an originating point in an effort to maintain order long enough to consider some problem. It is evident that this thesis does not require hypotheses, but hypothesis number 1 would certainly be an appropriate beginning of a scientific approach to a problem.<sup>58</sup>

(1) Hypothesis 1. Fundamental management principles, based on objective, scientific analysis, are essential to the economic performance of management functions regardless of the size of the firm.

The question as to whether a hypothesis is true or false makes little sense to many people. Some of the most useful theories and hypotheses cannot be proven true or false. A hypothesis is a fundamental concept, a way of looking at things from different angles, and not just from one dimension. If for no other reason than this, the hypotheses of this study have been stated.

In conclusion of this short chapter on one aspect of management, one of the few direct quotes to be used in the paper is stated to emphasize the student's belief in the future of labor-management relations, and to set the stage for a following chapter concerning employee

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<sup>57</sup>Miller and Starr, op. cit., pp. 40-41 and 173.

<sup>58</sup>U.S. Department of Commerce, "Economic Summary, Printing and Publishing and Allied Industries," Vol. 2, No. 12, (May 1961), p. 5.

participation.<sup>59</sup>

I believe that progress in personnel relations involves recognition that the development of the individual employee is of first importance to which must be added chiefly the promotion of the will to collaborate. The essential first step in accomplishing these functions is complete sincerity and honesty of employers and managers.

To some, the practical significance of the preceding general observation may seem out of place because a following chapter pertains to communications and employee participation directly. But in the judgment of the student, communications and management cannot be separated, and it would be an exceedingly bad practice even to attempt it.

It cannot be denied that co-operation amplifies human capacities. A high-level of co-operation between labor and management may not be sufficient to prevent the decline or even the destruction of an organization, but the achievement of a higher rate of productivity through improved techniques and methods is closely related to the problem of employee acceptance (of management and change) and collaboration.

The weak link in most labor-management philosophies is that the production employee frequently lacks confidence in management. For years leadership has been the subject of an extraordinary amount of dogmatic nonsense. There is only one way to gain the worker's confidence--earn it.

The philosophical root of science is that some degree of order exists in the universe.<sup>60</sup> The end product of the scientific method is

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<sup>59</sup>Barnard, op. cit., p. 23.

<sup>60</sup>Albers, op. cit., p. 19.

an accumulation of knowledge, which results in a better understanding of both man and society. And although there are certain qualifications without which a man cannot be trusted to think scientifically, the man who has the best method, under the circumstances, of accurate observation of things and events, and utilizes theory and hypotheses not as things dogmatic or quasi-religious, but as modest, even pedestrian affairs, something to serve as a guide along the way or as a walking stick, will in the end, achieve economic and psychological success.

## CHAPTER III

## SCIENTIFIC OFFSET IMPOSITION

Introduction to Offset Lithography

This chapter is nothing more than an attempt to determine whether or not scientific methods are applicable to offset imposition. It will also become apparent as the chapter progresses that many of the observations involved extend over a period of years far exceeding the time usually necessary to obtain the degree for which this thesis is a partial requirement.

Although this chapter emphasizes craftsmanship and individual performance, the student is not making a plea for individualism (which would not diminish its importance even if this were the case), but in this respect a precautionary word is warranted. The student is firmly convinced that every man should be capable of performing something, maybe just one thing, efficiently--a final plea for craftsmanship in a technical industrial society. If a balance can be achieved between the two, the employee's job satisfaction and optimum productivity become congruent. The development of employee job satisfaction while maintaining optimum productivity is one of the primary objectives of management.

Offset lithography is a relatively new printing process. Since its introduction early in the 20th century, it has developed from a mere novelty among letterpress printers to a major industry.<sup>61</sup> Moreover,

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<sup>61</sup>"Up From The Stone Age," Time, Vol. LXXIX, No. 11 (March 16, 1962), p. 43



there is no denial that the industry has made phenomenal progress in both technology and management techniques. But the present-day condition of the industry seems to indicate that a position has been reached in which a combination of factors are forcing a change in management methods and procedures.<sup>62</sup>

It is traditionally American to live and work with the idea of finding better and more economical means of doing things. In the beginning, lithography was costly and slow, and might never have advanced beyond the "stone age" but for the curiosity and determination of early experimenters to find better, more efficient, and less time-consuming methods. It is already past time to begin the application of some of the newer scientific methods to the printing industry. The scientific approach we will be concerned with in this chapter is frequently called "operations research."

Operations research is the systematic, logical, and mathematical analysis and synthesis of problems.<sup>63</sup> According to Peter F. Drucker,

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<sup>62</sup>Warren L. Rhodes, "Graphic Arts Processes," Vol. VIII, No. 6 (Nov.-Dec. 1961), Rochester Institute of Technology, p. 1-4.

See also Voris, *op. cit.*, p. 42. According to Voris, one of the most significant innovations in management science which has occurred during the last ten years has been that of operations research in the manufacturing industries.

<sup>63</sup>Randolph W. Cabell and Almarin Phillips, Problems in Basic Operations Research Methods For Management (New York: John Wiley & Sons, Inc., 1961), pp. 1-10.



it is not operations nor is it research.<sup>64</sup> It is, however, logical and mathematical, and involves the use of symbols and model-making techniques in problems analysis.<sup>65</sup>

Corresponding to the growth and progress of offset lithography has been the inevitable decline in craftsmanship involved in the work.<sup>66</sup> There remains, however, a part of the process in which the machine has not reduced the work to a point of mere machine-tending. This is the art and science of imposition, and conversely offset stripping. If anything, the individual skill and dexterity involved in the work of imposition and stripping tends to increase with quality and press sheet size.

On the basis of the foregoing generalizations, a rather oversimplified hypothesis is restated (see Chapter I) to serve as a guide in the analysis that follows:

(4) Hypothesis 4. The elementary principles of operations research can be utilized to improve the operations of imposition and offset stripping.

It may be appropriate to emphasize at this time the significant aspect of this chapter--that a scientific approach is prima facie applicable to offset imposition, and to some degree, to offset stripping since the two are related.

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<sup>64</sup>Drucker, The Practice of Management, op. cit., p. 366. A majority of the time I am in complete accord with Drucker, but in this case I am inclined to accept the scientific approach to management techniques and skilled work as research, and the word "operations" seems valid enough to me in the context in which it is used.

<sup>65</sup>Miller and Starr, op. cit., pp. 103-104.

<sup>66</sup>Franklin G. Moore, Manufacturing Management (Homewood, Ill.: Richard D. Irwin, Inc., 1958), pp. 3-6.

## Offset Imposition

Any printing job of more than one page involves imposition. When more than one page is to be printed on a single press sheet, imposition is the arrangement of the pages so that when the sheet is folded the pages will be in the proper sequence (properly paginated) and will have correct margins.<sup>67</sup>

Stripping is the general term applied to the work of assembling, positioning, and attaching negatives and/or positives to a sheet of opaque paper in preparation for making a lithographic offset plate. The result of stripping is referred to as a flat.<sup>68</sup>

Shown in Figure 2A is a sheet lay for a 32-page signature, printed sheetwise.<sup>69</sup> This lay, with pages 1, 4, 5, and 8 in the proper positions as shown, was part of the "Offset Stripper, Offset Platemaker, or Letterpress Stoneman" questionnaire, (see Figure 18) and the stripper question number 17 in Table V was the information and instructions

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<sup>67</sup>Charles C. Ball, "Imposition--How to Lay it Out For the Press," Graphic Arts Monthly, Vol. XXIII, No. 7 (July 1961), pp. 76-84.

For a description of how pages are numbered and the relationship between page margins, see James B. Cooper and Robert E. Goode, "Dummy Aids in Communication Between Printer and Designer," Reproduction Methods For Business and Industry, Vol. II, No. 4 (April 1962), p. 18.

<sup>68</sup>Halpern, op. cit., p. 346

<sup>69</sup>According to the U.S. Government Printing Office's Layouts for Flat-bed, Rotary, and Web Press Imposition (Washington, D.C.: 1957), p. iii, a stone lay is the face-up arrangement and position of the type and/or plates as they lay on the imposition stone or press. An impression or diagram of a stone lay is referred to as a sheet lay. An offset flat positioned readable side down on a stripping table would be the equivalent of a stone lay.

For a much clearer distinction between a sheet lay and a stone lay, see Printing Industry of America, Inc., A Composition Manual (Washington, D.C.: 1953), pp. 104-105.

X			X
5			8
4			1
X			X

Figure 2A

Figure 2B

28	12	24	52
5	12	9	8
4	13	16	1
29	20	17	32

Figure 2. The 32-page sheet lay that was part of the offset stripper questionnaire and a sheet lay showing the proper positions of the pages

furnished with the sheet lay.<sup>70</sup>

The objective of question 17 was to determine respondents' ability to provide the missing page numbers to the sheet lay, as shown in Figure 2A, without preparing a folding dummy.<sup>71</sup> Table V shows the responses to this question, and responses to other questions addressed to managers and pressmen concerning imposition, stripping, and instructions for imposition and stripping.

The missing pages for the 32-page sheet lay, which was part of the stripper questionnaire, are shown in their proper positions on the sheet lay in Figure 2B. The corner pages, which are marked with an "X" could have been determined by utilizing the "companion page rule,"

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<sup>70</sup>The exact wording of some of the questions has been slightly altered in order to provide clarification for the yes or no responses which are more easily compared to those of the panel responses.

<sup>71</sup>To prepare an imposition by making a folding dummy, a sheet of paper is folded by hand in the sequence to be used on the folding machine. The leaves are then paginated, and when the sheet is opened flat it is called a sheet lay.

Technically, a folding dummy is a sheet of the actual stock to be used to print the job which has been folded on the folding machine to be used to fold the job and then paginated. But the term is frequently applied to a folded sheet regardless of size. Excellent definitions are to be found in I.T.U. apprentice textbook No. 7, op. cit., pp. 103-115.

See also "How to Prepare and Use Offset Impositions," In-Plant Offset Printer, Vol. II, No. 2 (March-April 1962), pp. 44-48. This short and precise article demonstrates explicitly how to make a folding dummy, and explains some of the more elementary techniques of imposition.

supposedly a rule of common trade practice.<sup>72</sup>

The answers to question 17, Table V, indicate that the strippers who responded were not well read insofar as imposition was concerned. Note in Table V the panel responses, which can be compared with the other responses for further analysis.<sup>73</sup>

### Positional Relationship of the Numbers

One need not have a gift for mathematical ability to comprehend the positional numerical relationship that exists between the page numbers on a sheet lay, yet the approach to the problem of imposition in this chapter is purely scientific, and to a large extent, what is frequently referred to as operations research. In this respect it cannot be over-emphasized that observation and experience, and the ability to think scientifically are primary factors in the management of technicians.

If the history of printing has been interpreted correctly, then

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<sup>72</sup>The companion page rule is usually taught college students in schools of printing at the sophomore level. This rule is discussed in the following books: Planning For Better Imposition, by H. Wayne Warner (Washington, D.C.: Judd & Detweiler, 1958), p. 21; A Composition Manual, op. cit., p. 107; Arithmetic For Printers, by J. Woodard Auble, op. cit., p. 169; General Printing, by Glen V. Cleeton and Charles W. Pitkin (Bloomington, Illinois: McKnight & McKnight Publishing Co., 1953), p. 103.

For a definition of the four major characteristics of companion pages, see Donald E. Hill, "Six Rules For Improving Your Imposition," op. cit., p. 52.

<sup>73</sup>The panel was requested to answer the questions either yes or no, according to their personal belief as to whether the person concerned (management or craftsmen to whom the questionnaires were addressed) should know the information asked. No comparison was intended to be made between the plants in which the panel members are employed and the plants in the study areas.



Table V. Questions and Replies Concerning Imposition, Stripping, and Imposition Instructions

No.	Question	Replies			
		Mgt.		Panel	
		yes	no	yes	no
8	Does the plant have written standard operating procedures?	11	31	5	0
27	Does the plant work order inform the pressman whether the job is work & turn, work & tumble, sheetwise, etc.?	22	19	5	0
		Stripper		Panel	
9	In your opinion, is the work order now being used sufficient or should it be revised?	11	14	5	0
17	If you were given a 32-page sheet lay, printed sheetwise, could you determine the page numbers and their positions?	13	12	5	0
18	In your opinion, what is the importance of the "paper line" insofar as the pressman is concerned?	22	3	5	0
		Pressman		Panel	
9	In your opinion, what is the minimum information a pressman must have before he can print a job?	19	11	5	0
11	Do you ever have to move the cylinder to get a proper image lay?	21	0	3	2
18	In your opinion, is the work order now being used sufficient or should it be revised?	19	11	5	0

the student has discovered, as have others before him, that what the future holds, in all probability, is a technocracy. Under such a system



the problems of management, if the student may be permitted to be exceedingly optimistic and sanguine, will be infinite.

The pages for the two inside rows in Figure 2A (the page rows are vertical in Figure 2) can be determined by utilizing the positional numerical relationship that exists between the page numbers on sheetwise front and back flats.<sup>74</sup>

A series of illustrations is necessary to clearly explain the numerical relationship between the pages on front and back sheetwise flats.<sup>75</sup> In Figure 3, the numbers to the left in each column, from 1 through 500, are outside page numbers, and will always be located on front flats. Observe that the numerical relationship between the front numbers is 3, 1, 3, etc. When the number is odd, add three to it to obtain the next number ( $1+3=4$ ), and when the number is even, add one to it to obtain the next number ( $4+1=5$ ).

Figure 3 is a useful illustration that cannot be fully discussed

<sup>74</sup>Donald E. Hill, "S.O.P. For Stripping: Step-and-repeat for Bookwork," Modern Lithography, Vol. XXIX, No. 11 (Nov. 1961), p. 43.

Sheetwise is a kind of imposition using two plates and the same gripper edge of the press sheet to print both sides of the sheet. Sheetwise impositions are almost always used in bookwork.

<sup>75</sup>In this chapter, the terms page and page number are synonymous. To avoid confusion, only the term page will be used when possible. The sheet lays illustrated in this chapter begin with page 1 in order to simplify the arithmetic and clarify description of the procedure. In actual practice this is frequently not the case. The usual procedure is to number the copy (pages) with a shop-guide number, beginning with the copy or page which is to occupy the "key position" on the first front flat, and numbering it 1. Utilizing this method it does not matter to the planner or stripper what the actual page numbers are. The imposition and/or flats are prepared according to the shop-guide numbers.

at this time, but notice that if a line is drawn between 1 and 32 it will contain all the front page numbers for a 16-up sheet lay (as shown in Figure 2B, and frequently referred to in this chapter as a 16MO). The form shown in Figure 3 also gives the conjugate page numbers for books with 500 or fewer pages.

The numerical relationship of the pages on front flats is illustrated in Figure 4, which shows sheet lays for 4, 8, 16, and 32-page signatures. Page 1 on each sheet is in the lower-right or lower-left corner, and the corner pages are always 1, 4, 5, and 8. Utilizing the "relationship of the numbers rule," and moving always in a direction along or with the gripper edge of the sheet, the corner page numbers on any sheetwise front flat can be determined. The head position or the direction of the head of each page is determined by the head-to-head, foot-to-foot, "alternate rows rule."<sup>76</sup>

It can now be seen that if page 1 is located and positioned on a press sheet, the relationship of the numbers can be used to determine corner pages, and the "companion page rule" can be used to determine the companion pages for corner pages. These two rules are sufficient to determine and locate the pages on sheet lays of 4, 8, or 16 pages and the two outside rows of a 32-page sheet lay (Figure 4D), but in order to locate the page positions, and determine the page numbers for the two inside rows of a 32-page signature without preparing a folding dummy, a more scientific approach is necessary.

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<sup>76</sup>On a properly arranged sheet, all the pages will be aligned head-to-head, foot-to-foot, or head-to-head, etc., in alternate rows.



