PN-ARE-342

THE NEW YORK UNIVERSITY PROGRAM IN ISRAEL

(May 24, 1957 to August 31, 1960)

FINAL REPORT

under the terms of a contract between

The United States International Cooperation Administration

and

New York University

"Technical cooperation among nations is essentially the exchange of knowledge and skills. For newly developing nations, technical cooperation hastens economic and social progress. For more industrialized nations, technical cooperation provides the means not only of assisting lesser developed nations to become stronger economic partners in the free world, but also establishes the framework for an increasing cooperation, extending far into the future, in other fields of mutual interest."

Technical Cooperation through American Universities
International Cooperation Administration
Office of Public Reports
Washington 25, D. C.

NEW YORK UNIVERSITY
Graduate School of Business Administration
100 Trinity Place, New York 6, N.Y.

August 31, 1960

International Cooperation Administration
Washington, D. C.

Gentlemen:

The submission of this final report on the New York University Program in Israel provides me the opportunity of expressing the pleasure which we at New York University experienced through participation in this important international educational undertaking.

We believe the accomplishments and promise of the business administration and industrial management curriculums established respectively at the Hebrew University and the Israel Institute of Technology (Technion), are significant for the progress of the new state of Israel. We are hopeful that the introduction of these disciplines, so important to our country, will contribute to the educational and professional services which these two great educational institutions are called upon to provide to the people of Israel.

In turn, the program has been singularly rewarding for New York University. Important academic and cultural benefits have accrued to us. As we expand in this area of international cooperation, with new projects now under way, the experience and depth gained by our faculty and staff should prove to be most helpful. We are also pleased that our large foreign student body has been enhanced by a number of Israeli students of outstanding ability and scholarship.

New York University wishes to express its deep appreciation to the faculties and administrative staffs of Hebrew University and the Technion for the spirit and devotion which they brought to this project. These educators made our association professionally productive and personally rewarding. We look forward to continuing the close relationships which have developed between our respective institutions.

Very sincerely,

Joseph H. Taggart

Joseph H. Taggart
Dean

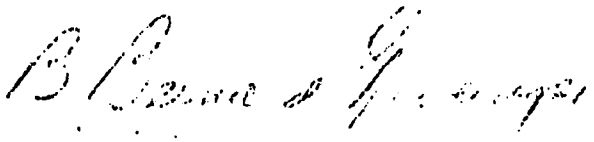
FOREWORD

This final report, the last in a series of five (four of which were previously published on a semi-annual basis), summarizes the accomplishments of the NYU Program in Israel from its inception on May 24, 1957 to its terminal date, August 31, 1960, under the terms of a contract entered into between New York University and the U. S. International Cooperation Administration and corollary agreements with Hebrew University and Technion.

The program, as agreed upon between the several parties, and as embodied in the contract, was principally designed to provide technical assistance in the development of a curriculum in business administration at Hebrew University, and a graduate program in industrial management at the Israel Institute of Technology (Technion). Specifically, New York University assumed the responsibility of assisting the respective Deans and Faculties in the development of curricula, assisting in teaching methodology, and stimulating research and consultation. To achieve these objectives over the long run and to insure the continuation of these programs following the termination of our project on August 31, 1960, the NYU team, by means of a phasing-out process, gradually turned over their responsibilities to the faculties of Hebrew University and Technion. This was accomplished in two ways. Selected faculty members of the two institutions were assigned as counterparts to work with the NYU staff members in Israel, and to teach the newly-introduced courses under their supervision. In addition, training in the United States under the guidance of New York University was provided for a number of Israeli participants to prepare them for teaching and research careers

on the staffs of both Hebrew University and the Technion.

This program has been a cooperative effort from the outset. Its achievements to date were made possible by the splendid cooperation and support received from all participating agencies--Hebrew University, the Israel Institute of Technology, the Government of Israel, the United States Operations Mission in Israel, the International Cooperation Administration in Washington, and the administration and staff of New York University.



B. Bernard Greidinger
Coordinator
N.Y.U.-I.C.A.-Israel Program

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EXHIBITS

(These are illustrative of some thirty excellent and highly informative exhibits received. Limitation of space prevents the inclusion of all.)

NEW YORK UNIVERSITY-ISRAEL PROGRAM STAFF

New York

University Contract Coordinator	Dr. B. Bernard Greidinger
Project Supervisor	James F. Gilsenan
Administrative Secretary	Gerda Sadlier

Israel

Chief of Party	Assoc. Prof. Eugene Richman
HEBREW UNIVERSITY	
Visiting Professor of Management	Prof. Andrew Barta
Visiting Professor of Accounting and Business Administration	Prof. Theodore Lang
Visiting Professor of Marketing and Foreign Trade	Prof. Edward E. Pratt [1]
ISRAEL INSTITUTE OF TECHNOLOGY--TECHNION	
Visiting Associate Professor of Operations Research	Assoc. Prof. Sylvain Ehrenfeld
Visiting Associate Professor of Industrial Engineering	Assoc. Prof. Eugene Richman
Visiting Professor of Operations Research	Prof. Glen D. Camp [2]
Visiting Professor of Statistical Quality Control	Prof. Sebastian B. Littauer [3]
Visiting Lecturer of Industrial Management	Mr. Raymond E. Hartstein [4]

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1. Professor Pratt was on a short-term assignment to Hebrew University for the period June 1, 1958 to August 31, 1958. At the request of Hebrew University, his appointment had been extended to August 31, 1959.
With deep sorrow we report the death of Professor Pratt on July 4, 1960.
2. Professor Camp was on a short-term assignment to the Technion for the period November 11, 1958 to January 25, 1959.
3. Professor Littauer was on a short-term assignment to the Technion for the period May 28, 1959 to August 9, 1959.
4. Mr. Hartstein was assigned half-time to the Technion, and the remainder of his time as management advisor to USOM/Israel.

HEBREW UNIVERSITY

I. INTRODUCTION

This final report is intended as a review of the progress and problems which have characterized the efforts of the New York University team together with the resident faculty of Hebrew University in the development of a professional program of business administration at the Eliezer Kaplan School of Economics and Social Sciences.

Under the contract, the primary mission of the NYU team-- Professors Theodore Lang, Andrew Barta, and Edward E. Pratt*-- was the development of the overall curriculum and of the courses in the special areas. Each professor was responsible in his area of primary interest for course content and development, training assigned counterparts, required teaching, and stimulation of research. Collectively, they addressed themselves to such common tasks as curriculum building, analysis of present and projected structure, standards of performance, prerequisites and overall policy. In these endeavors, both as an individual and as a member of the team, the NYU staff worked with and enjoyed the fullest cooperation of their Israeli colleagues -- the late Professor Alfred Bonné, former Dean of the Kaplan School; Dean Jacob Katz, the present Dean; Professor Bertram Gross, former Chairman of the Kaplan School's Department of Business Administration; and Dr. Daniel Haft, the present Acting Chairman. This was really a joint undertaking.

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*Professor Pratt served on the team from May, 1958 through August, 1959. It is with deep sadness that we here record the death of Professor Pratt on July 4, 1960.

II. CURRICULUM PLANNING

Formal work began with the arrival of Professor Lang in Jerusalem in September of 1957. He was followed one month later by Professor Barta. The first few months were devoted to preliminary study of the existing business course structure and preparation of course material. In addition, work in the case method was started, counterparts assigned, and participation in seminars and study-days took place. Organization and development work in the core courses was commenced and a number of these were offered in the project's first academic year (1957-58).

In planning ahead, an interim curriculum was worked out which contained the courses to be taught in the first year and the tentative plan of course offerings for the ensuing years (Table 1, p.4). The courses for the first year comprised the new core courses developed by the team and several existing courses such as Business Law and Business Taxation which were being given by the resident faculty.

The plan for the curriculum was worked out following a preliminary analysis by Professor Lang and a statement of guiding criteria for its design by Professor Barta. This plan in substance called for: 1) a number of general required courses; 2) a core of required courses in the basic fields, i.e. Accounting and Financial Management, Production Management, Marketing and Foreign Trade; 3) advanced or specialized courses in one field or major as chosen; and 4) some electives in fields other than the major, or other business-related subjects. (Table 2, p.6).

With Prof. Lang handling the extra duties of Chief of Party, Prof. Barta assumed a major responsibility during the academic year for analysis and projection of curriculum structure. In March, 1958, he submitted an extensive report entitled, "Problems of Curriculum

TABLE 1

FIELDS OF STUDY	COURSES 1957-1958	
GENERAL ADMINISTRATION	Feasibility of Industrial Enterprises	S3
BUSINESS LAW	Legal Aspects of Business Administration	Y2
MANPOWER	Personnel Management	W2
	Labor Relations	S2
	Measurement Techniques in Personnel Management	S2
ACCOUNTING	Introduction to Accounting	Y3
	Fundamentals of Cost Accounting	Y2
FINANCE	Business Taxation	S2
MARKETING		
PRODUCTION	Elements of Production Management	Y2
OFFICE SYSTEMS		
TOTAL NUMBER OF COURSES		9

Key: Y - Full year course
F - First trimester
W - Second trimester
S - Third trimester

The number appearing after the letters denotes the number of class hours per week.

COURSE OFFERINGS 1957-1960

ADDITIONAL COURSES 1958-59		ADDITIONAL COURSES 1959-60	
Fundamentals of Administration	Y3	Problems in Management (M.A. Course)	Y2
Selected Problems, etc.	WS2	Seminar in Business Policy Problems in Israel	Y2
		Institutional Labor Relations - Public Policy	W2
Business Budgeting	Y2	Accounting Theory	Y2
Seminar in Accounting Problems	Y2	Analysis of Financial Statements	F2
		Controllership	W2
		Managerial Accounting	S2
		Auditing	Y2
Fundamentals of Business Finance	Y1	Special Problems in Business Finance	FW2
		Investments in Business Enterprises	S2
		Principles of Banking	Y2
Fundamentals of Marketing	Y2	Seminar - Market Research	Y2
Foreign Markets	WS2	Development of Sales Program	F2
		Retailing	W2
Production Planning & Control	W2	Basic Technological Processes	
		Seminar on Production Problems	
Office Management	Y2		

TABLE 2

Business Administration Program (Curriculum Plan)
As Planned in December, 1957

Fields	Required "Core" 16 hours for all students	Specialization 6 hours in one of the fields listed below	Electives 6 hours - to be selected from any of the courses outside required "Core"
1. General Administration	3		
2. Business Law	2		
3. Manpower	2		
4. Accounting and Finance	5	6	
5. Production	2	6[x)]	
6. Marketing	2	6	
Total	16 +	6 +	6 = 28
7. Courses in other departments:			
Statistical Methodology (with special exercise in business statistics),	required		
Human Relations	elective		
Cooperatives		6	
Managerial Economics			

x) Includes course in Cost Accounting, 2 hours.

Development and Faculty Personnel Needs of the Business Administration Department." This report, the end product of many meetings between our team and the Kaplan School faculty, dealt in detail with the problems and procedures of curriculum building and related manpower needs.

The curriculum has been developed over the past three years following the plans set forth in the several curriculum projections. The first year, nine (9) courses were offered, the second year eighteen (18), and the third year twenty-six (26). The teaching program for next year (1960-61) will also offer twenty-six courses (Table 3, p. 8). This last table shows clearly that the course program for next year approaches closely the original curriculum design.

III. STUDENT BODY

The following statistics relate to the number of students registered in business administration during the last three years, as well as the number of degrees and certificates granted. During the first year of the program (1957-58), 76 students were admitted. In the academic year 1958-59, 85 new students plus 49 advanced students were registered for a total of 134 students. For 1959-60, there were 90 new students and 57 advanced students or a total of 147. There has thus been a steady increase in registration. Because of limitations of both adequate space and qualified faculty, additional registration may have to be curtailed.

TABLE 3

THE ELIEZER KAPLAN SCHOOL OF ECONOMIC AND SOCIAL SCIENCES
THE HEBREW UNIVERSITY, JERUSALEM

DEPARTMENT OF BUSINESS ADMINISTRATION

Teaching Program, 1960-61

Required Courses

1.	Introduction to Accounting	(3)	Dr. Z. Ophir
2.	Elements of Production Management	(3)	Mr. T. Weinshall
3.	Elements of Marketing	(2)	Mr. A. Ilan
4.	Elements of Business Finance	(2)	Mr. M. Sarnat
5.	Elements of Business Administration	(2)	Mr. A. Meshulach
6.	Personnel Administration (Autumn, Winter)	(2)	Mr. D. Bar-El
7.	Labor Relations (Spring)	(2)	Mr. D. Bar-El
8.	Business Law	(2)	Adv. C. Hausner

Required Course for Advanced Students

9.	Business Policy	(2)	Dr. D. Haft & Mr. A. Meshulach

Elective Courses

10.	Accounting Theory	(2)	Dr. Z. Ophir
11.	Cost Accounting	(2)	Mr. A. Shapiro
12.	Business Budgeting and Controllership	(2)	Dr. D. Haft
13.	Analysis of Financial Statements (Winter, Spring)	(2)	Dr. D. Haft
14.	Auditing	(2)	Mr. A. Ginossar
15.	Production Planning and Control (Autumn, Winter)	(2)	Mr. Y. S. Eksztajn
16.	International Marketing (Autumn, Winter)	(2)	Mr. P. Meysels
17.	Problems in Market Research (Autumn, Winter)	(2)	Mr. A. Ilan
18.	Banking Policy and Financial Institutions	(2)	Mr. M. Sarnat
19.	Measurement of Techniques in Personnel Management (Spring)	(2)	Prof. A. L. Guttman
20.	Business Taxation (Autumn, Winter)	(2)	Dr. T. Brosch
21.	Quality Control (Autumn)	(2)	Mr. R. Bar-on
22.	Introduction to Linear Programming (W)	(2)	Mr. R. Bar-on
23.	Selected Problems in Managerial Accounting (Seminar)	(2)	Dr. Z. Ophir
24.	Selected Problems in Production Management (Seminar)	(2)	Mr. T. Weinshall
25.	Selected Problems in Marketing (Seminar)(Autumn)	(2)	Mr. A. Ilan & Mr. Tal
	(Winter, Spring)	(2)	Mr. A. Ilan
26.	Selected Problems in Financing (Seminar)	(2)	Mr. M. Sarnat

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Note:- The number appearing in brackets denotes the number of class hours per week.

The number of students who completed their work in business administration and qualified for their final examinations either for a Master's degree or for the Certificate is as follows:

July	1959	7 students
October	1959	8 "
March	1960	4 "
	Total	19 students

So far, 18 candidates have signified their intention to take the final examinations at the time of this report. Actually, the figures are misleading; many more students have completed the course program than the above tabulation would seem to indicate. Most of the students either were interested only in specific courses, or if they did take the entire prescribed program, were unwilling to meet the exacting requirements for academic recognition at the graduate level. In the field of accounting, for example, there is no distinction between candidates who offer Business Administration as a minor for the Master's degree and those working for the Certificate in Business Administration. The candidates must pass both final written and oral examinations besides satisfactorily completing a seminar course which involves the writing of a research report.

IV. ACCOUNTING AND FINANCIAL MANAGEMENT

In the subject area of accounting and financial management, planning and control, it has been necessary to establish definite prerequisites for the courses. Students are permitted to take basic accounting during their undergraduate career. In fact, in order to complete the requirements in accounting in two years of graduate work

they must take their basic accounting before completion of the work for the Bachelor's degree. Since accounting is, in any event, a requirement in economics, this poses no problem, as many of the Business Administration students offer economics as one of their fields.

All the advanced accounting courses are on a graduate level and cannot be taken until the student has completed his Bachelor's degree requirements in at least one of his two major fields. Moreover, he must demonstrate certain scholastic achievements in the form of high grades before being admitted to the studies in Business Administration. In accounting, he will not be able to take Cost Accounting except upon satisfactory completion of the introductory accounting course. The same is true of Accounting Theory. To be admitted to the course in Budgetary Control and Controllership Accounting, he must have completed the basic course, and the courses in theory and cost. Thereafter, these courses constitute a prerequisite for Auditing, Analysis of Financial Statements, and the Seminar in Accounting.

It was not possible to adhere strictly to these prerequisites in the early stages of this program. However, beginning with the year 1960-61, steps have been taken by the faculty of the Department of Business Administration to assure that all prerequisites will be strictly adhered to. This will mean a full two-year program beyond the Bachelor's degree, instead of the present arrangement. The sanction of the Faculty of the Humanities for the two-year program is being requested.

Under the direction of Professor Theodore Lang, all the accounting and related courses in financial management, planning, and control have been established on a very sound basis. Much of the success achieved in this area is attributable to the fact that excellent counterparts were appointed to work closely with Professor Lang. These counterparts were: Dr. Daniel Haft, Mr. Arieh Shapiro, and Zvi Ophir.

The structure and the development of the accounting curriculum may be seen from the following tabulation:

1957-8	Basic Accounting Cost Accounting
1958-9	Basic Accounting Cost Accounting Budgeting and Controllership Seminar in Accounting
1959-60	Basic Accounting Cost Accounting Accounting Theory Analysis of Financial Statements Auditing Seminar in Accounting

Beginning with the year 1960-61 the following program will be offered:

Basic Accounting
Cost Accounting
Accounting Theory
Analysis of Financial Statements
Budgeting and Controllership
Auditing
Seminar in Accounting
Business Policy (in cooperation with other branches of Business Administration)

1957-58 - In the first year of our program, two fundamental courses were offered. The counterpart to Professor Lang in BASIC ACCOUNTING was Dr. Daniel Haft, a graduate engineer and an Israeli certified public accountant. Dr. Haft, who at the time was serving in an adjunct capacity, conducted the course in Hebrew and all books of account were adapted to Israeli conditions.

The course in COST ACCOUNTING was given to 21 students. At the beginning of the year there were 38, but some of these were inadequately prepared, and because of the shortage of textbooks, it was necessary to limit the size of the class. Mr. Arieh Shapiro served as the counterpart in this course, and toward the end of the spring semester he was able to assume an increasingly active part in the direction of the course.

1958-59 - In this second academic year the two fundamental courses were continued with the counterparts successfully carrying on the basic work. In addition, the curriculum was expanded to include BUDGETING AND CONTROLLERSHIP as well as a SEMINAR IN ACCOUNTING.

Dr. Haft also served as the counterpart for the Budgeting and Controllership course. Professor Lang and he conducted the course on a combined lecture-case study basis and visual aids were employed. The chief difficulty encountered was that students were admitted who did not have the required background. In the circumstance, it was necessary to accept students provided they also registered for cost accounting. The prerequisite requirements of completion of the basic accounting and cost accounting courses were made firm. Consequently, with so few eligible in the second year, the course in Budgeting and Controllership was not offered in 1959-60. With the natural course sequence established, it will be offered in 1960-61.

The research course, Seminar in Accounting, was introduced by Professor Lang at the request of the Kaplan School authorities. Covering selected problems in the field of financial accounting and cost accounting and with an emphasis on methods of research, it is limited to graduate students only. As initially organized and planned, each student is interviewed and a series of projects decided upon. In addition, current problems in the field are reviewed and summarized.

