DEVELOPMENT OF INDUSTRIAL MANAGEMENT CURRICULUM

FOR NORTH TEXAS STATE COLLEGE

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THESIS

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INTRODUCTION

North Texas has always been primarily an agricultural section. As cities have grown and the farmer has become more dependent upon the outside world, trade and commerce have come into prominence. Education has followed these trends. North Texas now finds the growth of industrial enterprise thrust upon her with startling power; whether it can cope with that situation remains to be seen. It therefore seems logical to assume that education must adapt itself to the rapid transitions of a society which is constantly in flux. Its educational system must not become obsolescent.

A problem of considerable significance thus may be seen to exist with regard to the attainment of an ever-closer relationship between the responsibilities of education in the North Texas area and the provisions being made to meet these responsibilities. The fact that North Texas is changing from an agricultural to an industrial economy would seem to justify a comprehensive study of the types, extent, and growth of industry, and the potentialities of North Texas as an industrial area. After the industrial opportunities of the area have been determined, the next step of the program resolves itself into a review of educational facilities available.

Since such a study would be too broad for one paper, this thesis will concentrate on a two-fold purpose: first, to determine whether an industrial management program at North Texas State College is justified; and second, to present a broad outline that will form a foundation upon which the content of such a program can be based.

The problem of how best to prepare for one's future in the industrial world is as old as industrial history itself, yet the answer is new with each individual. If such were not the case, the vast differential among college curricula would be untenable. Furthermore, if one answer would suffice, this report would have no justification. Even so, the birth of the Atomic Era has so increased the tempo of modern industrial life that changes in concept have been augmented during the course of the preparation of this report. In view of the growth of industry in this area, and of its potentialities for the future, both for small and large industrial enterprises, a study of the needs for an industrial management program at North Texas State College and of the form which such a program might take seems a worthy project.

Treatment of data and approaches to the problem

This study was approached from many angles, most--though not all--of which were found to have some value. In order to concentrate the findings of this study for maximum benefit to North Texas State College and the area which it serves, as well as to make it of possible value to others who might find it

pertinent, only the most contributory material has been included in this final presentation.

College training is an expensive and time-consuming process. As such it should develop a graduate who can take his place in life with assurance that he has the fundamental background for attaining success in his chosen field. This would indicate that the curriculum in preparation for industrial leadership should be based upon the duties and responsibilities of industrial management. The needs of industry must necessarily be forecast for such a program to be of ultimate value, and these needs should be periodically reviewed in order to maintain the program on a current basis.

One early approach which was later discarded was sufficiently enlightening in indicating what not to do that it deserves brief mention. It is commonly called the "scissors and paste" development. A comparison of the courses offered in other schools in the field of industrial management was made. These courses were charted from the bulletins of twenty-five of the leading schools offering programs in the industrial management field.

This comparative study revealed that North Texas State College currently offered thirty-seven of the forty-six most popular courses in the field according to the 1948-49 bulletins. The study also revealed that it lacked only three courses which were offered by as many as half of those surveyed, and that it offered a few courses which some of the other colleges omitted.

While the information thus obtained seems on the surface to be very valuable, and does offer some weight to the proposition that North Texas State College should instigate an industrial management program, it was discarded for the following reasons.

First, the inclusion of any particular course at other schools does not unequivocally prove its necessity, nor perhaps even its desirability in this particular area. It could be viewed from diametrically opposite viewpoints. For example: the fact that twenty of the twenty-five schools offer one particular course could indicate that the field is broad, and hence should be offered in the program--or it might mean that too many people are being trained in that field, flooding the market, and thereby limiting the opportunities of future graduates.

Second, the exclusion of any particular course may be viewed in similar manner: it might not be offered because of its little value--or, on the other hand, it could indicate a lag of the educational system in recognizing the potentialities of such a course. If this latter proved to be the case, it seems that early graduates trained in that field would have "ground floor" advantages.

In recognizing these shortcomings the comparative method based on offerings of other schools in the field of industrial management has been discarded in favor of working from more basic material.

An early consideration for determining basic needs was to go directly to industrial leaders for their suggestions on development of this program. While those industrial leaders consulted concur in their statement of managerial functions, their suggestions as to what should constitute an industrial management program were affected by the needs of their own particular industry. Whereas the information thus obtained would be valuable in developing content of individual courses, such an approach was too broad for this thesis. Thus, their primary contribution to this paper was in emphasizing the need for such a program.

As already mentioned, the purpose of this study is two-fold. First, for justification of an industrial management program at North Texas State College, the principal types of evidence which will be used are:

1. A brief examination of the general background of industry will be conducted to show new concepts of managerial and educational responsibility and to indicate the role which technology has played in setting living standards and depleting natural resources. This comprises Chapter II.

2. Chapter III will present an analysis of the types, extent, and growth of industry in North Texas compared with that of the state and nation, thereby showing industrial trends which will affect curriculum.

3. Chapter IV will show how North Texas State College has grown in comparison with other colleges in the nation, and will

show enrollment for 1960 on the basis of its continuing to meet current needs.

The second phase of the purpose--that of determining material to be included in the curriculum--will depend largely upon the relative emphasis which recognized authorities in the field of industrial management place upon the different areas.

The selection and definition of the local area to be considered as served by North Texas State College presented the next problem. One method of defining the "local area" would be to include all counties within a selected radius of Denton. Such a method would necessarily be arbitrary, and the over-lapping of this area with the fields of influence and service of other colleges would present another problem. As the term "North Texas" is subject to various definitions, it was finally decided to limit the "local area" to Denton and its adjoining counties. (See Fig. 1, page 7.) In thus narrowing the field, it was felt that the comparison with "state" and "national" figures would be in good proportion; that the area of influence was definitely within bounds; and that by so limiting the area, a more concentrated and a more valuable study might result.

Delimitation

In this study, many ramifications have been considered, but only those which make the most profitable and direct contribution have been included in the final analysis. Therefore, this study will be confined to the justification of and the foundation for a curriculum in the field of industrial management.

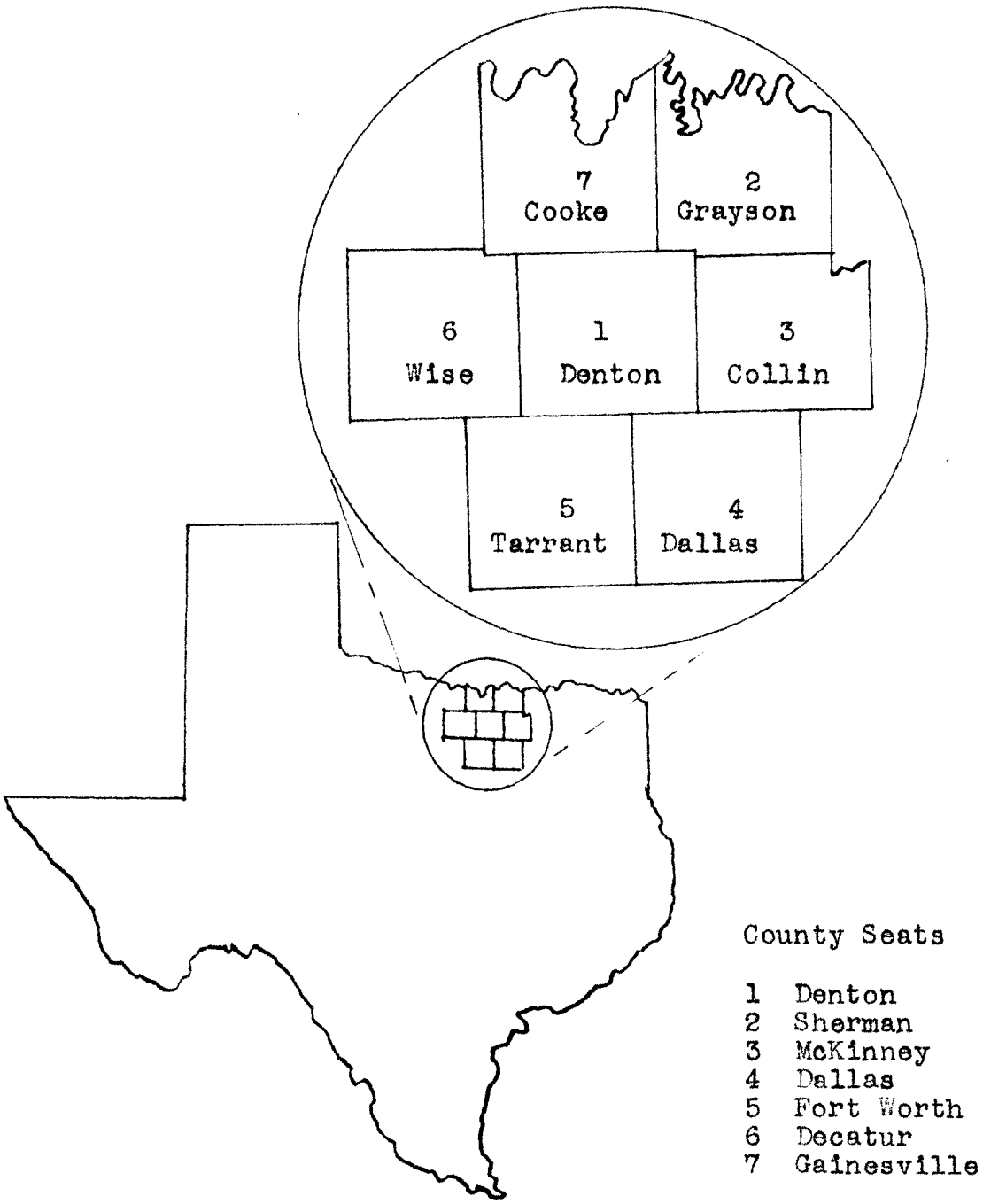

Fig. 1--North Texas "local area" defined:
Denton and adjoining counties.