Job. No. \_\_\_\_\_ Name \_\_\_\_\_  
 Amount \_\_\_\_\_ Sheet Size \_\_\_\_\_ Trim \_\_\_\_\_  
 Fold \_\_\_\_\_ Bind \_\_\_\_\_ H. Margin \_\_\_\_\_ Back In. \_\_\_\_\_

1 2	101 102	201 202	301 302	401 402
4 3	104 103	204 203	304 303	404 403
5 6	105 106	205 206	305 306	405 406
8 7	108 107	208 207	308 307	408 407
9 10	109 110	209 210	309 310	409 410
12 11	112 111	212 211	312 311	412 411
13 14	113 114	213 214	313 314	413 414
16 15	116 115	216 215	316 315	416 415
17 18	117 118	217 218	317 318	417 418
20 19	120 119	220 219	320 319	420 419
21 22	121 122	221 222	321 322	421 422
24 23	124 123	224 223	324 323	424 423
25 26	125 126	225 226	325 326	425 426
28 27	128 127	228 227	328 327	428 427
29 30	129 130	229 230	329 330	429 430
32 31	132 131	232 231	332 331	432 431
33 34	133 134	233 234	333 334	433 434
36 35	136 135	236 235	336 335	436 435
37 38	137 138	237 238	337 338	437 438
40 39	140 139	240 239	340 339	440 439
41 42	141 142	241 242	341 342	441 442
44 43	144 143	244 243	344 343	444 443
45 46	145 146	245 246	345 346	445 446
48 47	148 147	248 247	348 347	448 447
49 50	149 150	249 250	349 350	449 450
52 51	152 151	252 251	352 351	452 451
53 54	153 154	253 254	353 354	453 454
56 55	156 155	256 255	356 355	456 455
57 58	157 158	257 258	357 358	457 458
60 59	160 159	260 259	360 359	460 459
61 62	161 162	261 262	361 362	461 462
64 63	164 163	264 263	364 363	464 463
65 66	165 166	265 266	365 366	465 466
68 67	168 167	268 267	368 367	468 467
69 70	169 170	269 270	369 370	469 470
72 71	172 171	272 271	372 371	472 471
73 74	173 174	273 274	373 374	473 474
76 75	176 175	276 275	376 375	476 475
77 78	177 178	277 278	377 378	477 478
80 79	180 179	280 279	380 379	480 479
81 82	181 182	281 282	381 382	481 482
84 83	184 183	284 283	384 383	484 483
85 86	185 186	285 286	385 386	485 486
88 87	188 187	288 287	388 387	488 487
89 90	189 190	289 290	389 390	489 490
92 91	192 191	292 291	392 391	492 491
93 94	193 194	293 294	393 394	493 494
96 95	196 195	296 295	396 395	496 495
97 98	197 198	297 298	397 398	497 498
100 99	200 199	300 299	400 399	500 499

Figure 3. Sample form of front and back page numbers, and examples of how the pages for various flats are indicated



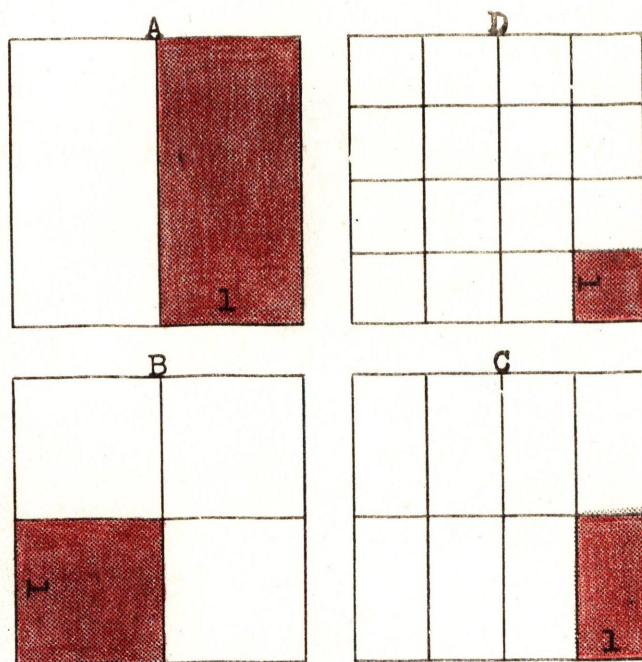


Figure 4

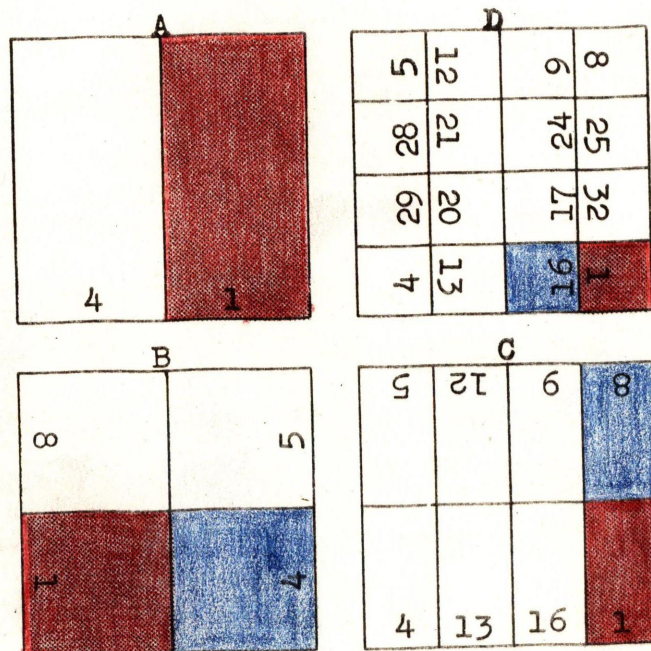


Figure 5

Figures 4 and 5. Four sheet lays showing key position and key position opposite pages. Key position opposite pages in blue

### The Key Position

The initial step in the application of a scientific method to imposition is to determine some point of reference on the sheet lays. Because page 1 is always located in a particular position on certain lays, it can be used as a reference point. This position, occupied by page 1 or the low page on the sheet, is referred to as the "key position," and in Figures 4 and 5 (and all other Figures in this chapter) is shown in red for identification.

### The Key Position Opposite

To determine the pages for the two inside rows of a 32-page signature (Figures 4D and 5D), the page that is to be located in the "key position opposite" must first be determined. The key position opposite is that page opposite the key position but not its companion page. In Figure 5D the key position opposite page is 16. The key position opposite page will always be foot-to-foot with the key position page when the signature has open heads, and head-to-head when the signature has closed heads. When possible, a signature should have closed heads, in which case the head direction of the page in the key position will always point (or be head-to-head) to the key position opposite.<sup>77</sup>

The key position opposite page number can be determined by utilizing the following formula:

---

<sup>77</sup>Signatures with closed heads must be trimmed at the head before the leaves will open. Signatures with open heads usually must be trimmed at the foot before the leaves will open. Signatures with closed heads are more desirable for the reasons mentioned in footnote 79.

$$(1) KPO = \frac{KP + KPC - 1}{2}$$

where: KPO=key position opposite  
 KP=key position  
 KPC=key position companion

Utilizing the above formula to determine the key position opposite page number for the sheet lay as shown in Figure 4D:

$$KPO = \frac{KP + KPC - 1}{2}$$

$$KPO = \frac{1 + 32 - 1}{2}$$

$$KPO = 16$$

Once the page for the key position opposite has been determined, the numerical relationship between it and the key position page can be used to find pages opposite corner pages. Notice in Figure 5D that the sum of the key position page and the key position opposite page equals 17 (1+16). In order to determine a page opposite a corner page, find a number that when added to the corner page equals 17. In this case for Figure 5D, the numbers are 16, 13, 12, and 9.

When pages 16, 13, 12, and 9 have been located and positioned, the "companion page rule" is used to determine pages 17, 20, 21, and 24. The key position opposite is shown in blue in the illustrations for identification and to more readily observe its relationship to the key position page.

### The Mnemonic Wheels

The discussion thus far has been an attempt to elucidate a system whereby when three positions on a sheet lay have been determined; (1)



the key position, (2) key position opposite, and (3) the key position companion, the remaining pages on sheet lays of 4, 8, 16, and 32 pages can be determined. The entire problem therefore reduces to a simple matter of remembering the location of the "key position," from which the other two positions can be located.

As a mnemonic device, the sheet lays are positioned on a "memory wheel" as the one shown in Figure 6. The key position is indicated in red and the key position opposite in blue for identification.

This wheel, however, is nothing more than the entire sheet lays in a particular arrangement, and offers no definite mental advantage over memorizing the actual sheet lays. But if the wheel is further reduced to only the key position and folding instructions as shown in Figure 7, the problem of memorizing the key position for signatures of 4, 8, 16, and 32 pages is considerably simplified.<sup>78</sup>

### Further Scientific Analysis

The wheel concept as a memory device, however, presents one major problem. The 32-page signature as shown in Figure 5D has open

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<sup>78</sup>The terms folio, 8VO, 16M), and 32MO are terms used to describe the type and number of leaves used in the sections of a book. For example, if a press sheet is folded once it is called a folio (one fold, two leaves, four pages). A quarto is a press sheet which has been folded twice to make four leaves and eight pages, etc.

For a lucid and rational description of sheet folding, see A Glossary of Literary Terms, by M. H. Abrams (New York: Holt, Rinehart and Winston, 1961), pp. 38-39. Also see The Bookman's Glossary (New York: R. R. Bowker Co., 1951), pp. 25-27.

For the technical terms of page sizes after press sheets have been folded, see The Oxford University Press General Catalogue of Oxford University Press (Fair Lawn, N.J.: 1961), p. xi.

heads. In order to have closed heads, the front pages on a 32-page signature must be positioned as shown in Figure 8A. Compare Figures 8A and 8B and observe what takes place between open and closed heads of a sheet is that the companion pages and the direction of heads are reversed. The three major positions on each sheet have changed, but the fundamentals of the procedure for determining the remaining pages is the same.

Because a folio (2 leaves, 4 pages, see Figure 6) is somewhat elementary and is not frequently used in bookwork, there is no need for including it in an advanced discussion of scientific imposition. Suppose the folio is removed from the wheel as shown in Figure 6, and replaced with a 64-page sheet lay (a 32MO), and the key position on each sheet lay is positioned so that press guides and folder guides on the sheets are identical.<sup>79</sup>

The wheel that results after the folio has been removed and replaced by a 32MO sheet lay is shown in Figure 9. This wheel, of course, is nothing more than the sheets in a particular arrangement, and if further reduced to only the pages in the key position rows, a "wheel memory device" would appear as in Figure 10.

If the wheel in Figure 10 is difficult to remember, it can be further reduced to the device shown in Figure 12, in which only the key

---

<sup>79</sup>Press guides and folder guides on a sheet must be the same so that any variation in the size of the sheet will not affect the margins. The same concept is utilized in stripping head-to-gripper edge of the sheet when possible. When a trim is made opposite the gripper edge of the sheet, the margins on all sheets will be the same.

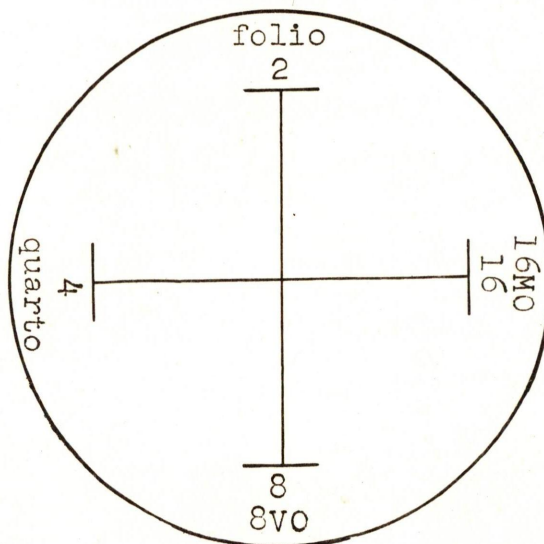


Figure 7. Simplified device for remembering the key positions and folding instructions for signatures of four, eight, sixteen, and thirty-two pages

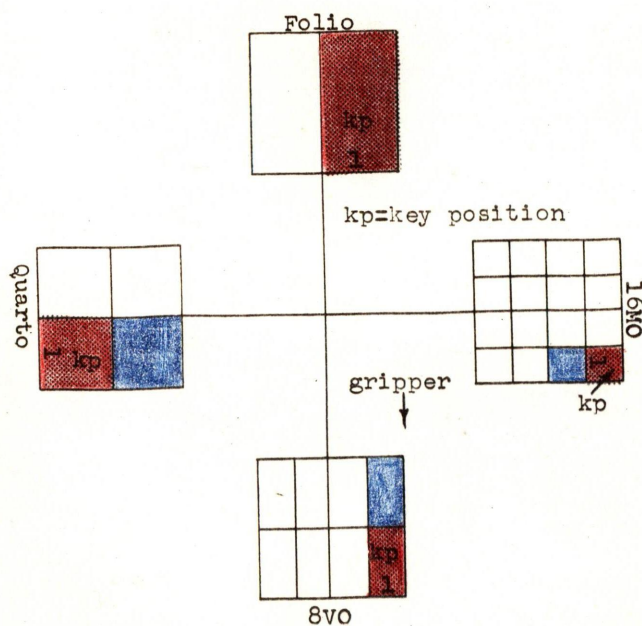


Figure 6. Sheet lays for four, eight, sixteen and thirty-two page signatures on a wheel arrangement



Figure 8B

open heads

8	25	32	1
6	42	41	91
12	21	20	13
5	82	62	4

Figure 8A

closed heads

52	8	1	23
24	9	16	17
12	21	31	02
28	5	4	29

Figure 8. Two signatures illustrating how the key position and the key position opposite relocates on sheets with open and closed heads

position page is shown. The arrow indicates the head direction of the page in the key position.

The memory device in Figure 12 can be clarified by observing what takes place in the sheet lay diagrams as shown in Figure 11. Beginning with the quarto sheet lay at the top of Figure 11, as the number of pages on each sheet lay doubles, the key position moves downward to the next page position in the key position row. For example, on the quarto sheet lay, the top-right corner of the sheet is the key position. As the number of pages increases from four up on the quarto to eight up on the 8VO, the key position moves downward to the lower-right corner of the sheet, two pages down from the top of the sheet or the second row. On the 16MO sheet lay the key position is in the third row down from the top of the sheet. And on the 32MO sheet lay the key position moves downward into the fourth row of pages from the top of the sheet.

This downward movement of the key position in the key position row on sheet lays for 8, 16, 32, and 64 pages, simplifies the memory device as shown in Figure 12.

In order for press and folder guides to be identical, the gripper edge of the sheet is the top edge in the sheets shown in Figure 11. This places the normal side-guide to the left as indicated by the arrow on the side-guide side of the sheet pointing to the gripper edge.