The seminar course, more than any other, has revealed the inherent capacity of the Israeli student. Each of the seven students in the first year of the course wrote a thesis on a special topic. The following is a list of titles:

1. Cost Problems in Flint Clay Mining in the Negev
2. Cost Systems for a Paper Box Manufacturer
3. Feasibility of Manufacturing Lube Oils
4. Cost Problems in the Manufacture of Coca and Chocolate
5. Cost Accounting for Kubbutzim
6. Direct Costing
7. Problems in Railroad Costing

The students have shown a great deal of aptitude and initiative in attacking their problems. Because their training up to now has been rushed, some found themselves in deep water. Nevertheless, they have done creditable work. Some valuable lessons have been learned in working with the initial class which have and will continue to be used to improve the content of the course and the method of handling the research work.

1959-60 - The third academic year, and the final year of the NYU program, has now been completed. With a firm foundation established in the subject area of accounting and financial management, all course requirements were made more exacting, the students being expected to observe professional standards in the preparation of their work. As noted, it was decided not to repeat the Budgeting and Controllership course, but to wait until the next academic year when there will be an adequate number of qualified students. However, much additional progress was attained with the introduction of three new courses: AUDITING, ACCOUNTING THEORY, and ANALYSIS OF FINANCIAL STATEMENTS.

Being the last year of the program, Professor Lang was anxious to have these courses started under his supervision.

Both Auditing and Analysis of Financial Statements were given jointly by Professor Lang and Dr. Haft. With the outlines and content of the courses worked out by the end of the first trimester, they were offered in the second and third trimesters. Auditing, while it was given as an intensive course, will be a full year course in the future. The Analysis of Financial Statements course is given on a combined lecture and case-study basis. Not being on an intensive scale, it will continue to be offered during these two trimesters.

Accounting Theory, including both intermediate and advanced accounting, was a new course initiated by Dr. Zvi Ophir, a new faculty member at the University. For this course, the intermediate and advanced texts of Finney and Miller are used. Dr. Ophir also assumed responsibility for the introductory accounting course, relieving Dr. Haft.

It is Professor Lang's view, that since a firm foundation has been developed in the area of accounting and financial management planning and control, thought should be given to the introduction of such specialized courses as may become necessary to meet the changing needs of the Israeli business community. For example, a course in Systems might very well be added at some time in the future. This is something which is urgently needed in Israel. During the three years that Professor Lang was in Israel, he was consulted repeatedly by his former Israeli students and by Israeli business managers who sought advice in matters of system construction. The course should take into account all the progress which has been made in that direction, including machine accounting, integrated data processing and use of electronic equipment.

In addition, it is his judgment that some attention should be given in the existing courses, notably in auditing and perhaps in other courses, to sampling techniques as applied to the accountant. American accountants have found it important in view of developments in the last two or three decades to familiarize themselves with statistical techniques and to place more reliance upon proper sampling in the conduct of their audit. The fact that most of the students have had extensive training in economics and statistics should simplify the introduction of the sampling technique in accounting.

V. PRODUCTION MANAGEMENT, PERSONNEL ADMINISTRATION, LABOR RELATIONS

In the development of the Business Administration program at the Kaplan School, Professor Andrew Barta assumed responsibility for the work in the fields of production management, personnel administration and labor relations. The courses in these subject areas were carefully developed over the three-year period, and they have been successfully integrated into the curriculum which is now firmly established.

In the second academic year, such subject material as quality control, budgeting, alternative production processes, advanced production management, and selected accounting topics and problems were developed in order to meet the objectives of the curriculum in terms of the over-all program.

Since most students specialized in economics and statistics as a general background, it may be seen that the framework in which the program operated was an exceedingly good one. However, with the introduction of "applied" courses, certain gap areas became evident. Students interested in labor relations, for example, should obtain some background in labor economics; no such course was offered at the

Kaplan School. Also, the need existed to treat the subject from the institutional relations and public policy points of view, these fields being considered particularly important in Israel. To meet these problems, the staff, in the second year, developed approaches to these subjects through research projects and seminars.

Personnel Administration - In Personnel Administration the original goals have been met. While there was some pressure at the outset to develop personnel and labor relations as one of the "majors" in the curriculum, this was considered unwise; in part because of considerations for a frugal curriculum, and in part because it was felt inappropriate to teach the personnel and labor relations aspects of management at a staff or professionalized level within what was originally planned as an undergraduate program.

Concerned with the lack of adequate preparation of students applying for course work in personnel administration, Prof. Barta arranged with Prof. Louis Guttman, Scientific Director, Israel Institute of Applied Social Research, to offer a course in social science measurement techniques used in personnel administration. The course was introduced in the spring term of the first year. In this way the students in Business Administration who took the Personnel Administration course in the second year had acquired some acquaintance with these techniques before entering upon the study of the administrative problems in this field.

There is now being offered a two-semester course in Personnel Administration, the entire content of which is based on Israeli cases, and taught completely in Hebrew. In addition, a prerequisite course in Measurement Methods and Techniques is offered jointly in the Public Administration and Business Administration programs.

In order to suit the Personnel Administration course to Israeli conditions, suitable Israeli cases were obtained and developed. In time, only Israeli case materials will be employed. The Personnel Administration course will, of course, require the normal changes and/or additions as all "case" courses do. The collateral readings and references are, however, mostly in English texts. To facilitate the work of the students, it would be desirable to have this material translated into Hebrew.

Labor Relations - As originally planned, a one-term course was developed on the intra-plant (or enterprise) aspects of collective bargaining in Israel. A casebook of all Israeli cases on labor relations has been published in Hebrew, and a sourcebook on labor relations in the country is now in preparation and should be completed shortly. The contents and introduction of the basic sourcebook developed for this subject area is included as Exhibit H-1.

Production Management - Under the curriculum plan the "major" in Production Management consists of the basic one-year course, which is required of all students in Business Administration, plus six (6) year-hours of advanced or specialized courses in the field. The staff has not yet succeeded in fully developing this major. Students who specialize in Production Management are required to take Cost Accounting as part of the "major". With this inclusion, course offerings cover about three-fourths of the projected six (6) year-hours. Further progress will depend on the speed with which Hebrew translations of the course materials can be accomplished.

The structure and the development of specific courses in these

subject areas may be summarized as follows:

1957-58	Elements of Production Management Personnel Administration Labor Relations
1958-59	Elements of Production Management Personnel Administration Labor Relations Production Planning and Control
1959-60	Elements of Production Management Personnel Administration Labor Relations Production Planning and Control Manufacturing Policy Institutional Labor Relations - Public Policy Seminar on Production Problems
1960-61	It is planned that all the courses will be offered in this first academic year following the conclusion of the NYU-Israel Program.

1957-58 - In spite of many handicaps--lack of course materials in Hebrew, students' deficient technical background, etc.--the full year course, ELEMENTS OF PRODUCTION MANAGEMENT, was offered in the first year of the program. In this regard, Professor Barta was fortunate in having the devoted help of Mr. Aaron Gilat, an excellent counterpart. Mr. Gilat, an experienced production engineer, gave unstintingly of his great abilities in the developing of, and subsequently, the teaching of this course.

In the first year, it was necessary to effect the reproduction of the course materials--tracings of numerous blueprints, photographs, charts, drawings, etc. Also, while the students lacked an adequate technical background and there was difficulty in obtaining exact translations into Hebrew of technical terms, their ability, nevertheless, to grasp the subject and their progress in this field was quite remarkable. In order to accomplish this progress, Professor Barta arranged regularly scheduled study periods to supplement the usual classroom time. The students thus could in part do their homework under the supervision of

the instructors, Professor Barta and his counterpart, Mr. Gilat. The course in PERSONNEL ADMINISTRATION, attended by 30 students was successfully offered at the end of the winter term (second trimester). Following in order, the course in LABOR RELATIONS was initiated and given during the spring term (third trimester), with 18 students in attendance.

The Labor Relations course stresses the aspects of internal administration. Attention is also devoted to the institutional aspects, such as, the history of the labor movement, labor legislation and industry-wide collective bargaining in Israel, but the main emphasis is on the problems arising in the day-to-day relations between labor unions and management within specific business concerns. The course was organized as both a lecture-discussion and a case method course. This was necessary since no background information or reference material relating to this subject existed in collected form in Israel. Professor Barta has obtained lecturers qualified, by virtue of their positions and experience, to develop and present appropriate parts of this course to the students. It was planned to collect, edit, and coordinate the material so as to provide the first Hebrew text in this field. This is a work Professor Barta undertook with the assistance of his counterpart, Mr. J. Simmons, a research assistant at Hebrew University, and the lecturers themselves, so that a substantively adequate and authoritatively written text would be available in succeeding years. In addition, for half of the course, a series of case discussions was projected, partly through the use of Israeli cases which had been developed.

1958-59 - Building upon the difficult pioneering work conducted during the first period, Professor Barta and his several counterparts advanced the development work to a more experienced and intensive scale in this second academic year of the project.

Under Professor Barta's supervision, Mr. Gilat assumed full responsibility for conducting the basic production course. As a result of course revision and translation work performed during the summer months, it was possible now to cover in one academic year, and in Hebrew, the same content which when first introduced took a year and a third to complete. As explained, there were several technical and administrative difficulties associated with the first class. To insure that this group received adequate and complete preparation, Professor Barta conducted a one trimester "catch up" for the first year's students.

The basic course, Personnel Administration, given during the fall and winter trimesters, was reorganized and amplified with the addition of eleven new Israeli cases and a set of references. The Israeli cases which were collected in the first year, were tested and with some exceptions were found to be satisfactory. Because personnel administration techniques for employee selection and wage and salary administration were somewhat rudimentary in Israel, difficulties were encountered in gathering appropriate cases in these areas. Case work continued, however, on both an intensive and an extensive scale. Both Professor Barta and his very able counterpart, Mr. D. Bar-El, aimed at presenting the course in 1959-60 in Hebrew and basing it completely on Israeli cases and reference materials.

The course in Labor Relations was enlivened by the participation of certain Israeli experts in collective bargaining, who represented management and labor in contract negotiations that had been recently

concluded in the metal trades industries. In this year, the preliminary editing of the basic descriptive text and source book was completed; further research and collection of case material continued; and the students, under the direction of Mr. Simmons, helped on projects in connection with the gathering of reference materials.

An advanced course, PRODUCTION PLANNING AND CONTROL, introduced by Professor Barta, was offered in the winter and spring trimesters. The counterpart assisting with this course was Mr. Y. S. Eksztajn, an outstanding industrial engineer and a consultant of high reputation in Israel. Course content consisted of cases on plant layout, production processes, alternative methods, various bases for production planning and control and various types of production control systems.

1959-60 - In this final year of the program, several additional courses were added to those previously established courses in the production and manpower areas. All the "older" courses were reviewed, revised, and streamlined, after which the conduct of the classes was turned over to Professor Barta's counterparts to be taught in accordance with approved lesson plans.

An advanced seminar course, MANUFACTURING POLICY, was prepared and introduced by Professor Barta in the winter trimester. Both the new and revised production courses necessitated intensive staff preparation through frequent meetings between Professor Barta and Messrs. Gilat and Eksztajn. Films obtained through the generosity of several American companies were used in the courses, and, in addition, a series of plant visits planned so as to broaden the students' background.

In the Personnel Administration course, Israeli cases were for the first time employed exclusively. A new case book of 25 cases, all in Hebrew, was published at the opening of the new school year.

In the area of labor relations, a new series of cases on intra-plant problems in Israel was prepared for the courses scheduled for the spring trimester. A seminar in Labor Relations, conducted by Professor Barta, was held at Tel Aviv. Because only a small number of students are eligible this year, Professor Barta arranged to hold the seminar in Tel Aviv so that labor relations "practitioners" and representatives from Histadrut and government departments could participate, on a purely voluntary and non-credit basis, along with regular degree students. As a by-product of this seminar, further materials were obtained for the completion of the source book in Labor Relations.

In planning ahead Professor Barta recommends the following:

1) The present Personnel Administration and Labor Relations sequence, constituting together a one-year required course for all Business Administration students, should be retained.
2) The course on the Institutional Aspects of Labor Relations, which Professor Barta gave as a seminar, should be developed further to constitute an elective course for selected students. This course should continue to be something of a forum for the discussion of these highly important issues, through the participation of management, labor, and representatives of the Government.
3) With the return of Mr. Levtov (a participant) a year from now, the addition of an elective course in Industrial Psychology will also be very useful.
4) An additional advanced course on Manufacturing Processes and Alternative Technologies, should be introduced in between the Production Planning and Control sequence, and the course on Manufacturing Policy.

5) The Manufacturing Policy course, which needs further adaptation to Israeli marketing and financing conditions, should be extended for at least two terms.

6) It had been planned to develop a course on Quality Control. In order to avoid overlapping and duplication, this subject was not introduced because a course in Statistical Quality Control was already being offered by the Department of Statistics which is also available to Business Administration students. However, since this course does not entirely meet the needs of students in Production Management, it is suggested that serious thought be given to the inclusion at some future time of an elective course in Quality Control.

7) The situation is similar with regard to Operations Research. Again, it was premature to undertake course offerings in this field. Later on, when the originally intended six (6) year-hours of advanced course requirements have been fully met, such a course, specially keyed to production management, should be developed.

VI. MARKETING AND FOREIGN TRADE

In view of Israel's shifting emphasis from agriculture to industry, and the balance of imports over exports due to the rapidity of the nation's growth, this area of the curriculum was also considered to be of prime importance. To achieve a sound foundation in the basic courses of this subject, Professor Edward E. Pratt, Professor Emeritus of Foreign Trade, New York University, was assigned to the team at the Hebrew University. He arrived in Israel in May, 1958 for what was originally intended to be a three months tour as a short-term expert.

However, the University and the Government of Israel requested that Professor Pratt's stay be extended for a much longer period; he served for a year-and-a-quarter, up to August 31, 1959.

1958-59 - Professor Pratt devoted his efforts to the development of two courses: MARKETING (basic and general) and INTERNATIONAL TRADE. In the summer months preceding the start of the academic year, he prepared detailed outlines, references, and examination questions for the entire year. With the recommendation of Professor Pratt, the following very excellent counterparts were assigned: Mr. Falk Meiseles for the area of foreign trade, Mr. Ben-Zion Shapira and, later, Mr. A. Ilan for the general area of marketing.

Both courses began with the November opening of the school year. The Marketing course had 45 students in attendance. The class was divided into six groups of about seven students each and each group made responsible for a project in the field of marketing under the leadership of one student. They visited industrial plants and discussed marketing problems with management personnel. The International Trade class also had a large registration. Case studies and problem material were prepared and made available to the students.

For the field of foreign trade, Professor Pratt engaged in the preparation of a textbook suitable for Israel. Entitled "Export Methods for Israel", the book has 27 chapters, each about 20 pages long, and each chapter is followed by a section of questions and problems. The text was translated into Hebrew and an English edition was also prepared. A chapter index is shown as Exhibit H-2.

1959-60 (and 1960-61 projection) - In the academic year following the completion of Professor Pratt's tour of service, the courses were conducted by the Israeli counterparts who had served under his direction.

The projection of course offerings in this area for the 1960-61 academic year follows:

Course	Instructor
Elements of Marketing	Mr. A. Ilan
International Marketing	Mr. P. Meysels
Problems in Market Research	Mr. A. Ilan
Seminar - Selected Problems in Marketing	Mr. A. Ilan and Mr. Tal

VII. RELATED ACTIVITIES OF N.Y.U. STAFF

Professor Theodore Lang - During the three years of Professor Lang's stay in Israel, his contributions, aside from teaching and administrative responsibilities, have taken various forms. He has written a number of articles for some of the technical magazines in Israel, notably the "Roeh Heshbon" (freely translated: Certified Public Accountant) and for the newly founded magazine "Tamhir". The subjects in general dealt with various aspects of managerial accounting, controllership, the nature of business education, etc. He participated actively in the planning and development of major seminars, study days, conferences, work shops, and professorial meetings sponsored by Hebrew University, management groups, and professional accounting societies. A partial list of technical papers and speeches delivered by Professor Lang cover such topics as:

Variance Analysis
Nature of Cost Accounting
Management in a Class Society
Budgetary Planning
Modern Controllership

Another achievement is the establishment of quarterly magazine "Tamhir" (translated it means "Cost Accounting"), sponsored by the

Productivity Institute. Professor Lang has served on its editorial board since the inception of the magazine. To date two issues have been published and the third is in the planning stage.

A great many of the accounting problems which Professor Lang brought with him from the States have been translated into Hebrew and, where necessary, have been adapted to local conditions. In addition a number of plant visits were made in the hope that such contacts might eventually prove fruitful in providing case material. Then too, such visits enabled Professor Lang to become familiar with methods of accounting practiced by manufacturers in Israel and provided the students with first-hand observations in the conduct of business. Notably successful have been visits to the Alliance Tire Company and the American-Israeli Paper Mills. In both cases, the students were given an opportunity to visit the plant under guidance and then to spend several hours in discussing with the management the problems faced and their solutions.

One of the last tasks that Professor Lang set for himself was the translation of one of his accounting practice sets into Hebrew and its adaptation to Israeli conditions. This has now been accomplished and the first sets have been made available to the students. It is hoped that the other practice sets will be similarly handled, following the phase-out of the NYU team.

Early in his tour of service, Professor Lang undertook a task on which he has been working ever since. This is the compilation of an English-Hebrew dictionary, as well as a Hebrew-English dictionary of technical terms. In the latter portion, the terms are carefully defined in Hebrew. The work was carried out by Professor Lang and a

committee composed of professional accountants and staff members of the Hebrew Language Academy. The first list of 250 technical terms has been released to the public for comment. According to the Hebrew Language Academy there has never been in its entire history such a response to a published list. A good many of the comments, to be sure, were somewhat negative or even unfavorable to the proposed terminology. On the other hand, most of the comments were commendatory and were even enthusiastic about the terminology. As the NYU program draws to a close, additional lists are being released, namely profit and loss terminology and basic accounting terminology. Other lists, including cost accounting, auditing, budgetary control, profit planning, business law, statistics, and economics have been prepared for consideration by the Hebrew Language Academy, and it is to be hoped that the work started by Professor Lang will be continued. In the meantime, it will be necessary to review, in the light of the comments and criticisms obtained from the profession and the general public, the balance sheet terminology and to see if any changes are needed. (See Sample Dictionary Page on next page.)

Another important activity in relation to Business Administration should be mentioned. Professor Lang has been asked from time to time to give advice to private industry in Israel. He has selected those which hold promise of possessing educational value by way of providing material that can be used in class. Usually such consultations took the form of a series of small seminars conducted at the plant itself. Among these were Fertilizers & Chemicals, American-Israeli Paper Mills, the Weizman Institute, and the Israeli Mines Corporation with special attention to the Timna Copper operations.

נפק COST

נפק אמוד ESTIMATED COST

1. העלות הצפויות של ייצור או רכישה,לעתים קרובות בסוגחי יחידות המוצר המחושבות על סמך אינפורמציה מצויה טרם שבוצעה הקניה או לפני שהותחל בייצור למעשה.

עולות משוערות רומזות על השלכה של עולות ממשיות צפויות.הן שונות מעולות תקניות בכך שאחרונות מבוססות על נתונים וסכומים הנקבעים באופן מדעי.

בשלב מאוחר יותר,משמשות עולות תקניות.

באלו כמסים אשר עמן אפשר להשוות את העולות המסטיות.