To outline each course offered in the industrial management curriculum with proper emphasis would require first hand job analysis of each field of industry within the area. Obviously such a task could constitute many theses. The portion of the thesis which is devoted to preparation of a broad outline of courses must therefore be concerned largely with the basic managerial functions which are common to all types of industry.

Some of the other factors which relate to the study, but which have been discarded due to the cost, time, or space involved, include the following:

1. Relationship between salaries and education
2. Texts, workbooks, and reference materials for the recommended courses
3. Additional facilities required
4. Qualifications of the instructors for the program
5. Methods of determining which students might expect to succeed at different levels of industrial management
6. Cost of instigating the program, and
7. Extent to which other colleges now serve this area and the suitability of their service.

Certain intangibles, which were mentioned by many of the industrial leaders consulted in the course of this study, influence attainments in the managerial field, yet cannot be taught as such. They include: honesty, integrity, cooperation, aggressiveness, grace, poise, and even personal appearance and habits. While the schools should not be expected to inculcate attributes which have their natural propagation at home, due consideration should be given to extra-curricular activities in evaluating the influence of athletics, the honor system,

social functions, and all phases of leadership. It therefore becomes evident that curriculum alone cannot determine fully the success of any new program, however well it might be planned.

Definition of terms

The term industrial management is too broad to lend itself to an easy or specific definition. It entails a supervision of all the functions from the birth of an abstract idea for a product to be manufactured to its final purchase by the ultimate consumer. It demands an acquaintance with some of the principles and processes involved in each of the following:

1. Organizing the enterprise
2. Locating the plant
3. Determining the tooling and processes involved
4. Laying out the plant for efficient operation
5. Manufacturing methods
6. Materials purchasing, handling, and storage
7. Production and quality control
8. All the ramifications of personnel administration
9. Selling the product at a profit
10. Record keeping
11. Finance, and
12. Working under the strain of "red tape" and taxes

While the field is broad, it allows for concentration on any one of the functions involved, and at the level of supervisory capacity chosen by the student as that which he is most interested in and qualified to fulfill.

The term curriculum is used as a combination of courses which constitutes a degree plan. Two phases of this curriculum have been developed, one for majors in Business Administration and one for majors in the Industrial Arts Department.

A principle is a fundamental rule or truth that usually applies under similar circumstances.

Policy is the particular group's application of principles.

Planning is the laying out of a course of action, based on principles and policies.

CHAPTER II

GENERAL BACKGROUND AND CONCEPTS OF EDUCATION AND MANAGERIAL RESPONSIBILITY

In recognition of the fact that further industrial development of North Texas is highly probable, this chapter will set forth the principles upon which the new concept of management should be based, in the hope that recognition of such fundamental considerations may result in a higher standard for those who will eventually manage industry in this area and preclude the exploitation of natural resources and the servitude of a free people. Those sections which were unprepared to absorb industrialization show adverse effects which need not necessarily result from industrialization in an enlightened society. The inculcation of managerial responsibilities broader than the materialistic aspects of mere profit-making needs to be fostered during the training period of future leaders. Thus it may be seen that curricula should evidence such considerations in potential industrial sections.

Within a very few decades civilization has undergone momentous changes. In a measure, man has out-witted himself and finds he is confronted with a complex world which presents problems both startling and formidable. He has devised instruments

or made scientific discoveries that portend the annihilation of all that he has sought to attain.[1]

In summarizing the influences that may have brought about the current world situation, the study of technology might well claim priority. This subject as it relates to living standards requires a glimpse into many factors, such as history, sociology, economics, education, and philosophy.

When civilization was more primitive, industry might have been defined as the systematizing of human toil based on human need. As man's skill, ingenuity and perseverance attained greater heights, mass production came into being; thus the so-called mechanized age brought on higher standards of living and new demands on society in general. In contrast, certain adverse situations also arose, creating economic changes of tragic consequence. Industrialization, with relentless greed, over-reached, encroaching upon the home environs and bringing women and children into its orbit of servitude. Hence, it is conceivable that forces which gave impetus to the Industrial Revolution in America were instrumental in undermining the less tangible, though vastly important assets of a people, in resultant child delinquency and disintegration of the home generally.

Further consequence of industrialization was the waste of resources, ruthless use of forests, pollution of streams and

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[1] Lewis Mumford, Technics and Civilization, pp. 433-4.

exhaustion of the fertility of the soil. Thus does nature mutely attest that every infraction of her laws has its penalty. Comprehending this, wise leaders in our government are seeking to rectify the ravages against our great national heritage, as well as devise protective measures for the safe-guarding of the people.[2] To counteract this trend toward government control, industrial leaders must recognize the situation and cooperate in the preservation of natural resources.

In analyzing the advantages and disadvantages incident to the successful development of industries in America, it is well to pause and consider the status of today's technology with relation to future advancement.

This new technology does not embrace mechanical inventions alone; there is a human equation of primary importance to its growth. Business responsibilities have broadened, and the Atomic Era demands that those in responsible positions of leadership no longer look upon natural resources and human energy as commodities which may be exploited for private gain. If the system of free enterprise is to live, management must re-evaluate its responsibilities to include not only self and stockholders, but the public, employees, government, and the consumers.[3] This re-evaluation of management's responsibilities will materially affect the curriculum.

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[2]National Resources Committee, Technological Trends and National Policy, passim, Part One, Sections I, III, pp. 3-38.

[3]Harwood F. Merrill, editor, The Responsibilities of Business Leadership, pp. xiv-xv.

Current significance and timeliness of this study regarding curricula development are indicated by the recent statement of J. R. Mulvey.[4]

> There is a great necessity for two groups, business men and educators, to work together toward a common end. One of the aims of education is to train young people to make a living. It seems that those who train and those who adapt that training should work closely together, and in the past this has not been the case. The Southwestern Council on Education for Business Responsibility has been created with the view of bridging the gap that exists between the training and use of the young people, with the overall objective being: 'To take such action as is necessary to provide that the graduates of schools and universities in the Southwest will be increasingly better prepared and qualified to assume their responsibilities in the business world.'

The magnitude of the task which education faces in serving industry may be appraised by comparing employment in manufacturing with employment in other occupations. Computations from figures published by the Bureau of Census of the United States Department of Commerce indicate that in 1947, the field of manufacturing led the nation in distribution of employment with approximately 31 per cent of the nation's total. Its nearest competitor was trade, with 18 per cent, followed by agriculture, with 15 per cent.[5]

A review of education on a national level does not indicate too close a correlation between educational training and the requirements of the job. As was stated by the United States President's Commission on Higher Education:

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[4]Unpublished minutes of meeting of Southwestern Council on Education for Business Responsibility, May 5, 1949.

[5]Survey of Current Business, November, 1947, p. S-9.

> It is urgently important in American education today that the age old distinction between education for living and education for making a living be discarded . . . . The ends of democratic education in the United States will not be adequately served until we achieve unification of our educational objectives and processes. American education must be so organized and conducted that it will provide, at appropriate levels, proper combination of general and special education for students of varying abilities and occupational objectives.[6]

North Texas State College has done well generally. In fact, it has received national recognition in some fields. But much is to be desired in its service to the managers of industry. If leadership is to be gained in the field of education, it is necessary that curricula keep abreast of the transition toward an industrial economy in this, one of the nation's fastest growing manufacturing areas.

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[6]Report of The President's Commission on Higher Education, Higher Education for American Democracy, I, 61-63.

CHAPTER III

INDUSTRIAL GROWTH

In order to augment further development of the content of individual courses within this broad field of industrial management, as well as to justify development of such a program, the growth and current status of industry in North Texas must be studied. The data for such a study are readily available.

In Table 1, page 17, the number of production employees and the value added by manufacturing in 1939 and in 1947 are presented for the United States, for Texas, and for the local area served by North Texas State College. Percentages of change in these indicators of industrial growth from 1939 to 1947 are charted in Figure 2, page 18.

