III-5 Personnel Administration

1) Personal Records

The primary method of achieving effectiveness in an organization and its functions is the assignment of personnel in keeping with the principle of "a right man in a right post". In order to survey manpower resources in the personnel and to make a proper assessment of an individual to determine whether the particular person is a right man for a given post, it is necessary to keep personal history records of the individual members in as much details as possible.

The basic data concerning an individual person himself provide information on his capabilities to deal with his duties while the records of his academic career and his specialization furnish information on his ability to adapt himself properly to the field of his job.

With regard to academic career, the personal records should include a description of (1) Date of graduation, (2) Name of the university or college, (3) Area of specialization, and (4) Academic degree.

As for vocational history, (1) Date of the initial employment, (2) Name of organization or business firm, (3) Name of occupation, and (4) Job position should be described in the order just given.

Concerning the job history within the SCA, the records should include a description of (1) Date of employment, (2) Job name, and (3) Job position.

The personal records are static records by nature, and these records themselves are not connected with the particular persons' activities in the organization and its functions. However, the personal records should be prepared and kept in order for use as basic data for such personnel administration measures the transfers, re-alignment, and promotions of personnel.

This personal record is based on a statement made by an individual person, and yet it will be convenient to have such attachments as a record of the final academic career, records of scholastic achievements, an academic degree certificate, a certificate of employment, a certificate of military services, a certificate of social services, certificates of prizes and punishments or the like, a photograph, a record of the driver's permit, a record of the passage pass for a bonded region a record of the passport number, a record of the social insurance number, and other necessary records relating to the particular person.

ECONOMIC UNIT

PERSONAL RECORD

DATE: / / PR. No. -

The undersigned hereby pledges that the statement made hereinbelow is true and correct.

Signature: _____

STATEMENT

NAME: _____

BIRTH DATE: _____ MONTH _____ YEAR _____ BIRTH PLACE: _____

ADDRESS PERMANENT: _____

PRESENT: _____

EDUCATIONAL RECORD:

BUSINESS EXPERIENCES:

JOB RECORDS IN SCA:

2) Administration over Attendance and Absence

Now that the jobs of the Economic Unit are software-related ones, information on the individual members' whereabouts is of the greatest importance.

For this reason, it is vitally necessary to perform specially scrupulous administration over the members' attendance and absence.

1. In case a member desires to take a paid leave of absence or an emergency vacation, he is required to fill in the format shown below, and, submitting the Application for Absence in this format to his superior, he should obtain an approval of his absence.

However, in the event of illness, etc. which can be considered to be urgent, a report on absence should be given by telephone to be followed by the submission of a formal application after the absence.

2. On the occasion when a member takes a vacation, he should be prepared to discharge his full responsibility for the attainment of his duties. In the event that he has any arrangement or appointment with any outside person or has any plan to perform work in the organization, he should not fail to transfer business affairs to his colleagues in order to ensure that everything will come out well.

3. An application for an approval of an early leave or an exit from the premises for private purposes during the working hours should be made in a manner corresponding to the procedure described above.

No _____

Application for Absence

Approved by: _____

1. Kind of Absence

   _____ Holiday _____ sick _____ other reason

2. Replacement:

   If it is unavoidable, specify another person responsible for taking over your job.

   NAME _____

   Signature _____

3. Application

   By: _____

   Date: _____

3) Appraisal of Members

The appraisal of the members if not merely for the purpose of evaluating the merits and demerits of the individual members, but also is a system designed for quantitative evaluations of their capabilities for accomplishing their effective utilization, the complementation of efforts, and the strengthening of the overall capabilities of the organization as a whole.

In view of these objectives, the personnel appraisal system presented here has been developed in the form of a simple and clear-cut method, and it has been established that the individual members of the personnel should be evaluated in respect of the five areas comprising vision, individual character, morale and loyalty, job-performing ability, and achievement.

It is further established that the marking system is composed of the five ranks, A, B, C, D, and E and that appraisers in each job rank should make an appraisal of his subordinates.

Moreover, this appraisal system is designed to permit changes in the relative weight of the appraisal marks distributed to the various areas of evaluation and in the relative weight of the appraisers, depending on which of the following items is to be considered on the basis of the particular appraisal:

1. Wage increase
2. Bonus assessment
3. Promotion
4. Another object of evaluation

The results which are obtained by adding up the points are scientifically valid and warrant fairness when used for personnel appraisal.