2. עולות שהוקנו ליחידה מוצר,או לאחת מתוך כמה מחלקות או לאחד מתוך מספר קוי ייצור.

COST CONTROL

בקרת נפק

הייעודות באמצעי מסכות הנהלתיים בעת ביצוע פעולה בחוצה וזאת לשם השגת מטרות קבועות מראש ביחס לזמן,איכות,וכמות בתשומה מינימלית של מחורות ושרותים.
אמצעים כנ"ל כוללים: מיפרט הומרים,הוראות,תקני ביצוע.
השגחה ישילה והטלת סיג על פעולות ופרטים.
עריכת מחקרים ודוחו"ת ביניים והחלטות המסבותות על הדיווח הנ"ל.

COST FINDING

גילוי נפק

קביעת העולות של פעולה או מוצר ע"י קיבון העולות הישירות בתוספת החלק היחסי של הבלתי ישירות.

בתהליך קביעת עולות יש לעתים קרובות להיעזר בהנחות והשערות ביחס לקיבון העולות המשותפות.

אי הודאיות המסונה בהנחות והשערות אלו גרמה במקרים לא מעטים להעדפת שיטות תמחיר ישיר על שיטות גילוי עולות.

קביעה,בדיעבד,של עולות ייצור,או של ביצוע שירותים,ע"י שמוש בנוהלים הלתי פורמליים שונים (בצורה מטטיסטית או באמצעות זכרון דברים) כלומר,מבלי להיעזר בתהליכי תמחיר המדיירים.

COST SHEET

גליון נפק:

דו"ח מסכם של מרכיבי עולות הייצור של מוצר.

המאוחד,יכולים גליונות תמחיר לשמש כספר-עזר לבקרת תוצרת בתהליך.

The relationship of an academic curriculum in business administration and the industry of Israel is illustrated by the following activity which Professor Lang pursued. In the spring of 1958, he conducted a small seminar which included Dr. Daniel Haft, Mr. Joseph Ami, General Manager of Chemicals and Fertilizers, Mr. Arieh Shapiro of Rafa Pharmaceutical Co., and several members selected from the Ministry of Development. The purpose of the seminar was to assemble material for Budgetary Control and Controllership, a comprehensive full-year advanced course intended to acquaint the students with methods of research in this field. During the summer of 1959, Professor Lang conducted a short course for selected groups of people in government, industry, and public accounting using the material gathered in the seminar.

In the spring of 1959, Professor Lang together with Dr. Haft organized a two-day seminar for public accountants. Israel has an established and governmentally licensed profession of public accountants, similar to the Certified Public Accountants in the United States. The profession is still young and at the present time composed of many practitioners who started their practice in other countries, and, upon fulfilling certain qualifications in Israel, were licensed to practice as public accountants. At this seminar Professor Lang presented a paper on the subject of Modern Controllership, which was of particular interest to the public accounting profession in Israel. In addition, a series of case studies was presented: problems of controllership, financial administration, and auditing procedure. The program was very successful. Professor Lang's paper was published both in the public accountant's magazine and as a separate article for general distribution.

Professor Lang also served on the Supervisory Committee for the

Tel Aviv University, which last year came under the direction of Hebrew University. In addition to his regular teaching and research, Professor Lang also served with distinction as Chief of Party until it was rotated to Professor Richman in the spring of 1959.

Professor Andrew Barta - Professor Barta has acted in a general advisory capacity in connection with case collections and has assisted specifically in reviewing the cases relating to production management, human relations, and personnel and labor relations. He has participated in numerous consultations with representatives of various enterprises concerning their managerial problems and executive training needs. Specifically, he was instrumental in the development of an internal program for the Israeli Institute of Productivity to enable its staff to provide better consulting services for small and medium-sized Israeli enterprises.

For purposes of brevity, Professor Barta's activities, outside of his primary area of teaching and research, may be summarized as follows:

1) Supervising case collections: editing and writing.

2) Consulting and advisory services:

Coordinating Committee, Advanced Management Center; management development in Israel.

Israel Institute of Productivity: program planning; internal staff development.

Israel Management Centre: committees on general management, manpower, and management research.

"Koor" Industrial Enterprises of the "Histadrut" (Israel Federal of Labor Unions): joint labor-management councils.

3) Publications:

Human Relations in Management
Israel Institute of Productivity
Tel Aviv, Israel, June 1958

The Use of Tests in the Enterprise
Israel Management Centre
Tel Aviv, Israel, July 1959

What is Management
"Koor" Magazine (Histadrut)
Tel Aviv, Israel, August 1959

Joint Management
"Aleh Shituf" Magazine (Histadrut)
Tel Aviv, Israel, October 1959

Casebook in Personnel Administration
The Eliezer Kaplan School of Economics
and Social Sciences, The Hebrew University
Jerusalem, Israel, November 1958
(Revised Edition, November 1959)

Casebook in Labor Relations
The Eliezer Kaplan School
Jerusalem, Israel, November 1958

Sourcebook on Labor Relations in Israel
In process - scheduled for publication
August 1960

4) Papers and Lectures:

The Case Method of Teaching
Symposium on Teaching Methods
Kaplan School, November 20, 1957

Human Relations in Cost Control
Seminar on Costs
Kaplan School, March 24, 1958

Human Relations in Management
Israel Institute of Productivity
Conference at Ohalo, Israel, March 11, 1958

Management in Israel's Expanding Economy
Israel Institute of Technology
(Technion) Seminar
Haifa, July 20 - August 1, 1958

Why Discuss?
Israel Management Centre Seminar
Tel Aviv, May 18, 1959

The Process of Selecting Employees
Israel Management Centre Seminar
Beit Berl, Israel, July 3, 1959

Executive Self-Development
Israel Management Centre Conference
Tel Aviv, November 15, 1959

Diagnosing an Organization
Israel Institute of Productivity
Conference
Shfayim, Israel, January 17-22, 1960

The Human Aspects of Management
C.M.P. - General Management "Impact
Team" Seminar
Herzlia, May 22-27, 1960

Professor Edward Pratt - In addition to his primary duties at the Hebrew University, Professor Pratt devoted his time as consultant and adviser to the (a) Israel Export Institute, and (b) the Ministry of Commerce and Industry.

From December 13, 1958 until April 16, 1959, he conducted a weekly seminar for the Koor Industries. These were held on alternate weeks in Tel Aviv and Haifa. Some of the subjects covered were "Market Research", "Direct and Indirect Export", "Channels for Export", and "Financing Methods." His address before the Economic Study Group of the Mapai Party, on the subject of Israel's exports attracted a large and distinguished audience representing all sectors of the economy.

Professor Pratt held numerous discussions and conferences with Dr. Kupferberg, Mr. Meiseles, Mr. Menachem Mayer and Colonel Kling, of the Ministry of Commerce and Industry, with respect to setting up a Market Research division in the Ministry. At the request of the Ministry, he prepared a number of articles and technical papers for publication relating to Israel's marketing and foreign trade.

In December, 1958 and January, 1959, he met with Dr. Warenberg, Franz Euler and other members of the Israel Export Institute, in order

to get the Institute into motion. At the request of USOM he prepared a report on the structure and operation of the Institute which included an evaluation and appropriate recommendations. In February, he held discussions with members of the Paints and Varnishes Industries, with respect to the formation of a group of exporters. At their request he prepared a detailed report which is being used as a guide in the development of this new activity.

VIII. PARTICIPANTS

Under the contract, Hebrew University, with a quota of nine man-years, is entitled to send a number of young men to the United States for advanced study. Upon their return to Israel, these participants, designated as junior faculty members, will take up the teaching of business administration. Four participants are now in the United States, studying for their doctorates. A fifth man, Yair Aharoni, who has been studying here on his own and who needs one additional year to complete his doctorate at the Harvard Business School, has been selected as a participant for the year 1960-61.

Since each of the four present participants has been on a two-year program of graduate study, the assignment of Mr. Aharoni for one year will complete the utilization of the University's nine man-year quota. The quality characteristics of these Israeli students have been uniquely outstanding. Their graduate work here in the United States has been of such high caliber, that the eight man-years devoted to their training will show the granting of four Doctorates and two Masters' degrees. In order to achieve this recognition, it was necessary for each to

undertake heavy and intensive workloads on a year-around basis. All four will have achieved in two years what would normally take a student working on a full-time basis a minimum of three years.

The first two participants from Hebrew University, Messrs. Theodore Weinshall and Avraham Meshulach, have now completed all formal requirements for the Doctor of Business Administration at the Harvard University Graduate School of Business Administration. They will return to Israel this September, in time for the new academic year. Mr. Weinshall, majoring in the field of production management and control, is also giving particular attention to a study of the case method of instruction. In the new academic year we are informed he will be responsible for the following courses: Elements of Production Management, and a seminar course, Selected Problems in Production Management. Mr. Meshulach is majoring in the general management and marketing areas and general business administration. In 1960-61, he is scheduled to teach the following courses: Elements of Business Administration, and Business Policy. Both will also be set to work gathering case material for use in the classroom. This, in itself, is valuable experience and will give these young men insight into the business problems which confront management in Israel.

The other two Hebrew University participants, Messrs. Amiram Levtov and Chaim Ben-Shachar are about to start their second year of training at New York University's Graduate School of Business Administration. Mr. Levtov's areas of specialization cover Industrial Relations, Personnel Management, and Industrial Psychology. Mr. Ben-Shachar is majoring in Corporate Finance, Banking, and Advanced Statistical Techniques. While the two-year period of study was intended for completion of all work

for the Ph. D., it was planned that the Master's degree also be incorporated into their programs. Accordingly, both participants have successfully achieved this degree. Mr. Ben-Shachar was awarded the degree of Master of Business Administration (Banking & Finance) this past June. Mr. Levtov will be awarded the Master's degree (Personnel Management) in October. Both of these trainees have continued to carry their heavy workloads during the summer semester being guided in their special subject areas by interested members of the faculty.

In recognition of their scholarship, the School, upon recommendation of the Faculty, has awarded them the following respective honors for 1960-61:

> Amiram Levtov, awarded the Research Assistant Fellowship in Personnel Administration.
>
> Chaim Ben-Shachar awarded the Marcus Nadler Fellowship in the field of Banking and Finance.

Mr. Aharoni is scheduled to complete his final year of study at Harvard University in the role of a participant. His special areas of concentration are Financial Management and International Investment. Upon the successful completion of his doctoral work, he will take up his duties at the Tel Aviv branch of Hebrew University's Kaplan School.

Considering the unqualified success of all participants to date, it is expected that they will make extremely valuable additions to the faculty.

With the contract terminating on August 31, 1960, the three participants remaining in the United States for the coming academic year--Ben-Shachar, Levtov, and Aharoni--will be under the administrative jurisdiction of ICA/Washington.

IX. CONCLUSIONS

Status of Program

A very promising start has been made in establishing the Business Administration curriculum at the Hebrew University. It is not yet complete; nevertheless, the nuclei for the several areas of major study have been developed. This represents a solid achievement.

The place of the Business Administration curriculum within the University's academic structure has yet to be decided. This problem concerns the conception of the nature of the business education to be provided. That is, (1) the degree to which professional training is made available to the student, and (2) the level at which this instruction is to be offered. Actually, these reduce to what might be considered as one problem--the status of the Business Administration curriculum within the academic structure of Hebrew University. By status is meant the question of recognition of the curriculum in terms of graduate or undergraduate level, degree or non-degree attainment.

These questions are of more than academic interest at Hebrew University, because the baccalaureate degree is traditionally a three-year program. Study on the graduate level in business administration, however, from the very beginning was divided into: (1) a diploma program which provided for an additional year of study beyond the normal three years required for the Bachelor's degree, and (2) the existing Master's program which permitted the inclusion of Business Administration as a minor field of study. Under this arrangement, the overall time accorded the new curriculum is not adequate to afford the necessary professional training in the fields of business administration. This became more evident as the advanced course sequences were established in

the core fields - in accounting and financial management where the sequence of courses required for an adequate specialization cannot be taken in less than three academic years, and in the field of production management, where the presently projected advanced course in production problems (at the production manager's level) cannot be taught unless the students have had the courses in production planning and basic production processes, both of which in turn must build upon the basic year course. Hebrew University is now faced with the related problems of deciding at what stage in the collegiate program professional education in business administration should begin, at what level or levels should the instruction be given, and the number of years to be utilized for training the student in the expanding curriculum of business education.

The Business Administration program presently in effect is essentially on a graduate level. It is our understanding that a resolution will be presented at the next meeting of the Faculty of Humanities requesting formal approval of a two year graduate program in business administration beyond the present bachelor's degree.

As presently constituted, the graduate program at the Kaplan School is geared for a yearly output of some 25-35 graduates. Obviously this is too small for the needs of Israel's economy. This program should be greatly expanded. There is no dearth of students. But obviously the higher academic level for the program, the smaller is the expected output. A partial solution might be the development of an undergraduate program in business administration at the University's division in Tel Aviv modelled along the lines of the undergraduate schools of business which have proved so successful in the United States. This of course will require an expansion of the curriculum into such areas as

marketing, production, finance, management, etc. so as to provide the broadly trained and competent managerial manpower to meet Israel's need.

Case Work

The case method of instruction has been fostered and encouraged and this has become the main although by no means exclusive instructional approach in the Business Administration program. Over the past three years, one hundred and nine (109) Israeli business cases were collected. This too represents a substantial accomplishment. While the case method is, of course, not the last word in instructional methodology, it is a good method. But it is also difficult and expensive.

It is difficult because it requires certain special competencies on the part of the teacher, which go beyond knowledge of the subject matter and ability to express it; such as the ability of sensing what is going on in the students' minds while a case is being discussed and guiding the development of their insights and understanding without seeming to do so.

The case method is difficult for the students because their previous educational conditioning usually does not prepare them to rely on their own resources; that is, instead of being fed answers, to have to face the hard necessity of thinking for themselves. And also the European system as in the Hebrew University, places great emphasis on final examinations. The students, therefore, are not used to day-to-day systematic study. There have been considerable difficulties in getting students to grasp that it is less important for them just to remember information than to know how to make use of concepts and techniques,

and that such competence can be acquired mainly by day-to-day systematic work. On this score there is still much to be done. But gradually the students are coming along.

In addition to these difficulties, the case method is also expensive. Case collection takes time and effort and it must be carried on continuously. Few cases can be used for very many years, except perhaps in technical fields, and nowadays even this is doubtful. As the matrix of business problems change with the general development, new cases must replace the old.

Until now the costs of case collections were - under the terms of the contract - budgeted mainly from the Joint Fund. As the NYU project ends, these costs will have to be borne by the Hebrew University. This however, presents a most disquieting problem.

Case collection and writing is not only a technical, research type activity, but a literary art. Not everybody - even a competent teacher - can do this successfully, and even if the various instructors collect and write their own cases - they can do this only in a limited fashion, at best, if they are to do full justice to their other responsibilities. Obviously, the administrative aspects of case collections need to be centralized.

The following is therefore recommended:

1) That an administrative position for case collections be restored (jointly for both Business Administration and Public Administration, and perhaps other fields where such instructional materials are used).

2) That, recognizing the fundamental necessity of continuing case collections, the Kaplan School foster this activity through adequate allocation of funds.

Textbooks

An important reason for using the case method in our program has been the expense and difficulty of obtaining textbooks for the students. There are no adequate textbooks in Hebrew now existing at the Kaplan School in the field of business administration. All texts used so far have been in English, published either in the United States or in Great Britain. For the forseeable future there is no great market for Hebrew texts, simply because of the small size of the population from which readers can be drawn. Nevertheless, as a matter of academic prestige, it is important that a beginning be made.

These obstacles were overcome to some extent by the use of Israeli cases and pertinent American cases translated into Hebrew. Professor Lang, for example, has translated one of his practice sets in Cost Accounting in Hebrew. Further, Professor Pratt prepared a textbook, "Export Methods for Israel," which has been translated into Hebrew. Professor Barta has prepared for translation text and source book material for the labor and industrial relations areas.

The team's experiences have shown that there is an urgent need for short, compact textbooks in Hebrew. English and probably French will always be a necessity. But an effort must be made to put into the hands of students material in their native tongue and assign reading in English or another language as collateral material. At the present time, the major difficulty that the team encountered, was the inability of the student to acquaint himself with the field in his mother tongue.

Faculty

With the departure of the team members, it becomes important that continuity of instruction be maintained. A good start has been

made and in another year, all the participants in the United States will have returned or will be returning to take up their duties at the Kaplan School. This corps of young teachers will have much to contribute. However, in view of the fact that business administration is still a somewhat new area of instruction at Hebrew University, consideration might be given to inviting highly qualified visiting professors for short intervals to review and supplement the teaching and research of the permanent staff.

In this regard, the continuity of the program through its teaching staff is likely to be an uneven process for the first few post-project years. In 1958, it was projected that for the 1959/60 and 1960/61 academic years the teaching load will require a minimum of eight full-time (or equivalent) persons; and that a full-time staff of ten will be required by 1961/62. At present, there is a full-time (equivalent) staff of eight. After the departure of the NYU staff members and when two of the participants return from the United States this fall and three more next year, the total faculty coverage of eleven will apparently meet the projected requirements.

However, it should be noted that this instructional coverage will consist of "full-time equivalent" and not actually of full-time staff. Coverage is obtainable, in other words, only with the use of part-time "outside" teachers. Actually there are now only six full-time men on the staff, including the two NYU visiting professors. Next year, therefore, only six full-time men will remain; and the total complement will be only nine in 1961/62.

ISRAEL INSTITUTE OF TECHNOLOGY (TECHNION)

I. INTRODUCTION

The first New York University staff member to arrive at the Technion was Professor Sylvain Ehrenfeld in October, 1957. He was joined in February, 1958 by Professor Eugene Richman, and in December, 1958, Mr. Raymond Hartstein began to contribute his efforts to the Technion program. Mr. Hartstein was assigned half-time to the Technion, the remainder of his time being devoted to management advisory work for USOM/Israel.

Work in the field of Industrial and Management Engineering was begun at the Technion as early as 1935 when Professor Kurrein, the collaborator of Professor Schlessinger of Berlin, one of the pioneers, began giving courses in the subject. In 1953, the basic elements of today's expanded program were introduced under the able direction of Professor J. Cahen. However, only a few basic courses were offered on the undergraduate level within the framework of the Department of Mechanical Engineering and a few specialized graduate courses were also given for a few highly qualified students. This was the extent of the offering in this field of study at the start of the New York University Program at the Technion.

In the first few months, the work of planning and organizing the graduate program in Industrial and Management Engineering was given top priority. Counterparts were assigned to Professors Ehrenfeld and Richman. These counterparts, both of whom proved to be extremely

well qualified, were respectively: Professor P. Naor and Professor S. Eilon. Numerous meetings of the N.Y.U. staff and their counterparts, together with Professor Littauer, were held to discuss problems, objectives, and contents of the graduate program. Such important matters as the existing undergraduate program, standards, prerequisites, existing and required staff, equipment requirements, and the need for an operations analysis and research group were also explored.

During the course of the contract, Professor Cahen became the Chairman of the new Department and Professor Naor was placed in charge of the Operations Analysis and Research Program. Additional counterparts were assigned to Professors Ehrenfeld and Richman. Mrs. S. Ben-Tuvia and Mr. S. Sacks, Assistants in the Department, were assigned to Professor Ehrenfeld. Mr. E. Cherizly, Lecturer, and then later Professor Cahen, were assigned to Professor Richman. We should like to record at this point, our deep appreciation to all our Technion colleagues who have served as counterparts--they have been most cooperative and have worked diligently to carry out the aims of the program.