It is apparent from Figure 2 that Texas has experienced considerably faster industrial growth than the nation as a whole. It is also evident that the local area has grown even faster than the state. While the number of production workers in the nation in 1947 increased to 152 per cent of the 1939 base, those in Texas increased to 196 per cent, and those in the local area increased to 224 per cent of its 1939 base. Likewise, the value added by manufacturing in the local area showed considerably greater growth than the nation as evidenced

TABLE 1

INDUSTRIAL GROWTH OF THE LOCAL AREA AS COMPARED WITH THAT OF THE NATION AND THE STATE

Area	No. of Production Workers			Value Added by Mfg.		
	1939	1947	Per Cent*	1939 (000's)	1947 (000's)	Per Cent*
U. S.	7,808,000	11,916,000	52	24,487,000	30,242,000	23
Texas	125,115	242,014	96	448,523	1,727,464	285
Total Local Area	27,467	61,629	124	98,729	419,005	324
Local Area:						
Denton County	181	603		668	4,683	
Dallas County	16,267	30,695		61,458	238,995	
Tarrant County	8,036	26,414		30,112	146,501	
Collin County	649	937		786	4,171	
Cooke County	121	219		404	924	
Grayson County	2,137	2,593		5,176	23,182	
Wise County	76	168		125	549	

*Per cent increase.

Source: Census of Manufactures, 1947, MC142, U. S. Bureau of Census, Washington, Government Printing Office, 1949.

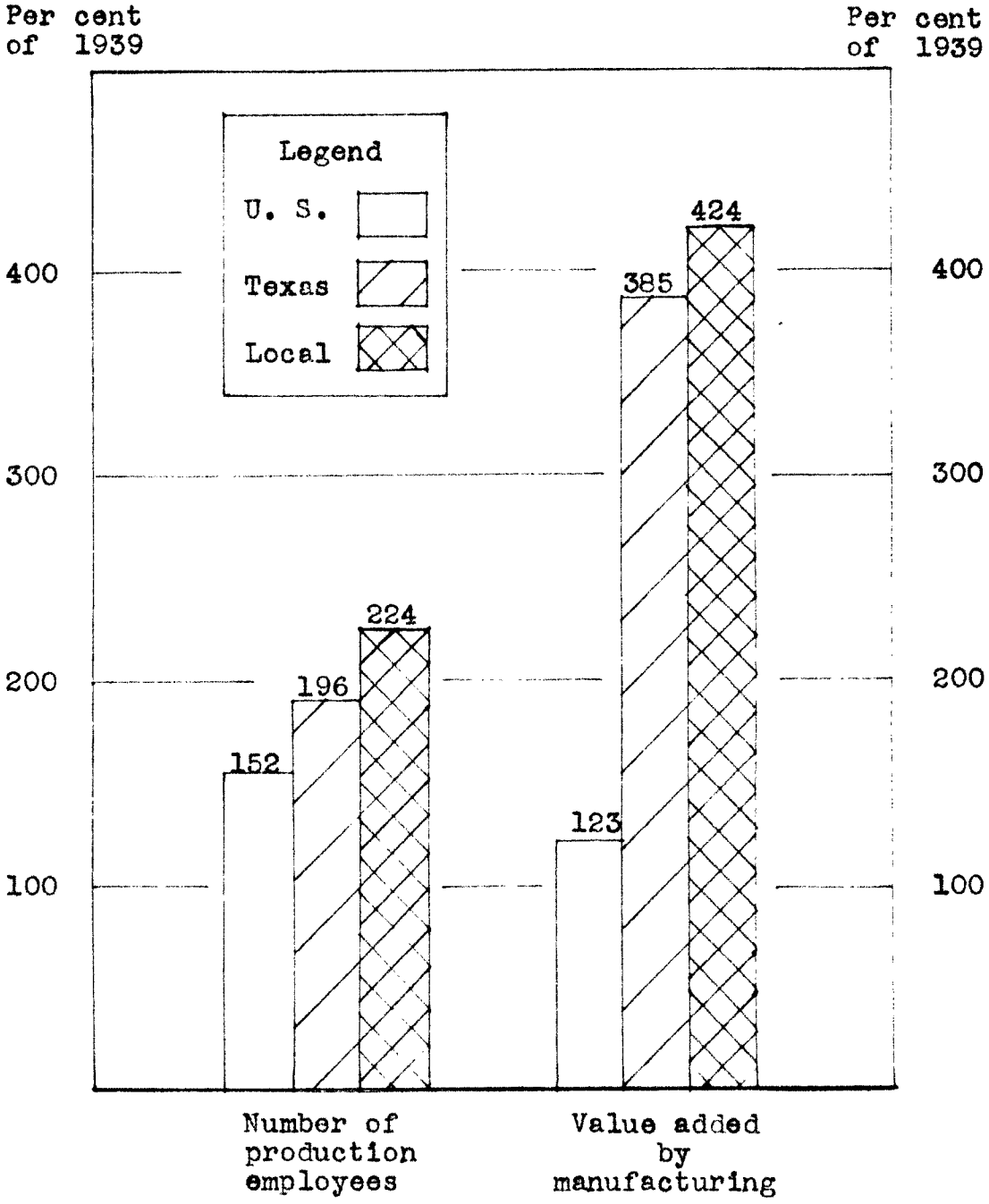

Fig. 2--Number of production employees and value added by manufacturing in 1947 in relation to their level in 1939 for the United States, Texas, and the local area served by North Texas State College. 1939 figures = 100 per cent.

Source: Table 1, page 17.

by the following figures. With the figures for 1939 taken as 100 per cent, 1947 value added by manufacturing for the nation had grown to only 123 per cent, while that of Texas was 385 per cent, and that for the local area was 424 per cent.[1]

Of much significance in indicating specific educational responsibilities to industry are the types of industry in the area and their importance relative to industry types throughout Texas. These educational responsibilities include preparing students for the jobs which will actually be available in the school service area.

Arranged by magnitude of production employment in Texas, Table 2, pages 20 and 21, compares the number of production workers of 1947 and 1939, the number of establishments between those two years, and the value added by manufacturing for the same. Analyzing the production workers section of Table 2, one may observe that transportation equipment has risen from twelfth place to sixth in the state; that, although gaining a few employees, textile mills have dropped from sixth place to twelfth, accentuating the rapid rise of other industries; and that printing has dropped from eighth place to tenth. By combining all machinery, transportation, fabricated and primary metal groups, and instruments, one sees that the aggregate metal industry is by far the largest employer in number of production workers, being over 1.4 times food which is the next largest group.

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[1]Table 1, page 17.

TABLE 2

GENERAL STATISTICS FOR THE STATE BY MAJOR INDUSTRY GROUPS: 1947 and 1939

Major Industry Group		Average Number of Production Workers	
No.	Title	1947	1939
20	Food and kindred products	42,817	25,146
22	Petroleum and coal products	29,662	18,971
23	Lumber and products except furniture	29,354	19,881
24	Apparel and related products	20,164	10,173
25	Machinery (except electrical)	18,327	8,358
26	Transportation equipment	18,285	2,767
27	Chemical and allied products	17,475	6,847
28	Fabricated metal products	10,964	4,183
29	Primary metal industries	10,585	3,140
31	Printing and publishing industries	10,332	6,590
32	Stone, clay, and glass products	9,284	5,098
33	Textile mill products	7,745	7,079
34	Furniture and fixtures industries	5,119	2,669
35	Paper and allied products	3,850	1,552
36	Electrical machinery industries	1,714	441
37	Leather and leather products	1,470	637
38	Instruments and related products	735	132
39	Miscellaneous manufactures	2,800	1,180
	All other major industry groups	1,332	271
	Total	242,014	125,115

Source: Census of Manufactures, 1947, MC142, U. S. Bureau of the Census, Washington, Government Printing Office, 1949.

TABLE 2--Continued

Number of Establishments		Value Added by Manufacture (In Thousands of Dollars)	
1947	1939	1947	1939
2,029	1,982	$ 337,558	$ 106,506
109	120	359,680	123,236
915	418	95,988	26,872
361	211	71,128	14,540
370	216	129,575	36,677
99	38	91,893	11,853
433	339	234,496	27,661
327	165	66,826	13,323
109	58	58,337	6,349
1,155	866	92,467	34,864
399	221	57,646	19,341
48	46	29,133	8,609
266	166	23,029	6,110
57	34	32,992	5,070
55	23	12,163	1,969
51	33	5,962	1,347
49	13	3,681	333
380	127	14,458	3,205
16	9	10,452	658
7,128	5,085	$1,727,464	$448,523

Table 3, pages 23 and 24, shows the distribution of establishments by employment size group within major industry groups for individual counties included in the area served most directly by North Texas State College. Having 341 plants in the local area, the aggregate metal industry is close behind food which is the leader with 358 plants. The local area has 33.6 per cent of the total aggregate metal plants in the state.

Table 4 uses the information from Tables 2 and 3, arranged by number of local plants as a rough indicator of job opportunities on the basis of numbers of plants within the industrial groups.

TABLE 4

RELATIVE POSITIONS OF INDUSTRIES
BY NUMBER OF PLANTS

Local Position	State Position		Industry
1947	1947	1939	
1	1	1	Food and Kindred Products
2	2	2	Printing and Publishing Industries
3	7	7	Apparel and Related Products
4	6	6	Machinery (except electrical)
5	8	9	Fabricated Metal Products
6	4	4	Chemical and Allied Products
7	10	8	Furniture & Fixture Industries
8	5	5	Stone, Clay, and Glass Products
9	3	3	Lumber and Products except Furn.
10	11	12	Primary Metal Industries
11	13	14	Transportation Equipment
12	15	17	Electrical Machinery Industries
13	14	15	Paper and Allied Products
14	17	18	Instruments and Related Products
15	11	11	Petroleum and Coal Products
16	18	13	Textile Mill Products
17	16	16	Leather and Leather Products
18	9	10	Miscellaneous Manufacturers and all other major industry groups

Source: Table 2, pp. 20, 21 and Table 3, pp. 23, 24.