### Advanced Scientific Offset Imposition

The various methods and procedures which have been described in this chapter for preparing sheet lays is sufficient for publications and jobs of a few pages, but the mathematical calculations, and devices that

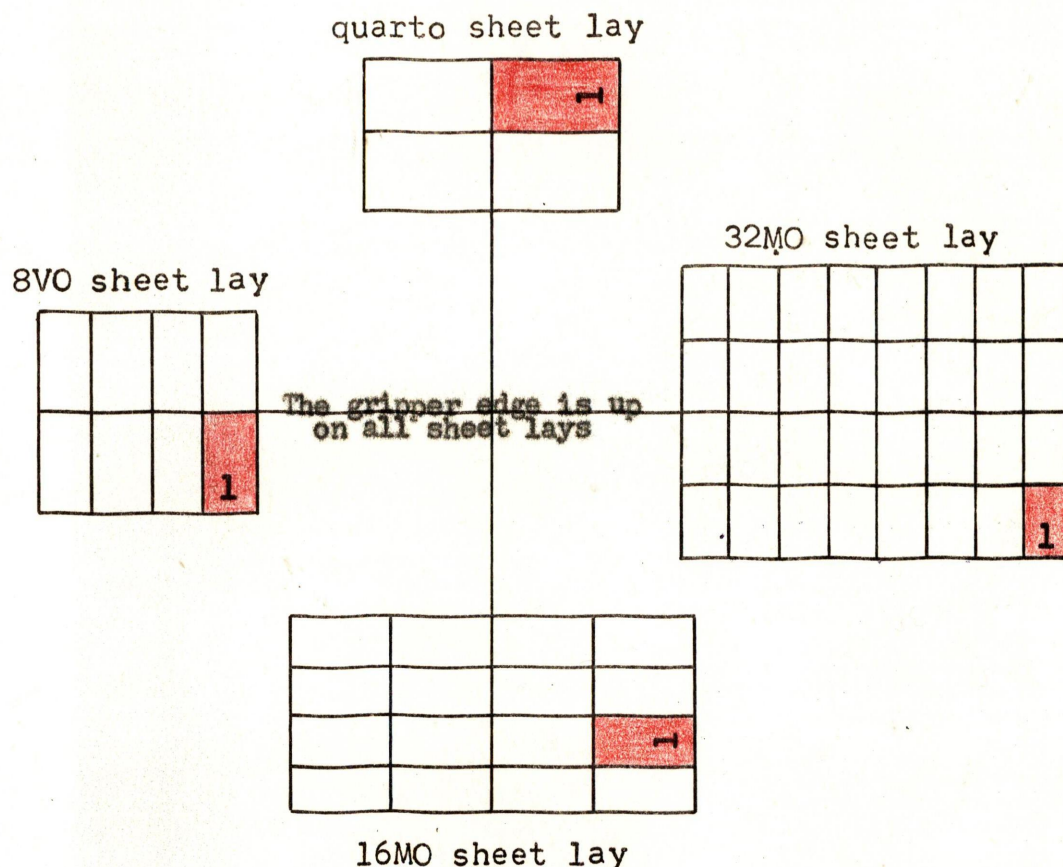


Figure 9. Sheet lay wheel arrangement of signatures of eight, sixteen, thirty-two, and sixty-four pages

must be remembered, become more involved as the number of pages per signature increases.

Suppose, however, an imposition is to be prepared for "front 11" of a job composed of 32-page signatures as shown in Figure 13. Using the formula (formula 1) to determine the page for the key position opposite on this sheet lay (page 336 in position H) would involve calculations exceedingly time-consuming for our purposes, and may at the same time be considerably difficult to perform mentally with any degree of mathematical accuracy.

Instead of using the formula to determine the key position



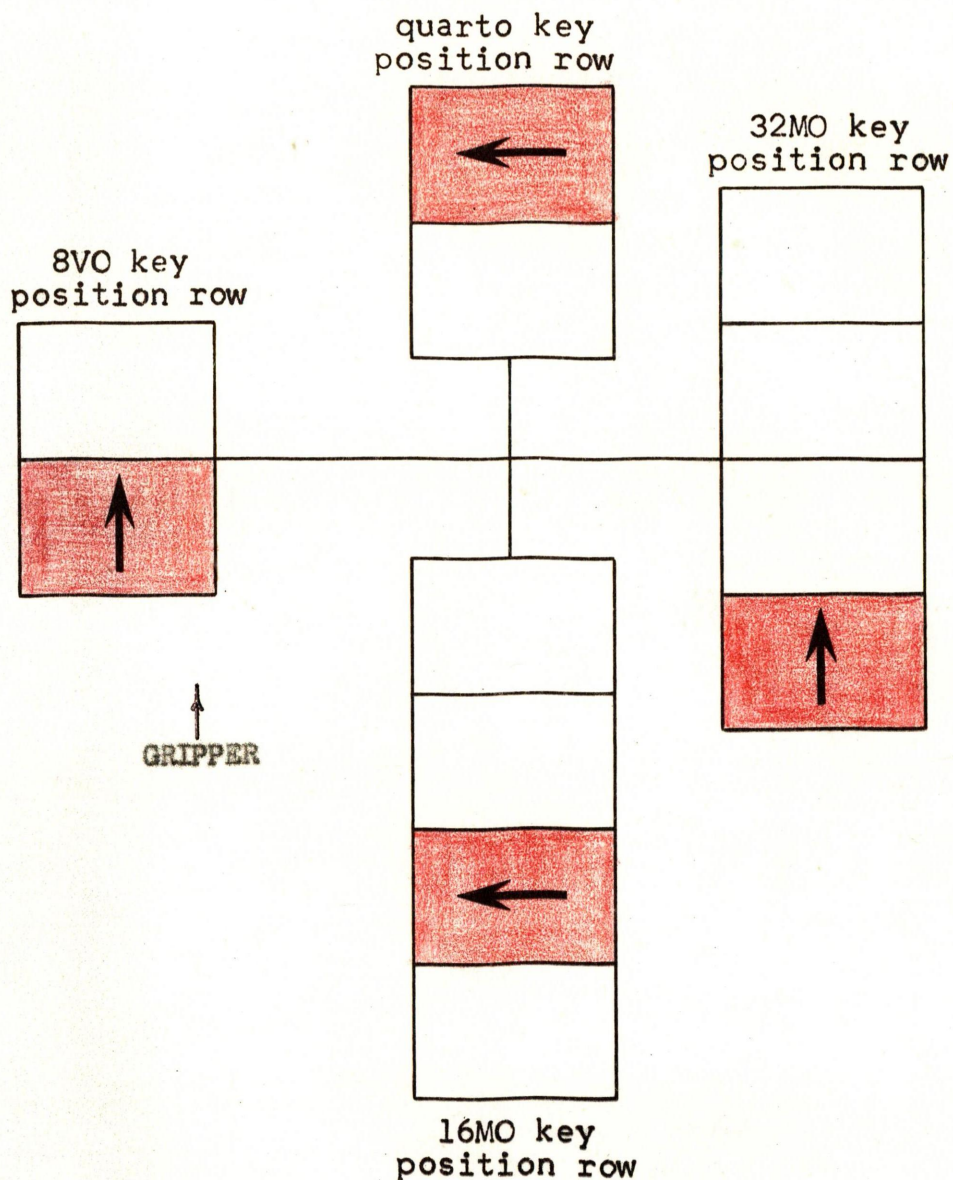
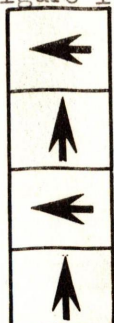


Figure 10. Wheel arrangement of key position rows only  
for quarto, 8VO, 16MO, and 32MO signatures

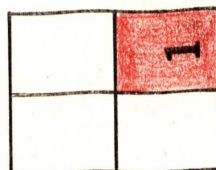
opposite page for Figure 13, notice that each page position has been assigned a letter, beginning with "A" for the key position, and terminating with "P" for the key position companion. In order to position the pages without the use of arithmetic, the "3, 1, 3, numerical relationship rule," in a clockwise, counter-clockwise movement is

Figure 12

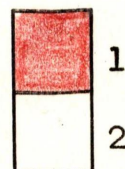


Final mnemonic device for  
remembering the key  
positions

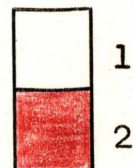
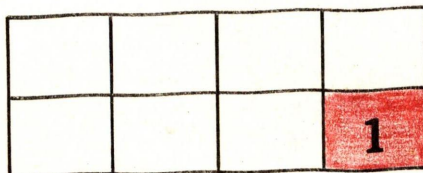
quarto



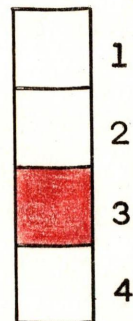
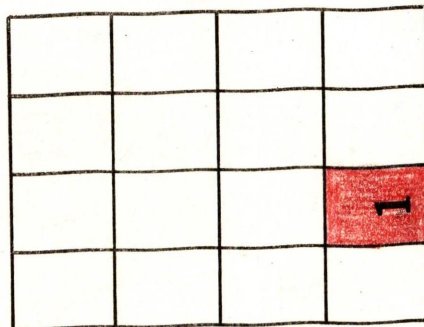
Row



8VO



16MO



The gripper is up  
on all sheets

32MO

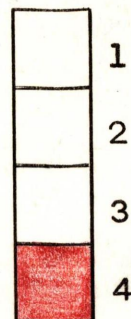
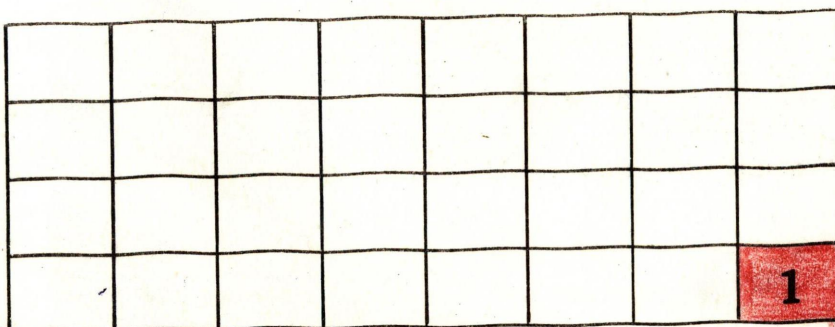


Figure 11. Sheet lays illustrating how the key position  
moves down the key position rows as the number of  
pages on the signature increases

utilized.

Beginning at the key position, page 321 in position A, move in the direction along or with the gripper edge of the sheet (usually the long side of the sheet) to positions B, C, and D, a clockwise rectangular movement, and number each successive page according to the "relationship of the numbers rule." When position D has been reached, page 328, four pages have been numbered and the direction of movement is reversed.

From position D, move to position E (page 329) because the two inside rows along the parallel fold must be numbered before any of the pages on the outside rows are numbered. Position E is also the nearest unnumbered position on the parallel fold from position D.

From position E the direction of movement is reversed from clockwise to counter-clockwise, and positions F, G, and H are numbered. When position H has been reached, a complete box-like movement has been made around the sheet, and the direction of movement is again reversed. Because all pages on the two inside rows must be numbered before any other pages on the outside rows are numbered, from position H move to the nearest unnumbered position on the inside rows, or position I. From position I the direction of movement is clockwise through positions J, K, and L.

When position L has been numbered, the two inside rows are complete. Move then to the nearest unnumbered position, in this case position M. From position M reverse the direction of movement and number counter-clockwise positions N, O, and P. The page head positions are determined in the usual manner, as discussed in footnote 76.



Front 11

348 N	K 143	344 L	M 345
325 C	F 332	329 E	D 328
324 B	G 333	336 H	A 321
349 O	J 340	337 I	P 352

parallel fold

Figure 13. Front flat 11, 32-page signature with page positions lettered to clarify direction of movement when utilizing the "relationship of the numbers rule." Observe that the movement is clockwise and then counter-clockwise

To prepare sheet lay impositions utilizing the "3, 1, 3, relationship of the numbers rule" and lettered positions is not difficult if the following fundamental rules are remembered:

- (1) Always begin at the key position, and the head direction of the page in the key position is determined by the mnemonic device shown in Figure 12.
- (2) The initial direction of movement is along or with the gripper edge of the sheet, and after each rectangular movement around the sheet, the direction of movement is reversed. This is repeated until every page on the sheet is numbered.
- (3) Four page numbers are located and determined with each clockwise or counter-clockwise movement around the sheet.

- (4) Page head positions are determined by the "alternate rows rule."
- (5) On a 16MO sheet lay, the pages in the two inside rows are numbered after the first movement around the sheet.
- (6) On a 16MO the fifth position numbered is always the opposite of the fourth position numbered.
- (7) When changing direction of movement from clockwise to counter-clockwise, move to the nearest unnumbered position and begin the movement.

At first glance the system may seem complicated, but it can be simplified by using it in conjunction with the "companion page rule." Notice in Figure 13 that after the first movement around the sheet, two pages have been determined and located on each of the two outside rows. After the second movement around the sheet, two pages have been determined and located on each of the two inside rows. With these eight pages numbered, the "companion page rule" can be used to calculate the remaining eight unnumbered pages.

The only problem that the student can foresee which may cause some difficulty, is the direction of movement after the first four pages have been numbered. On 16MO sheet lays (Figure 13) this is the move from position D to E. The fifth page to be numbered is therefore the opposite of the fourth page numbered, and is also the nearest unnumbered page on the parallel fold.

In actual practice the page positions are not lettered, of course, for they are lettered in the same sequence in which the pages are numbered. The positions are lettered in Figures 13 and 14 for illustrative purposes and convenience, but it is not inconceivable that a beginner in the study of this method of imposition may well find it expedient to

concentrate on the movement direction through the use of lettered positions. After the movements around the sheet have been mastered, it is a simple matter to apply the "3, 1, 3, relationship of the numbers rule."

#### The 64-page Signature

The procedure for locating and determining the page numbers on a 64-page signature, Figure 14, is the same as for the 32-page signature. The only major difference is that after the first four pages are numbered, the corner pages 1, 4, 5, and 8, the movement is directly to the nearest row along the aprallel fold of the sheet. This movement from position D to position E in Figure 14 crosses two unnumbered positions (see arrow in Figure 14), but from position E the procedure is the same as above described for the 32-page sheet lay.

From position L, which completes the two vertical rows along the parallel fold, move to position M and number inward every page in the two middle horizontal rows. The two middle horizontal rows are completed at position "X" or page 48. From position X move to the nearest unnumbered page (page 49 at position Y) and determine the page numbers and positions for the two outside rows. Observe that with the outside rows the numbering is from the inside to the outside, that is, when position BB is reached, the movement is to the nearest unnumbered position (position CC, page 57) and the direction is reversed.

#### Mathematical Formulas for Imposition

Up to this point the only mathematics involved, other than the elementary discussion concerning the relationship of the numbers, has



S	09	35	12	9	95	75	8
C	DD	AA	F	E	BB	CC	D
N	S	V	K	L	U	T	M
28	37	44	21	24	41	40	25
62	36	45	20	17	48	33	32
O	R	W	J	I	X	Q	P
B	EE	parallel fold Z	G	H	Y	FF	A
4	61	52	13	16	49	64	1

Figure 14. Sixty-four page signature with lettered positions to aid in remembering movement direction. Notice dotted arrow back to parallel fold

been the development of a formula for the key position opposite. In order to provide a sort of continuum in the discussion of determining page positions on various sheet lays used in bookwork, the key position opposite formula was discussed as closely as possible to the sections concerning the key position and the key position companion. The key position opposite formula, however, will be discussed to some extent in this section.

As an expedient in calculations and verifying the formulas, two press sheets are shown in Figure 15. The sheets were printed from front 8 and back 8 plates as indicated.

### Formulas for the Three Major Positions and the Flat Number

The four major formulas for offset imposition as originated in this chapter are listed below. The key position opposite formula is given primacy because it has already been discussed and assigned a number.

- (1) 
$$\text{key position opposite} = \text{key position}_1 + \frac{\text{position companion}}{2}$$
- (2) 
$$\text{key position} = \text{key position companion} - \frac{(\text{pages per signature} - 1)}{2}$$
- (3) 
$$\text{key position companion} = \text{front number} \times \frac{(\text{pages per signature})}{2}$$
- (4) 
$$\text{front number} = \frac{\text{key position companion}}{\text{pages per signature}}$$

It would be an exceedingly optimistic assumption for the student to imply that the above formulas would be of any practical value in present-day printing trade practices. This is a matter which remains to be seen. It is common knowledge among printing practitioners and graphic arts people that the printing industry is not emphatically predisposed to utilizing scientific or mathematical techniques.<sup>80</sup> However, it is not difficult to visualize the advantages of the system to the individual engaged in the work of stripping or imposition planning. Nor will many managers or craftsmen question the objectives involved in the development of the above listed formulas--which are to stimulate independent thinking, promote scientific analysis, and in general, to emphasize the ascendancy of a superior method of verification and inspection of flats.