II. UNDERGRADUATE CURRICULUM

Preliminary work was done at the very beginning of the N.Y.U.-Israel Program by both the Technion and N.Y.U. staffs on a study of the existing program in Industrial Engineering. Professor Richman undertook the primary responsibility for further analysis of the relationship between the undergraduate and graduate programs. The

purpose of this was to fix standards and prerequisites, to ascertain level and coverage of material, and to base the graduate program on a sound and comprehensive undergraduate training. The study involved a detailed review of the existing curriculum and numerous discussions with Professor Cahen and other members of the Technion staff about the contents and coverage of the various courses and their staffing. A number of shortcomings were observed in the undergraduate program and a continuing effort has been made to correct these.

The study helped to form the basis for determining prerequisites for graduate study as previously discussed. One of the more serious deficiencies was in the training provided in Engineering Statistics. Since it is believed that a sound and comprehensive training in statistical methods is a basic undergraduate requirement in all fields of engineering, a unified course in Statistical Method was introduced in the undergraduate program. This new course is now a prerequisite for admission to the graduate program in Industrial and Management Engineering. A question and answer manual developed for this subject area has been prepared both in English and Hebrew (Exhibit T-1).

III. GRADUATE CURRICULUM

Senior faculty members of the Technion, together with the visiting N.Y.U. staff members, constituted a committee which met regularly during the project years for the purpose of developing the Industrial Management and Engineering graduate curriculum. Later, with the establishment of the Department of Industrial and Management Engineering in the summer of 1958, the committee's work

was extended to cover the development of departmental policy and the resolving of other matters which, as might be expected, were constantly coming into focus.

Basic Planning

In order to organize and plan a graduate program which would be suited to the needs of the country and at the same time achieve a standard comparable to the highest standards in countries with advanced technology, two activities were simultaneously undertaken. The N.Y.U. staff first attempted to collect and assess information about the availability and capabilities of the Israeli undergraduate student as well as about the nature of the tasks which the undergraduate and graduate industrial engineer would be expected to perform in local industries. Secondly, a comprehensive review was made of the curricula of outstanding graduate programs in the United States and other highly developed countries.

It was necessary to study the existing undergraduate program in order to ascertain its content and coverage. In this way, shortcomings or deficiencies in prerequisites could be determined. Another undertaking was the determination of standards and prerequisites for the beginning graduate student. It was then necessary to structure and outline the subject matter to be included in the graduate program, to refine and delineate this subject matter and to determine specific time allocations. The next step involved the preparation of details of the courses to be given and development of course content. In addition, it was necessary to prepare and select text and homework material, case studies and case work, homework problems, examinations,

and illustrative materials and teaching aids.

Accordingly, the combined efforts of all were directed toward the goal of having an established course of study ready by the opening of the academic year beginning in October, 1958. Guiding the planning were the objectives of the graduate program, which were formulated at that time (Exhibit T-2). This intensive and extensive study and planning was successful, having crystallized into a definite program by the target date. Beneficially, this enabled our team to be on location for the full first two years of this new two-year graduate program.

During this preparatory period, it soon became evident that a modern graduate program required course work in two different but highly interrelated areas which we shall designate as the "Operations Research" area and the "Substantive" area. Professor Ehrenfeld, together with his counterparts, undertook primary responsibility for developing the Operations Research area, while Professor Richman and his counterparts concentrated primarily on the Substantive area of the program.

The following were the courses which Professor Ehrenfeld helped to develop:

a) Introduction to Operations Research

b) Statistical Methods in Industry

c) Stochastic Processes

d) Techniques of Operations Research

e) Production and Inventory Control

f) Experimental Design Techniques

g) Case Study Workshop

The following were the courses which Professor Richman helped to develop:

a) Costing and Cost Control

b) Production and Inventory Control

c) Computers and Computing

d) Human Engineering

e) Methods Analysis and Work Measurement

f) Plant Layout

g) Materials Handling

h) Statistical Quality Control

i) Job Evaluation

j) Wage Incentives

Degrees Offered

It was felt that not only should a graduate degree be made available in Industrial Engineering, but also a separate graduate degree should be offered for those students specializing in the field of Operations Research. After much study and deliberation, it was officially decided that the following degrees would be offered for graduate work successfully completed in the Department of Industrial and Management Engineering:

M.Sc. in Industrial Engineering

M.Sc. in Operations Research

M.Sc. in Operations Research (Statistics)

M.Sc. in Industrial Engineering. To qualify for admission, students must possess an engineering degree from an accredited university or its equivalent. In addition, it is required for such

a degree candidate to take the necessary prerequisites in the field of Industrial Engineering, to ensure his having a background at least equivalent to that of a man possessing a B.Sc. Degree in Industrial Engineering from the Technion. This means that a graduate engineer with a degree in a field other than Industrial Engineering would have to complete a full year course in each of the following three subjects: Organizational Methods (this covers both Organization and Management and Work Study); Economics and Finance; and Costing and Budgeting.

In addition, the candidate would be required to have a background in Statistics equivalent to the second year undergraduate course in Statistics at the Technion. The second year Statistics course at the Technion is a new, revised and up-to-date one-year course, of which the Technion can well be proud. A candidate possessing an undergraduate degree in Industrial Engineering is also required to make up any deficiencies which he may have in the above listed prerequisites. The thesis required for the Master's degree in Industrial Engineering must be on an industrial engineering subject.

M.Sc. in Operations Research. This degree is open to all candidates possessing an undergraduate degree from an accredited institution or its equivalent, in the following fields: Engineering, Mathematics, Physics, Chemistry, and Statistics. The prerequisites for such candidates are the same as those required for the M.Sc. in Industrial Engineering. Similarly, the thesis for an M.Sc. Degree in Operations Research must be in the area of this discipline.

M.Sc. in Operations Research (Statistics). This degree is offered to candidates who successfully completed the Master's program

in the same manner as described for the M.Sc. in Operations Research. The degree may be awarded, however, only if the thesis is a significant contribution, not only to the field of operations research, but also to statistical methodology.

Program of Study

A chart outlining the entire two-year program of graduate study in Industrial Management and Engineering is on the following page. The course work consists of 24 compulsory credits (12 courses), 10 optional credits (5 courses) and a Master's thesis. Thus, there is a basic core of courses required for all students, plus a number of courses giving specialization and depth in chosen areas. One of the optional courses is designated to be an advanced course in a subject of the original engineering degree work completed by the student. Research culminating in a Master's thesis is required of all degree candidates. No course credit is given for thesis research.

A seminar which is given in the second year of the program is assigned three course credits for both the third and fourth semesters of the program. This seminar is designed to integrate the various areas in Industrial Engineering and to expose the students to a variety of disciplines. There are three phases to the seminar: (1) presentation of progress reports by students on their graduate research; (2) preparation and presentation by students of reports on selected case studies or current literature in the field; and (3) lectures by members of the Faculty and invited guests on topics of special interest.

The Master's program is designed to allow for its completion

MASTER'S DEGREE IN INDUSTRIAL AND MANAGEMENT ENGINEERING

		SEMESTER I	SEMESTER II	SEMESTER III	SEMESTER IV	CREDITS
PREREQUISITIES	Organization and Management	2 &(3)*	2 &(3)			-
	Economics	2	3			-
	Costing	2 &(1)	2 &(3)			-
REQUIRED SUBJECTS	Organization and Management		2 &(2)**			2
	Plant Layout	2 &(2)**				2
	Plant Layout (Project)		(2)**			2
	Production Planning and Inventory Control		2 &(2)			2
	Statistics I, II	2 &(2)**	2 &(2)			4
	Operations Research I, II	2 &(2)**	2 &(2)**			4
	Industrial Relations I	2				2
	Managerial and Engineering Economics			2 &(2)		2
	Seminar			3	3	4
OPTIONAL SUBJECTS	Statistics III			2 &(2)		2
	Statistics IV				2 &(2)**	2
	Operations Research III			2 &(2)**		2
	Industrial Relations II		2			2
	Computers		2			2
	Psychology	2				2
	Adv. Work Study			2		2
	Adv. Control Techniques				2	2
	TOTAL HOURS:					
	Prerequisites	6 &(4)	7 &(6)			
	Compulsory	8 &3(2)**	8 &5(2)**	5 &(2)	3	
		21	26	7	3	

REQUIRED FOR DEGREE: 24 credits in compulsory subjects, 10 credits in optional subjects, and one subject in original engineering degree work.

Notes: * Figures indicate hours; figures in parentheses indicate time for tutorials.

** Two-hour tutorial once a fortnight.

over four consecutive semesters. As initially planned, some of the prerequisites may be taken simultaneously with the regular graduate courses for those students qualified to carry this extra burden. In addition, it has been possible to give certain of the prerequisites during the summer and thus enable the students to proceed at the fastest possible rate with their course of studies.

Student Body

Although the program was designed to accommodate 15 to 20 students, 32 students were accepted in the first class which commenced its graduate work in the Fall of 1958-59. This allowance was made because of the backlog of demand for a program of this type. Of these 32 students, it is expected that a total of 18 will complete the program. Two of this number already have obtained their degree under the auspices of the Department as of the end of the first year of the program. They had taken graduate work on a special basis in the field of Industrial and Management Engineering. Three more of the 18 are scheduled to obtain their degree this summer, having completed all requirements for the degree including the thesis. The remaining 13 have, for the most part, completed all course work and are still engaged in their thesis research. It is taking the majority of the students more than two years to complete their degree program due to the need for making up prerequisites, and because of the policy which sets a high professional level of acceptance for research work.

During the second year of the program, both first year and second year courses were offered. This accounts for some of the overlapping of courses which may be seen in the listings of the courses given. During

the second year (1959-60), seventeen new students were admitted to take their first year of study. Since a number of the new students had to make up a considerable number of prerequisites, it will take them additional time to complete all requirements for the degree. Also, because of this situation, all of the first year courses were not offered during the second year. This, however, is a temporary situation which will disappear with the development of course sequences between the undergraduate and graduate programs.

Course Content and Development

Continuing Development. Most of the existing courses required revision and replanning. For example, the course in Plant Layout and Materials, given during the first year of the graduate program was designed to cover the subject matter over two semesters and to have the student complete his course research project over the same period of time. It was found that the course would be more effective if all the subject matter was covered during the first semester; devoting the Spring sessions completely to the students' research projects, the latter carried on under laboratory supervision. This required that new students have the necessary prerequisites and, accordingly, the redesigned course will be offered with the advent of a sufficient number of qualified students.

Another example of the continuous development work on the structure and content of the courses may be seen in the area of operations research. During the first year, a course called Introduction to Operations Research was given during the first semester, and a course

called Operations Research Techniques I was given during the second semester. The initial plan was to have two additional courses given during the second year, Operations Research Techniques II and III. However, during the second year, this schedule was revised so that a total of three operations research courses were to be given instead of the original four. This required a great deal of streamlining and changing in the content of the courses. One aspect of this rework was to place greater emphasis on the study of actual case histories.

Collection of Case Material. Both members of the N.Y.U. team at the Technion have gathered case material in order to provide practical examples for teaching purposes. Visits were made to industrial concerns to gain familiarity with their problems, to establish their needs, and to gather data for case studies. Conferences were held with individuals in various engineering disciplines at the Technion for discussion of pertinent problems from these related fields. All the members of the teaching staff of the Department have been attempting to include, whenever practicable, actual case material taken from Israel's industrial life.

Description of Courses. The courses offered during the first two academic years of this two-year graduate program, together with a brief description of each, follows in semester order:

FIRST SEMESTER 1958-1959

1. Advanced Statistics I - Professor Naor

Statistical methods and probability theory from an advanced viewpoint. Development of basic statistical tools as used in industrial and engineering application: sampling, statistical control, analysis of variance, regression and correlation sequential analysis, stochastic processes.

2. Organization and Management - Professor Cahen

General principles of organizational relationships, emphasizing both the quantitative and qualitative approach and discussion of main organizational functions.

3. Introduction to Operations Analysis and Research - Professors Naor and Ehrenfeld

Introduction and background to the application of scientific methods to the study of operational problems. An introduction to such topics as: waiting lines, replacement, MonteCarlo, inventory, linear programming and competitive models. Careful consideration is given to the applicability of the various techniques. Case problems are discussed.

4. Plant Layout and Materials Handling I - Professors Richman and Eilon

A study both from the technical and economic point of view of the general problems of plant layout, design and evaluation. Included are such consideration as plant location, problems of materials flow and space utilization, power requirements, etc.

5. Advanced Statistics III - Professor Ehrenfeld

Application of statistical methods to the efficient design, analysis and interpretation of industrial experiments. Consideration will be given to the appropriateness, as well as the sensitivity, of the various techniques to be studied. Some of these techniques are: regression analysis, analysis of variance, randomized blocks, incomplete block, factorial confounding and fractional replication. The determination of optimum conditions. Sequential tests of significance. Analysis of time series.

SECOND SEMESTER 1958-1959

1. Advanced Statistics II - Professor Naor

Statistical method and probability theory from an advanced viewpoint. Development of basic statistical tools as used in industrial and engineering application: sampline, statistical control, analysis of variance, regression and correlation sequential analysis, stochastic processes.

2. Advanced Statistics IV - Professor Ehrenfeld

Application of statistical methods to the efficient design, analysis and interpretation of industrial experiments. Consideration will be given to the appropriateness, as well as the sensitivity, of the various techniques to be studied. Some of these techniques are: regression analysis, analysis of variance, randomized blocks, incomplete block, factorial confounding and fractional replication. The determination of optimum conditions. Sequential tests of significance. Analysis of time series.

3. Techniques of Operations Research I - Professors Naor and Ehrenfeld

Two techniques of operations research are discussed in detail:

a) Queueing: basic mathematical tools stochastic processes with special reference to the Poisson process. Various models: trunking problems, machine interference, aircraft stacking, etc.

b) Programming: transportation technique, simplex technique. Convex and dynamic programming.

4. Methods of Operations Research II - Professors Naor and Ehrenfeld

Presentation and discussion of case studies are reported in the literature.

5. Plant Layout and Materials Handling II - Professors Richman and Eilon

A study both from the technical and economic point of view of the general problem of plant layout, design and evaluation. Included are such considerations as plant location, problems of materials flow and space utilization, power requirements, etc.

6. Methods of Operations Research III - Professors Naor and Ehrenfeld

Mathematical basis of programming and of game theory. Analysis of competitive situations. Mathematical theory of production and inventory. Inventory theory of production and inventory. Inventory theory and its relationship to stochastic processes.

7. Production Planning and Inventory Control - Professor Eilon

Functions of production control, types of manufacturers and production procedure. Product development and design. Sales forecasting. Evaluation production methods. Machine capacity and allocation. Scheduling problems in batch production and inventory control. Lot size theory, choice of criteria, multiproduct production scheduling, inventory fluctuations.

8. Industrial Relations I - Professor Tabb

a) Human relations in industry. The plant as a social system. Problems in communication and motivation.

b) Personnel administrations. The individual employee - selection; training; job analysis and evaluation; merit rating. Industrial safety.

c) Union-management relations. Collective bargaining. Mediation and arbitration. Wages. Fringe benefits. Discipline.

9. Computers - Mr. Yoeli and Dr. Nathan

Elementary principles of automatic digital computing. Logical design of automatic digital computers. Mathematical logic; binary arithmetic; coding; electromechanical and electronic switching; logical design of arithmetic unit and control. Survey of available computing devices and their applications. Analogue computers and their applications.

FIRST SEMESTER 1959-1960

1. Advanced Statistics III - Professor Ehrenfeld

Application of statistical methods to the efficient design, analysis and interpretation of industrial experiments. Consideration will be given to the appropriateness, as well as the sensitivity, of the various techniques to be studied. Some of these techniques are: regression analysis, analysis of variance, randomized blocks, incomplete block, factorial, confounding and fractional replication. The determination of optimum conditions. Sequential tests of significance. Analysis of time series.

2. Methods of Operations Research II - Professors Naor and Ehrenfeld

Presentation and discussion of case studies as reported in the literature.

3. Seminar in Industrial and Management Engineering - Professor Richman

4. Psychology - Dr. Rim

The scientific study of human factors in industrial problems. Rating methods. Principles and problems in the selection and classification of workers. The interview and personal-data analysis. Psychological tests. Nature and characteristics of human work. Conditions of work and productivity. Accident and the safety problem. Training in industry. Motivation of workers.

5. Managerial and Industrial Economics - Dr. Zangen

Expenses, income and profit. Contractual and residual income. Interest and profit. Criteria of maximum profitability. Reduction of value (depreciation) and interest on investments. Methods of analysis and representation. Immediate and delays investments. Effects of capital origins. Tax effects. Market situations and competitive behavior. Marginal expense towards average expense (cost plus). Fixing costs for a series of products under assumptions. Origins of capital, and capital necessities. Financing problems in Israel. Norms of liquidity, profitability and assurance.

6. Advanced Statistics I - Professor Naor

Statistical method and probability theory from an advanced viewpoint. Development of basic statistical tools as used in industrial and engineering application: sampling, statistical control, analysis of variance, regression and correlation, sequential analysis, stochastic processes.

SECOND SEMESTER 1959-1960

1. Computers - Mr. Joeli

Elementary principles of automatic digital computing. Logical design of automatic digital computers. Mathematical logic; binary arithmetic; coding; electromechanical and electronic switching; logical design of arithmetic unit and control. Survey of available

computing devices and their applications. Analogue computers and their applications.

2. Advanced Problems in Industrial Engineering - Mr. Cherizli, Dr. Huppert, Dr. Siegel

Marketing. Marketing Research. Problems of Time Study. Plant Layout. Balancing. Incentive Wages.

3. Methods of Operations Research III - Professors Naor and Ehrenfeld

Mathematical basis of programming and of game theory. Analysis of competitive situations. Mathematical theory of production and inventory. Inventory theory and its relationship to stochastic processes.

4. Seminar in Industrial and Management Engineering - Professor Richman

5. Advanced Statistics II - Professor Naor

Statistical method and probability theory from an advanced viewpoint. Development of basic statistical tools as used in industrial and engineering application: sampling, statistical control, analysis of variance, regression and correlation sequential analysis, stochastic processes.

IV. OPERATIONS ANALYSIS AND RESEARCH

The research program of a graduate school is a vital function and constitutes one of the most important contributions that an educational institution can provide. Consequently, an Operations Analysis and Research Group was formed at the very beginning of the graduate program as an integral part of the graduate Department of Industrial and Management Engineering.

What Is Operations Research?

The subject matter of Operational Analysis and Research is the totality of strategies and tactics for the effective utilization of

human and material resources to accomplish specified objectives. In the most general sense it can be characterized as the application of scientific methods, techniques and tools to problems involving the operations of systems so as to provide those in control of the operations with optimum solutions to the problems. More specifically, Operations Research is the application of the scientific method for providing a quantitative basis for decision-making regarding operations. The function of Operations Research is to assist the responsible authorities of an organization by clarifying, through scientific studies, uncertainties in the factors upon which action is based.