TABLE 3

DISTRIBUTION OF ESTABLISHMENTS BY EMPLOYMENT SIZE GROUPS WITHIN THE MAJOR INDUSTRY GROUPS, FOR LOCAL AREA, 1947

County and Size Group	Number of Establishments by Major Industry Groups							
	Total firms	Food and Kindred	Tobacco Mfg.	Textile Mill	Apparel	Lumber Products Except Furniture	Furniture and Fixtures	Paper and Allied Industries
Code		20	21	22	23	24	25	26
Denton								
1-19 emp.	19	6	1	--	2	--	--	--
20-99	8	4	--	--	--	--	--	--
100-plus	2	--	--	--	1	--	--	--
Dallas								
1-19 emp.	687	109	1	2	68	31	31	12
20-99	293	63	--	3	62	10	16	4
100-plus	88	16	--	5	18	1	5	5
Tarrant								
1-19 emp.	271	46	--	1	11	13	20	--
20-99	113	43	--	--	6	2	8	5
100-plus	43	12	--	1	5	--	2	1
Collin								
1-19 emp.	17	9	--	--	1	--	1	1
20-99	9	5	--	--	1	--	--	--
100-plus	1	--	--	1	--	--	--	--
Cooke								
1-19 emp.	15	6	--	--	--	--	--	--
20-99	4	2	--	--	1	--	--	--
100-plus	0							
Grayson								
1-19 emp.	46	24	--	--	1	3	1	--
20-99	10	5	--	--	--	--	1	1
100-plus	10	5	--	2	1	1	--	--
Wise								
1-19 emp.	4	3	--	--	--	--	--	--
20-99	2	--	--	--	1	--	--	--
100-plus	0							
Total	1642	358	2	15	179	61	85	29

Source: Census of Manufactures, 1947, MC142, U. S. Bureau of the Census, Washington, Government Printing Office, 1949.

TABLE 3--Continued

Number of Establishments by Major Industry Groups--Continued												
Printing & Pub. 27	Chemicals 28	Petroleum 29	Rubber Products 30	Leather & Prod. 31	Stone, Clay and Glass 32	Primary Metal 33	Fabricated Metal 34	Machinery (except*) 35	*Electrical Mach. 36	Transport. Equip. 37	Instruments 38	Miscellaneous 39
3	--	--	--	--	3	--	1	1	--	1	--	1
2	--	--	--	--	1	--	1	--	--	--	--	--
1	--	--	--	--	--	--	--	--	--	--	--	--
149	51	3	3	4	29	14	51	50	16	9	11	43
32	16	--	2	1	7	4	28	24	5	2	2	12
3	2	3	--	--	2	1	9	8	4	4	--	2
74	11	4	--	1	13	5	13	19	5	8	5	22
7	7	--	1	1	4	4	6	12	--	4	1	2
4	3	6	--	1	1	2	--	3	--	2	--	--
5	--	--	--	--	--	--	--	--	--	--	--	--
1	--	--	--	--	--	--	2	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--
4	--	1	--	1	--	1	--	1	--	--	--	1
--	1	--	--	--	--	--	--	--	--	--	--	--
10	1	--	--	--	3	--	--	--	--	--	--	3
2	--	--	--	--	--	1	--	--	--	--	--	--
--	--	--	--	--	--	--	--	1	--	--	--	--
1	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	1	--	--	--	--	--	--	--
298	92	17	6	9	64	32	111	119	30	30	19	86

Analysis of the data in this chapter should aid in determining the relative weight to be given to the requirements of each industry in preparation of course material and possibly aid in forecasting the employment needs of the area. A periodical re-evaluation of such material on a current basis would be necessary in order to maintain the correct proportion of time to be spent in the industrial management curriculum.

Another pertinent characteristic of industry in the state and local area is the extreme range in size of plants, numbers employed, value added by manufacturing, and capital investment per plant. Graduates in the local area are fortunate in being able to pick the size plant which interests them for future employment.

Throughout the Southwest, small plants outnumber large plants, but the large plants employ 60 per cent of the people.[2] Table 3 shows this relationship on the local level. For example, nine of the fifteen textile mills employ over 100; nine of the seventeen petroleum plants employ over 100; while printing at the opposite extreme with 298 plants in the area has only eight which employ over 100 people.

While it might seem that the industrial potentialities are of primary concern to industrialists who consider moving into this area, a brief appraisal of these potentialities has a place in this thesis because the employment market of North Texas

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[2]Keith W. Johnson, "The Growth of Manufacturing in the Southwest," Monthly Business Review of the Federal Reserve Bank of Dallas, XXXV, Number III, (March 1, 1950), 46-7.

graduates will be vitally affected by the quantity and quality of future industrial development. It, therefore, becomes expedient to review the reasons for this past growth in the light of factors which might contribute to its future development.

Much has been said about the premium which Texas pays for the lack of development of her own natural resources, such as the leather which she buys back in the form of expensive shoes after having shipped it out at low raw material prices. Another example of our industrial sluggishness is the fact that Texans pay exhorbitant prices for machinery when there are ore deposits which lie dormant or are shipped out as raw materials. Texas sells grain at raw material prices and buys it back as expensive finished products. This unnecessary transportation raises the cost of all such products to the ultimate consumer.

Since 18,000,000 people are within a 500-mile radius of the area, the market potentiality of almost any product is virtually unlimited.[3] Since the population per square mile is considerably below that of other industrial centers, the market should increase with an influx of industrial workers who will be attracted by the excellent living conditions. These include climate, uncrowded housing, recreational facilities, educational opportunities, low taxes, and the friendly spirit of the Southwest.

This area has a favorable record with regard to labor management relations, efficiency, and employee adaptability.

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[3]Thomas W. Finney, Dallas Chamber of Commerce, Speech before Management Club, North Texas State College, February 22, 1950.

While the educational standards of the area are already high, the fact that this curriculum is being developed through the cooperation of business, education, and industry is further evidence of the progressive attitude toward supplying industry with employees capable of satisfying its needs.

The attitude of civic and industrial leaders of the area has contributed to its development, and when considered with the cooperation of the financial institutions, is contributory to the propagation of all types of industry.

A network of railroads, highways, and air lines connects the market area with its sources of supply and manufacture.

An adequate supply of efficient, reasonably-priced fuel, water, and other utilities is available.

Texas tax structure is good. As late as 1949 the per capita state debt was only sixty cents.[4] The corporation laws and taxes are favorable to industrial expansion.

For the three years, 1946, 1947, and 1948, Texas led the nation in industrial construction.[5]

It appears that the factors which contributed to the remarkable expansion of industry in the past decade are favorable to its further development. And as industry grows, the job market will expand for qualified graduates. The college training program must, therefore, keep abreast of the local industrial picture.

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[4]C. C. Welhausen, "Industrial Development in Texas," Proceedings, The Second Annual Management Engineering Conference, A. & M. College of Texas, 1949, p. 91.

[5]Ibid., p. 92.

CHAPTER IV

COMPARATIVE GROWTH OF NORTH TEXAS STATE COLLEGE

Since it is understandable that an educational program affects enrollment, this phase of the study will concern the growth of North Texas State College.

Fine arts schools, normal schools, vocational and professional schools all have their places in the American system. Considering the total of these, higher education has grown approximately seven times as fast as the United States population since 1900. This estimate is based on the fact that college enrollment for 1945 was nine and one-half times that of 1900, while United States population of 1945 was just a little over one and one-third times the population of 1900. (See Table 5, page 29.)

A cursory study indicates that North Texas State College has consistently taken even larger proportions of the national enrollment than the average. In 1930 North Texas State College's percentage was .0013, in 1940 it was .0026, and in 1948 it was .0035 of the national total college enrollment.[1] By projecting that line the 1960 percentage would be .0048. Based on these and the American Association of Collegiate Registrar's prediction of 2,400,000 total college students for 1960[2], North

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[1]Table 5, page 29. [2]Ibid.

TABLE 5

COMPARISON OF NORTH TEXAS STATE COLLEGE ENROLLMENT WITH COLLEGE ENROLLMENTS OF UNITED STATES AND WITH POPULATION OF UNITED STATES 1910 THROUGH 1948

Year (Fall Term)	No. Students at N.T.S.C.	No. Students All Colleges	U. S. Population
1910	160	183,572	91,992,266
1911	170	198,453	
1912	272	202,231	
1913	239	216,493	
1914	241	237,168	
1915	579	259,511	
1916	776	not available	
1917	614	254,113	
1918	566	not available	
1919	589	356,594	
1920	597	not available	105,710,620
1921	838	437,822	
1922	1088	not available	
1923	1397	664,266	
1924	1396	not available	
1925	1263	822,895	
1926	1473	not available	
1927	1620	1,053,955	
1928	1805	1,077,092	
1929	1749	1,100,737	
1930	1963	1,127,111	122,775,046
1931	1858	1,154,117	
1932	2018	1,103,634	
1933	1704	1,055,360	
1934	1807	1,129,210	
1935	1984	1,308,227	
1936	2230	1,277,576	
1937	2448	1,350,905	
1938	2891	1,420,273	
1939	3377	1,494,203	
1940	3581	1,538,800	131,669,275
1941	3268	1,403,990	
1942	2595	1,209,150	
1943	2016	1,155,272	
1944	1889	not available	
1945	2936	1,040,000	139,621,431
1946	4322	2,078,000	
1947	3289	2,338,226	
1948	5756	2,408,249	

Sources: The World Almanac and Book of Facts, 1930, 1948, 1949, and 1950, New York, New York World Telegram.