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<sup>80</sup>Albers, op. cit., p. 257.



Front 8

249	248	247	252
232	233	932	229
225 Key	opposite 240	232	228
952 companion	241	442	253

Back 8

152	246	442	250
230	235	432	231
222	238	632	226 key
452	243	242	255

Figure 15. Sheet lays for press sheets printed from front 8 and back 8 plates. Notice the key position on back 8 as compared with key position on front 8

press sheets, and folding dummies.

### The Flat Number

To demonstrate how the formulas are related, suppose the objective is to determine the front number for the press sheet as shown in Figure

15. Utilizing the formula:

$$(4) \text{ front number} = \frac{\text{key position companion}}{\text{pages per signature}}$$

$$\text{front number} = \frac{256}{32}$$

$$\text{front number} = 8$$

As with all mathematical formulas, if two constants are known, a third unknown can be determined. This is an important mathematical technique because several imposition and stripping values will generally be known. For example, the number of pages per signature and the flat number will usually be known, therefore, the key position companion could be found by using the formula:

$$(3) \text{ key position companion} = \text{front number} \times \begin{matrix} \text{(pages per)} \\ \text{(signature)} \end{matrix}$$

$$\text{key position companion} = 8 \times 32$$

$$\text{key position companion} = 256$$

Utilizing the key position companion and the flat number, a third useful unknown can be determined:

$$(3) \text{ key position companion} = \text{front number} \times \begin{matrix} \text{(pages per)} \\ \text{(signature)} \end{matrix}$$

$$256 = 8 \times \begin{matrix} \text{(pages per)} \\ \text{(signature)} \end{matrix}$$

$$32 = \begin{matrix} \text{(pages per)} \\ \text{(signature)} \end{matrix}$$

The most important formula, of course, is for the key position. The two unknowns in the key position formula are generally simple to ascertain. A general statement that may be helpful in determining the key position page number is that there is always a numerical spread between the lowest and highest pages on a press sheet which equals the number of pages on the signature minus 1. The lowest page number on a press sheet is generally located in the key position, and the high page number is generally the key position companion. At any rate, as discussed in footnote 75, this will always be the case in the system described in this chapter.

### The Paper Line

One of the most basic and elementary concepts of dynamic offset stripping is the standard paper line. The paper line is a mark scribed on a flat, a distance up from the gripper edge of the masking sheet necessary for the plate to be mounted on the press plate cylinder. A certain portion of a plate must be secured under the plate cylinder clamps, and no image can be positioned within this area.<sup>81</sup>

The basic layout lines of a flat are shown in Figure 16. A masking sheet does not become a flat until the negatives and/or positives have been positioned and the mask cut away. A completed flat is shown in Figure 17. The blue area below the paper line (below in the

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<sup>81</sup>For a more detailed discussion of the paper line and its relationship to press make-ready, see Donald E. Hill, "S.O.P. For Stripping: Marking the Masking Sheet," Modern Lithography, Vol. XXIX, No. 8, (August 1961), pp. 30-32.



diagram because the flat is face down) is that part of the plate which is secured under the plate cylinder clamps, and no image can be placed within this area. The red area, which is between the paper line and the gripper line, is under the impression cylinder grippers when transfer takes place, and no image can be positioned within this area.

Standard paper line distances are economical because even the slightest variation will cause unnecessary make-ready at the press, and could possibly delay a delivery date, or require a new plate to be made.

Variations in paper line distances for the same press may also have detrimental affect on pressroom morale. Adjusting press plate cylinders increases the physical requirements of press operation. A pressman is primarily concerned with making impressions from plates, and if he must continuously adjust the plate cylinder in order to obtain a proper image position on the press sheet, his attitude toward the stripper as well as management may be one of ridicule.

A standardized paper line distance for each particular press is just one of the many minute details which must be planned and initiated by printing plant managers in controlling and motivating skilled craftsmen. Numerous such details which are frequently overlooked could be controlled with standard operating procedures. Several questions included in the questionnaires were especially designed to obtain information about written standard operating procedures and standardized

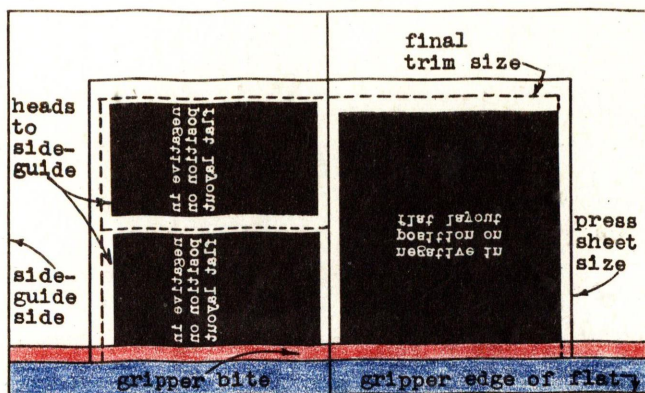


Figure 17. Three negatives shown in the proper position on a face-down flat

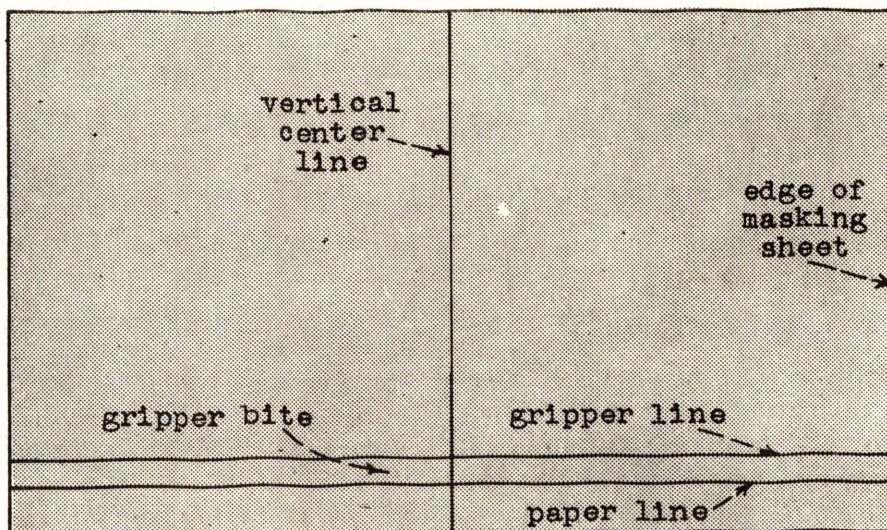


Figure 16. The basic layout lines of a flat

paper lines.<sup>82</sup>

In Table V, management question 8 indicated that of the managers who responded, a majority of the plants in which they were employed did not have any type of written standard operating procedures.<sup>83</sup> Also in the same table, stripper question 18 indicated that although most of the strippers who responded did realize the importance of the paper line, pressmen responses to pressman question 11 indicated that press plate cylinder adjustment in order to obtain a proper image position is a common occurrence.

Observe the panel responses to every question in Table V. Their responses are unanimously affirmative except for pressman question 11. The two negative responses to this question does not mean that two panel members advocate adjusting the press plate cylinder to obtain image position. Everyone makes mistakes regardless of how well trained, and the two panel members who answered in the negative felt that even a highly skilled stripper will occasionally make a mistake which will require the pressman to adjust the press plate cylinder in order to obtain a proper image position. However, the two panel members who responded in the negative were prompt to express their position that this should not be a common occurrence.

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<sup>82</sup>For many other small but important stripping details that are frequently overlooked by management, see Donald E. Hill, "S.O.P. For Stripping," Modern Lithography, Vol. XXIX, No. 4, (April 1961), p. 47.

<sup>83</sup>I have questioned printing plant managers for years on the subject of written standard operating procedures. Their most frequent and vociferous complaint or excuse for not having any written procedures is inflexibility to change them.



### Three Experiments in Offset Imposition

During the Spring quarter of 1962, the student was a graduate assistant in the Department of Printing and Journalism at South Dakota State College, and assisted in teaching a course (PM 45) in imposition and lockup for letterpress, and layout and imposition for offset. This is an upper division course primarily for juniors.

For the first time, insofar as the regular instructor was able to determine, this course was divided into two parts, offset stripping and imposition and letterpress lockup and imposition. The investigator was responsible for the offset phase, and although the course supposedly consisted of nine hours of laboratory assignments and projects, this was reduced to eight hours and the additional hour was utilized in classroom instruction in the system of offset imposition described in this chapter.

Several experiments were conducted near the close of the quarter in an effort to determine whether the system was valid as an instructional device, and if the advantages as claimed by the originator (Donald E. Hill) were practical and economical.

#### Experiment Number One

The first experiment consisted of question 17 of the Offset Stripper, Offset Platemaker, or Letterpress stoneman questionnaire (see Appendix B), which is shown in Figure 18. There were ten students in the class. Each was given a copy of the same questionnaire that had been mailed into the study areas. The students were timed in order to determine the average time necessary to complete the question correctly. The average time was found to be  $3\frac{1}{2}$  minutes. One student completed the

question in two minutes.

The students were not notified in advance of the experiment, but when the experiment was administered they were informed that they were to be timed.

The result of this experiment can be compared with the responses to stripper question 17 in Table V. Observe that almost 50 per cent (12 out of 25) responding strippers were unable to determine the page numbers without referring to an imposition book or making a folding dummy, even though they had unlimited time.

During the first experiment it was observed that much of the time required to answer the question was used in reading the instructions, and the instructor felt that the average time necessary to position the page numbers on a 16MO could be reduced if the students were given the instructions orally in a form which they were accustomed to hearing in class. This was the procedure used in the second experiment.

#### Experiment Number Two

In the second experiment the students were not aware that they were being timed. In this experiment the students were instructed to draw a 16MO sheet lay on a piece of paper. They were then given orally identical instructions as in question 17, Figure 18, except that the front number was changed from 1 to front 11. (Front 11 is shown in Figure 13.) The students were then instructed to determine and position the page numbers for front 11, which all were able to do. The average time was 4 minutes.

Front 11 was selected because there are several expedient methods



FOR OFFSET STRIPPERS ONLY (or any person with the duties of stripper)

17. If you were given a sheet lay as the one below, and were told that it was a 32 page, 16MO, sheetwise, saddle-stitched job, with pages 1, 4, 5, and 8 positioned as shown; how would you determine the page numbers of the pages marked with the "X" (the corner pages)?

X			X
5			8
4			1
X			X

Without referring to an imposition book, how would you determine the page numbers for the two inside rows in the diagram at the left?

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18. The "paper line" is a line marked on a flat, parallel to the gripper edge of the flat, and up from the gripper edge a distance necessary for the plate to clamp on the press plate cylinder. In your opinion, what is the importance of the "paper line" in so far as the pressman is concerned?

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Figure 18. Reproduction of the sheet lay and instructions furnished as part of the offset stripper questionnaire, and used in experiment number one

of determining either the key position page number or the key position companion page number that tend to simplify the arithmetic involved in the solution. The experiment was not intended to be a mathematical problem, therefore, front 11 was selected.

### Experiment Number Three

The third experiment involved a 64-page sheet lay (see Figure 14). The student who completed the first experiment in 2 minutes was asked if

he would care to attempt to determine the pages and positions for a 64-page sheet lay, which had been drawn on the blackboard by the instructor. The student was willing, even enthusiastic, and properly positioned the pages in 45 seconds. This experiment occurred the day following a class discussion and lecture on the 32MO sheet lay. During the experiment the student was not aware that he was being timed, and front 1 was used to simplify the arithmetic involved (Figure 14 is front 1). The experiment was conducted primarily to determine if the students could apply the same procedure to a 32MO sheet lay as for a 16MO sheet lay, although the time of 45 seconds is exceptionally fast.

### Conclusions to Chapter III

The limitations of such a system of imposition and stripping as described in this chapter are not difficult to perceive. This is admittedly a mere sketch of an enormous subject. It should be evident that no attempt has been made to substitute regulation for skill, or to imply in any way that the various methods and procedures as herein described are exhaustive.

Many exceedingly optimistic assumptions have also been made. Several of these assumptions have been based solely on man's willingness to work and to improve his skills by various self-development methods, and not on economic factors. There is a clear and present pressure, of course, in the economic direction. That is, a printing establishment is a business, and exists purely for economic reasons.

To reiterate, the deftness of managers as well as craftsmen, depends to a large extent on their ability to observe and analyze promptly.

Through the use of mathematical logic and intelligent criticism, the student is biased toward the system described.

To conclude a chapter that represents years of observation, research, and experimentation in offset stripping and imposition, a significant quote:<sup>84</sup>

A genuine grasp of research methods is a life-long value. The habit of sifting evidence, weighing bias, winnowing fact from opinion, assessing the judgments of others, and reaching an opinion on one's own with due regard for the possibility that new-found evidence may change it tomorrow--this is far more than a means to better grades and better papers; it is a way of mature and responsible thinking which can affect one's competence in every aspect of living.

The student is especially fond of the phrase "with due regard for the possibility that new-found evidence may change it tomorrow."

It is conceded that progress is in part definable as change that permits survival in a changing environment.<sup>85</sup> A man should not consider himself educated who does not believe in change, who attaches his faith entirely to science and production rather than the search for wisdom.

For those who are interested, Appendix E contains a brief discussion of work and turn impositions, and suggests how they may be incorporated into the system described in this chapter.

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<sup>84</sup>Sheldon W. Grebstein, ed. The Monkey Trial (Boston: Houghton Mifflin Co., 1960), p. vii. The quote is taken from the introduction, and although the book itself may not be of particular interest, the introduction is superbly objective.

<sup>85</sup>Van R. Potter, The Concept of Human Progress (Brookings, South Dakota: South Dakota State College, 1962), p. 5. This is a reprint from Land Economics, Vol. XXXVIII, No. 1 (Feb. 1962).

## CHAPTER IV

## COMMUNICATIONS, PARTICIPATION, AND INSTRUCTIONS

Introduction

An adequate method for performing anything worthwhile cannot be given by prescription alone. The prescription must be supplemented by patient practice, illustrations, diagrams, and occasionally by bold experiments. Throughout this thesis communications, participation, and instructions have frequently been discussed. On numerous occasions these topics have been elaborated upon in some detail, especially communications, possibly to an extent not altogether justifiable at various places. Subsequently, in this chapter what remains to be discussed (with relevancy as a guide and time permitting) pertaining to these topics, in addition to several tables of questions and responses, and a few communications forms will be incorporated as ingenuously as possible.

Management should be a function of assistance rather than dominance.<sup>86</sup> As of late there has been considerable controversy regarding whether or not management is becoming more a matter of communications and employee relations than anything else. There is no denial that the traditional principal tasks of management have been planning, co-ordinating, motivating, and control. However, there are many things in this world which are considered successful and admirable, but which are not in the least logical. This would seem to indicate that as time goes on

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<sup>86</sup>James F. Lundy, Effective Industrial Management (New York: The Macmillan Co., 1957), p. 5.

management will be faced with the problem of utilizing additional scientific methods, and concurrently with motivating and controlling workers who are more concerned with individual goals than with company objectives.

Scientific management differs from traditional management basically in the method in which decisions are made. Scientific management is an approach philosophy to decision-making in which decisions are based on analysis of facts and a recognition of the problem. Frequently the traditional manager is more of a "hunch player" than anything else.

Management is therefore confronted with the problem of motivating people, preferably their own employees, to render services in a coordinated action, while each individual worker pursues his own economic, social, and other goals. Management cannot hope to supplant the primary motive of self-interest by a motive to serve the enterprise. The problem, of course, is to cause these two motives to coincide and be interrelated in such a way that the first cannot be satisfied without in turn causing satisfaction of the latter.