Operations Research, under that name, was a product of the urgent need during World War II, and led to the successful utilization of scientists in the study of military operations. This experience in war time has stimulated similar activities in industry and other operational contexts. Thus, in the years since the war, Operations Research has had a rapid development.

The interest and conern of Operations Research is with operations of all kinds, be they industrial, governmental, or military. An operation is considered to be any activity in which a responsible authority utilizes available human and material resources to accomplish that purpose. Thus, a battalion of soldiers doing its assigned job, an assembly line, or a sales organization is more than a collection of men and machines; it is an activity, a pattern of operation. These operations can often be studied, their regularities investigated, and sometimes they can be effectively modified and improved by the responsible authorities.

Experience with operational problems has highlighted certain features and brought about an increased awareness of them:

1. Repetition of a number of general characteristics in operating systems in a variety of different contexts;

2. Interdependence of the different components of operating systems, and the importance of studying these interrelationships quantitatively;

3. Need for an explicit, quantitative treatment of the effect of uncertainties in some variables of the operating system;

4. Use of mathematical models to describe and study operations.

A mathematical model is a symbolic representation of the system under study. Because of the recurrence of certain types of systems, Operational Analysis and Research has developed what might be called prototype models which are applicable to the frequently encountered systems. Most of these models express the effectiveness of the operation as a function of characteristics of the operation, some subject to control, others not. The objectives of these models are to describe the present system and to determine which values of the control variables will yield maximum effectiveness of the system. Perhaps the most significant aspect of the field of Operational Analysis and Research has been its ability to provide effective solutions for many operational problems, including problems in industry.

Development of OR Group at the Technion

With justifiable pride on the part of Technion and the N.Y.U. Project, it may be said at the outset that the Operations Analysis and Research Group has developed into the leading exponent of Operations

Research in Israel.

The membership of this research group is comprised of several members of the graduate faculty assisted by graduate students. The function of such an OR group can be summarized as follows:

1. Service to industry by formulating and solving problems by the latest operational and analytical techniques available.

2. Training of students by giving them practical and research experience under trainer supervision. Such experience is especially important to Israel, since students going out into industry are expected to commence working with a minimum of supervision.

3. Stimulation and promotion of research for staff and students and contribution to the teaching efforts of the staff.

4. Stimulation of research towards the development of new problem-solving techniques.

With the start of the graduate program, the group was formed under the leadership of Technion's Professor Naor. Almost immediately upon its establishment, requests were made for information and training in this field. The Operations Analysis and Research Group offered a special intensive course during the 1958-59 academic year to a selected group of qualified students. This was in addition to the regular graduate courses offered by the Department. The bulk of this work was carried on by Professor Naor and N.Y.U. staff member Professor Ehrenfeld.

During the past two years, the OR Group has made many contacts with industry; research activities for faculty and students have been undertaken and are being negotiated in several selected Government agencies, in selected companies, and in given industries--textiles, chemicals, mining, and transportation.

An additional benefit of contacts with industry by the OR Group is that it facilitates the development of useful case material. As mentioned previously, some case material has already been collected and it is expected that this work will continue on an increasing scale.

Assignment of Experts

Under the N.Y.U. Project, the assignment of well known experts in the field as short-term staff members contributed greatly to the development of the graduate curriculum in general, and to the Operations Analysis and Research Group in particular. The specialists assigned on this basis were Professor Glenn D. Camp of the Case Institute of Technology and Professor Sebastian B. Littauer.

Professor Camp served with the Technion from November, 1958 through January, 1959. His mission was to assist in the development of operations research, especially in its effective application to important problems of the country. "Unifying and Expanding Operations Research in Israel", Exhibit T-3, is illustrative of the significant contribution Professor Camp made in stimulating interest in the application of operations analysis and research techniques for the solution of industrial problems.

In summary, Professor Camp's activities covered: (1) participation in the graduate instruction program by giving lectures and seminars for

graduate students and faculty members; (2) visits to numerous industrial, commercial and transportation activities throughout Israel to explore the possibilities for application of OR techniques to their problems; and (3) conferences and talks to various interested groups. Of particular interest was a lecture given in the Prime Minister's office, attended by about 50 high-level Government officials and university people on "Operations Research as an Aid to National Planning." Professor Camp also submitted a proposal to the Ministry of Transport on "Coordinated Air-Land-Sea Transport."

Professor Littauer served from late May, 1959 to August, 1959. His contribution to the development of the Operations Analysis and Research Group is evidenced from the following summary of his activities:

1) Conducted seminars for the faculty on the subjects of curriculum, teaching methodology, advanced operations research techniques, the coordination of practical experience with classroom work, and the development of case studies and other teaching materials.
2) Met with the OR Group for consideration of such topics as criteria for projects in government and industry to be undertaken by the Group, alternatives to such outside projects for giving students practical experience, and the establishment of an Operations Research Laboratory.
3) Conducted seminars and talks on the practical applications of operations research for outside groups, which included military and industrial organizations and the Israel Managers' Association.

4) Prepared a major evaluation of the Operations Research and the Engineering Statistics programs of the graduate curriculum in Industrial Management and Engineering, in relation to: the undergraduate curriculum, the needs of Israeli government and industry, and operations research programs in other countries.

V. RELATED ACTIVITIES OF N.Y.U. STAFF

All the N.Y.U. staff members engaged in management development activities as well as in auxiliary work related to the academic program.

The activities of the N.Y.U. team over the three-year period of the contract involved participation in planning committees, discussion groups, seminars and symposia, working with Israel Management Teams and with Impact Teams, helping in the selection of books, equipment and training aids, and advising the Israel Management Center in connection with the proposed Resident Managers' School scheduled to commence operations in October, 1960.

Another specific responsibility in the field was that of discharging the duties of Chief of Party. This burdensome collateral assignment was undertaken in the second half of the project by Professor Richman. Responsibility for the office of Chief of Party was assigned for the first half of the contract to the team at Hebrew University, and was undertaken by Professor Lang. The Chief of Party, being the team leader in the field, handled such duties as: coordination of reports, liaison with Israeli and U.S. Government offices, housekeeping, and a host of

other responsibilities too numerous to be set forth in this report.

Academically Related Activities

Professors Ehrenfeld and Richman served on numerous department committees over the three-year period. As an example, Professor Richman served with Professor Cahen on the Building Committee of the Industrial and Management Engineering Department to see through to completion the design, erection and furnishing of the new building for the Department which was dedicated in June, 1960. Both Professors worked with the other Department members in selecting and assigning priorities for the urgently needed instructional aids which have been ordered under the amended N.Y.U.-I.C.A. contract.

Both Professors, together with Professors Cahen and Naor, worked with selected graduate students to undertake research activities in selected Government agencies and industrial firms. Many visits were made to these concerns and promising projects are under development.

In the performance of his duties at the Technion, Mr. Hartstein worked closely with Professors Cahen, Richman and Mr. Cherizly, as well as with Professors Eilon, Naor and Ehrenfeld. The following is illustrative of the range of Mr. Hartstein's participation in the development work at this host institution:

a) Assisting with lectures in "Organization and Management" and "Plant Layout" courses of the graduate program.

b) Advising and counseling senior students pursuing the B.Sc. and engineering students pursuing the Engineering Diploma in connection with specific projects assigned to them.

c) Supervising the graduate students in factories on assigned problems and in classroom discussions in connection with "Work Study and Costing" prerequisites.

d) Assisting with graduate student seminar having presented material on "Getting Facts", "Making Decisions" and "Case Studies".

e) Prepared Work Standards and Methods Engineering lectures for fourth-year undergraduates.

f) Prepared and presented a special seminar along with Professor Cahen, and lectured on the subjects: "Communications" and "Motivation".

g) Developed source and equipment lists for Industrial Engineering and Management courses and laboratories.

Management Development Activities

In addition to their primary teaching and research assignments at the Technion, all three members of the N.Y.U. team, Professors Richman and Ehrenfeld and Mr. Hartstein actively participated in the development of management seminars, workshops, and conferences sponsored jointly by Technion and industry, Government, and the Israel Management Center.

The Technion conducted a special Production Management Seminar in January, 1959. Professor Richman was a member of the Technion's planning committee for this seminar and was one of the four speakers at the seminar. He lectured on "Plant Layout and Materials Handling" and participated in case work and in discussion sessions during the seminar.

In response to numerous outside requests for training in operations research, the Operational Analysis and Research Group,

with Professor Ehrenfeld participating, conducted a specialized and intensive course, consisting of 120 hours of instruction, given in five unified sections spread out over a period of five months, from February through June 1959.

Both Professor Richman and Mr. Hartstein were called upon by the Israel Management Center for advice, guidance and professional counseling in the development of a program aimed toward enabling personnel of Israeli institutions and industries to assume greater responsibility for their own training. In this capacity, both staff members at the request of General I. Barnea, Director of the Israel Management Center, served on the committee which planned and organized the Center's resident school for managers. They helped to develop criteria for the selection and training of candidates, plan curriculum and develop course material. In addition, they served on the Production Management Planning Committee of the Center in the planning and coordination of a "Cost Reduction" seminar.

During the three contract years in which the team was in the field, Mr. Hartstein's assistance to the Chief of Party was invaluable in the handling of the myriad of details connected with an international project of this nature. As noted, Mr. Hartstein's primary assignment, in addition to his Technion duties, called for his serving half-time as management consultant to USOM/Israel. His activities in this area were coordinated through the offices of the Chief of Party and the Industry Division of USOM. Since it would not be practical to list each and every program and activity with which he was associated, representative activities are cited on the following page.

Productivity Institute: In working with Mr. Bar-El, Training Head of the Productivity Institute and his staff, Mr. Hartstein helped in the establishment and presentation of courses in many fields of study new to Israel's management, helped to plan and run seminars, wrote booklets, and provided advice and counsel on aspects and fields of training and management development. Some of the courses he was involved in are:

1) Planned and presented, along with Mr. Herman, a 21-hour course (3 hours a week) on Public Relations. It was held in Jerusalem for public relations men from industries and ministries.

2) For Key central office personnel and bank managers of Bank Leumi, planned and presented with Mr. Bar-El a 20-hour course (2 hours a week) on Customer-Employee Relations.

3) Presented a 14-hour course on "Creative Thinking" to executives in Jerusalem; repeated same course for executives of Tel Aviv.

4) Helped in the development of the following new courses of study:

    a) With Mr. Speizer on "Sales Training"

    b) With Mr. Avinal on "Secretaries Course"

    c) With Mr. Glazer on "Communications - Oral and Written

    d) With Mr. Privas on "Reading Improvement"

5) Conducted a one-day seminar on "Creative Thinking" for the staff of Productivity Institute.

Companies and Organizations: In conjunction with companies and organizations, Mr. Hartstein conducted courses and seminars of the in-plant nature, helped set up long-range development plans, and offered advise and counsel to many of their management development

problems. Typical of these activities were the following:

- An 18-hour course presented along with J. Pridan to key people of Koor Industries on "Creativity".
- Helped to plan a three-day seminar for Malben at Oholo near Tiberias and gave presentations on "Planning and Organizing - Key Administrative Tools", "Carbon Copy or Creative Administrator - Aim of Management Development".
- Presented a Top Management Seminar at intervals for Ata Textile.
- Ran a one-day Management Seminar for State Controllers Office.
- Worked with J. Pridan of Koor on a "Long-Range Development Plan" for Koor Industries.
- Ran a seminar on "Organization and Planning" for Amidar.
- Assisted Mr. Bar-El in planning a detailed course of study for Tahal and made presentations at intervals on "Human Relations", "Morale", and "Communications"; also advised and guided Tahal at the same time in connection with long-range development plans and means of setting up a sound Personnel Department.
- Also worked with Mr. Ferdman on "Management Development" and "Planning of Time" for Rassco's top management, with Mr. Sanderson on "Management Development" and "Human Relations" for top management of El Al and Mr. Sever of Koor on "Public Relations".

Managers' Clubs and Writings: Other activities of Mr. Hartstein included speeches to managers' clubs, contributing to publications, writing of booklets and assisting others in similar such efforts.

From time to time Mr. Hartstein was called upon to address managers' clubs or groups and civic organizations. For example, he addressed the Public Relations Association on "Basics of Public Relations", Haifa Managers' Club on "Managing the Individual", Tel Aviv Managers' Club on "Basic Management Concepts", a Tel Aviv group on "Planning and Organizing - Key Administrative Tools", Skal on

"Service is Your Business", etc. He also served on USOM's panel for the Rotary to cover "Management Development in Israel".

In conjunction with his many tasks, Mr. Hartstein also wrote a number of booklets, some of which have been translated into Hebrew, e.g. "Executive Development", "Communications", "Planning and Organizing Your Time", "Public Relations", "Cost Control", "Creativity", "Human Relations", "Morale", etc. Those on "Creativity", "Cost Control", "Executive Development", and "Public Relations" have been translated in Hebrew.

VI. PARTICIPANTS

Technion's participant, Dr. Yeshayahu Rim, arrived in the United States on September 27, 1958 and returned to Israel on June 15, 1959 to resume his duties at the Technion. During his stay in America Dr. Rim observed, studied, and did practical work in industrial psychology and educational testing. Dr. Raymond Katzell, Professor of Psychology and Director of the Research Center for Industrial Behavior at New York University, and one of the outstanding industrial psychologists in the United States, served as Dr. Rim's faculty advisor during his period of training.

While Dr. Rim's detailed, final report on his participantship is appended (Exhibit T-4), the following partial listing of his program will serve to indicate the depth and range of his training program:

a) Educational and Vocational Testing and Test Development

Testing and Advisement Center, New York University
Laboratory for Psychological Studies,
Stevens Institute of Technology
The Psychological Corporation
Educational Testing Service

b) Testing Programs of Individual Firms

General Electric Plants
Prudential Insurance Company
International Business Machines
Celanese Corporation of America
General Motors Corporation
International Harvester

c) Teaching of Industrial Psychology

New York University
Stevens Institute of Technology
Renssalaer Polytechnic Institute
Massachusetts Institute of Technology
Harvard University
Yale University
Purdue University
Ohio State University
University of Michigan
University of Minnesota

d) Industrial Training Programs

National Training Laboratories' two-week
Management Workshop on Leadership Skills
Advanced Management School of General Electric
American Management Association

e) Governmental Programs

New York State Employment Service

In addition, Dr. Rim attended seminars and informal meetings with a number of the leading industrial psychologists in the United States.

Two other capable young men are scheduled to begin their studies in the United States in September, 1960. Since the

N.Y.U.-Israel program terminates with this report (August 31, 1960), these participants will be under the administrative control of The International Cooperation Administration, Washington, D.C. The first of these, Mr. Gil Shaal, is at present with the Department of General Studies at the Technion and is working in the field of industrial relations and labor economics. Mr. Shaal will study at Princeton University for a period of one year. Upon completion of his studies, he will teach industrial relations and labor economics in the Department as well as in the several faculties of the Technion.

The other, Mr. Shelemyahu Sacks, was one of the first graduates to complete the two-year Master's program at the Technion. He will attend Columbia University for a period of 1 to 2 years. His major field of advanced study will be in the area of application of statistical methods and techniques to the control of industrial processes, automatic systems, inventory control, and quality control. Upon his return, to Israel, he will teach Industrial Statistics, Design and Analysis of Experiments, and Quality Control.

Another candidate proposed by the Technion for participantship is Mr. Binyamin Avi-Yitzhak. He is another graduate of the new Industrial Engineering program. It is hoped that he will commence his studies in the United States in September, 1961.

VII. CONCLUSION

A high point in the progress of the Technion program occurred during the summer of 1958, when the Senate of the Technion officially approved the establishment of the Department of Industrial and Management Engineering. It consists of an Undergraduate Division, a Graduate Division, and an Operations Analysis and Research Group. A brochure proclaiming the commencement of the graduate program of the newly created department was prepared in both Hebrew and English. The brochure was sent to educators, Government officials, educational institutions and other interested parties, not only in Israel and the United States, but throughout the world.

A complete curriculum has been developed and is in operation. The first graduates have begun to emerge from the Master's Degree program and others are part way through their training. Research contracts are underway and many contracts for future research have been made. While the Technion was able to send only one participant to the United States during the contract period, the remaining quota of five man-years will be used by the several junior faculty members about to leave for advanced training. These men are exceptionally qualified and speak well for the future of the Department. Important also, is the fact that the stature of the existing senior staff members is excellent. The Faculty is well trained and highly qualified in their respective fields. All have cooperated fully with the visiting N.Y.U. staff and have displayed much willingness to participate with our team in the attainment of stated project objectives. There has been a free exchange of information and an

excellent esprit-de-corps in the Faculty which has spread to the students as well.

Another event of major significance took place early in 1959 when construction was started on a new building to house the Department on the lovely new scenic campus of the Technion. An impressive dedication ceremony took place on June 6, 1960. Present were Mr. Benjamin Cooper, the principal donor of the building, together with outstanding and distinguished guests from Israel and abroad. The new building to house the Faculty, laboratories, and classrooms will be ready for occupancy at the beginning of the next school semester.

The much needed books and equipment to be used as instructional aids have been ordered under a $25,000 allowance provision of the contract. These orders are being processed by the home office at New York University, and the material should be arriving in Israel in the near future.

Despite the achievements and accomplishments at the Technion, there remains a number of problems. One of these is in connection with the scarcity of qualified teachers in some areas of the program. In particular, there will be a need for replacements for Professors Richman and Ehrenfeld. This is so because a full year of the project had passed by before the new Department came into being and because participants could not be sent out soon enough in order to return prior to the termination date of the contract. Accordingly, this phase of the project has not been as fully self-liquidating as initially planned. The Technion is attempting to obtain qualified

replacements to carry on this work.

Professor Sebastian Littauer, one of America's foremost specialists in the field of industrial engineering, was, as previously noted, assigned last summer for nine weeks as a short-term staff member to the Technion. One of his major responsibilities at this particularly critical point in the program (between the close of the first graduate year and the final academic year of the contract), was to analyze and evaluate the development of the graduate curriculum at the Technion. His clear and discerning report contributed much in the guidance of the project in its assigned development work. Relative to his analysis and recommendations, we reviewed with him the progress of the past twelve months. Essentially, his overall view of the curriculum is that it is well-balanced between substantive and theoretical material and that a fully developed program of analytic techniques is provided. It is his opinion that the needs of Israel in industrial and management engineering, and as exemplified in statistical quality control and operations research, are very well taken care of in the program which has been developed. In this regard, Professor Littauer notes that the Department is now producing a generation of engineers with background in industrial and management engineering principles, and indoctrinated with principles of statistical control and operations research and the various techniques supporting them, so that the management function in Israel is becoming progressively more effective in making the economy of Israel self-sustaining.

While the progress to date has been highly satisfactory, Professor Littauer also expressed his concern about the problem of manning the program during the next few academic years. His concern is for the need to continue the current development work for at least another 12 to 20 months to fully establish the Department and its program, complete the writing of teaching materials, and develop the Operations Research Group to a necessary degree of effectiveness. His candid appraisal and the detailed analysis which he set forth in the subject report is included as Exhibit T-5.

EXHIBIT H-1

Collection of Publications and Lectures on Labor Relations

(Published by the Eliezer Kaplan School of Economics and Social Sciences, Business Administration Department, 1959)

Contents

Collection of Publications and Lectures

on

Labor Relations

INTRODUCTION

This publication has been prepared as reading material for the course in Labor Relations by Prof. Barta with the Business Administration teaching program. This publication comes as an addition to the publication published last year under the name of "Basic Material for the course in Labor Relations given by Prof. Barta, 1958," and both publications should be used together.