PERSONNEL APPRAISAL

	Appraisal Item	Particulars	Appraised Person / Appraiser: Primary / Secondary		
			Manager Director (Deputy Director)	Group Leader Manager (Deputy Director)	Member Manager (Group Leader)
Weight Points ( )	1. Vision	Extensive field of vision and long-range prospect about the long-term development of the Suez Canal and his own future role			
	2. Individual Character	Abundant culture and knowledge as well as a broad range of flexibility and tolerance and a large caliber; Harmonious co-operation with other members and individual character worthy of respect by other people			
	3. Moral & Loyalty	Loyalty toward the Suez Canal Authority and devotion to religion			
Weight Points ( )	4. Job-performing ability				
	4-1 Planning ability	Planning ability for work and sufficient workability of plans			
	4-2 Planning ability	Sufficient effectiveness in work management			
	4-3 Research ability	Sufficient capabilities for full achievement of researches and sufficient development and studies of new methods and techniques			
Weight Points ( )	5. Achievement				
	5-1	Faithful and unfailing execution of orders			
	5-2	Faithful observance of job regulations			
	5-3	Good cooperation, communication, and coordination with other members			
	5-4	Earnest performance of work			
	5-5	Constant self-teaching and modest attitude towards work performance			
	5-6	Positive stance to work performance			
	5-7	Quality of work achievement			
	5-8	Contributions to the Bulletin			
	5-9	Contributions to short analyses			
	5-10	Attendance and absence			

Appraisal Marks

A:	Outstading
B:	Satisfactory
C:	Normal
D:	Must Improve
E:	Unsatisfactory

III-6 Cost Control

1) Standard Time Cost (Tentative)

The time cost by the individual members will prove effective for performing a job at a high level of efficiency and also for measuring the cost-effectivenness of its product as delivered to the recipients within the SCA. Furthermore, the time cost serves the purpose of developing keener cost-consciousness in the individual member's mind.

However, it is a prerequisite condition to the calculation of the time cost that the overall basis, i.e. the costs of the Economic Unit, is accurately calculated.

Yet, it was found that many items of costs could not be divided in such a way as to identify the costs of the Conomic Unit itself.

It these circumstances, the initial annual costs of the Economic Unit for 1980 were calculated by adding the wages and the wage-related expenses, which were clearly and definitely known, to the other direct expenses and the overhead expenses, which were estimated on the basis of the total expenses, and then the amount of the annual costs was allocated to the individual members in proportion to the sun total of the wages and wage-related expenses for each member. The annual cost so calculated was divided by the actual working hours to determine the standard time cost.

In this regard, it is believed that it will be possible for calculating a more precise standard time cost for 1981 and the subsequent years by the application, if possible, of the cost calculation method which will be explained separately. The results of trial calculations of the unit hours costs of the individual persons in the Economic Unit are shown in the following:

Unit: Pound (£E)/hour

Economic Research Group		Systems Analysis Group	
Haggag	3,659	Negm	3,659
Beshir	3,659	Khaled	2,698
Hegazi	3,419	Manakhly	1,984
Kadry	3,178	Rizk	1,488
Maghraby	2,682	Marei	1,488

2) Standard Time Cost of Individual Member

This time cost expressed in Pounds/hour is an estimated cost of each member per hour. Your standard time cost represents the amount allocated to you by a sliding scale system applied to the

amount of your wages out of the total sum obtained by adding up the wages, the wage-related expenses (the bonuses, the social insurance expense, and the medical expense), the administration expenses required for the managing staff members from the Section Manager to the Director of the Department, and the portion of the overhead expenses, such as the expenses of the SCA which is allocated to the Economic Unit.

The individual items of the direct expenses spent for jobs, which are variable expenses by category, have been calculated by estimation from the actually recorded values and have been allocated in the same manner as the fixed expenses.

In addition, the total number of the working hours has been calculated at 1,548 hours. This number excludes Fridays, fifteen paid holidays, and seven emergency holidays.

This standard time cost is effective for cultivating keener cost-consciousness and also for determining the cost-effectiveness of a job.

ECONOMIC UNIT
PLANNING AND RESEARCH DEPARTMENT

YOUR TIME COST (UNIT COST PER HOUR)

The unit cost given below is your standard time cost (unit cost per hour). When you are going to set about a job or has done a job, calculate the number of hours spent, or planned for spending, on the job.

Then, multiply the number of hours by your standard time cost to determine the cost of the job.

This unit time cost includes your wages, as well as the wage-related expenses, the direct expenses, and the overhead expenses.

NAME	Standard Time Cost (Unit Cost/Hour)
	£E/hour

3) Calculation of Costs for Specific Job

Example: Compilation of Extract/Abstract

The time spent for the compilation of an abstract/extract is recorded.

1-1	Collection of informational materials	1 hr.
1-2	Reading through the materials to find the needed parts	1 hr.
1-3	Reading and analysis of the needed columns for data and information	3 hr.
1-4	Entering the data and information in the format for Extract/Abstract	1 hr.
1-5	Copying of the format	10/60 hr.
1-6	Idle time	30/60 hr.
1-7	Storage for preservation and filing work	10/60 hr.
	Total:	40/60 hr.