### Communications

There is some opinion that the primary challenge of tomorrow's executives will be communications.<sup>87</sup> One thing is certain in communications, and that is that tradition does not favor the upward movement. There is also a natural proclivity to communicate upward only desirable

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<sup>87</sup>William S. Tacey, "What Stops Our Communications?", Advanced Management, Vol. XXV, No. 4 (April 1960), p. 6.



information, which makes difficult the procuring of accurate communications concerning operations in need of corrective action.<sup>88</sup>

Communications is a bilateral process.<sup>89</sup> The downward flow is generally dominated by orders, usually in the form of oral or written instructions, or both, whereas the upward flow consists chiefly of what has been done rather than what should be done. In any case, communications takes many forms, such as informal discussions between employees and foremen, formally organized and regularly held conferences, and various written and oral information and instructions.

#### Table VI. Management Communications Questions and Responses

Every question in Table VI is a communications question of one form or another. The table construction is identical to that of most other tables in the thesis in that panel responses are included for comparison purposes.

The student is of the opinion that the day of the suggestion system (question 12) has passed. The table shows that only four of 42 companies had a suggestion system in operation. Notice that the panel responses were three yes and two no for question 12. The three panel members who were in favor of company suggestion systems also commented that they must be diligently administered, employees must be well informed as to the procedure for submitting suggestions, what the monetary

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<sup>88</sup>William V. Haney, Communications Patterns and Incidents (Homewood, Illinois: Richard D. Irwin, Inc., 1960), pp. 41-62.

<sup>89</sup>Charles E. Redfield, Communications in Management (Chicago: University of Chicago Press, 1958), p. 5.

rewards are, and employees must be notified regardless of acceptance or rejection of their submitted suggestions.

There was a time when the company suggestion system was a major communications technique, beneficial to both the company and the employee. In recent years it has declined because it is an expensive technique, and frequently not economical. Another reason for the decline in the suggestion system is for social reasons. In present-day business operations, monetary rewards are not as important as they once were. As the standard of living of the worker increases, he becomes more concerned about such things as security, job satisfaction, recognition, and participation, than about purely monetary matters.<sup>90</sup>

Probably the most important question in Table VI is number 17, which involves standard operating procedures. This is a digression to the premise that the most efficient workers are informed workers. The two panel members who responded no to question 17 commented that reading company rules and regulations is a poor method of familiarizing new employees with such things, and that written procedures are more difficult to change.

Another important question is number 16. Observe that the panel was unanimous concerning question 16.

#### Table VII. Craftsmen Questions and Responses

Observe in Table VII how communications, participation, and especially instructions, are interrelated. For example, notice in question

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<sup>90</sup>Barnard, *op. cit.*, p. 67.

Table VI. Questions to Management Concerning Communications, Participation, and Instructions

No.	Question	Responses			
		Mgt.		Panel	
		yes	no	yes	no
12	Does the company have a suggestion system with monetary rewards for usable ideas and workable suggestions?	4	38	3	2
15	Within the last week, have you had a conference or meeting of department heads (foremen or supervisors), for the purpose of discussing various plant work or production problems?	17	24	4	1
16	Does the company provide for employee appraisal at least once a year?	5	28	5	0
17	Does the company require new employees to familiarize themselves with company policy by reading various rules and regulations sometime during the first few days after they report for work?	14	25	3	2
18	To the best of your knowledge, did the top executive in the company go into the backshop at any time during the last week and talk to an employee other than a foreman or supervisor?	28	11	4	1
19	Did you happen to read an article in a printing trade magazine last month?	28	12	5	0
20	When your company makes an important appointment, is an announcement and other information about the new employee circulated, so that present employees will know of the appointment, and a little something about the new employee?	22	18	5	0

5 the number of responding craftsmen who indicated that they have received "oral" instructions. This is not to say that there should not be oral instructions, but the tendency is for oral instructions to replace

written instructions. Frequently in special cases it will be necessary to utilize oral instructions for supplementary purposes, but they should never be permitted to replace written instructions. In this respect it may be that Gresham's Law could be applied to communications.<sup>91</sup> In any case, it is not difficult to preconceive the affects of oral instructions on a work order; the worker will simply lose faith in the work order because he knows that eventually he will be given oral instructions.

In Table VII the participation question is supposedly number 15. In such a situation the production employee is given the opportunity of frank and open discussion with his immediate supervisor about production and other matters of importance to him.

A considerable amount of oral instruction is typical in small plants, and the responses to question 5 were not surprising to the student. The primary factor involved here is that the industry is composed of small units, and decentralization is the general practice rather than the exception. As previously discussed, in a plant that is decentralized, each department or part of the process is controlled almost entirely by a supervisor or foreman. Although such a system of control, usually referred to as "foreman control," has definite disadvantages as volume of work and number of employees increase, it does provide the

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<sup>91</sup>A definition of Gresham's Law may be found in Harold S. Sloan and Arnold J. Zureher, A Dictionary of Economics (New York: Barnes & Noble, Inc., 1958), pp. 146-47. The idea of its application to communications is my own, and if Spencer can coin such phrases as "survival of the fittest," and Darwin "natural selection," I see no legitimate reason why I may not designate the idea as "Hill's Law of communications."

Table VII. Stripper, Platemaker, and Stoneman Questions Concerning Communications, Participation, and Instructions

No.	Question	Responses			
		Craftsman		Panel	
		yes	no	yes	no
5	Have you ever received "oral" instructions concerning your work?	24	1	4	1
6	Have you ever received a written description of your job, informing you exactly what your duties and responsibilities are?	1	24	4	1
7	Have you ever received instructions about a particular job you were working on from two different persons?	18	7	4	1
12	Does the company require new employees to familiarize themselves with company policy by reading various rules and regulations sometime during the first few days after they report for work?	3	22	3	2
14	How often do you sit down with your supervisor and discuss your job, the progress you are making, and other job matters of importance to you?	20	5	5	0
15	In your opinion, do you think your supervisor is performing his job well?	22	3	5	0

department foremen and employees the opportunity of becoming well acquainted with the other's abilities and limitations. This makes it possible for the department foreman to utilize equipment and personnel more effectively.



### Special Printing Communications Forms

As the size of a printing firm increases, there is a tendency toward more centralized control of the process, which necessitates the use of more printed control forms. Whereas oral instructions are the general rule in small plants, special control forms are typical of larger shops. Shown in Figure 19 is a special change notice form used in a combination offset-letterpress commercial printing company employing 150 persons. Observe in the third line that "verbal changes cannot be accepted." Notice also the routing instructions at the bottom of the form. This particular form is a triplicate, carbon interleaved snap-out.

The control functions performed by the department foreman in a small shop are performed by a centralized production control department in a large shop. Shown in Figure 20 is a press reservation, schedule request and delivery confirmation form used in a commercial printing company employing 350 persons. This form is also a triplicate, carbon interleaved snap-out, and is used primarily to reserve press time. In a small shop this would be determined by the pressroom foreman.

With centralized control, a stock order as shown in Figure 21 is generally used to assure that paper stock will be delivered to the pressroom at the proper time and there will be no delay. Such a form is completed by the centralized production control department when the job is accepted, and sent immediately to the stock room. Figure 22 is the same type of form but is called a cutting ticket, and includes not only stock information but also cutting instructions.

The spoilage report as shown in Figure 23 is almost always used

## SPECIFICATION CHANGE NOTICE

All instructions not on the original job ticket must be submitted on this form. Submit via the Service Department. **VERBAL CHANGES CANNOT BE ACCEPTED.**

To \_\_\_\_\_ Date \_\_\_\_\_ (AM) (PM)  
 Re: Job No. \_\_\_\_\_ Customer \_\_\_\_\_  
 Job Description \_\_\_\_\_ Salesman \_\_\_\_\_

### MAKE THESE CHANGES

- ☐ Not on Original Ticket  
☐ Changes from Original Ticket  
☐ Involves Additional Cost (see below)

Illustrate as necessary:

#### AUTHORIZATION FOR ADDITIONAL COSTS

The above changes cost approximately \_\_\_\_\_ per estimate by \_\_\_\_\_

- ☐ To be charged to Customer  
☐ To be charged to Rose

Authorized by \_\_\_\_\_  
 Authorized by \_\_\_\_\_

Comments \_\_\_\_\_

Changes Ordered by \_\_\_\_\_

Changes Received by \_\_\_\_\_

Noted on Job Ticket by \_\_\_\_\_ Date \_\_\_\_\_

**ROUTING:** Triplicate copy retained by Salesman. Original and duplicate submitted to Service where the duplicate will be given to Production and the original to Accounting to be affixed to the job cost summary sheet.

Figure 19. Special change notice form used in a plant  
employing 150 persons

# **PRESS RESERVATION, SCHEDULE REQUEST AND DELIVERY CONFIRMATION**

To:.....Date:.....  
 From:.....Confirm By:.....  
 Type of Reserve: ☐ Orange ☐ Yellow ☐ Schedule Required ☐ L.P. ☐ Offset  
 Customer:.....  
 QUANTITY:.....JOB TITLE:.....  
 No. of Pages:.....Trim Size:.....No. of Colors:.....  
 Copy Due:.....(☐ Type copy — ☐ Camera copy) Time Required for OK of Proof.....  
 ART REQUIRED: ☐ Layout ☐ Photography ☐ Pasteup ☐ Colored Art ☐ None  
 PROOFS REQUIRED: Type Proofs: ☐ Galleys ☐ Page ☐ Repros ☐ Engraving ☐ None  
 Offset Proofs: ☐ Brown Print ☐ Ozalid ☐ Diazo ☐ Color Proofs ☐ None  
 Stock Due:.....Positives Due:.....Outside Finishing Required?.....  
 Shipping Date (From K-C).....(☐ complete — ☐ partial) (If partial shipment, how many needed in first shipment?.....When does balance ship?.....

**IF JOB HAS BEEN ESTIMATED, ATTACH ESTIMATE TO THIS REQUEST!!!!**

**IF NO ESTIMATE AVAILABLE, FILL IN FROM LAST COST SHEET OR SEE PLANNING!!!**

Refer to Est. No. ....attached! Refer to folio.....  
 PRESS HOURS REQUIRED: Press No. ....Hours:.....  
☐ Press Perforate? Press No. ....Hours:.....  
☐ Diecut + Score? Press No. ....Hours:.....  
 Press No. ....Hours:.....

## **FINISHING OPERATIONS:**

Fold.....Hours on.....	Cut.....Hours (Flat)
.....Hours on.....	.....Hours (Brackett)
Stitch.....Hours ( <input type="checkbox"/> Side — <input type="checkbox"/> Saddle)	Score.....Hours
Gather.....Hours	Perforate.....Hours
Punch.....Hours	Count.....Hours
String.....Hours	Seal.....Hours
Pad.....Hours	Address.....Hours
Banding.....Hours	Inspect.....Hours
Other.....Hours	Tipping.....Hours

If no estimate is available, will one be made?.....When?.....  
 SALE TO BE VERIFIED BY.....OTHERWISE CANCEL RESERVE

Reserve confirmed, as requested, by.....Date:.....  
 (signature)  
 Schedule Issued by.....Date:.....  
 (signature)  
 Requested Date Refused by.....Date:.....  
 (signature)

Best date we can make based on above data and existing load is.....

**SPECIAL NOTES:**

**Figure 20. Form used to reserve press time, schedule request and delivery confirmation in a plant employing 350 persons**

<h2 style="margin: 0;">STOCK ORDER</h2> <p style="margin: 0;">Circle dept. for which intended and deliver stock as indicated below to</p> <p style="margin: 0; text-align: center;"> <b>JOB PRESS—COMP. ROOM—PRESS ROOM—F. &amp; B.—OFFSET</b>  <b>RULING—BINDERY—OFFICE—STATIONERY</b> </p>				Job No. _____ For _____ _____ _____ Quantity _____	
<div style="display: flex; justify-content: space-around;"> <span>19</span> </div>					
QUANTITY		SIZE SHEET	RM. WT.	COLOR, GRADE, ETC.	CUT TO SIZE
Reams	Sheets	X			X
		X			X
		X			X
		X			X
		X			X
		X			X
		X			X
		X			X
		X			X
		X			X
		X			X
		X			X
		X			X
Special stock ordered from _____		Paper Co. _____		Date Delivered _____ By _____ Stockman	

Figure 21. Centralized control paper stock order form

<h2 style="margin: 0;">CUTTING TICKET</h2>				No 16065	
LITHO <input type="checkbox"/> LP <input type="checkbox"/>		ORDERED _____ <input type="checkbox"/>		IN STOCK <input type="checkbox"/>	
Job For _____			Need _____ A.M. P.M.		
Cut _____	Sheets of _____	X _____	Color _____	Sub. Weight _____	Ream Weight _____ lbs.
	Cut to . . .	X _____	= _____ Up		per _____
	Getting . . .	X _____	= _____ Out Press Size		Cost _____
Cut _____	Sheets of _____	X _____	Color _____	Sub. Weight _____	Ream Weight _____ lbs.
	Cut to . . .	X _____	= _____ Up		per _____
	Getting . . .	X _____	= _____ Out Press Size		Cost _____
Cut _____	Sheets of _____	X _____	Color _____	Sub. Weight _____	Ream Weight _____ lbs.
	Cut to . . .	X _____	= _____ Up		per _____
	Getting . . .	X _____	= _____ Out Press Size		Cost _____

Figure 22. Cutting ticket used in centralized control as paper stock order form and cutting instructions

Fill out in duplicate and turn in to Plant Superintendent.

## **SPOILAGE REPORT**

Job No. \_\_\_\_\_ Customer \_\_\_\_\_

Spoilage occurred due to the following reason: \_\_\_\_\_  
\_\_\_\_\_

The following is necessary to correct the job: \_\_\_\_\_  
\_\_\_\_\_

Permanent Spoilage Job. No.	<input type="checkbox"/> Complete Spoilage	Cost \$ _____
To be filled in by Prod. Office	<input type="checkbox"/> Partial Spoilage	Cost \$ _____

Date \_\_\_\_\_

Original to Prod. Office. Duplicate to Acctg. after fully completed. Signed \_\_\_\_\_

Figure 23. Sample of spoilage report form



in larger firms, and the form in Figure 23 is presently being used by a company employing 150 persons. However, there are many plants employing as many as 100 persons which do not maintain spoilage records and which are not aware of their spoilage costs. The student is of the belief that every print shop (other than one-man operations) should maintain spoilage as well as waste records.

#### Table VIII. Pressmen Questions and Responses

The relationship of communications to instructions is clearly indicated in Table VIII. Question 19 is a participation question, and the responses are typical of plants having foreman control. The responses to question 22 in Table VIII are similar to those in Table VII for question 15. The questions are identical, differing only in that they were addressed to different craftsmen. The responses to these two questions are typical of plants with decentralized production control.

#### Table IX. Terminology

Each of the three questionnaires that were mailed contained a question concerning terminology. The questions and responses are shown in Table IX. Refer to the table footnotes for panel responses to the questions in Table IX.<sup>92</sup>

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<sup>92</sup>According to J. L. Vaughan, "Literature as Case History For Business," Advanced Management, Vol. XXV, No. 2 (Feb. 1960), p. 19, even Socrates insisted on adequate definition of terms.

Table VIII. Offset Pressman and Letterpressman Questions Concerning Communications, Participation, and Instructions

No.	Question	Responses			
		Pressmen		Panel	
		yes	no	yes	no
8	Have you ever spoiled or otherwise ruined a job because of inaccurate information or instructions on the work order or job ticket?	20	5	3	2
14	How often do you receive "oral" instructions concerning your work?	25	0	3	2
19	Do you often sit down with your supervisor and discuss your job, the progress you are making, and other job matters of importance to you?	21	4	5	0
21	Within the last six months, were you up in the front office and talked to the top executive of the company?	16	9	2	3
22	In your opinion, is the supervisor of the pressroom doing a good job?	23	2	5	0

Table IX. Questions to Management and Craftsmen  
Concerning Terminology<sup>a</sup>

Question number	Question	Replies <sup>b</sup>	
		yes	no
Mgt. 26	The definition of printing terms usually differ from shop-to-shop. In your opinion, what is the definition of the "stripping" term <u>paperline</u> ?	17	9
Stripper number 18	The "paperline" is a line marked on a flat, parallel to the gripper edge of the flat and up from the gripper edge a distance necessary for the plate to be clamped on the press plate cylinder. In your opinion, what is the importance of the paperline insofar as the pressman is concerned?	12	3
Pressman number 20	The definition of printing terms usually differ from shop-to-shop. In your opinion, what is the definition of the press term "slur?"	17	8

<sup>a</sup>Except for Management question number 26, in which the panel voted 4 to 1 that managers should know the definition, the vote was unanimous in favor of craftsmen knowing the terms asked.