The material in this publication has been chosen because of its factual information.

The opinions expressed in respect of various problems in the publication are those of the writers themselves, and they should not be indentified with the views and opinions of the University.

The articles dealing with the development of the labor movement and the labor unions are in most cases up-to-date until 1950. Therefore there is some material that does not reflect conditions in 1959. To the extent that the material supplied dealt with proposed legislation, which meanwhile has been enacted, the necessary corrections have been introduced.

In some articles short passages not relevant to the problems connected with the course have been deleted.

The main purpose of this publication is to give a general idea on the historical development of the institutional structure and of the organizations connected with labor relations in Israel.

Part I and the article "The Situation in Industry" in Part III have been taken from the book "Beshnat Hashloshim" published by the Waad Hapoel of the Histadrut. Part II consists of lectures given in the course on Labor Relations in the Kaplan School in 1958. The article "Working conditions in the Israel industry (in 1957)" in Part III has been taken from the Training Manual of this name, published by the Productivity Institute of Israel.

We express our thanks to the Waad Hapoel of the Histadrut, to the Productivity Institute, to Adv. J. Hausmann, head of the Labor Department of the Manufacturers' Association and to Mr. R. Shari, Chief Labor Relations Office in the Ministry of Labor, for the material put at the disposal of the editors of this publication.

EXHIBIT H-2

Export Methods for Israel

By Dr. E. E. Pratt

Chapter Index

EXHIBIT T-1

Sample Pages

Question and Answer Manual for Statistical Analysis Program

1. Two machines A and B have each 10,000 hours of life. Machine A costs $1,000. and machine B costs $2,000. Each machine produces parts which are sold at a profit of $1. a piece. The cost of production, disregarding the initial cost of the machine, is $0.5 per part. The machines do not produce parts at the same rate, moreover, the number of parts produced per hour varies. 50 hours of observations yielded the following numbers of parts produced per hour:

Machine A

8	3	5	6	6	6	4	8	7	4
6	8	4	7	6	4	6	7	4	3
4	8	5	6	3	5	5	5	7	7
8	6	4	5	4	9	4	3	8	4
4	5	5	4	3	6	4	4	4	6

Machine B

7	7	8	8	5	5	7	9	7	4
4	5	7	7	7	8	7	6	8	8
10	7	8	7	3	9	7	10	8	8
4	7	3	7	7	7	7	8	7	8
8	7	6	3	7	7	8	8	7	8

a) Tabulate the frequency distribution for the above data. Compute:

b) The mean profit per hour from machine A, from machine B, taking into account production costs and machine deterioration.

c) An additional investment of $500. on machine B would reduce the production cost per part to $0.3. Is this investment justifiable?

d) How many hours over the life times of the machine B work at a rate which is not less than that of machine A?

e) What other criteria for comparing the machines can you suggest?

2. A container is to be designed for a part. If part is smaller than container the difference is filled by felt pads 0.125 inches thick. Experience with the production of containers and parts on present the variations of part lengths and container lengths produces a histogram for E (the difference to be filled by felt pads), given below. The cost of a felt pad is C_p. The cost of an interference (part bigger than container, i.e. - E 0) is given by C_1.

Cell (inches)	Percent
0.0355-0.0955	1%
0.0955-0.1555	1%
0.1555-0.2155	4%
0.2155-0.2755	5%
0.2755-0.3355	13%
0.3355-0.3955	18%
0.3955-0.4555	22%
0.4555-0.5155	23%
0.5155-0.5755	8%
0.5755-0.6355	5%

a) Find arithmetic average of E (gap length).

b) Find average number of felt pads used.

c) What cost do you expect for packing 1,000 containers when C_p = .0.03 dollars? What assumptions are you making?

d) What would be the percent interference if average container length is reduced by 0.20 inches. What cost (due to interference and felt pads) would be accrued in this case for the conditions in (c), (assume $C_I = 0.08$ dollars).

e) Plot percent interference as a function or $\bar{r}$, where $\bar{r}$ is the average number of inches that contained length is reduced.

f) Plot expected cost per contained as a function of $\bar{r}$.

g) Find optimum $\bar{r}$.

3. A fleet of N bombers is sent to a certain target. The probability of a bomber reaching the target is $1 - \frac{50}{N + 50}$. The probability that a bomber, having reach the target t, will score a hit is independent of N and equal to 1/3.

a) What is the probability of K bombers reaching the target as a function of N?

b) How many planes should be sent so that the probability of hitting the target at least once is not less than 0.95?

4. A manufacturing process is intended to produce electrical fuses with no more than 1 percent defective. It is checked every hour by trying 10 fuses selected at random from the hour's production. If one or more of the 10 fails the process is halted and carefully examined.

a) If in fact its probability of producing a defective fuse is 01, what is the probability that the process will needlessly be examined in a given instance?

b) If the probability of producing a defective fuse is in fact 0.05, what is the probability of halting the process 5 hours after it has been started?

c) For what sample size the probability will be at least 0.95 to halt a process, for which the probability of a defective fuse is 0.15, not more than two hours after it has been started?

5. The frequencies at which certain plants suffered from three principal diseases, were registered over a long period. Experiments were conducted for various numbers of treatments and the results are given below:

Disease/damage per plant	RELATIVE FREQUENCY OF DISEASE AFTER RECEIVING: No treatment	1 treatment	2	3	4
1	3.5	0.42	0.15	0.12	0.10 0.09
2	4.0	0.355	0.12	0.08	0.06 0.05
3	6.0	0.21	0.09	0.04	0.03 0.02

Let the cost of treatment per plant be $0.50.

a) Assuming that the 3 diseases occur independently, how much damage will you expect for a plantation containing 10,000 plants after receiving:

i) No treatments.

ii) 1 treatment.

iii) 2 treatments.

b) What is the gain of the fourth treatment?

c) What is the optimal number of treatments?

d) What is the probability of a plant suffering from all three diseases? - only from the first? (for no treatment).

6. The length of life, t, of a certain part of a machine has the following exponential probability density function:

$$f(t) = 0.01e^{-0.01t}$$

where t (non-negative) is measured in days. The machine comes supplies with one spare. What is the probability density function of the combined life-time of the part and its spare?

EXHIBIT T-2
Objectives

Graduate Program in Industrial and Management Engineering

The development of a graduate program of industrial and management engineering at the Technion was especially complicated, both by the particular needs of the Israeli economy and the rapid growth and changing structure of this field. A modern curriculum in Industrial and Management Engineering can be structured and disseminated in a variety of ways. The outline of the subject matter and percentage time allocation for the Industrial and Management Engineering program at the Technion follows:

I. Operational Analysis and Research - 30%
   a. Introduction to Operations Research
      1. Scientific orientation
      2. Probability and statistics
      3. Decision approach
      4. Utility
      5. Introduction to techniques of Operations Research
   b. Advanced Statistics and Probability
   c. Techniques and applications of operational analysis (with case studies)
      1. Linear programming and scheduling
      2. Monte Carlo technique
      3. Queueing
      4. Game theory
      5. Replacement theory
      6. Inventory
      7. Stochastic processes
      8. Other techniques

d. Case Study Workshop

This would include work with the Technion Operational Analysis and Research group.

II. Substantive Material - 50%

a. Costing and cost control

b. Production and inventory control

c. Computers and computing techniques

d. Industrial relations

e. Finance and marketing

f. Human engineering

g. Methods analysis and work measurement

h. Plant layout and materials handling

i. Statistical quality control

j. Job evaluation and wage incentives

The subject matter above is not intended to be complete; advanced work will be given where undergraduate work in some of these areas is prerequisite.

III. Industrial Projects - 20%

Students engaging in industrial projects to be supervised to a lesser extent than in the Case Study Workshop. Student participation in these projects is to be guided and controlled by the Operational Analysis and Research Group.

EXHIBIT T-3

Unifying and Expanding Operations Research in Israel

by Prof. Glen D. Camp

Is the unification and expansion of operations research work in Israel desirable? If so, how can this best be done?

Much exeellent research is now being done on operations (large-scale purposeful human activities) and, logically, all of this is operations research. However, most of this work is fragmented under many different names (economic analysis, feasibility studies, etc.) in many different parts of governmental and industrial organizations, with little professional communication between the researchers. This causes special cases of the same basis principles, methods and techniques of operations research to be independently discovered over and over again, because the individual researcher does not have the knowledge accumulated by many other researchers, and his productivity is thereby reduced; or, worse it leads to results of lower value to the decision-maker than would have been possible if principles, methods and techniques known collectively had been known to the individual.

This was precisely the situation throughout the world until, during and since World War II, more and more scientists realized that it is logically possible and practically useful to bring the scientific study of all strategies and tactics, both military and non-military, together into a single unified science. This has led to an enormous cross-fertilization of ideas, and there is now a rapidly growing body of knowledge (principles, methods and techniques) whose applicability cuts across the widest variety of human endeavors. The name of this new

applied science, operations or operational research, arose from a historical accident: military commanders of World War II chose this name to distinguish such applied research from the kind whose product is new instruments, equipments, materials, etc. Some feel that a better name might be fould, but it would be very difficult to change the name now. However, the particular name appears to me to be much less important than the existence of a single name to serve as a focal point for bringing together elements of knowledge which logically belong together, even though gained by the study of the most diverse variety of operations. The history, logical basis and practical utility of operations research are briefly discussed in "Operations Research as an Aid to National Planning" and, for the purpose of this paper, it must suffice to summarize by saying that a valuable potential asset will be realized if the presently fragmented operations research work now being done in Israel is unified.

Unification does not necessarily require that all engineers and scientists engaged inthe study of operations be brought together into one or a smaller number of operations research groups, although some move in this direction may be desirable (e.g., single groups in each of the following: the Prime Minister's Office, most of the ministries, and in some of the larger government-controlled industries).

Also, unification does not require exchange of specific information, which might be difficult or impossible owing to security classification of such information, especially with regard to military operations.

What it does require is exchange of ideas and knowledge on general principles, methods and techniques via colloquia, publications, etc. In fact, the formation of a professional society, the Operations Research Society of Israel, would seem to me to be an excellent means of

establishing good communication between scientists in this field by furnishing Israeli formums and possibly a scientific journal for the presentation of non-security-classified work. By affiliating with the International Federation of Operations Research Societies, the Israeli society would be kept in touch with developments throughout the world by exchange of journals, etc.

In summary on unification, I believe that it could be accomplished to a high degree in a year or two, and that it would yield a large return by greatly improving communication between those scientists who, regardless of the particular operations which they are studying, all have the same general purpose: to supply decision-makers with scientific results which will assist them in getting the most out of available human and material resources.

Turning to the expansion of operations research work, I believe that there is clear evidence that this is desirable. During visits to various operations in Israel, several promising projects suggested themselves. One is a study of the whole air-land-sea transport system; "Coordinated Air-Land-Sea Transport" is a rough draft of a proposal to make such a study. Others include studies of the operations of various industries in which the managements do not have adequate scientific staff assistance. At a higher level, there are many problems of the country as a whole which I believe to be susceptible to effective O R study, some of which are briefly mentioned in "Some High-Level Problems Suitable for O R Study." Present activities in operations research are far below that here suggested, both in volume and level, and I therefore conclude that expansion is highly desirable.

How can expansion be effectively accomplished? First, let us consider existing personnel in operations research. At the Technion, there is a small operations research group in the Department of Industrial and Management Engineering and another in the Building Research Station. Graduate instruction in operations research is given, but this produces only a few graduates per year. At Hebrew University there is great interest but, at present, no working group and no instruction offered. Thus one must reluctantly conclude that the present educational program will not produce anything approaching the required number of operations researchers in time to assist on huge decisions which will have to be made in the next few years.

There is another possible source of personnel, namely the many scientists, mentioned at the beginning of this paper, who are doing operations research under other names. If these scientists can be put in better communication with one another, in line with the previous discussion on unification, then their productivity will be greatly increased in a short time of a year or so, and then it may be possible to use this additional productivity on new studies. It may also be desirable to establish incentives favorable to the transfer of some of their present work to problems of higher priority (see later discussion of this point).

Finally, there is one other highly important possible source of O R personnel, namely, engineers and scientists at Hebrew Univerisyt, the Technion, The Weizmann Institute, and elsewhere. Some of these are doing applied research on problems or less importance and urgency than the pressing decision-problems previously mentioned, and of these, some will have sufficient breadth of interest to become useful contributors in O R groups in a very short time. By getting one here and one there, it may

be possible to get something of the order of 40 or 50 able scientists without seriously injuring the structure of the institutions from which they come.

Others are working on fundamental research, and these present a more complicated problem. First, some fundamental scientists are so deeply devoted to their work that they would leave it only very reluctantly, and then would not be very effective; these are best left alone. Others are intellectually challenged by difficult problems per se, more or less independently of the problem area, and these are excellent material for operations research. However, here there is a human-value question: Although fundamental research has many by-products of a great practical value, its basic incentive is knowledge for its own sake, and in this respect, it is on a par with art and music in that it contributes to the non-material needs of man. Any effort to transfer scientists from this kind of work must therefore be based on a decision made at the highest policy level.

This question should, I believe, be taken to the highest level in the hope of favorable action, because a few of the latter-mentioned type of fundamental scientists are urgently needed in operations research, both for their keen scientific minds and for the prestige which they will bring. In final analysis, the Government of Israel does indirectly put a "value" on the non-material aspect of fundamental research, by the funds which it allocates for its support. Since the determination of this allocation is one of the many responsibilities of the Government, and since a change would change the amount of fundamental research done, then there is nothing philosophically new in the Government taking other action which might also change the amount of this research done.

I discussed this question informally with two outstanding Israeli scientists, beginning by asking this question: "If a high Government official were to ask you to leave your work for two or three years, to make your ability and prestige available for the formation and operation of one or more high-level operations research groups, what would your reaction be?" One replied: "I would be very reluctant." He then went on to say that he doubted that scientific work in this area would be fully appreciated or would have any significant influence on decisions, and that he would therefore prefer to stay in his present research. The other was more hopeful that thoughtful consideration would be given to operations research results, although not fully convinced, and he said that, if he were reassured on this point, he would undertake the assignment enthusiastically.

It seems to me that this conversation highlights a matter which is of fundamental importance in recruiting the most able scientists for operations research work, namely, their skepticism as to whether the results of their effort will be considered in reaching decisions. They know, of course, that the decision-maker can never guarantee them in advance that he will act on their recommendations, since this would be complete abdication of responsibility. However, the decision-maker can properly guarantee in advance that he will give thoughtful consideration to all scientific results that reach him in proper form and well before the time that the relevant decision must be made. If such assurance is given, then I believe that a few of the most able scientists of Israel would gladly make themselves available.

Thus the matter boils down to whether high Government officials believe that operations research, applied by good scientists whose efforts are directed by a few of the most able scientists in the whole country,

will be of real assistance to them in reaching their important decisions. If this belief is held, then I believe that great success is possible. However, I also believe that it would be a grave mistake to attack high level problems without the services of some of the best scientists.

If it is decided to adopt this general approach, then the first step might well be to call a meeting of a small number of the best scientists of the country. Since some of these may be unfamiliar with the great development of operations research during the past few years, and perhaps skeptical of its practical utility, it would be well to have them addressed by an outstanding scientist whom they all know, at least by reputation, and who also has operations research experience.

This group of able scientists will of course have their own ideas about how to proceed, and hence only sketchy suggestions are offered here. An excellent beginning would be to establish one group in the Prime Minister's Office and another to work for the Chief of Staff of the Armed Services, each directed by one of the most able scientists available. The prestige of these two directors will enable them to recruit a first class scientific staff.

The military group should immediately begin to develop and work on its research program, whereas the Prime Minister's group has two tasks: To develop and work on its own research program, and also to help in establishing and staffing other O R groups. To guide both activities, it should first consider the major problems of Israel and assign priorities based on importance and urgency. This will furnish a basis upon which to attempt to transfer capable and interested engineers and scientists, in Government, industry and research institutes, from lower to higher priority problems. Each group formed will educate itself in

operations research by reading selections from the extensive literature now available, participating in joint seminars, etc. Hebrew University and the Technion can be very helpful here in giving special short courses, conducting joint seminiars, etc.

In conclusion, it is my opinion that the program here outlined for the unification and expansion of operations research in Israel can be very significantly advanced in as little as one year and will, by that early date, already have produced very valuable results. This opinion is based upon observation of several operations research groups from the time of their formation (staffed by able scientists with, however, no O R experience) to the time when they were producing effectively.

EXHIBIT T-4

Report on Participant Training in Industrial Psychology

(October 1, 1958-June 15, 1959)

by Dr. Yeshayahu Rim

This report consists of two parts.

Part I is a description of the current status and trends in industrial psychology in general and in the U. S. A. in particular, as I have seen and experienced it, based both on firsthand experience and a review of the contemporary literature.

Part II is an attempt to describe the impact of the experience I gained during my stay in the U. S. A. and to predict in what way this will be useful to me at the Technion.

I would like to take this opportunity to thank all those who have given of their time and made efforts to help me make my stay a successful endeavor, particularly Dr. B. Bernard Greidinger, Coordinator of the NYU-Israel Program, and Dr. Raymond A. Katzell, Chairman, Department of Industrial and Management Engineering, my professional adviser.

PART I: Trends in Industrial Psychology

After World War II certain changes in emphasis became obvious in the field of Industrial Psychology in the United States. One way of assessing the shift in trends is perhaps to analyze the articles on Industrial Psychology in the Annual Review of Psychology since 1950. A study of the articles shows some of the changes which I consider most significant:

1. A decrease in the number of references in the field of testing.
2. A growing interest in the field of motivation, morale, attitudes and human relations.

   A good example of the work done in this field is The Man on the Assembly Line by Walker and Guest,[1] a well-planned attitude survey carried out in a new automobile plant.

   A second example is the major study in human relations by Jaques,[2] The Changing Culture of a Factory. A team of social scientists studied the personal relations of factory employees and management over a period of several years. Management from the beginning was highly

1. C.R. Walker and R.H. Guest, The Man on the Assembly Line (Harvard University Press, Cambridge, Massachusetts, 1952.
2. E. Jaques, The Changing Culture of a Factory, Tavistock Publications, Ltd., London, England, 1951.

progressive and wanted to become even more democratic. Some of the difficulties in this process are shown.

3. An ever-growing concern with the refinement of criteria.

In this area two representative studies have come from Brogden and Taylor.[3] They classify various kinds of biasing factors in criteria; they also discuss problems of bias in relation to this classification and in relation to the following types of criteria: production records, ratings, and job sample measures.

In their second paper the authors apply the concept of cost accounting to the construction of criteria. A worker's effectiveness is determined by his contribution to the objectives of over-all efficiency of the organization, and this contribution can best be expressed in dollars and cents. Any criterion measure such as production, accidents, wastage, errors, etc., can, according to the authors, be expressed in these units.

4. The new interest in organizational policies and practices.

Katzell,[4] in reviewing the studies on employee attitudes, states that they call to our attention the fact that performance and satisfaction are profoundly affected by the institutional nature of the industrial enterprise, including especially its goals and values, the roles expected of its members, and its system of rewards and

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3. Educ. Psychol. Measurement, 10, 159-86 (1950); Personnel Psychology, 3, 133-54 (1950).