Registration records, North Texas State College, annually 1901-1949.

Texas State College should have an enrollment of 11,520.[3] Using the Conference of Higher Education's prediction of 2,500,000, North Texas State College should have 12,000 students.[4] Most optimistic of these three authoritative sources, the United States President's Commission of Higher Education predicts 2,700,000 students enrolled in colleges and universities in 1960.[5] If North Texas State College had .0048 per cent of that total, its enrollment in 1960 would be 12,960. If, however, enrollment levels off to the 1940 percentage of .0026, North Texas State College enrollment might be as low as 6,240. Where her enrollment falls within that broad range may depend largely upon what curricula are presented.

Disregarding all external factors such as the national enrollment, the possible influence of intervening wars or depressions, the influx of "war babies" who should be swelling the enrollments at that time, and using only data regarding past enrollment in this college from forty-nine volumes of the Registrar's records (See Table 5, page 29), 10,900 should be the total number of students at North Texas State College in 1960. (See Figure 3, page 31.) This enrollment

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[3]John W. Bunn, "Reappraisal of Enrollment Trends and Implications," Current Trends in Higher Education 1948, National Education Association of the United States, p. 43.

[4]C. S. Ball, "State Finance and Higher Education," Current Trends in Higher Education 1948, National Education Association of the United States, p. 161.

[5]Report of The President's Commission on Higher Education, Higher Education for American Democracy, I, 45.

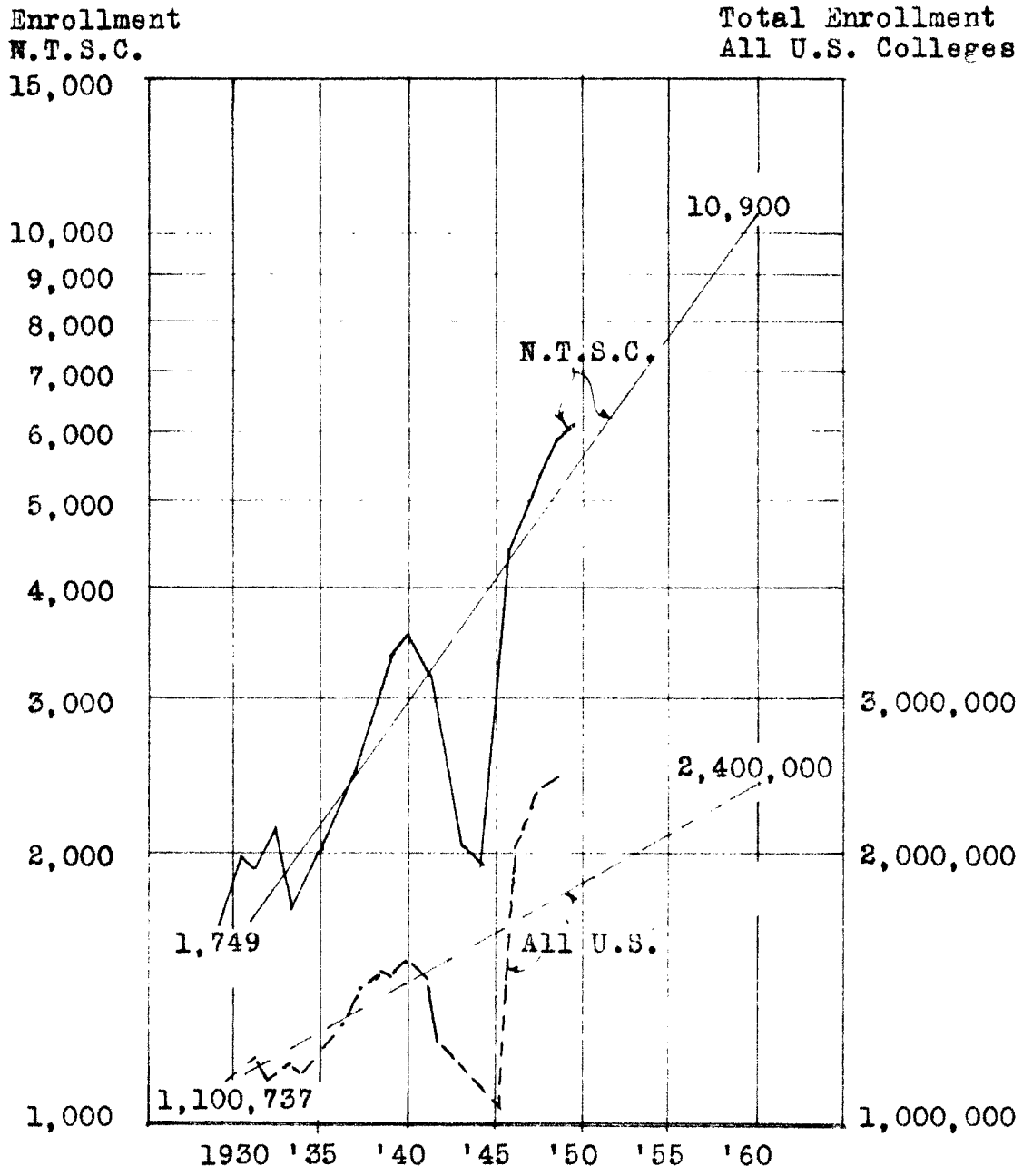

Fig. 3--Comparison of North Texas State College enrollment with total U. S. college enrollment: 1929-1949, with trend line extrapolated to 1960.

Method of establishing trend line: Exponential least squares:
$Yc=ab^x$, or Log Yc=Log a+xLog b

Enrollment for 1960 is indicated: Total U. S.: 2,400,000
N. T. S. C.: 10,900

Source: Table 5, page 29.

estimate was derived by extrapolation in Figure 3 using the formula: Log Yc = Log a + x Log b, or $Y = ab^x$. Employing the same formula with the national college enrollment data produces an answer of 2,400,000 for the national college enrollment, which is in line with the estimates of the aforementioned authorities.

A study of the past and present offerings listed in the catalogues indicates that North Texas State College's spectacular growth was not so much the result of expanding facilities to teach more students the same thing, but rather in expanding facilities in the direction of new requirements. It is believed that if the administration continues exercising that vision by predicting and providing for these new requirements as it is now doing through joint cooperation of the Industrial Arts and Business divisions of the College in instigating the proposed program relative to industrial management, North Texas State College may meet the specifications of a university and possibly double its present enrollment by 1960.

CHAPTER V

DEVELOPMENT OF INDUSTRIAL MANAGEMENT CURRICULUM

Having justified the need for a program leading to industrial management, the first step in developing such a curriculum is that of determining the functions of its graduates. As graduates of banking do not expect to begin as bank presidents, the graduate in this field can expect to spend years on the job in minor positions before realizing the opportunity to exercise the full extent of his training. By properly recognizing this situation, he may increase his ultimate chances by thoroughly learning the processes from the ground up. With such a background, when opportunity presents, he may find advancement hindered only by personal qualifications.

As a basis for establishing and classifying these basic functions and responsibilities, ten recognized texts on the subject of industrial management have been analyzed.

Coman's Sources of Business Information and other sources were surveyed in addition to the North Texas State College library files and stacks for books in the industrial management field. Those published before 1940 were disregarded as obsolete because of the rapid advance in the field of scientific management. After an examination of the other books, those devoting more than 30 per cent to any one phase were discarded on the basis of being too highly specialized.

Following this process of selection, these ten texts remain:

A. Principles of Industrial Management, L. P. Alford, Consulting Engineer; Chairman, Department of Industrial Engineering, College of Engineering at New York University; Past Vice-president, The American Society of Mechanical Engineers; Past Vice-president, American Engineering Council.

B. Production Handbook, L. P. Alford and John R. Bangs, Professor and Head of the Department of Administrative Engineering, Cornell University.

C. Management of an Enterprise, C. Canby Balderston, Professor of Industry and Dean, Wharton School of Finance and Commerce, University of Pennsylvania.

D. Organization and Management in Industry and Business, William B. Cornell, M. E., Professor of Management, and Chairman of the Department of Management and Industrial Relations, School of Commerce, Accounts and Finance, New York University; Member, American Society of Mechanical Engineers, Institute of Management, and American Management Association; Consulting Management Engineer.

E. Industrial Organization and Management, Ralph Currier Davis, Professor of Business Organization, The Ohio State University; Consultant in Industrial Management.