<sup>b</sup>It is obvious upon examination that the questions cannot be answered simply yes or no. The student has interpreted the respondents reply as to whether or not respondent's answer was yes or no.

#### Chapter IV Conclusions

What could a student possibly say that would conclude a thesis chapter pertaining to communications, participation, and instructions? Not only in a commercial enterprise, but in life itself, are these things never concluded. Examine the index of practically any book listed in the bibliography of this thesis, and you will undoubtedly find communications.

When man came down from the trees he did not first begin to make textiles as some would lead you to believe. Instead, he began to communicate--even though it may have been nothing more than a pile of rocks to mark a spot where a deer had been killed or to signify some other important event.

The tables in the chapter have been discussed to some extent, but in most cases they are clear upon examination and need no further elucidation. Various conclusions have been made throughout the chapter and not much remains to be stated. There has been no intention to persuade anyone either for or against the contents of this paper, especially Chapter III. The student recommends that his word not be taken for anything that has been considered, but one should go forth for himself and listen, examine, and observe, then derive his own conclusions. In time to come, the realization will present itself that many things are capable of being learned by observation.

Although scientific methods, in general, are the topics of this thesis, it would seem that one should also become extensional oriented. This is another verbose way of stating that a person who aspires to be a

manager, especially a printing manager, should be predisposed to observation first, and then to construction of written and even oral strategy to correspond with the observations.<sup>93</sup> Admittedly, the technique has limited use in the printing industry because observation would generally acquaint you with what not to do rather than what actually should be done.

One of the greatest extensionalists in history (in the student's opinion) was Galileo. He refused to be controlled by the postulates of his time, and went instead to observe for himself. One of his books, Dialogue Concerning the Two Chief Systems of the World, placed him in danger of being burned at the stake for heresy. Nevertheless, he said:

Not even God can prevent my reason from seeing what it sees, but . . . I can withdraw my public adhesion from it to avoid scandal among the faithful.

One of these postulates was "The Aristotelian Law of Falling Bodies," which had stood unquestioned and unchallenged for nineteen centuries. But Galileo had to observe for himself, and proceeded to climb the Tower of Pisa with two metal spheres, one weighing a hundred times that of the other. With these two metal balls he exploded the "Law" and started the world thinking about a new theory of gravity.<sup>94</sup>

Go and do likewise, because "you can see a long way when you

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<sup>93</sup>Haney, op. cit., p. 174.

<sup>94</sup>Lane Cooper, Aristotle, Galileo, and the Tower of Pisa (Ithaca, New York: Cornell University Press, 1935), pp. 15-22. The experiment supposedly took place in 1591, and the balls were dropped from the 70th tier of arches of the tower.

See also Giorgio De Santillana, The Crime of Galileo (Chicago: University of Chicago Press, 1955), pp. 292-321.



stand on the shoulders of a great man."<sup>95</sup>

The first requirement of a lucrative observer is to ask educational questions. Never criticize, for criticism alone is not enough. It is an indispensable element in most sound thinking, but it must not be practiced for itself.

The statements contained in this section and most of the philosophical ideas are the writer's, and are based primarily on personal observations. To many, I'm afraid, they will be thought of as only useful generalizations, which may or may not be true. The point to be made here is not whether businessmen agree or disagree as to company objectives, but one of methodology. And although scientific methods have been emphasized from the beginning, they are not as appropriate in printing as in other manufacturing activities. The factors responsible for this situation have previously been discussed. There remains only the recommendation to go into the "sleeping Giant" (a contemptuous label applied to the printing industry by those whose research expenditures far exceed the industry's) and observe.

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<sup>95</sup>The quote is attributed to Isaac Newton, whose laws of motion are based on Galileo's book Dialogues of Motion, published in 1636.

Galileo has been dead since January 8, 1642, the same year that Newton was born. Some 320 years have now passed since the death of Galileo, and many historians consider him the founder of experimental science.

## CHAPTER V

## WORK ORDERS

Introduction

The basic control form in a printing plant is the work order.<sup>96</sup> It is frequently referred to as a job ticket, production order, job jacket, and by various other terminology. It may range in format from a plain number 10 envelope to an elaborate and detailed form as shown in Figure 25 or Figure 27.

Throughout this chapter the term "work order" will be used mainly because the discussion is limited to instructional forms from which craftsmen are able to perform the work required. From an academic standpoint at least, a production order is a form authorizing the manufacture of a specific quantity of an item, and occasionally instructions will be incorporated with the authority. This chapter pertains to work orders as instructional devices, and not as orders to initiate an operation to produce a given quantity of an item.

During the period of this study, 38 work orders, job tickets, production orders, and job jackets were accumulated. More than 200 printing control, communications, and other forms were also collected. Several of these are shown in a special section in the preceding chapter. Subsequently, Chapter V will pertain only to work orders as instructional devices for craftsmen.

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<sup>96</sup>Ipsa facto. This is one of the conditions that will be evident upon observation of the "sleeping giant."

## CHAPTER V

## WORK ORDERS

Introduction

The basic control form in a printing plant is the work order.<sup>96</sup> It is frequently referred to as a job ticket, production order, job jacket, and by various other terminology. It may range in format from a plain number 10 envelope to an elaborate and detailed form as shown in Figure 25 or Figure 27.

Throughout this chapter the term "work order" will be used mainly because the discussion is limited to instructional forms from which craftsmen are able to perform the work required. From an academic standpoint at least, a production order is a form authorizing the manufacture of a specific quantity of an item, and occasionally instructions will be incorporated with the authority. This chapter pertains to work orders as instructional devices, and not as orders to initiate an operation to produce a given quantity of an item.

During the period of this study, 38 work orders, job tickets, production orders, and job jackets were accumulated. More than 200 printing control, communications, and other forms were also collected. Several of these are shown in a special section in the preceding chapter. Subsequently, Chapter V will pertain only to work orders as instructional devices for craftsmen.

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<sup>96</sup>Ipsa facto. This is one of the conditions that will be evident upon observation of the "sleeping giant."

### Work Order Selection Criteria

The accumulated work orders were divided into four similar groups.<sup>97</sup> Each group was mailed to a panel member who was to analyze and select the three most appropriate work orders according to the following criteria:

- (1) For a plant with 19 employees or less.<sup>98</sup>
- (2) For a combination offset-letterpress plant.
- (3) A work order to be used primarily as an instructional device for craftsmen who were to work on the job, and not as a cost or estimate sheet.
- (4) If possible, the work order should not require supplementary oral instructions.

### Panel Work Order Selections<sup>99</sup>

(1) The first panel member to return the work orders sent him selected three similar to the one shown in Figure 24, which was his first choice. All three were of the same general format, and all were kraft

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<sup>97</sup>Each group contained orders of a similar nature. That is, all four groups contained small and large kraft envelopes, simple work orders on which practically all job information was filled in, snap-out forms, and complicated flat sheets which included check lists, as the work order shown in Figure 27.

The reason for only four work order groups was that one group of 14 work orders was sent to two different panel members for comparison purposes.

<sup>98</sup>This category includes approximately 84 per cent of the printing plants in the United States. Supra, footnote 12.

<sup>99</sup>The panel member comments are numbered in this section according to the order in which the work order groups were returned, and to provide a convenient method of reference when discussing and comparing the selections and comments of the two panel members who were sent the same group of work orders. Panel member comments number (1) and (5) in the listing received the same group of work orders.

envelopes large enough to enclose  $8\frac{1}{2} \times 11$  inch copy. Examine the work order in Figure 24. Practically all information pertaining to a job must be written in. The panel member's rationale for his selection was excellent. In his opinion, under the criteria imposed, the work orders (the three selected) are all very simple to complete, and are well suited to small shop printing.

(2) The second group of work orders were returned almost immediately, and the panel member selected only the one shown in Figure 25. Observe that this work order is complicated and contains much detail. The original size of this work order was  $9\frac{1}{2} \times 14\frac{1}{2}$  inches. Information is not available as to the size of the plant where this work order was used, or the type of printing performed. However, if it is examined in detail, it is evident that it is a publisher's production order, and probably used in a plant specializing in bookwork (books of novel length, magazines, and other printing involving numerous pages, large press sheets, and considerable folding).

Although the criteria of selection was identical for all four groups of work orders, observe the tremendous difference in the orders shown in Figures 24 and 25.

(3) In the third group of work orders returned, the panel member selected a  $9 \times 12$  inch kraft envelope with a format similar to the work order shown in Figure 26. Notice that the order in Figure 26 is only slightly more detailed than the work order shown in Figure 24. In both cases the information concerning the job must be written in.

(4) Figure 27 was the first choice of the fourth panel member to return work orders. The original order was a flat sheet, printed one



# JOB TICKET

Sold To \_\_\_\_\_

Ship To \_\_\_\_\_

Date \_\_\_\_\_

Job No. \_\_\_\_\_

Customer's \_\_\_\_\_

Order No. \_\_\_\_\_

Promised \_\_\_\_\_

Salesman \_\_\_\_\_

Terms: Net cash thirty days

Quantity Ordered	Quantity Delivered	ITEM DESCRIPTION AND SIZE	Form No.	Price	

SET BY: \_\_\_\_\_ FILED: (Location) \_\_\_\_\_ LOCKED UP BY: \_\_\_\_\_

COMPOSING	
STOCK	
PRESS ROOM	
BINDERY	
SPECIALS PACKAGE	

Figure 24. Example of simple kraft envelope work order on which all job information must be written in

Title Edition — Text		Edition — Specia.		Code N Press Order	
PRESSWORK	Text	Forms Imposition Color of ink Margins: Back, single	Head, single	plus trim of	Presswork class Bleed-off class
	Maps	Bleed-off trims: Gripper	Tail	Gauge end	Off end
	Inserts	Forms Colors Margins: Back, single Bleed-off trims: Gripper	Head, single Tail	plus trim of Gauge end	Off end
	Special	Forms Colors Margins			
Title		Date	Quantity	Code No. Binding Order	
Binding Style		Meet state spec.	Trimmed pp.	Untrimmed pp.	Imp. Date
PAGES	Front matter text Print-ins End matter		Special Press Instructions		
	Blanks at end (cut off leave) Total paper pages				
	See list for location of print-ins and inserts.				
	End papers—front —back		plain plain	printed printed	
PAPER	Text	Basis waste		Map Form	Basis waste
	Inserts	Basis waste			Basis waste
	Dummies				
	Sets		Printing marks		
BINDING	Stamping				
	Cut.	Text: Maps: Inserts:	sheets to cut as sheets to cut as sheets to cut as	Special	
	Folding	Text: Maps: Inserts:	sheets as sheets as sheets as	Special End papers	
	Gathering	End papers—plain or printed Taping (and papers first sig. and last sig.) with No. Inserts: Pastings (see list) outside Guarding No. inserted No. wires		1-cut No. gathered	2-cut center Total units
	Sew.	Sew as Stitching—Singer	McCain	Smashing	Bulk not to exceed
	Forward.	Untrimmed size Trim to Lining-up: Headbands Tinting	3 sides Inside super Gilding	rough at trim Gluing Outside super	fore trim Back-flat Paper loose
	Covermaking	Cloth Dies Stamping—Total impressions Blank Ink Gold (imitation, real)	Board— side side side	shelfback shelfback shelfback	reverse reverse reverse
	Special Bindery Instructions				
Prepared by		Approved by		Stock Control Dept.	

Figure 25. Publisher's production order, a complicated type work order used by printing plants specializing in bookwork

side only in a light brown ink. The panel member's second and third selections were similar in format, although the work order shown in Figure 27 was the most complete and detailed of all 38 work orders mailed to panel members.

Observe the check lists on the order shown in Figure 27. (A check list is a list of operations or instructions where only a small square box is checked instead of writing in the information.) There are several, and such check lists are generally effective. For example, notice in the LITHO section the check list of imposition instructions, which is also found in the composition and letterpress section. Such a check list was found on only four of the 38 work orders collected and examined. Notice also the section near the bottom "Additional Instructions To Any Department," which indicates to the student that the work order was the product of good planning.

In the student's opinion, the work order shown in Figure 27 is the most appropriate order under the criteria imposed. It should, however, be printed on the reverse side with labor and material cost information.

The first and fifth panel members were sent the same group of 14 work orders. The first panel member selected Figure 24 as the most appropriate work order. The fifth panel member did not select the same work order, but one slightly more detailed and resembled the order shown in Figure 26.

Both panel members who were sent the same group of work orders were influenced primarily by the first criteria imposed (select a work

<b>JOB No.</b>	Date Received	Date to be Shipped	Date Billed	CREDIT OK				
<b>FOR</b>				Customer's Order No.				
<b>Address</b>				Salesman				
				Code				
<b>DESCRIPTION</b>								
TRIMMED SIZE								
<b>STOCK</b>								
Inside Stock								
Bindery Stock								
Electrotypes								
Outside Purchases								
<b>COMPOSITION</b>  Special Instructions           Send Proofs to  <table border="1" style="width: 100%;"> <tr> <td>Date Sent</td> <td>Corr. Rec'd</td> </tr> <tr> <td>Corr. Proofs Mailed</td> <td>Date OK Received</td> </tr> </table> Lockup	Date Sent	Corr. Rec'd	Corr. Proofs Mailed	Date OK Received	<b>PRESS WORK</b>  INSIDE  PRESS    INK       COVER  INK       <b>IMPORTANT—give complete instructions on each form— Color of Ink, etc.</b>	<b>BINDING</b>  Folding  Stitch  Perforate  Punch  Binding  Trim  Number from _____ to _____  Number To Pad  WRAPPING or MAILING INSTRUCTIONS		
Date Sent	Corr. Rec'd							
Corr. Proofs Mailed	Date OK Received							
<b>SHIPPING INSTRUCTIONS</b>								
Ship to		Address						
Ship Via	EXPRESS	FREIGHT	PARCEL POST	OUR TRUCK				
Collect	Prepaid	Collect	Prepaid					
REMARKS				F.O.B.  NUMBER SHIPPED				

Figure 26. A simple kraft envelope work order on which practically all job information must be written in

<input type="checkbox"/> New Job <input type="checkbox"/> Rerun    Old Ticket No. _____ <input type="checkbox"/> Quoted		<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>	
Date _____		Delivery Date <span style="border: 1px solid black; padding: 2px 20px;"> </span> Salesman _____	
Customer _____		Proof To _____	
Address _____		Type of Proof _____	
City _____ P. O. No. _____		Date Wanted _____	
		Date Sent _____	

<b>DESCRIPT.</b>	Quantity _____	Form No. _____	Trim Size _____
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<b>STOCK</b>	Stock Furnished _____ <input type="checkbox"/> Litho <input type="checkbox"/> Letterpress		MULTIPLE FORM				
	Inside	<u>BOOK</u>	Part No.	Sub.	Color	Kind & Size	Part Name
	Kind	Color	Sub.	1			
	Cover			2			
	Kind	Color	Sub.	3			
	Other			4			
	Kind	Color	Sub.	5			
	Kind	Color	Sub.	6			