4. Annual Review of Psychology, 1957.

penalties. Haire[5] points out in his book Psychology in Management, that developmental trends in modern industry such as bigness, work rationalization, and automation require advanced planning regarding the management of men if the changes are to be successful. Haire's recommendations are that a) managers develop greater sensitivity to human nature and be guided in their actions accordingly, and b) provisions be made for greater employee participation in decisions.

5. The concern with the selection, training and behavior of management.

As an example of work done in this area Fleishman, Harris and Burtt's[6] study can be mentioned. They evaluated a supervisory training program at International Harvester. One of the most important findings is that the effects of supervisory training may become neutralized when the trainees' superiors possess attitudes contrary to those developed through the program, pointing to the importance both of organization-wide training and of evaluating training results in terms of post-training on-the-job performance.

6. The development of Engineering Psychology into a field of its own.

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5. H. Haire, Psychology in Management, New York, McGraw Hill, 1956.

6. Leadership and Supervision in Industry: An Evaluation of a Supervisory Training Program, Columbus, Ohio, 1955.

> This is underscored by the fact that in 1958 a special chapter was devoted to it in the Annual Review of Psychology. As Fitts, its author, points out, Engineering Psychology has both a professional and a scientific aspect. The professional aspect involves the application of psychological knowledge to the design of human tasks, man-operated equipment, and man-machine systems, usually in collaboration with engineers. The scientific data supporting the professional side of engineering psychology are contributed mainly by conventional areas of experimental psychology such as vision, hearing, perception, and learning.

The study of textbooks on industrial psychology led me to expect a wider use of tests in the selection of workers in industry than is actually the case. I soon found out that testing was practiced mostly in large companies, and very little, or not at all, in smaller firms. I discussed this phenomenon with leading psychologists in the field and their explanations were to the following effect:

a) Full employment during and in the years following World War II made testing less and less important; most firms were happy to employ anybody available.

b) The de-skilling of jobs, due to automation and other factors, made it less and less necessary to find men of special aptitudes.

c) A third possibility is the lack of reliable criteria, which is responsible for some of the discouraging results.

The growing concern with criteria is reflected in the number of references in the reviews published in the ARP.

This lack of reliable criteria of successful performance may also be partly responsible for the shifts in emphasis to the field of human relations, and later to the behavior of management. But after the first enthusiasm of "measurement" in these new areas, psychologists are bound to encounter again and again the problem of reliable criteria. Thus, e.g., we are faced at present with it in the attempts to evaluate executive development programs. Too early and/or overambitious attempts to evaluate them against unreliable or meaningless criteria may jeopardize many a valuable program.

d) Finally, it may have been realized at one time, somewhat overoptimistically, that it is perhaps more reasonable to invest in foremen's training or management's training than in an individual selection program, and that a well-trained foreman will make selection by testing superfluous.

Another striking aspect in the field of testing is the heterogeneity of procedures used. Some companies have extended and detailed programs, devising at least some of the tests they use, following up the results, trying to validate the tests and the interview procedures, and doing all the research necessary for improvement. Other companies make use of tests, but let the testing be done by outside agencies, relying entirely on the reports of the consultant. One large company even made it a point of policy not to have psychologists on their payroll; the reason given was that employees should be free to accept

or reject the psychologist's counsel. It may be the psychologist's advice, e.g., that an employee should seek psychiatric help; it is obvious that it would be embarrassing to get such advice from a colleague rather than from somebody outside the company.

The shift of interests to the field of human relations is also remarked by Kendall in his article in the ARP, '56, "Once viewed as a test technician, he (the psychologist) is now being called upon by management to aid in solving a variety of problems involving individuals and groups . . . Unless subject matter is restricted to employee selection, . . . Industrial Psychology, as it is presently developing, does not represent a unified technical-scientific specialty. And except for a statistical, psychometric orientation, there is little to distinguish the industrial psychologist from other social scientists working in industry."

R. A. Katzell, who agrees with Kendall, goes one step further and points out some of the paths into which industrial psychologists are venturing. He writes in his article on Industrial Psychology in the ARP, 1957: "The discovery and investigation of significant variables and issues constitute possibly the most solemn obligation that the scientist has toward society, his profession and himself. Such issues now germinating in industrial psychology appear to include: The ingredients and consequences of directive and permissive organizational climates; The identification and development of executive ability; faciliatating integration among financial, social and personal goals of employees and alighment of these goals with those of the company; the objective measurement of industrial and organizational performance effectiveness; . . ."

The movement of Executive Development run by industry, very often with the help of universities, is another new striking feature in the industrial life of the U.S. Many psychologists are employed in such programs, in their planning, in teaching and evaluating. Others, particularly in universities, are engaged in research aimed at exploring the dimensions of values in industry, leadership and organization, in order to better understand the background against which the Executive Development programs are organized. There is a growing awareness that without a better knowledge of this area, and with the changes going on all the time in the philosophy of management, it may be impossible to appropriately plan and later evaluate the programs.

PART II: Experience Gained in the United States

In trying to evaluate the program to which I was exposed during my stay in the U.S., it is important first to outline the program objectives. As stated in my Participants' Workbook they were:

1. To teach Industrial Psychology and Industrial Testing at the Technion.
2. To set up a selection program for the admission of high school students to the Technion.
3. To serve as a consultant for industry.
4. To train psychologists to be absorbed by industry.

Having these objectives in mind, a varied program was set up to enable me:

a) to get insight into the many procedures in use in the field of testing, both for industry and educational institutions;

b) to talk to teachers engaged in teaching psychology to students of engineering, management and business;

c) to talk to psychologists serving as consultants in business and industry;

d) to get acquainted with the research going on at present at various research centers, universities and in industry;

e) to talk to executives in charge of personnel and management development, both in industry and universities;

f) to participate in a management workshop on leadership skills given under the auspices of the National Training Laboratories.

The program as a whole was a very satisfactory one and I can very well appreciate the unique and valuable contribution it made to my experience, all the more so, since I had been engaged in teaching, consulting and research in Israel prior to my coming to the U.S. The experience gained contributed in many ways, some of which are obvious:

1. It brought me up-to-date with regard to techniques, points of view and thinking in the field of industrial psychology.
2. It strengthened my belief in the preference of certain procedures over others, since I saw them applied in many of the leading institutions I visited.
3. It enabled me to discuss points of vital interest with leading psychologists, and establish lasting contacts with many of them.

Activities Related to Testing

Since psychological testing for the purpose of selection in industry and institutes of higher learning was from the outset an important item in my program, I concentrated my efforts to learn as much as possible in this field. Therefore, the first institution in whose activities I participated was the Testing and Advisement Center of N.Y.U., where I spent three weeks. There I got acquainted with all the tests in use and discussed with the director, Dr. Gobetz, and other members of the staff, procedures and techniques used inthe administration, scoring and interpretation of tests.

To supplement my experience in this field, and to observe a similar service department functioning at an Institute of Technology,

I spent two weeks at the Laboratory for Psychological Studies, Stevens Institute of Technology. Here, too, the director, Prof. Gaudet, and other members of the staff discussed with me the procedures used, and I familiarized myself with the few tests used in addition to the ones I knew from TAC. With the aid of case studies, various points of interpretation of data were clarified.

I also visited two other testing centers attached to Institutes of Technology: Brooklyn Polytechnic Institute, and Rensselaer Polytechnic Institute, where their activities were explained to me.

I had the opportunity to discuss with Dr. Wesman of The Psychological Corporation, problems of interest, such as tests for the selection of students on the technical high school and university levels. It was particularly helpful to hear Dr. Wesman's opinion on the value of tests of dexterity as predictors of success in industry and in technical high schools.

The most important experience in the field of testing were doubtless the four weeks I spent at the Educational Testing Service in Princeton. There, I had the unique opportunity of observing, discussing and participating in the construction and use of tests of aptitude and achievement for selection in the field of education. I gained insight into the mechanics of test-construction, was involved in the project of an alternate form of the Psychology Test for the Graduate Record Examination, and discussed with the research staff projects being worked on at present. Of particular interest to me was the research related to business and industry, which focuses on an Executive Study and an Engineering Study (see Activities Report

for March).

An important addition to my experience in the field of testing was the period spent at the New York State Employment Service, where I learned about the day-to-day activities and the research done in and for industry. There I got acquainted with the General Aptitude Test Battery, and with many of the validation studies done in the State of New York (see Activities Report for January).

My informal talks with psychologists and directors of personnel in industry gave me the invaluable opportunity of learning in detail how tests are used in selection and what the current opinion is with regard to their usefulness. I dicussed these problems at: General Electric, Prudential Insurance Co., International Business Machines, Celanese Corporation of America, General Motors Corp., International Harvester Co.

I am confident that this varied experience added significantly to my knowledge and effectiveness in the field of testing. This is very important in view of the fact that Israeli industry, in the process of expansion, is faced with an ever-growing need for more and better selection. The problem is particularly acute when we take into account the constant influx of new immigrants, speaking different languages, of different cultures and attitudes, and being of a wide range of skills and experience. One of the first endeavors in which I may be involved is the immediate training of personnel technicians, who would be absorbed by industry. Such a two-year course is considered at present by the Department of General Studies of the Technion. Other applications of this experience would be:

a) helping industry in setting up testing programs;

b) setting up a testing center at the Technion, primarily for the use of industry;

c) setting up a selection procedure involving testing for the applicants to the Technion and to the Technical High School at the Technion.

Activities Related to Teaching

With regard to the other main objective of my program, i.e., teaching of psychology, it should be emphasized at the outset that I profited very much from the interchange of ideas with experienced colleagues. The specific teaching problem preoccupying me over the last few years was to find the best possible curriculum and teaching technique for students of Engineering and Management. It is obvious that the teacher of such students is faced with special problems and an increased responsibility.

The most intensive and rewarding experience was my participation in the Seminar on Industrial Psychology given by Dr. Katzell at N.Y.U. for the Ph.D. candidates in Psychology. This seminar, a combination of lectures and discussions based on extensive preparation, gave the students the possibility of contributing from their own experience in business and industry.

Dr. R. Barrett kindly discussed with me his course in Basic Psychology given to graduate students of engineering at N.Y.U.

I also sat in at lectures given by Dr. T. Costello of N.Y.U., to students at the School of Commerce and the Graduate School of Business Administration. Apart from this, I discussed with Dr. Costello several times questions of curriculum and teaching techniques. He also gave

me the opportunity of sitting in on one of the meetings he held as consultant to a group of bankers, an experience which contributed to my knowledge about consulting.

Of special interest to me was the chance to participate in and discuss the lectures given by Dr. Gaudet and Mr. Stainton of Stevens Institute of Technology.

I had further conversations about the teaching of psychology (both curricula and techniques) with Dr. D. McGregor of M.I.T., Dr. Roethlisberger of the Harvard Graduate School of Business Administration, Dr. Argyris of Yale University and various professors at other schools.

There is a consensus among teachers that non-psychologists need a course of at least two semesters, one of which should be devoted to introductory psychology and the second to topics most relevant to the interests and specialization of the students. I was surprised to find the importance attached to psychology in schools of engineering, both by faculty members and students. Usually students are required to take at least one elective in psychology but most take more than one in consecutive years.

The interchange of ideas and opinions with teachers of psychology has certainly added to my knowledge and experience, and I feel that I could make use of it in the planning of my courses for the future. First and foremost I have in mind: a) the course in Industrial Psychology intended for the students of the Graduate Department of Industrial and Management Engineering; b) the two-year course for personnel technicians planned by the Department of General Studies of the Technion; and c) the course on The Human Factor in Industry,

Various ways of helping to solve the problem under consideration were discussed, and the clients told the group whether and to what extent they were helped.

2. Another interesting activity in which I participated was the planning of the evaluation of an Executive Training Program, sponsored jointly by the City of New York and the Graduate School of Public Administration of New York University and under the direction of Dr. S. Mailick. The evaluation will be done by the Department of Psychology of the School of Engineering, under the guidance of Drs. Katzell and Barrett. The planning included such items as: clarifying the opinions of the City Commissioners as to the primary objectives of the training program; exploration of suitable criteria to measure the success of the program; choice of appropriate tools for the measurement of the progress made during the training period. Participation in the preliminary steps of the evaluation was a valuable experience for me.

3. My participation in three meetings of psychologists should be mentioned here: a) The Invitational Conference on Testing Problems, sponsored by the Educational Testing Service; b) the Eastern Psychological Association Conference in Atlantic City; c) The Midwestern Psychological Association Conference in Chicago. The papers presented and the contact with psychologists from various parts of the U.S. have doubtless helped to enrich my experience of psychology in the U.S.

In conclusion I would like to point out the following: I am quite aware that it takes months, and perhaps years, for learning experiences of this kind to come to full fruition. I am therefore

intended for students of Industrial Engineering on the undergraduate level.

Miscellaneous Activities

1. One of my most interesting and rewarding experiences was my participation in the Management Work Conference sponsored by the National Training Laboratories of the National Education Association. The purpose of the Workshop was to gain greater insight and diagnostic sensitivity to the behavior of groups and of individuals and to gain greater ability to interact effectively with others. I had the unusual experience of being a member of a T-group, in which a vacuum is created by the trainer refusing to carry out the traditional expectations of his role: leadership, agenda, and procedure setting.

The members of a T-group participate in actual group and human relations situations and analyze their participations. In a sense, they set up a figurative mirror in which each can see the consequences of his own efforts on others.

A second feature of the Workshop was a series of lectures on vital topics of management, such as: Communication, Small Groups, Executive Development, Training as an Instrument of Organizational Development, etc. The most challenging Theory Sessions were given by Douglas McGregor of M.I.T.: Notes on Organization Theory, Management by Objectives, and The Role of Staff in Modern Industry.

The third feature of the Workshop was the Problem Analysis Sessions, in which problems brought up by group members from their working situations were analyzed. The group was divided into clients, consultants and observers. Role playing was used several times.

confident that the full impact of the multiplicity of experiences will become apparent in my regular activities of teaching, research and consulting in Israel.

EXHIBIT T-5

Report on Short-Term Assignment to the Technion

By Sebastian B. Littauer
Visiting Professor of Statistical Quality Control

This report consists of the following sections:

I PROGRAM

The following program of activity was mutually agreed upon between the Department of Industrial and Management Engineering and the writer.

1.	Seminar with Faculty	7 days
2.	Talks to outside groups	3 days
3.	Discussion and analysis of operations Research and Engineering Statistics specialization in second year of graduate studies including:	
	a. Course on Advanced Control Techniques	
	b. Case studies	
	c. Other teaching material	15 days
4.	Meeting with Operations Research Group	15 days
5.	Writing report	5 days
	Total	45 days

Subsequently the Department requested the writer to spend approximately one more week at the Technion and to prepare the report in the U.S.A. This report is in keeping with this request.

II INTRODUCTORY REMARKS

The writer left New York on the afternoon of May 28th and after a stop-over in Rome, arrived in Tel Aviv on the night of May 31st. He was met at the airport by Professor Richman, Chief of Party, and Mr. Goldman of the U.S.O.M. who, after shepherding him through customs, transported him to his hotel. On the morning of June 1st, in the company of Professor Richman, the writer reported to the U.S.O.M. offices and carried through all the necessary formalities together with establishing acquaintanceship with the various persons associated with his particular project as well as with the Chief of U.S.O.M. and the personnel officers. This business was completed on the morning of June 2nd whereafter the writer departed for Haifa where he arrived in the late afternoon. Reporting on the morning of June 3rd at the Hadar campus of the Technion in the offices of the Department of Industrial and Management Engineering, the writer found a very well-appointed office awaiting him together with his secretary, Mrs. Joyce Sofer, there to assist him during the period of his tenure as Consultant to the Program.

The members of the Department were there ready to meet with the writer and discuss the program of his activities as well as to conduct a meeting of the Department. The formal program given in Section I (above) was discussed by the assembled group. It was agreed that this program be followed in spirit, in accordance with the views of the writer as to how he could best carry it out. While it was followed in essence, this report is topically

organized so as to present the work of the writer and such views as he has developed with respect to the program in the most logical and effective fashion. The writer was invited to sit in on all the Departmental meetings to be held during his tenure and also to participate in the examinations of graduate students receiving graduate degrees during that period. The writer was also asked to review the work of some of the junior members of the Department. Then the writer made informal arrangements with the various members of the Department as to scheduling his meetings with them and the various phases of the work that he was to engage in.

III DISCUSSIONS WITH DEPARTMENT MEMBERS, AND OUTSIDE GROUPS

One phase of the discussions with members of the Department took place during faculty meetings. This had some merit since it gave the writer and the Department an opportunity to compare notes as to the functioning of the Department at the Technion and the Department with which the writer is connected at Columbia as well as the Department with which the Chief of Party is connected at the University of Southern California. The functioning of the Department meetings under the able Chairmanship of Professor Cahen is a very definite indication that this young Department is indeed a mature and progressive one. At the first of these meetings it was decided that the writer would meet informally with one or more of the faculty members at either their or his request. It was also decided that the writer's contact with outside groups would be determined in agreement with the members of the Department. The seminars with the faculty were quite informal and were conducted

essentially in the office of the writer. The principal topics of discussion were: the review of the curriculum, the requirements for advanced techniques and the means by which the students could get practical experience in the methods of operations research through the working of the Department's Operations Research Group.

The over-all current curriculum was but slightly varied from what was proposed when the writer left the Technion about one year ago. This curriculum is as comprehensive as any curriculum for the Master of Science degree with which the writer is familiar is Industrial and Management Engineering, and in particular, in Operations Research or Statistical Quality Control. It is well-balance between substantive and theoretical material and a fully developed program of analytic techniques is provided. Any graduate of this Master's program should have the means whereby to engage in Industrial Engineering and Management in a practical way and with a considerable degree of theoretical material and mathematical scientific techniques to be called upon as needed. It appears that the needs of the country in Industrial and Management Engineering and as exemplified in Statistical Quality Control and Operations Research, are very well taken care of in this program. There remains but to see the fruits of this program in the ensuing years and only time will indicate what modifications are necessary. It may be in place to remark here that the first year of the program has just been completed with an initial class of approximately thirty students, of which almost twenty completed the first year satisfactorily. This may be looked upon as somewhat of an heroic achievement since most of the students were from industry and were

undertaking a full-time program under very difficult conditions. Many were obliged to come from Tel Aviv (which is the center of small private industry) and in order to complete course requirements were obliged to spend some eight hours in one day in classroom attendance. This schedule is being modified with the beginning of the 1959-1960 academic year, but it was enforced upon the Technion during the first year. All factors considered, it appears to this writer that the first year of teaching in this program was eminently successful.

We then considered the individual curricula. Professors Eilon and Richman are each dealing with substantive material. The writer was fortunate in being able to see some of the work of each of these men and is happy to report that each is preparing a book on his subject and that in a reasonable time this material will be available to the Department for use in teaching. The work of both these men contains some of their original findings and will be important contributions to the field of Industrial and Management Engineering. Professor Richman is dealing with the subject of Plant Layout in a much deeper manner than has been the case so far. Professor Eilon is dealing with the field of Production Control in a manner that is taking advantage of much of his practical experience and his researches conducted while at the Imperial College of Science in London as well as of modern analytic techniques. The contributions of these men will not only prove of value to Israel but will serve to add to the prestige of the Technion.