Cost Calculation

Standard Time Cost for the Member: £ 1.5/hour

£ 1.5 / hour x 40/60 hours = £ 10

Thus, it is calculated that the cost of this Extract/Abstract is £ 10.

However, if it happens that many persons in other organizational units within the Suez Canal Authority engage themselves in the same process and make the same effort during their working hours, considering that they need the same information, the SCA will suffer large losses of expenses and opportunities.

On the other hand, if the Extract/Abstract containing useful information is distributed appropriately to the individuals or units in need of the information, then the cost of £ 10 will eventually mean an extremely small sum and its cost effectiveness is exceedingly high.

4) Estimate of Job Cost

1. The fixed expenses and overhead expenses of the Economic Unit are allocated to its individual members in proportion to the amounts of their respective wages. Then, the sum so obtained for each member is divided by the number of the annual working hours (1,548 hours) to work out the unit time cost (i.e. man / hour cost) for the particular member.
2. The time spent on each job is recorded for each member (Format: Weekly Job Report).
3. The direct expenses are recorded for each job (by the job number).

The job cost is calculated by the following mathematical operations:

Unit Time Cost x Time Spent on a Job

= The sum total of the fixed expenses and the overhead expenses spent on the job 1

The direct expenses by the jobs and by the expense items

= The sum total of the direct expenses spent on the job. 2

1 + 2 = Job cost

5) Budget Control

The actual expenditure of the various items of the fixed expenses and the variable expenses should be examined in comparison with the budgets at least as of the end of each month, each quarter period, and each year, and the factors accountable for the variances observed in the form of the differences between the budgets and the actual expenditures should be analyzed and evaluated for use as information for compiling the budgets for the following year.

JOB COST CALCULATION FORM

1	2	3	4	3 x 4	5	6	5 + 6
JOB	Members Participating in the Job	Member's Standard Man/Hour (£/hr.)	Time Spent on Job (hr.)	Job Cost by Member (£)	Sub-Total by Job Σ 3 x 4 Job Man/ Hour Cost (£)	Direct Expenses Spent on Job (Expense Items) D-1, D-2, ... D-n ΣD Direct Expenses for the Job by the Members	Total Costs of the Job

III-7 Administration of Other Jobs

1) Administration of Equipment and Fixtures

The various types of equipments, machines, and so forth, such as micro-computers, which the Economic Unit possesses for the purpose of its performance of jobs should be kept in proper custody, maintained, and utilized by the Economic Research Group or the Systems Analysis Group, being registered as items of equipment or fixtures of the Suez Canal Authority or as equipment or fixtures necessary for the Economic Unit's performance of activities.

These equipments are depreciable assets of the Suez Canal Authority, and, of course, adequate administration should be exercised over them as assets for depreciation.

On the basis of these premises, systems for the custody and administration of the equipments should be developed and established in such a way as to make it possible for any member of the Economic Unit readily to use these equipments as their common tools.

The Equipment Inventory sheet shown below is the fundamental form to be used as the basis for the above-mentioned activities. Accordingly, the staff in charge of equipment administration should immediately enter the necessary items of description in this format of Equipment Inventory Sheet when any equipment or fixture is purchased or is otherwise received into possession.

In addition, the Equipment Inventory Sheet is to be kept in file for custody together with such attached, related or incidental documents as the following:

1. Document with a statement of the price for the equipment or the like
2. Warranty Card for the Equipment, etc.
3. List of the locations of service stations for the equipment, etc.
4. Maintenance history of the equipment, etc.
5. Operation Manual for the equipment, etc.

As for the location of custody for equipment, it is considered necessary to appoint an appropriate staff to take such charge in each group or, along with an increase in the number of equipment and fixtures, to charge each group with common responsibility for proper custody of equipment, etc.

For the future, it is considered necessary to practice common administration over equipment, etc. in the Economic Unit.

ECONOMIC UNIT

EQUIPMENT

DATE: / / IV No.

PLACE OF CUSTODY: _____ ECONOMIC UNIT
_____ ECONOMIC RESEARCH GROUP
_____ SYSTEM ANALYSIS GROUP

DUSTODIAN: _____ SIGNATURE: _____

DATE OF RECEIPT	NAME OF ITEM (EQUIPMENT, etc.,)	QUANTITY	REGISTRATION No.

2) Administration of Documents

The documents (including letters, documents, and reports of the Economic Unit should be handled in the manners prescribed below.

1. Confidential Treatment

The products of the jobs done by the Economic Unit, such as reports, as well as letters, reports based on contracts, related information materials, etc. may be properly considered to form what is commonly referred to as "proprietary information".