<b>COMPOSITION</b>	<input type="checkbox"/> Set	<input type="checkbox"/> Dies From	<input type="checkbox"/> File Form
	<input type="checkbox"/> Standing	<input type="checkbox"/> Press Perf. <input type="checkbox"/> Dry <input type="checkbox"/> Ink	<input type="checkbox"/> Kill Form
	<input type="checkbox"/> Outside Comp.	<input type="checkbox"/> Die Out	<input type="checkbox"/> Print _____ Sides
	<input type="checkbox"/> 1/2 Tone From	<input type="checkbox"/> Emboss	<input type="checkbox"/> Wk. & Tumble
	<input type="checkbox"/> Line Cut From	<input type="checkbox"/> Score <input type="checkbox"/> Dry <input type="checkbox"/> Ink	<input type="checkbox"/> Wk. & Turn
	<input type="checkbox"/> Electro From	<input type="checkbox"/> Rough Proof	<input type="checkbox"/> Wk. & Back
	<input type="checkbox"/> Pen Rule From	<input type="checkbox"/> Repro Proof	

<b>LETTERPRESS</b>	<input type="checkbox"/> Kluge <input type="checkbox"/> Heidelberg <input type="checkbox"/> Vertical <input type="checkbox"/> Simplex	Number From _____ To _____	
	Press Size _____ X _____ Run _____ Sheets _____ Up _____	Press Count _____	Remarks:
	Press Size _____ X _____ Run _____ Sheets _____ Up _____	Press Count _____	
	Press Size _____ X _____ Run _____ Sheets _____ Up _____	Press Count _____	
	Color Ink & Kind _____ Quantity _____		
	<input type="checkbox"/> Perf.	<input type="checkbox"/> Print _____ Sides	Date _____ Pressman _____
	<input type="checkbox"/> Die	<input type="checkbox"/> Wk. & Tumble	
	<input type="checkbox"/> Emboss	<input type="checkbox"/> Wk. & Turn	
<input type="checkbox"/> Score	<input type="checkbox"/> Wk. & Back		

<b>LITHO</b>	<input type="checkbox"/> 17x22 <input type="checkbox"/> 20x25 <input type="checkbox"/> 22x34-SC <input type="checkbox"/> 22x34-TC <input type="checkbox"/> Mult. No. Plates on Job _____	<input type="checkbox"/> Brown Print <input type="checkbox"/> Color Proof
	Press Size _____ X _____ Run _____ Sheets _____ Up _____	Press Count _____
	Press Size _____ X _____ Run _____ Sheets _____ Up _____	Press Count _____
	Press Size _____ X _____ Run _____ Sheets _____ Up _____	Press Count _____
	Color Ink & Kind _____ Quantity _____	
	Plate No. _____	<input type="checkbox"/> Print _____ Sides
	Negative No. _____	<input type="checkbox"/> Wk. & Tumble
	<input type="checkbox"/> S&R	<input type="checkbox"/> Wk. & Turn
Negatives From _____	<input type="checkbox"/> Wk. & Back	Date _____ Pressman _____
Plates From _____		

<b>BINDERY</b>	<input type="checkbox"/> Pad _____ Side _____	<input type="checkbox"/> Gather	Punch or Drill	<b>SHIPPING</b>	<input type="checkbox"/> Wrap _____ Package	<b>BILLING</b>	Art Work
	<input type="checkbox"/> Fold		<input type="checkbox"/> Round <input type="checkbox"/> Slot		<input type="checkbox"/> Band In		Composition
	<input type="checkbox"/> Perforate		Drill _____ Size		<input type="checkbox"/> Return		Cuts or Half Tones
	<input type="checkbox"/> Score		On _____ Centers		<input type="checkbox"/> Art <input type="checkbox"/> Negs. <input type="checkbox"/> Cut		Printing
	<input type="checkbox"/> Rd. Cor. _____ Cor.		Side		<input type="checkbox"/> Comp. <input type="checkbox"/> _____		Alterations
	<input type="checkbox"/> Snap Out		<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3		Delivered		Total
	<input type="checkbox"/> Stitch		<input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6		Via _____		Sales Tax
	<input type="checkbox"/> Tip In		Tag Bind		Samples To _____		Gov't. Postcards
<input type="checkbox"/> Drawn Cover <input type="checkbox"/> Hard Bind <input type="checkbox"/> Marble or Press Board Bind			PLACE 3 COPIES IN TICKET	Gov't. Envelopes			
Additional Instructions To Any Department				Invoice No. _____  Shipping Total _____			

<b>BILLING INSTRUCTIONS</b> _____ _____ _____	<b>SHIPPING INSTRUCTIONS</b> Ship To _____ Prepaid <input type="checkbox"/> Collect <input type="checkbox"/> Via _____
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Figure 27. Example of extremely complicated and detailed flat sheet work order. Printed in light brown ink and used in a plant employing 150 persons



order for a small plant), and were aware of the fact that the industry is composed primarily of small units. Both panel members also agreed that a work order should be an instructional device, and should not require supplementary instructions except in unusual circumstances. They also suggested that both sides of a work order should be printed, and a record of labor costs and materials be kept of the job on the same form.

(5) The fifth panel member's selection of the most appropriate work order was a kraft envelope, but he commented that it could just as well be a flat sheet used in conjunction with an envelope that has not been printed. In this way the flat work order could be filed and the envelopes re-used. The work order envelope usually serves not only as an instructional device and to protect copy, but also for filing sample copies of the completed order. If sample copy files are not maintained, or are kept by other methods, then it is not necessary that printed envelopes be used as work orders.

## Chapter V Conclusions

As with the work performed by the printing industry and management methods utilized, work orders vary in format, size, and information contained. There is no one work order that could be considered typical or generally used by the industry, although the small plant tends to favor the 9x12-inch kraft envelope on which practically all job information is written in.

The work order used by a printing plant depends on many factors, among the most important are the number of persons employed, the

complexity and variety of the work performed, degree of specialization, and physical size of the plant. To a large extent, the work order is just another control form--control the form and you control the order, the process, and the personnel performing the work. This is a conservative view and an over-simplification of manufacturing control generally known as form control, but is basically what takes place.

It is evident that as the work required becomes more complicated and expensive, the necessity for written instructions increases in importance. If an order of printing is complicated and must be performed in a precise way (which is generally the case), only written instructions are economical. High hourly cost rates cannot be reduced with verbal instructions.

Although there is no such thing as a standard work order that would function effectively in the entire printing industry, there is, nevertheless, a considerable amount of information necessary on a work order that is subject to standardization. For example, regardless of other factors, the plates (whether offset or letterpress) must be printed on a press. An offset pressman must have certain information before he can print a job (see Appendix C, question 9), and this information includes the number of plates, number of impressions per plate, kind of imposition, press sheet size, and color of ink. An assumption is made concerning this information (generally an exceedingly optimistic assumption); that the plates (offset) contain control marks, otherwise the pressman would not be able to determine which edge of the plate was

the gripper, nor could he position the image properly.<sup>100</sup>

The pressman information previously mentioned is the minimum necessary to print, but if the pressman is to perform any work other than operate a press, such as cut paper stock or make plates, he will of course require additional information. At the same time, however, if a production control department makes arrangements and schedules the paper stock to arrive at the press when needed (through the use of stock control forms as shown in Figures 21 and 22), it will not be necessary for the pressman to have advanced knowledge of the press sheet size.

The same work order planning approach can be utilized in many other areas of a work order from which the conclusion can be drawn that there is a specific amount of information for each separate department that must be included on the work order. Additional instructions will vary with working conditions and various other factors.

Under the criteria imposed, a majority of the panel considered the most appropriate work order similar to Figure 26 in format, and would be a kraft envelope printed on both sides. Time and materials should be recorded on one side of the envelope, and job instructions on the other. The envelope is generally large enough to enclose copy as large as 8½x11 inches.

The controlling criteria imposed was that the work order was for a small plant. However, two panel members selected detailed work orders (Figures 25 and 27), and commented that regardless of plant size, there

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<sup>100</sup>Donald E. Hill, "S.O.P. For Stripping: Control Marks," Modern Lithography, Vol. XXIX, No. 9 (September 1961), pp. 48-51.

was information basic to a well planned work order.

A majority of the panel also agreed that the work order should be an instructional device, and supplementary "oral" instructions should be kept to a minimum.

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## APPENDIX A

## MANAGEMENT COMMENT AND OPINION SHEET

(Plant executives, plant managers, production control supervisors, and other management personnel familiar with plant methods and procedures, and company policy)

## INFORMATION FOR COMPLETING THIS FORM

This form may be filled out by any management person familiar with overall plant operation and company policy. Please comment as fully as possible on every question. If you need more space, attach additional sheets and number replies the same as the question number. DO NOT sign your name or the name of the company. When you have completed the form, return it in the self-addressed, stamped envelope, furnished for your convenience. This is not a study by an undergraduate college student, but by a graduate student in Printing Management with almost nine years experience in the printing industry. This study will not be used for any commercial purposes, but as a basis for a graduate thesis in Printing Management. The information will remain confidential, and individual firms will not be identified. Thank you very much for your cooperation.

1. What is your job title? \_\_\_\_\_
2. How many years have you worked in the printing industry? \_\_\_\_\_
3. How many persons are employed by your company in connection with printing? \_\_\_\_\_
4. Is the plant a union shop? ☐ Yes: ☐ No.
5. Does the plant have a production control system in operation? ☐ Yes: ☐ No. If so, does it utilize a control board of any type? ☐ Yes: ☐ No.
6. Does the company notify customers if promised delivery dates cannot be kept? ☐ Yes: ☐ No.
7. Does the plant have a library for employee use? ☐ Yes: ☐ No.
8. Does the plant have written standard operating procedures? ☐ Yes: ☐ No.
9. Does the company have written job descriptions for each employee? ☐ Yes: ☐ No.

10. Does the company have any apprentices at the present time? ☐ Yes: ☐ No.
11. Has a time study ever been done in your plant? ☐ Yes: ☐ No.
12. Does the company have a suggestion system with monetary rewards for usable ideas and workable suggestions? ☐ Yes: ☐ No.
13. Has the company ever issued an organizational chart of the entire company organization to each employee? ☐ Yes: ☐ No.
14. Does the plant keep maintenance records, indicating the date a piece of equipment will be serviced (oiled, greased, adjusted)? ☐ Yes: ☐ No.
15. Within the last week, have you had a conference or meeting of department heads (foreman or supervisors), for the purpose of discussing various plant work or production problems? ☐ Yes: ☐ No.
16. How often does the company provide for employee performance appraisal? ☐ Once a year: ☐ Twice a year: ☐ Every two years: ☐ Other.
17. Does the company require new employees to familiarize themselves with company policy by reading various rules and regulations sometime during the first few days after they report for work? ☐ Yes: ☐ No.
18. To the best of your knowledge, did the top executive in the company, go into the back shop at any time during the last week, and talk to an employee other than a supervisor or foreman? ☐ Yes: ☐ No.
19. Did you happen to read an article in a printing trade magazine last month? ☐ Yes: ☐ No. If yes, what magazine? \_\_\_\_\_
20. When your company makes an important appointment, is an announcement and other information about the new employee circulated, so that present employees will know of the appointment, and a little something about the new person? ☐ Yes: ☐ No.
21. Does your plant keep any kind of file on new developments in equipment, processes, or methods and procedures? ☐ Yes: ☐ No.
22. In your plant, is there a production control system or department, that can determine the amount of work in the shop, what jobs are actually being worked on, and which jobs will be delivered tomorrow? ☐ Yes: ☐ No.
23. In your plant, how is it determined which jobs will be run on what press, and the sequence in which these jobs will be run? \_\_\_\_\_

- 
24. What system is used in your plant to provide for paper stock to be delivered to the pressroom when a job is ready to be printed? \_\_\_\_\_
- 
25. After a job or part of a job, has been spoiled or ruined, what system or procedure does the plant have for recording this ruined job and reducing future spoilage? \_\_\_\_\_
- 
26. The definition of printing terms usually differ from shop-to-shop. In your opinion, what is the definition of the "stripping" term paperline? \_\_\_\_\_
- 
27. Does the plant work order (job ticket) inform the pressman whether the job is work-and-turn, sheetwise, work-and-tumble, etc? Yes:  
No. If not, how does he receive this information? \_\_\_\_\_
- 
28. Would you enclose a copy of the work order or job ticket now being used, and any other forms, when you return this form? They will not be reproduced or used for any commercial purpose. If you desire to do so, obliterate the company name if it appears on any of the forms.



9. In your opinion, is the work order or job ticket now being used in the plant, a good work order under the circumstances, or do you feel that it should be revised? \_\_\_\_\_
10. Do you happen to own any books concerning printing? \_\_\_\_Yes: \_\_\_\_No.
11. Do you happen to know what the company policy is concerning "tardiness"? \_\_\_\_Yes: \_\_\_\_No.
12. Does the company require new employees to familiarize themselves with company policy by reading various rules and regulations sometime during the first few days after they report for work?  
\_\_\_\_Yes: \_\_\_\_No.
13. Have you ever spoiled or otherwise ruined a job because of inaccurate information or instructions on the work order or job ticket? \_\_\_\_Yes: \_\_\_\_No. If so, what were the causes? \_\_\_\_\_  
\_\_\_\_\_
14. How often do you sit down with your supervisor and discuss your job, the progress you are making, and other job matters of importance to you? \_\_\_\_\_  
\_\_\_\_\_
15. In your opinion, do you think your supervisor is performing his job well? \_\_\_\_Yes: \_\_\_\_No. If not, what would you change if you were the supervisor? \_\_\_\_\_  
\_\_\_\_\_
16. Would you enclose a copy of the work order or job ticket you are now using, and any other forms, when you return this form? They will not be reproduced or used for any commercial purposes. If you desire to do so, obliterate the company name if it appears on any of the forms.





8. Have you ever spoiled or otherwise ruined a job because of inaccurate information or instructions on the work order or job ticket?  
☐ Yes: ☐ No. If so, what were the causes? \_\_\_\_\_

---

9. In your opinion, what is the minimum information a pressman must have before he can print a job? \_\_\_\_\_

---

10. Do you happen to own any books concerning printing? ☐ Yes: ☐ No.

---

11. FOR OFFSET PRESSMEN ONLY: Do you ever have to move the plate cylinder on your press in order to get a proper image position on the sheet? ☐ Yes: ☐ No. If yes, how often? \_\_\_\_\_

---

12. FOR OFFSET PRESSMEN ONLY: How do you feel about the quality of the work of the strippers in your company? ☐ Low quality: ☐ Average quality: ☐ Above average quality: ☐ Excellent quality.

---

13. FOR LETTERPRESSMEN ONLY: How do you feel about the quality of the work of the lock up men in your plant? ☐ Low quality: ☐ Average quality: ☐ Above average quality: ☐ Excellent quality.

---

14. How often do you receive "oral" instructions concerning your work: \_\_\_\_\_

---

15. What procedure do you use to get more stock, if you are printing a job and do not have enough stock to finish it? \_\_\_\_\_

---

16. Has your present job as a pressman ever been studied by a person with a stop watch, who observed your work for several hours, and recorded what you did during that time? ☐ Yes: ☐ No.

---

17. Is your work planned in advance so that you know the next several jobs you are to print on your press? What procedure do you use for selecting the next job to be printed on your press? \_\_\_\_\_

---

18. In your opinion, is the work order or job ticket now being used in the plant, a good work order under the circumstances, or do you feel that it should be revised? \_\_\_\_\_

---

19. How often do you sit down with your supervisor and discuss your job, the progress you are making, and other job matters of importance to you? \_\_\_\_\_

---

20. The definition of printing terms usually differ from shop-to-shop. In your opinion, what is the definition of the press term "slur"? \_\_\_\_\_

---

21. When was the last time you were up in the front office and talked to the top executive of the company? \_\_\_\_\_
22. In your opinion, is the supervisor of the pressroom doing a good job? \_\_\_\_Yes: \_\_\_\_No. If not, what would you change if you were the supervisor? \_\_\_\_\_
23. Would you enclose a copy of your work order or job ticket, or other forms you may be using, when you return this form? They will not be reproduced or used for any commercial purposes. If you desire to do so, you may obliterate the company name if it appears on any of the forms.