F. Introduction to Industrial Management, Franklin E. Folts, Professor in Industrial Management, Graduate School of Business Administration, Harvard University.

G. Principles of Industrial Organization, Dexter S. Kimball, A. B., M. E., Dr. Sc., Dr. Eng., LL. D., Professor Emeritus of Industrial Engineering and Dean Emeritus of the College of Engineering, Cornell University; Fellow and Past President American Society of Mechanical Engineers; Past President American Engineering Council. And Dexter S. Kimball, Jr., M. E., M. M. E., Factory Manager, Bendix-Westinghouse Automotive-Airbrake Co.; Formerly Assistant Professor of Industrial Engineering, Cornell University, Production Manager, General Household Utilities; Plant Manager Ansco Camera Plant; Member, American Society of Mechanical Engineers.

H. Industrial Management, Asa S. Knowles, Dean, School of Business Administration, Rhode Island State College; formerly Dean, College of Business Administration, and

Head, Department of Industrial Engineering, Northeastern University. And Robert D. Thompson, Associate Professor of Industrial Management Northeastern University; Owner and General Manager, Thomson Manufacturing Company, The A. E. Liebsch Co., and The F. R. Benner Co.; formerly Management Consultant.

I. Management of Industrial Enterprise, Richard Owens, Ph. D., C. P. A., Professor of Accounting and Business Administration, George Washington University.

J. Industrial Management, William R. Spriegel, Ph. D., Professor of Industrial Management and Chairman of the Department of Management, School of Commerce, Northwestern University; Management Consultant; formerly General Superintendent, United States Rubber Co., Detroit; Production Superintendent, Dodge Brothers, Plant 6; Assistant Factory Manager, Fisher Body Corporation, Plant 1.

The relative emphasis applied in each to various divisions of subject matter may be used as a criterion for indicating subject matter areas and course divisions most essential in the industrial management curriculum. The most convenient indicator of relative emphasis would seem to be that of proportion of text space devoted to each subject area; this criterion should be roughly satisfactory, although factors such as complexity of certain topics and variation in completeness of treatment of some phases by any given author may be reflected, in addition to relative importance of subject areas.

The percentages of text space devoted to the specified subject areas are shown in Table 6, page 39.

In order that Table 6 might be analyzed in the light in which it was prepared, it is necessary to define its primary sections. While some of the authors group the material differently, analysis of the texts allows definition in the

following manner which is somewhat arbitrary but inclusive. The percentage beside each major group indicates the average amount of space the authors devoted to it.

1. Introduction and summary -- 7.58 per cent
   - General background
   - Economics
   - Technology and inventions
   - Research
   - Opportunities
   - Scope

2. Responsibilities and organization -- 11.29 per cent
   - Principles of management
   - Office management
   - Policies
   - Diversification
   - Expansion and contraction
   - Coordination and executive control
   - Structure

3. Personnel -- 13.30 per cent
   - Measurements of administrative and managerial performance
   - Transfer, promotion, demotion, and discharge
   - Educational training
   - Job analysis and evaluation
   - Merit rating
   - Financial incentives
   - Wage Plans
   - Wage and salaries administration
   - Selection

4. Supervisory Management -- 5.82 per cent
   - Labor-management relations
   - Safety
   - Discipline
   - Grievance

5. Manufacturing methods -- 7.64 per cent
   - Product design
   - Production development
   - Materials control and standardization
   - Plant layout
   - Materials of industry
   - Tools, jigs, and fixtures
   - Machinery and equipment
   - Production planning
   - Plant maintenance
   - Engineering

6. Physical plant -- 11.18 per cent
   Plant location and transportation
   Building
   Layout
   Materials handling
   Safety (physical)

7. Materials Management -- 10.87 per cent
   Purchasing
   Marketing
   Sales management and salesmanship
   Product development and introduction
   Raw materials supply
   Advertising
   Storekeeping
   Inventory control
   Salvage

8. Time and motion study -- 7.44 per cent
   Measures of performance
   Motion study
   Time study and operation analysis
   Work simplification and standardization

9. Production control and quality control -- 15.21 per cent
   Production controls systems
   Production planning control
   Inspection
   Quality control
   Job estimating
   Symbols

10. Finance -- 9.67 per cent
    Cost analysis and control
    Investments
    Ownership of industry
    Budgeting
    Financial statements
    Insurance

Miscellaneous tool courses which seem to be most necessary to the understanding and execution of the above include:

Business law
Business statistics
Business mathematics
Business correspondence
Typing and other office machine skills
Accounting
Speech
Shop experience

Five of the authors devote their whole books to the ten represented phases; four others devote 90 per cent or more; while one devotes only 79 per cent. The remainder of the books is taken up with symbols, case studies, and other material closely related but not enough to be tabulated under the listed headings.

In order that the percentages of the texts might be significant, they are tabulated on the basis of related material only. The figures for separate phases do not always total 100 because they were rounded out to the nearest tenth. All but one of the authors included a separate chapter on introductory background to the field.

Whereas North Texas State College does not yet offer a course in production and quality control, it is given much importance by these authorities, each one mentioning it and the average devoting 15.21 per cent of the space to it. Office management, as such, is so commonly accepted in all phases of business that most of these authors devoted very little separate space to its discussion, including it with other phases. Hence, for this study it has been included in the phase of responsibility and organization.

If personnel and supervisory management were considered as one unit, their sum would equal 19.12 per cent of the total space in the selected industrial management texts. While their division is unequal, the function of each is such that they might well constitute two courses. Supervisory management is

TABLE 6

PERCENTAGE OF TEXT SPACE DEVOTED TO PHASES OF INDUSTRIAL MANAGEMENT BY TEN LEADING AUTHORS*

Phases	A	B	C	D
Introduction	15.6	0	5.3	9.5
Responsibilities & Organization	7.4	5.6	15.0	11.2
Personnel	6.0	19.3	13.1	7.1
Supervisory Management	5.6	0	4.6	7.7
Manufacturing Methods	5.2	16.8	9.3	10.3
Physical Plant	8.6	6.5	13.9	4.9
Materials Management	11.8	8.7	16.7	15.8
Time & Motion Study	8.4	11.7	10.5	4.9
Production and Quality Control	12.6	23.2	4.6	20.0
Finance	18.9	8.3	6.8	8.7
Total	100.1	100.1	99.8	100.1
Total pages in book	501	1636	474	792
Per cent of book devoted to field	100	90	100	100

*A - L. P. Alford, Principles of Industrial Management.
B - L. P. Alford and John R. Bangs, editors, Production Handbook.
C - C. Canby Balderston, Management of an Enterprise.
D - William B. Cornell, Organization and Management in Industry and Business.
E.- Ralph Currier Davis, Industrial Organization and Management.
F - Franklin E. Folts, Introduction to Industrial Management.
G - Dexter S. Kimball and Dexter S. Kimball, Jr., Principles of Industrial Organization.
H - Asa S. Knowles and Robert D. Thomson, Industrial Management.
I - Richard Owens, Management of Industrial Enterprise.
J - William R. Spriegel, Industrial Management.

TABLE 6--Continued

E	F	G	H	I	J	AVERAGE
2.6	1.8	24.1	4.6	7.8	4.5	7.58
23.8	22.8	10.8	0	6.5	9.8	11.29
11.2	16.3	4.7	18.7	21.9	14.7	13.30
8.1	0	9.2	6.8	8.9	7.3	5.82
6.1	0	3.3	6.3	9.1	10.0	7.64
10.0	13.7	5.7	19.9	13.6	15.0	11.18
11.9	13.5	5.9	2.8	8.8	12.8	10.87
6.8	9.0	6.8	5.4	7.1	3.8	7.44
15.5	12.1	11.5	26.0	11.7	14.9	15.21
3.9	10.7	18.0	9.7	4.7	7.0	9.67
99.9	99.9	100.0	100.2	100.1	99.8	100.00
621	636	522	747	631	618	
100	79	93	100	97	97	95.6

of sufficient importance to those interested in direct production supervision that it should constitute a separate course; and personnel, with 13.30 per cent of the text space is of comparable value to business administration majors.

As can be seen from Chapter II, responsibilities and organization, with 11.29 per cent, is composed of sorely neglected subjects. As the program progresses and awareness of this situation becomes recognized, it might well develop into two or more courses, becoming a field of semi-specialization.

The fact that these authorities devote 11.18 per cent of text space to the physical plant gives that field sufficient weight for a course of study. It might, however, prove profitable to combine it and manufacturing methods, which has 7.64 per cent, in the early stages of the industrial management program development.

No business executive, at any level, could be considered educated by modern standards without some conception of industrial finance. The authors devote 9.67 per cent of their space to this field.

Materials management, including salesmanship, constitutes 10.87 per cent of the texts. Because of its nature, this might be one course during early development of the program, and possibly branch out later.

Although introduction and summary with 7.58 per cent could continue as early lectures in each course, it would seem

justifiable as a separate course in order to frame the picture for each degree plan.

Time and motion study is already a recognized tool of industrial management. As it is a specialized field requiring some mathematical background, it might be treated briefly with other phases of the early program. The recent development of work simplification and standardization methods and procedures portends considerable opportunity for such training.