Professor Cahen gave an exceptionally valuable and practical course in Organization and Management which serves to unify the teaching of the Department around the central concepts of the aims and objectives of Industrial and Management Engineering. It is not known whether Professor Cahen has preserved this material in the form of notes but it is hoped that in subsequent presentations of the course, notes will be taken and teaching materials derived from them which can be used for a number of years to come.

Professors Naor and Ehrenfeld have been presenting the material in Probability and Statistical Method, Statistical Quality Control, the Methodology of Operations Research and Operations Research Techniques. Much of this material is recorded in written notes which can be preserved for future teaching use. During the preceding year, the writer together with Professor Ehrenfeld, had been working on notes Statistical Method since this is the foundation of most of the analytic work done in the Department. More will be said about the cooperative efforts of Professor Ehrenfeld and the writer in developing teaching materials in Statistical Method and Statistical Quality Control. The specific curricula of the courses given by Professors Naor and Ehrenfeld are of a high order theoretically with an abundant number of practical problems to illustrate the work. Their teaching is highly to be commended. In this connection both these professors consulted the writer on the development of a course of study to be called Advanced Management Contro.. More will be said of this in Section IV.

Considerable time spent in discussions with members of the faculty, in particular, Professors Naor and Ehrenfeld, was in connection with advanced subject matter and Operations Research practice. These two topics will be reported on in separate sections, IV and VI, respectively.

Another aspect of the work participated in by the writer in conjunction with other members of the Department was the examining of Master's degree candidates and reviewing their work. The writer reviewed a joint paper written by Mr. Ben-Israel and Professor Naor, entitled, "A Problem of Delayed Service." This is an excellent piece of work and shows the high level of achievement that the Department is maintaining among its graduate students.

The writer was one of the examiners who read the dissertation of Mr. Shlifer and conducted an exacting oral quiz of this candidate in defense of his thesis. It is worth emphasizing that the Master's thesis of Mr. Shlifer is an excellent one and is far superior to that usually offered for a Master's degree in this country. It contains a sufficient degree of novelty to be the basis for a doctoral dissertation. It is also well to note that this dissertation was developed analytically with rather clever and sharp mathematical tools and yet is also a very practical piece of work whose results are being used in the desing of certain storage facilities. As an addendum, it may be mentioned here that both Mr. Ben-Israel and Mr. Shlifer have been awarded excellent opportunities for research and further study in the United States during the next year, and if need be, for the

succeeding one. They will return to the Department of Industrial and Management Engineering at the Technion after completing further research studies.

Discussions with outside groups (Part 2 of the Program) consisted of participation in a three-day Seminar which the Department held in closing a project with a reserve officer group. The writer gave a talk before the Israel Managers Association and had various conferences with members of industry on the possibility of implementing various aspects of Operations Research in their work. Participation in the Seminar for the reserve officers and civilian employees of the military industries served as a rather good proving ground for the effectiveness of this program. In the first place, there was evidence that a tremendous amount of interest had been aroused among the group. In the second place, there was considerable evidence that a good deal more training would be necessary. And third, there was evidence that many of these people were thinking in terms of practical application of the ideas learned. It seems that this special program conducted by the Department is evidence of one of the important services which the newly created Department of Industrial and Management Engineering at the Technion can render to the country. There are many other groups that can be drawn from industry and government service which can profit from such an intense training program as was given them last spring and summer.

Late in July, at a seminar held for middle and upper management by the Israel Managers Association, the writer was invited to

speak on "Management Uses of Statistical Control Principles." It seems that this talk was very well received. In attendance at these sessions was Mr. Carl Ferderer of U.S.O.M. and Mrs. Shoham from the Prime Minister's Office. There were a number of other calls by representatives of industry and some from military organizations who consulted the writer on aspects of applications of operations research to their problems. The talk to the Israel Managers Association was taken down in shorthand and reproduced both in English and Hebrew for the participants of the seminar. In addition to the talk, the writer submitted as Appendix an example of this aspect of management entitled, "The Quality Control Cycle."

All in all, during this short period of two months and a week, at a time of the year when so many people are not in the country, there seemed to be considerable active interest in having advice on the application of the ideas that are being promulgated by the Industrial and Management Engineering Department at the Technion.

IV CONSULTATION ON ADVANCED SUBJECT MATTER

In the original Program there is provision for discussion of a course on advanced controls techniques. Professors Naor and Ehrenfeld were primarily concerned with this topic although, of course, it was the concern of the whole Department. It was decided that such recommendations as were to be made on this topic would result from consultations between these two professors and the writer. Discussion of the whole program, those aspects which were highly developed, and in particular, the second year of

the Master's program and advanced control techniques led to acceptance of the writer's suggestion that this material be looked upon from the point of view of higher management functioning. When we refer to "higher management functioning" we do not exclude the use of these ideas by representatives of management at the lower eschelons. We mean that management is provided with a systematic means for controlling an enterprise without devoting itself to the specific details of "putting out fires" as is so common in many organizations. It was concluded that the writer develop a course of study to be entitled, "Advanced Management Controls" in keeping with his ideas on process management wherein the point of view of operational analysis leans on principles of statistical control so employed as to provide management with the necessary clues to determine whether or not it need take action on the processes under its responsibility. This set of notions was developed in keeping with explicit recognition of the need for delegation of authority, yet with the added caution that he who delegates authority shall know when he must express authority himself in order that operations under his direction function as effectively as circumstances permit.

At the time of the writer's departure this course was conceived in general outline and detailed for the equivalence of six sessions. This much of the work was done in consultation with Professor Naor. It was decided that the remainder of the detailing be done by the writer himself and forwarded to Professor Naor prior to the opening of the next academic year. This work is in the process of completion and will be forwarded in good time.

V PREPARATION OF TEACHING MATERIAL

One important basic subject in the graduate program is Probability and Statistical Inference. It is used in every phase of work in Industrial and Management Engineering, is of particular importance in modern developments in Statistical Quality Control and Operations Research and embodies the most useful and facile analytical tools. Hence, the teaching of this subject in all its stages (and it is taught through some three years: one year in the undergraduate preparatory program and two years in the graduate program) is of greatest importance. This subject must be taught thoroughly and well. One aspect of good teaching is the preparation of a good course of study; another is the provision of a good source of material to refer to. In general, both are embodied in a good textbook, in classroom notes or perhaps in reprints of published papers. There is almost nothing in Hebrew that could be called upon at present and, while there is some text material in English, that material does not conform to the course of study developed at the Technion. To the credit and indsutry of the N.Y.U. Team, they have been preparing material adapted to and designed especially for the courses of study being given by them at the Technion.

The writer had the pleasure last year of collaborating with Professor Ehrenfeld on the development of teaching materials in statistical method and was happy for the opportunity to further advance this work during this period of consultation. Considerable time was spent on reviewing and revising the course of study in statistics and in relating it to its applications in other subjects.

There was considerable work done by the writer and Professor Ehrenfeld in preparing teaching materials, which it is hoped, can subsequently be published in book form. This will serve a dual purpose: 1) to provide the teachers in the Department with permanent material to use in their teaching of statistical method, and 2) to give prestige to the Department for having a text published on the basis of work done in the Department. This work is far from completed and both Professor Ehrenfeld and the writer will continue it in order that it attain the completeness and the degree of polish that such material deserves. It might be pointed out here that this teaching material is being so prepared as to possess an inner unity and a theoretical soundness. It is especially designed to be useful in problem solving, decision making and consideration of industrial and management engineering objectives.

The writer also worked in collaboration with Professor Richman on some topics which may eventuate in some joint publications. For the present, there remains of this but an interchange of ideas and a review of individual works which may, when opportunity permits, be reconstituted as joint papers.

VI CONSULTATION WITH OPERATIONS RESEARCH GROUP

This Group constitutes all the senior members of the Department. In point of teaching, however, Professors Naor and Ehrenfeld give those subjects which are considered to be more specifically Operations Research. Nevertheless, in the initial stages, the

writer discussed the problems of concern with all the members of the Department. The principal issues were: what to focus attention on, what to emphasize and how to provide practical experience for the graduate students in the program. The group, of course, had been making contacts with industry and the government for possible projects. One of the policies adopted by the group is that they not undertake work that was merely of a consultative nature and that could be handled as well by a consulting group in private practice. The other point in this connection is that such projects as they undertake shall be of an educational nature, that is to say, shall provide an opportunity both for application of principles and novel inquiry and serve as a basis for case studies and future teaching. In particular, it was desired that some of these projects be of such a nature that one need not assign only members of the faculty and junior staff members who are, so to speak, employed for the purpose of carrying out projects, but to give the graduate students an opportunity to try out their talents on some of these problems in order that they may come to grips with real issues. On this aspect of the Operations Research Group's work, the writer did not have much to contribute. Although the writer is familiar with many persons in Israel and with many organizations which could be approached in connection with prospective O.R. work, the members of the Department are, of course, equally if not better connected. And, of course, when Professor Camp was here, he did contact may prospective clients for the O.R. Group. This however, was not the principal concern of the discussions with the Operations Research Group.

While wherever possible the contract work engaged in by the Department was to be made available to graduate students for practical experience, the greater concern was with the establishment of a practical O.R. Laboratory and the delineation of directions of inquiry and problem work for the graduate students. In this connection, the writer brought over with him a dozen or so papers written by his students at Columbia on the formulation of Operations Research problems and suggestions for their solution. The writer does not have the opportunity at Columbia for putting his students on actual, practical Operations Research problems. But most of his students are engaged in industrial work or business management and have a wide range of problems confronting them which can be approached from the Operations Research point of view. One of the principal assignments that has been given these students over the past five years is the formulation of realistic problems drawn from experience, together with suggestions of an approach towards solution in terms of some systematic methodology. This assignment has turned out quite successfully in the writer's experience and, in fact, has served as a source of stimulation to the students to undertake in their daily jobs problems which they had not thought of undertaking before the assignment was made. Furthermore, the students were stimulated in these problems to use theoretical perspective drawn from Operations Research and so to plan, organize and formalize the approach to these problems more clearly in terms of useful results. It should be pointed out that the students in the writer's course have already had their background in statistical method, statistical quality control, programming and other

operational, analytical techniques. Again, the second year students at the Technion will have had a good part of the principal background that is required and hence, in their practice in the Case Study Workshop it is desirable to provide them with somewhat challenging realistic problems on which they can try out their ingenuity, their understanding of the operational analysis methodology and their ability to apply the formal techniques that they have been taught.

Most of the discussion on this topic was held with Professors Naor and Ehrenfeld. In addition to the material which the writer gave to Professor Naor from the work of his graduate students, they were also given a large number of reprints and other non-published Operations Research reports to serve as teaching material in the Case Study Workshop. A number of cases can be developed by taking some of the problems dealt with by others, modifying the input materials, setting up data and then having the students use Monte Carlo methods for working out solutions. It is believed that these discussions have left with the members of the staff concerned with the Case Study Workshop other alternatives to the assignment of graduate students to practical contract work for gaining experience in the practice of Operations Research.

VII DISCUSSIONS WITH GENERAL DORI, PRESIDENT, THE TECHNION

The writer had three extensive discussions with General Dori about this program. General Dori showed very great interest in the program and quizzed the writer quite thoroughly about various

aspects. General Dori is quite familiar with the progress of the program and is very happy with its results. One of the problems which conerned him is that of manning the program when the present contract terminates. It is the writer's understanding that there is under consideration a subsequent two-year extension of this contract with the Technion. It is this with which General Dori is concerned. He is strongly interested in having the program continued because he recognizes the good work which has been done so far and will be done during the coming year must be continued for at least another year or two in order that it shall take permanent root. It is also desirable in the critical period the program will go through until the Fall of 1961, (during which time Professor Eilon will be at the Imperial College of Science in London and Professor Naor will be an overdue sabbatical (1960-1961) that there be personnel to carry on the work presently being conducted by Professors Ehrenfeld and Richman. It is, of course, desirable that both these men continue for another two years if the program is renewed. General Dori will be very delighted if this happens to be the case. This writer agrees with him and other faculty members of the Department that it will require another two years to fully establish the Department, its program, the writing of teaching materials, as well as to fashion various administrative activities and develop the Operations Research Group to a necessary degree of effectiveness. The writer should like to convey at this point his strong recommendation that the program at the Technion be continued for two years past the present termination date with

the same type of support that it receives at present.

General Dori was also interested in making explicit what the service of the Technion in Industrial and Management Engineering shall be to the country. There is, of course, in Israel considerable interest in developing skill in the present managers in the practice of modern techniques of Industrial and Management Engineering, especially as expressed in Statistical Quality Control and Operations Research. As indicated in the earlier sections of this report, service and assistance to management in these areas is being contributed by the Technion program through the Department of Industrial and Management Engineering. But there is a much greater service that the Technion has to offer. An ideology requires a number of years to germinate in the population and in order for it to be effectively practiced it must become a part of the approach of the people; it must become a part of the tradition of practice of the professionals in the field in which the new ideology is applied. One cannot convert a generation of professionals within a few years, nor can one make out of them practicing "modernists" in a few years. The biggest problem in developing professionals is making them ideologically sensitive to new methodology and techniques. In spite of the great interest that is being shown by many of the present generation of managers in the work of the Technion's Department of Industrial and Management Engineering, in spite of the many seminars they are attending and in spite of a considerable amount of study on the part of these managers, it is not the present crop of managers that is going to

be converted into the modern so-to-speak scientific managerial personnel. It is rather the graduates of the course at the Technion who are going to transform the practices of Industrial and Management Engineering and inculcate the outlook of modern scientific management as it is being taught at the Technion.

The Technion is contributing to the short term and immediate needs for management training. It is providing what every university should provide: establishing the tradition of good, sound practice and of the interest in keeping apace with modern developments and passing on these modern developments to the community. So the Technion's Department of Industrial and Management Engineering is keeping itself fully enlightened as to modern ideas in its field, contributing them in its teaching, contributing to its teaching materials in terms of prepared text material, giving practice in practical methods to its graduate students and engaging in both theoretical and practical research in its field. This is the essence of what I believe is being achieved in this program and I have so communicated these views to General Dori.

VIII DISCUSSIONS WITH THE CHIEF AND OFFICERS OF U.S.O.M., AND THE U.S. AMBASSADOR

The writer has also discussed the accomplishments and merits of this program with Mr. Carl Ferderer and Mr. Howard Tilson, Deputy Chief and Chief of the Industry and Transportation Division immediately supervising the program, as well as with Mr. John J. Haggerty, Chief of the U.S.O.M. in Israel, with Honorable Ogden R. Reid, Ambassador of the United States to Israel.

Discussions with Messrs. Federer and Tilson were essentially technical. Both of these men kept in close touch with the program, were informed about it and, I must say, were quite enthusiastic about the program. The discussion with Mr. Haggerty followed somewhat along the lines of the discussions with General Dori. At the close of our discussion, the writer briefly expressed what he thought were the essential values of the program. Again, I can report the earnest and serious interest of Mr. Haggerty in the success of this program.

On the day before his departure, the writer was asked to visit the Ambassador who showed a considerable knowledge of the program and a great deal of interest in it. The discussion was far from formal and dealt with some of the real economic problems confronting Israel and with certain insights and local attitudes which the Ambassador gained from his discussions so far with persons concerned with industrial production. While the Ambassador had not been in direct contact with personnel in the Technion phase of the program, he was very well aware of what it was attempting to do and of the great problem confronting Israel in developing a managerial group which can cope with its production problems, its problems of providing for the country's needs from manufacture at a cost commensurate with the input, and with the necessity to export. The writer was very happy for the opportunity to speak with the Ambassador and to convey to him his views as to the accomplishments of the program, its high merits and the ultimate long term value of the program.

I think that this point is especially important since so many people who are engaged in Industrial programs are looking for immediate results. In the writer's extensive consulting experience, he has been engaged in many projects where immediate results were obtained (by "immediate" meaning results within three to six months). However, one does not transform the economy of the country, one does not develop a generation of skillful and efficient managers within six months or within six years. But one does have to see evidences of progress in actual practical results. This progress can be seen from such matters as the graduate theses for which the writer was privileged to serve as examiner and to review. These papers solve practical Operations Research problems and the results obtained are being put to practical use. There is also evidence of work done by members of the Department which is being effective in such matters as statistical control in the textiles and other industries, the application of linear programming to the mixing of feed for fowl and other animals for certain Kibbutzim, and other projects. These are a few among the many practical results being obtained at the present time.

But more important is the fact that the Department is developing a generation of engineers with background in Industrial and Management Engineering principles, indoctrinated with principles of statistical control and operations research and the various techniques supporting them so that the management function in Israel is becoming progressively more effective in making the economy of Israel self-sustaining. To this achievement the

N.Y.U.-I.C.A. Israel Program is contributing significantly in the work that is being done at the Technion.

IX CLOSING REMARKS

There remains but to give the writer's candid appraisal of the status of the graduate Department of Industrial and Management Engineering at the Technion, for whose establishment and development the Technion phase of the N.Y.U.-I.C.A. Israel Program was conceived. Since the writer was very closely connected with the development of this Department in all its phases, he can speak not merely from his recent period of service but from his association with this activity over the last three years. The appraisal will cover these facets: 1) the course of study for the M.S. degree; 2) the faculty; 3) the O.R. Group; 4) the administration of the Department.

In view of the supporting material that has preceded and in view of the official reports that have been submitted to the Coordinator, the writer's impressions will be expressed without further substantive discussion.

The course of study represents a healthy balance between substantive and analytical material and contains all that is significant in modern developments. In the writer's very serious and candid opinion, it is one of the best programs for the M.S. degree in Industrial and Management Engineering offered by any university.

The three senior members of the faculty are highly competent group of men possessing an extensive practical experience and an exceptionally fine analytical background. The two members of the "N.Y.U. Team" complete the senior group of five professors thus representing a thoroughly comprehensive, well-balanced and highly qualified group of scholars. Their accomplishments of both practical nature and in published research papers is of a very high order and more than adequate to meet the needs of the Technion and of Israel.

The senior men are supported by an excellent group of junior men both resident in Israel and in the U.S. All of the younger men are developing both in practical background and in formal engineering. Within two years the return of the junior men from the U.S. together with those junior men currently resident, will provide as highly trained a group of scholars and practical engineers engaged in production, statistical quality control, and operational analysis. All these people are exceptionally well-trained in statistical method and eventually the Department will have more than a half-dozen men capable of producing all the teaching requirements in probability and statistical inference.

There is, however, a possible time gap in the strength of the teaching staff during the academic year 1960-1961 when both Professors Naor and Eilon may be absent on leave. This gap may be partially closed by the return of Mr. Reinitz (who should have his doctoral degree by that time). The teaching strength

and ultimate excellence of the Department will be considerably enhanced if persons of Professor Ehrenfeld's and Richman's calibre and backgrounds are made available to the Department during the academic period 1960-1962.

The five senior members of the Operations Research Group and the three junior members currently with the Group are exceptionally equipped for carrying out both operational analysis in business and industry as well as to provide practical case work for the Master's students. The activities of Professor Naor in providing adequate practical activity for the students is highly effective.

The administration of the Department during the past academic year has been excellent, productive of Departmental cooperation. This high degree of cooperative effectiveness of the Department is expected to continue.