## APPENDIX D

## THESIS PANEL MEMBERS

Harold W. Braun, President  
Fetter Printing Company  
P. O. Box 1919  
Louisville, Kentucky  
Recommended by Printing Industry of America, Inc.

Edward H. Christensen, Vice-President of Operations  
Central Typesetting & Electrotyping Company  
4600 Diversey Avenue  
Chicago 39, Illinois  
Recommended by International Association of Printing House  
Craftsmen, Inc.

Gordon R. Ewing, Vice-President and General Manager  
Meredith Printing Company  
P. O. Box 1394  
Des Moines 5, Iowa  
Recommended by Printing Industry of America, Inc.

Edward W. Hill, Technical Director  
Printing Industry of America, Inc.  
5728 Connecticut Avenue, N.W.  
Washington 15, D.C.

George McKiernan, General Manager  
A. Carlisle & Company  
645 Harrison Street  
San Francisco 7, California  
Recommended by Lithographers & Printers National  
Association, Inc.

## APPENDIX E

Work and Turn Impositions

Work and turn is a kind of imposition on which both the front and back page numbers are placed on one flat and the same plate used to print on both sides of a double-sized press sheet, which must be cut before folding. The same gripper edge of the press sheet is used in printing both sides, and the sheet must be turned when backing from side to side. Figures 28A and 28B are examples of work and turn sheet lays. The dotted lines represent the back of the sheet.

Compare the sheet lays in Figure 28 with those in Figure 11, and notice that the major difference is that the lays in Figure 28 have been rotated counter-clockwise one-quarter turn. Observe that the mnemonic device in Figure 28C is the same as the one shown in Figure 12 except that it has been rotated as described.

In Figure 28 the procedure for locating and positioning the pages on the front side of the sheet is the same as for sheetwise impositions as shown in Figure 11. The only difference is that the initial movement is toward the gripper, and the gripper edges of the sheets are down in Figure 28.

Work and turn impositions are frequently utilized in conjunction with sheetwise impositions in bookwork for economical reasons. Shown in Figure 29 is a production planning sheet for a 48-page magazine utilizing one work and turn plate and two sheetwise plates. Notice the method of determining companion page numbers. This is evidently the third issue of this particular magazine because the page numbers begin



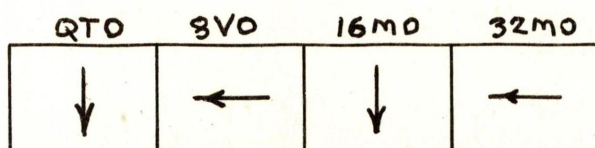


Figure 28C

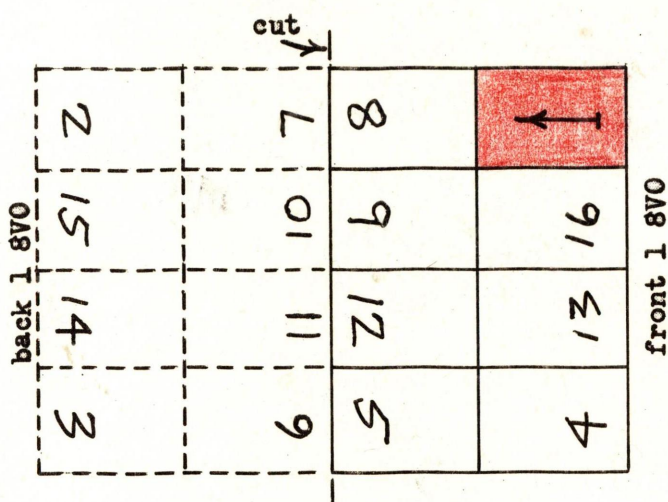


Figure 28B

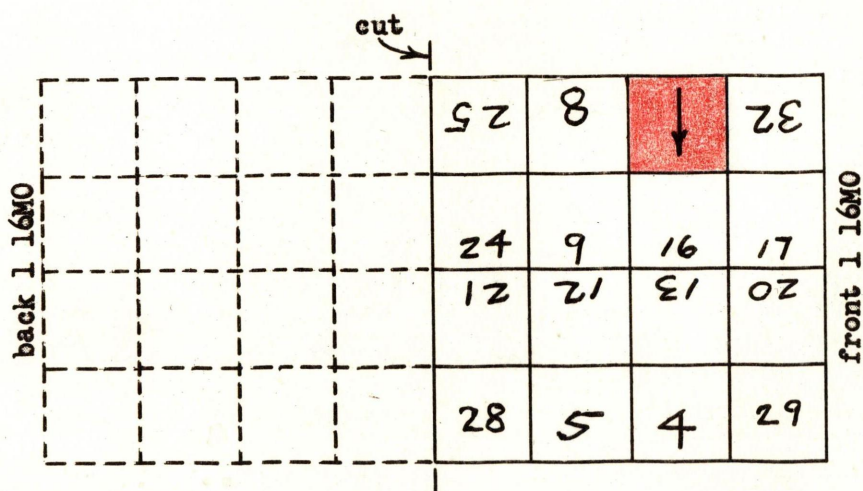


Figure 28A

Figure 28. Work and turn sheet lays and system for incorporating a memory device. Dotted lines represent the back of the sheet. All work and turn press sheets must be cut before folding, and the 16-page work and turn sheet lay is front 1 and back 1 of an 8VO positioned to cut at the center

PRODUCTION PLANNING SHEET		Account <u>NAT. PARKS ASSN.</u>		Description <u>July-August Sept 1958 Magazine</u>	
JOB No. <u>406-9</u>		Paper <u>MAG. COATED</u>	<u>WHITE</u>	Size <u>29x42</u>	Wt. <u>90</u>
Date <u>7-14-58</u>		Cover <u>MAG. COATED</u>	<u>WHITE</u>	Size <u>14 1/2 x 21 1/2</u>	Wt. <u>33</u>
Quantity <u>11,800</u>		No. Pages <u>40 COVER</u>	4 Color <u>I</u>	<u>IV</u> Black	10 3/4 x 14 1/2
Trim to <u>6 3/4 x 9 1/2</u>		Trim to <u>6 3/4 x 9 1/2</u>	Black II	III Black	VERT
Head Trim <u>Scant 1/2"</u>		Head Trim <u>Scant 1/2"</u>			VARNISH COVER
HEADS <u>15</u>		HEADS <u>15</u>			
BACKS <u>9</u>		BACKS <u>9</u>			
Sheet <u>29x42</u>		Sheet <u>29x42</u>			
COVER <u>10 3/4 x 14 1/2</u>		COVER <u>10 3/4 x 14 1/2</u>			
LAY:		LAY:			
Straight <u>32</u>		Straight <u>32</u>			
Parallel <u>16</u> <u>16</u>		Parallel <u>16</u> <u>16</u>			
Sheetwise <u>16</u> <u>16</u>		Sheetwise <u>16</u> <u>16</u>			
Work & Turn <u>16</u>		Work & Turn <u>16</u>			
Tumble		Tumble			
Twist		Twist			
Saddle <u>Cover 16 32</u>		Saddle <u>Cover 16 32</u>			
Side Wire		Side Wire			
Sew		Sew			
Paste		Paste			
Inserts		Inserts			
Tipping		Tipping			
Folder		Folder			
Folder		Folder			
Press		Press			
Press		Press			
Chase		Chase			
Delivery <u>7-21-58</u>		Delivery <u>7-21-58</u>			
Remarks		Remarks			

97	144	98	143	99	142	100	141	101	140	102	139	103	138	104	137	105	136	106	135	107	134	108	133	109	132	110	131	111	130	112	129	113	128	114	127	115	126	116	125	117	124	118	123	119	122	120	121

Lock 16 32

$\frac{1}{8} + 9\frac{3}{4} + \frac{3}{4} + 9\frac{3}{4} + 1\frac{1}{4} + 9\frac{3}{4} + \frac{3}{4} + 9\frac{3}{4} + \frac{1}{8} = 42" L$

$\frac{3}{8} + 13\frac{3}{4} + \frac{3}{4} + 13\frac{3}{4} + \frac{3}{8} = 29" W$

NOTE CHANGE IN Lock up FORMULA  
BOTH SIDEWAYS & LENGTH WAYS.

Figure 29. Production planning sheet illustrating how work and turn and sheetwise impositions are used in bookwork

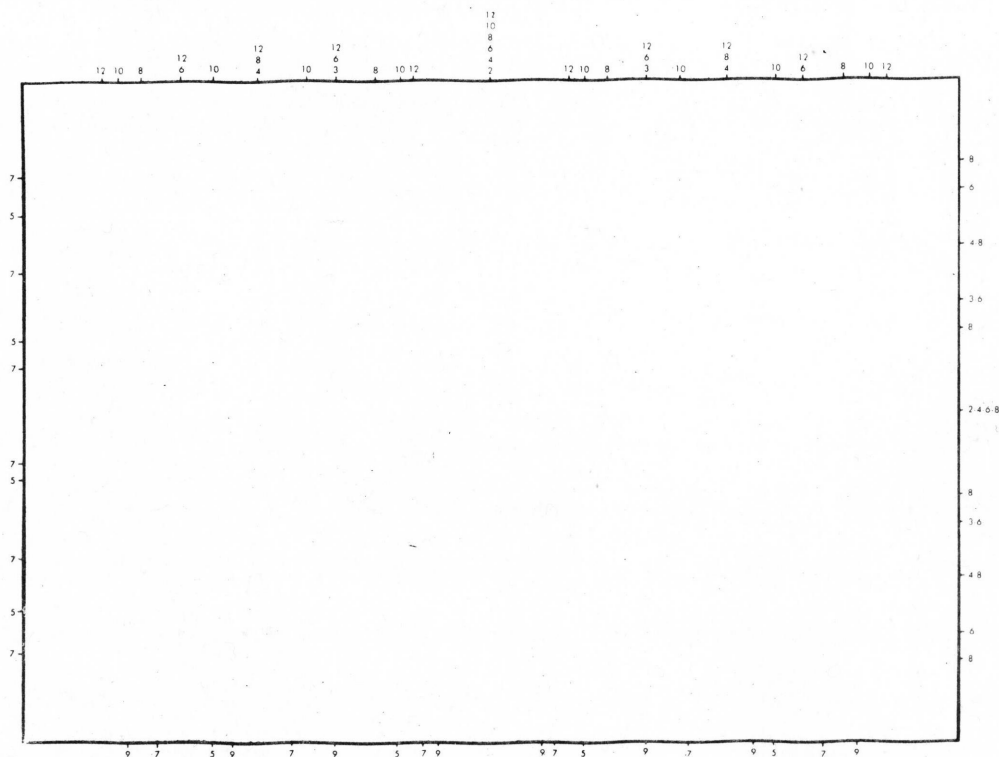
with 97. The companion pages are determined by numbering one-half or 24 of the pages down a vertical column, and the remaining 24 pages up a vertical column and opposite the first column. This method of determining companion page numbers is demonstrated in Figure 29.

The 48-page magazine that is planned on the production planning sheet shown in Figure 29 consists of one work and turn plate and two sheetwise plates. The pages for the work and turn plate are those page numbers above the horizontal line on the planning sheet on which the number 16 is circled. Those pages below this line are imposed on two sheetwise flats.

The outside section would be the work and turn section, as shown to the left on the planning sheet where the binding instructions are indicated (in the column where the words "saddle, cover, 16, and 32 are indicated).

The impositions for the magazine as planned in Figure 29 would be planned on an imposition instructions and layout sheet as shown in Figure 30. Note the code for a bleed page on the imposition layout sheet (a small black dot), and examine the planning sheet in Figure 29 and notice the pages that are to bleed.

IMPOSITION INSTRUCTIONS AND LAYOUT SHEET		WORK ORDER NUMBER
Customer.....	Address.....	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <b>Sheet Layout</b>  <input type="checkbox"/> Sheetwise  <input type="checkbox"/> Work and Turn  <input type="checkbox"/> Work and Flop  <input type="checkbox"/> One Side Only         </div> <div> <b>Type of Plate</b>  <input type="checkbox"/> Presensitized  <input type="checkbox"/> Albumen  <input type="checkbox"/> Deep Etch         </div>
Flat number.....	<div style="text-align: center; margin-bottom: 10px;"><b>Margins</b></div> <div style="border: 1px solid black; width: 80px; height: 80px; margin: 0 auto;"></div> <div style="text-align: center; margin-top: 10px;"><b>Code</b></div> <div style="margin-top: 5px;">           ● Bleed            H Head            ★ Folder guide            X Cut            ↓ Guide side pointing              to gripper edge         </div>	
No. of flats in job.....		
File flat.....		
Flat quality.....		
Press.....		
Press sheet size.....		
Final trim size.....		
Trim margin long bar.....		
Trim margin short bar.....		
Head trim.....		
Front trim.....		
Binding.....		
Bleed.....		
Number of chase.....		
Form disposition.....		
Stripper.....		
Makeup man.....		
O.K. to plate by.....		



TA 13, PM 45, Printing-Journalism Dept., SOSC, Brookings, Form designed by D. Hill.

Figure 30. Imposition instructions and layout sheet  
designed by Donald E. Hill

## EPILOGUE

Now in August, after almost a year of work, I can finally see the thesis as a whole. There were days of confusion and disorder that were like both a beginning and an end. It has been a long year--longer and more full of meaning than many that have gone before it. There were nights when I felt that the project was moving, and there was purpose for being at a certain place at a certain time. And then there were both days and nights when things did not go so well.

As I look back now, after a year has passed, to the beginning, I realize that some of the earlier material may already be old, obsolete, and of no practical value. A man need do nothing more than raise his hand to see that the industry is changing. There are several fundamentals, however, that I am inclined to believe will withstand the test of time. And there are parts (far too many I suspect) that will survive no longer than if they were scratched in the sand on Anzio Beach and the tide was rising. In this respect, I am contented that I have heard or read somewhere that nothing is really finished or left behind forever.

It is obvious that I have intentionally avoided several problems that were impossible to prove under the best of circumstances. At the same time, I have avoided going into detail or elaborating on the obvious. This is a writing technique for which I claim no credit, the opposite of which has been developed to a high degree by others and occasionally relied upon by me.

Of change there is little doubt, but progress is another matter entirely. There are some things that cannot be measured, and there are



persons who do not believe in anything that cannot be measured. This gives rise to the problem of how to quantify qualitative factors, and this is one of the problems I have tried to avoid. In theory, there is nothing to hinder our following what we are taught, but in reality there are many things that influence and draw us aside.

I am not alone when I want to know what life is, and happiness, and whether or not the things I am struggling for are worth struggling for. Science, in a sense, would be embarrassed by such questions, and would ignore them completely or dismantle them into sub-questions until the answers become meaningless. Science too frequently gives information about particulars when I am interested in wholes.

The English philosopher John Locke (1632-1704) said that all men are liable to error, and most men are by passion or interest, under temptation to it. I am no exception, and when I propound questions that breed questions this may not entirely solve the problem at hand or provide a sound conclusion. But this is the beginning of a new era, possibly even new worlds, new systems--there is a need not only for men who can make and do things, but also for men who will ask why they should be done. I do not believe that this age is far away nor is beyond the comprehension and imagination of men. Let us therefore not make delay; let us for all our small part, do all that we can.

What I have written on the preceding pages is more a point of view than a philosophy. I do not know anything about philosophy. But I do believe that the integrity of craftsmanship shall prevail because in the beginning and always, the individual has the potentiality to make a lot

or a little out of the time he has. And real, living time is measured by a man's mind, not the ticking of a mechanical man-made contraption or the setting of the sun. It is the biological clock that has doomed us.

And I cannot, any more than you, see through the extenuating circumstances that diminish our reason and weaken our facilities to see beyond tomorrow. Reason governs well when it understands the circumstances, but the great and final test of intelligence remains with the individual.