A study of Table 6, pages 39 and 40, will indicate the importance of each phase in relation to all of the others, on the basis of text space devoted by the selected authors.

While it would be impossible for any one man to be a specialist in all these fields, the potential top executive does need a basic understanding of how they can be correlated to form one integrated program. To achieve this unification, it would seem wise for the student to have a general economics background and an introductory course which would lay out the overall picture explaining the scope and opportunities of industrial management. This would serve not only in framing the industrial picture, but also aid the student in choosing the field for his semi-specialization which is necessary in preparation for entrance into industry. It should also stress the fact that while such a program prepares the way for ultimately higher managerial positions, the very nature of its broadness necessarily hinders beginning on as high a plane as that of specialists. It would be necessary to start lower in order to

advance higher. Students should be made to realize the extent of that sacrifice early in their educational program.

C. S. Lumley, Director of Engineering, H. E. Beyster Corporation, in a personal letter dated March 24, 1949, expressed it this way:

> . . . the one job above all which is the most difficult to fill is that which calls for an overall knowledge of the field in which the individual is operating and the ability to express in both the written and spoken word the findings and recommendations involved. There is no difficulty with respect to the technical aspects of the work per se. The main difficulty is with the high degree of specialization which is in evidence . . . . The man who can see the entire picture all the way through from basic metallurgy through processing, product design, manufacturing costs, methods, through all phases of manufacture, and is able to express himself in these fields, is the ideal man because he can not only attack broad assignments but is interchangeable from one assignment to another. It is this versatility which is most valuable.

Other personal letters from practicing consultants concur in this idea. Two pertinent letters are reproduced in the Appendix. The fact that these consultants and authors agree gives emphasis to the justification of such a broad program.

It is believed that such a broad field of related tool courses will well equip a graduate to find immediate employment in a tightening market, while opening the way for specialization and ultimate success in whatever branch of the field he may choose.

While the foregoing analysis has indicated the relative importance which these authors attribute to problems which are basic to all industries, the material in the preceding chapters precludes the formulation of a standard degree plan. Instead

of making a standard plan for everyone interested in the industrial management field, the curriculum should be worked out according to current job opportunities and personal qualifications of the student. Although this would require more counseling than has been evidenced in the past, this guidance is vital to the ultimate success of the student. Through proper guidance a student may be able to decide for himself which phase of management he wishes to enter.

Thus a student whose interests, aptitudes and other qualifications indicate direct production supervision as his most promising field of endeavor might well major in industrial arts, thereby developing skills and necessary familiarization with shop techniques. He should then have a minor in business to give him the overall picture of how production ties in with the other phases of industrial enterprise.

For the student who wants staff and administrative responsibilities and whose aptitudes indicate some measure of success in this field, a major in business administration would provide the necessary tools and techniques. For proper recognition of the relationship between office and shop and for the necessary respect of shop personnel he should take a broad enough range of industrial arts courses to constitute a minor.

The industrial management curriculum might therefore be divided into two basic plans as foundation for development of individual degree plans, Plan A for Business Administrations, and Plan B for Industrial Arts majors. The two plans are

offered as transitional degree plans. The material presented on the following pages, from which they evolved, is basic and should form a foundation for developing the curriculum with the changing industrial picture. The "general requirements" are listed as they appear in the current catalogue of North Texas State College in order that the plans might be shown complete.

INDUSTRIAL MANAGEMENT CURRICULUM

Plan A (For Business Administration Majors)

Professional Field	Hours	
Introduction to Industrial Management	3	
Personnel Administration, including Job Evaluation	3	
Supervisory Management	3	
Manufacturing Methods and Physical Plant	3	
Materials Management	3	
Time and Motion Study	3	
Production Control and Quality Control	3	
Industrial Finance	3	
		24 hours
General Business Requirements		
Vocational Guidance	1	
Principles of Accounting	6	
Business Mathematics	3	
Business Correspondence	3	
Business Law	3	
Business Statistics	3	
Office Management	3	
Business Psychology	3	
Principles of Economics	6	
		31 hours
Minor Requirement		
Industrial Arts:		
Mechanical Drawing	3	
Wood Shop (Combined Hand & Machine)	3	
Metal Shop (Combined Foundry and Machine)	3	
Materials of Industry	3	
Plant Layout and Tooling	3	
		15 hours
General Requirements		
English	12	
Library Service	1	
Natural Science	6	
Physical Education	4	
Social Science	9	
Speech	3	
		35 hours
Free Electives		21 hours
TOTAL		126 hours

INDUSTRIAL MANAGEMENT CURRICULUM

Plan B (For Industrial Arts Majors)

Professional Field	Hours	
Mechanical Drawing	6	
Wood Shop	6	
Sheet Metal Shop	3	
Machine Shop	3	
Foundry	3	
Materials of Industry	3	
Plant Layout and Tooling	3	
Safety Engineering	3	
Shop Mathematics	3	
Welding	3	
Shop Care and Management	3	
Philosophy	3	
Industrial Arts electives	12	
		54 hours

Minor Requirements		
Business Administration: (18 hours selected fromthe following)		
Introduction to Industrial Management	3	
Supervisory Management	3	
Materials Management	3	
Production and Quality Control	3	
Principles of Accounting	3	
Business Law	3	
Business English	3	
Typing		
		18 hours

General Requirements		
English	12	
Library Service	1	
Natural Science	6	
Physical Education	4	
Social Science (including 6 hours Economics)	9	
Speech	3	
		35 hours
Free Electives		17 hours
TOTAL		124 hours

CHAPTER VI

SUMMARY

In view of the foregoing presentation, it can be seen that an industrial management curriculum is justified.

1. It was shown that North Texas is changing rapidly from an agricultural to an industrial economy. Factors were considered which seem likely to contribute to further industrialization.

2. The results of irresponsible industrialization in other sections have been indicated to show the need for enlightened management.

3. The correlation between educational processes and industrial needs should be brought closer together.

4. The existing courses at North Texas State College form a good basis for a program in industrial management.

5. The growth of North Texas State College has been considerably faster than that of the average college of the nation; this appears to be at least partly explainable by the fact that the school has predicted and provided for the changing requirements of its students.

6. This study indicates that if North Texas State College is to continue growth, not only in enrollment, but in the capacity of its graduates to fit the needs of the area, one of the most fertile fields for advancement is that of industrial management.

After justification of an industrial management program is thus accomplished, a broad outline of subject areas most basic in the proposed curriculum can be formulated. As an expedient and roughly satisfactory means of revealing these major subject areas, the proportions of space devoted to them in ten general texts in the field were analyzed.

The subject areas thus obtained indicate that students preparing for eventual management in industry need at least cursory training in the following fields:

Introduction and general background of industrial management
Responsibilities and organization
Personnel administration and supervisory management
Manufacturing methods and shop experience
Layout, location, and maintenance of the physical plant
Materials management, from purchasing to sales
Time and motion study and other measures of performance
Production and quality control
Finance

Because of the consideration that factors such as the individual student's capacities, interests, and abilities, as well as fields of employment and industrial development all affect job opportunities, it is recognized that no standard curriculum will offer optimum value to all. For that reason, only foundation plans are presented, one for majors in Business Administration and one for majors in Industrial Arts. Upon these foundations, degree plans may be built for individual students with varying objectives.

APPENDIX A

THE EMERSON ENGINEERS
Management Counselors

New York Offices
30 Rockefeller Plaza . New York 20, N. Y.

April 7, 1949

Dear Mr. Orr:

In reply to your March 18th letter, it makes a difference whether you enter an industrial company or a professional Management Engineering firm such as The Emerson Engineers. The industrial company, if large, will look for specialists such as time study engineers, storekeepers, accountants, etc., whereas a Professional Management Engineering firm will more likely want a rounded out junior with knowledge of the many sub-divisions of a business and its methods.

We find it most difficult to obtain prospective engineers who have or can develop these rounded out qualifications or have the ability to adjust themselves to changing conditions or assignment.

In school you are taught much that will aid you in actual practice, but you will have to continue with self-improvement as long as you are in professional work to become a success.

Our Engineers are trained to meet varied and changing situations. Perhaps the most promising and difficult applications are the controls for Management, the Administrative Organization setup and program, Planning, Scheduling & Dispatching work, Standards, and Incentives.

As I have working with me graduates of both Texas A & M and Texas University, I have a high regard for their graduates. Their Industrial Engineering Courses are excellent. I might also suggest the Harvard Business School, Massachusetts Institute of Technology, Wharton School of University of Pennsylvania, Syracuse University School of Business and Administration, Cornell, Northwestern, and there are many others.

Enclosed is an application blank for you to fill out and return. I would suggest you contact The Emerson Engineers about March 1950.

I send you best wishes in your effort to prepare for life.

Very sincerely,

(Signed)
Alonzo Flack
Chairman & Treasurer,
THE EMERSON ENGINEERS

Mr. Jack K. Orr,
Route 1,
Denton, Texas.

Enclosure.

The Professional Engineer's Attitude toward the Curriculum and Graduate Industrial Engineer

by

Alonzo Flack
The Emerson Engineers

In our institutions of learning, great stress is laid on training the minds and broadening the vision of our youth so they may render service to mankind and make money to acquire the necessities and comforts of life. They are given scant instruction on the way to take care of their earnings so as to retain, use, and enjoy them. The recent past has given vivid evidence of this state of affairs, not only as to the shrinkage and misappropriation of individual fortunes, but as to those of the nation as a whole.

Our young graduate industrial engineer will greatly enhance his value to a new employer if he has been grounded in these two fundamentals. He will find every business requires two controls: administrative and financial.

In most businesses, administration and management of manufacture and distribution are given close attention, but the scrutinizing of expense losses and waste is dodged and neglected. This was especially true in prosperity, is being corrected somewhat now, but will probably recur again soon when management is engrossed in another deluge of orders, expansion, profits, and easy living.

Having this in mind, there is outlined what seems to be a logical grouping for the curriculum of the course in industrial engineering.

1. General Education

   Liberal arts as a broad cultural and mental training and background.
   Grammar and English for correct writing of letters, reports, etc.
   Mathematics for accurate general and business calculations.
   Psychology - general, social, industrial, and employment.
   Economics - general, industrial, and geographic.
   Travel and plant visits for practical observations of successful applications.

2. Industrial Engineering Education

   A. Administrative and Management Control

      Organization and Management for Industry and Factory.
      Business law.
      Business administration.

Management of business, office, production and distribution.
Public relations.
Government regulations.

Planning and Production Control
Research for organization and management.
Time, motion, and method study.
Analysis, routing, loads, and balance.
Investigations of appropriations and expenditures.
Simplification and waste elimination.
Standardization of conditions, methods, routing, times, and costs.
Planning, scheduling, and dispatching.
Production control.
Production records and reports.

Labor Control.
Personnel management.
Selection, assignment, and training of employees.
Industrial relations.
Labor problems.

Materials Control
Purchasing.
Receiving.
Storage.
Processing.
Shipping.
Traffic.
Handling.
Transportation.

Product and Plant Engineering.
Products - research, design, experiments, tests, drawings, etc.
Tools, equipment, structures, and land.
Plant and shop layout and design.
Production equipment.
Tool design, manufacture, storage, and care.
Installation.
Maintenance.
Service - power, heat, light, water, etc.
Quality - inspection and tests.

B. Financial Control

Business and Finance
Money and banking.
Management of capital.
Corporation finance.

Statistics, Standard Costs, and Budgets.
Indistrial statistics.
Budgetary control.

Accounting.
Theory of accounting.
General Accounting.
Costs - Actual and Standard.
Cost Accounting.
Time, Pay, and Incentives.
Wage and incentive systems.

C. Supervision and Superintendence.

Management
Execution

D. Distribution (Sales)

Management
Execution
Markets
Merchandising
Advertising
Salesmanship
Service

Certain liberal-arts fundamentals constitute the finest preparation and background the student in industrial engineering can have. From it he obtains a broad cultural and social training that is helpful to a man as his influence and interests grow.

He also needs a very practical training in the work the artisan, mechanic, or laborer may do.

It is important such elementary subjects as English, arithmetic, and penmanship be stressed. Case after case of a woeful lack of knowledge and ability to apply and use these simple subjects have been evidenced by young men, graduates in industrial and other engineering courses from our finest universities.

The objectives of such an education in industrial engineering are to master organization and management; investigation and research; standardization; planning, scheduling, and dispatching; execution of plans; efficiency rewards; records and statistics for comparison and measure.

Accomplishing this, the graduate may look forward to a broad and active career in industrial engineering, extending into management.

The outlook and aims of the graduate have considerable to to with the scope of his activities and success. Does he desire to become a time study engineer, planner, industrial engineer in the broader sense, wage specialist, or an executive?

In Industry and professional service, the employer may limit his scope to specialized effort in industrial engineering from which he may find difficulty in emerging.

Managers of industry or professional services are looking not only for trained engineers, but certain other qualifications, as follows: character, aptitude, ability, judgment, tact, persistence, perseverance.

The requirements of the industrial manager and the professional engineer are not quite the same. To start on the road to his chosen work the graduate will probably find three avenues open to him.

In the first instance, he may enter an industry where he is placed either by himself or in a department to carry on industrial engineering. If alone, he will be under supervision that may or may not be able to render him much direction or assistance. He tries to apply his knowledge, finds out there is much he does not understand, endeavors to supplement his education by reading, attending meetings, and visiting successful installations in other plants, and makes rather slow progress. If assigned to a department in a larger corporation, he is usually under trained supervision and is surrounded by others with a common interest. However, he may find himself assigned to specialized work such as time study, wage calculations, statistics. In time his education and experience will broaden by successive changes in assignment.

He may be selected to enter or direct a department of industrial engineering in a company that is organizing such a department to be trained by employed professional industrial engineers. He will then be able to observe and assist in a practical installation by specialists.

He may be fortunate enough to be engaged by a firm of professional industrial engineers of experience and broad application of industrial engineering. Such a firm is usually unbiased, fair, and impelled by the necessity for service. They do their work usually on the basis of a specific performance to be completed within a prescribed period of time. For the installation to be successful, there must be an accomplishment. The management sooner or later questions this and weighs the results against the expense of the service. To work under these conditions requires intensive application and concentration. Each step of the program is carefully planned. The junior engineer, preferably taken after he has had from 2 to 5 years of practical office, shop, or industrial engineering experience in a corporation, is given special assignments under close supervision of the supervising engineer. Having been in only one or more companies he is often surprised to find out how little he knows about the operation of the new one, for he is as yet unaccustomed to change of environment. After working on one assignment after

another which have taken him through several departments, in three or four different companies, he begins to comprehend the broader concept of the mechanism of management and industry. By that time he may have served under several experienced and successful engineers and from each of them gained much through association and careful instruction, and is ready for senior engineering work.

Almost daily the industrial engineer is called on to write up reports, data, and instructions in concise, logical and correct grammatical form. It may be necessary for him to investigate office procedure, analyze statistics and accounting data. He may compile figures, tables, and statistics. To do this well he must be well grounded in these fundamental subjects and be able to apply them accurately.

KTS

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APPENDIX B

H. E. BEYSTER CORPORATION
Architects & Engineers

Industrial Bank Building
Detroit 26

March 24, 1949.

Mr. Jack K. Orr
Route #1
Denton, Texas

Dear Mr. Orr:

1. Your letter of March 18, asking for recommendations regarding your choice of technical school and the courses which you should pursue, is most interesting. It is our desire at all times to help forward-looking students such as yourself, however, the assignment which you have given us is not easy, as you can well imagine, as it involves personality patterns, aptitudes, and other factors which have a far-reaching effect on your future welfare and happiness.

2. The writer has only a little faith in the various personality inventory and intelligence tests which are presently being used by many educational institutions, and as these tests are, in your case, the only basis which we have for giving advice, it is felt that we should be extremely careful in making recommendations; therefore such recommendations as are contained herein will of necessity be of a general nature.

3. Assuming that you have a personality pattern and aptitudes which would definitely indicate engineering as your vocation, and assuming that your artistic and creative factors are not superior such that you would not be an outstanding success in product design and styling work, the writer believes that you should choose that branch of industrial engineering in which your past experience indicates you have the most opportunity for satisfying your natural bent.

4. In reply to your question, "What job do you find hardest to fill with qualified engineers?" - the one job above all which is the most difficult to fill is that which calls for an overall knowledge of the field in which the individual is operating and the ability to express in both the spoken and written word the findings and recommendations involved. There is no difficulty with respect to the technical aspects of the work per se. The main difficulty is with the high specialization which is in evidence on the part of junior engineers. The man who can see the entire picture all the way through from basic metallurgy through processing, product design, manufacturing costs, methods, through all phases of manufacture, and

is able to express himself in these fields, is the ideal man because he can not only attack broad assignments but is interchangeable from one assignment to another. It is this versatility which is most valuable.

5. With respect to your question, "What should we be taught that we have not been taught?" - the two most important things are the ability to express in the spoken and written word, as mentioned above, and an appreciation of manufacturing costs in all their ramifications.

6. With respect to your question, "What is your most promising field of industrial engineering specialization?" - the answer to this is cost analysis. In closing we might emphasize this cost aspect more by stating that there are many engineers who have good technical ability, high specialization, who have no concept of costs. Cost is the factor which is the most important to the manufacturer. If you will bear this in mind constantly, I believe it should be of help to you in choosing your path.

7. With respect to making an application for a position, you can appreciate that we as a firm of engineers cannot offer you anything of interest until you have acquired experience in your chosen field of industry. After you have acquired five or ten years' experience we will be pleased to talk with you.

8. We are sending you one of our brochures, which you will note does not describe our industrial engineering services; it is primarily directed at building work. Our industrial engineering service usually has to be discussed individually with the client and cannot be advantageously coveren in brochure form. However, we are attaching one of our "Scope of Services" brochures which touches on these branches of our services. Trusting that this material will be of some help to you, and wishing you every success, we remain,

Very truly yours,

H. E. BEYSTER CORPORATION

(Signed)
C. S. Lumley
Director of Engineering.

CSL/eg.
Attach. (2)

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