Furthermore, these information materials may be regarded as the sources of strategic and tactical information for the Suez Canal Authority.

On the other hand, there are some types of job-related information, such as information on the wages, the personnel affairs, the personnel appraisal, etc., which must not be disclosed by a manager to his subordinates, depending on the job positions of the particular persons concerned.

Therefore, these types of information must be placed under rigorous administration and in strict custody, being classified into the categories described in the following:

i) Categories of Information for Custody Restricted to Internal Access within SCA
Restricted to Internal Access within SCA
Restricted to Limited Internal Access within SCA
Disclosure limited to:
Restricted to Limited Internal Access within the Department
Disclosure limited to:
Restricted to Limited Internal Access within the Economic Unit
Disclosure limited to:

ii) Staff in Charge of Custody
Name:

2. Filling

The various forms used for the purpose of job administration should be filed in accordance with a filing system for them.

3. Distribution

Criteria should be established for the distribution of the documents, bulletins, reports, information materials, and so forth which are dispatched by the Economic Unit.

IV RESEARCH JOB MANUAL

IV-1 Outline

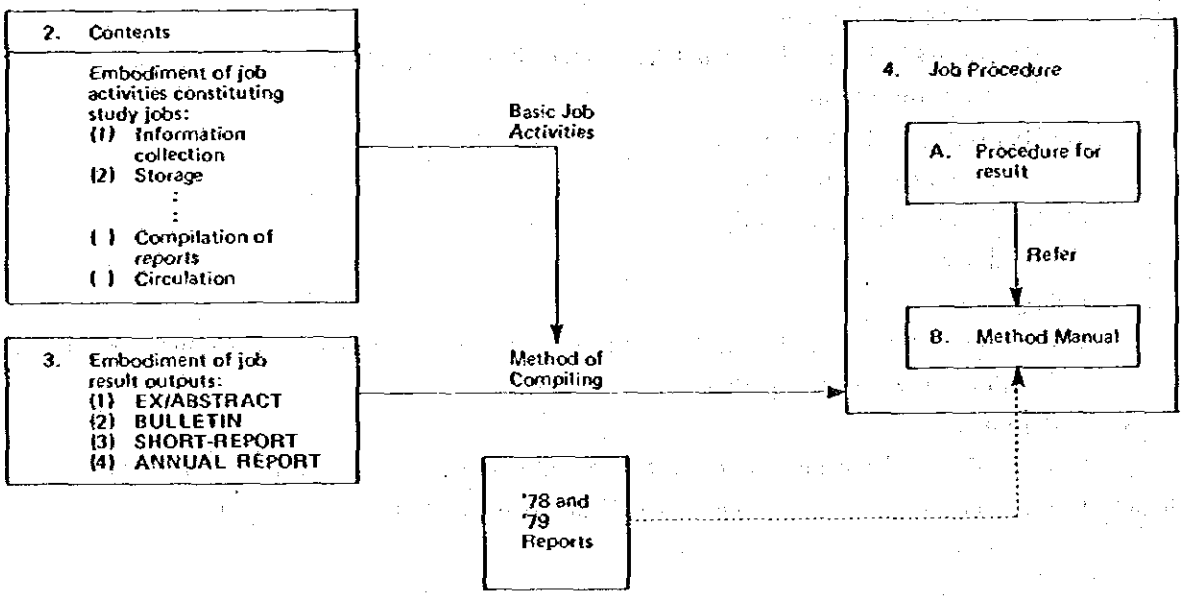
This Chapter defines a research job in the economic unit and shows a procedure for its accomplishment.

In IV-2 "Job Contents", job activities constituting the study job are embodied, and relationships among these job activities and with study job results will be made clear.

In IV-3 "Job Results", a structure of results of study jobs will be shown, and the significance of the results as seen from job objectives will be clarified.

In IV-4 "Job Procedure", the procedure to compile results will be shown in a form of work procedures. The related techniques will be translated into a manual anticipating that the work in it will be made by fixed techniques, to be offered as a reference material.

Fig. IV-1-1 Constitution of Survey Job Manual



IV-2 Structure of Research Job

The following tasks consist of the Research Job.

(1) Collection of Information

Information relevant to the Canal planning is collected from newspapers, regular documents etc.

(2) Arrangement and Storage of Information

Collected information is arranged and stored to be circulated and to be analized, evaluated

and processed.

(3) Analysis, Evaluation and Process of Information

Analysis and evaluation of the relationship between the Canal planning and stored information is maid. And collected information should be processed to support the Canal planning. The output of these tasks mainly takes a form of BULLETIN and SHORT REPORT.

(4) Completion of Document

The output is reported in a document.

(5) Circulation

Completed documents are circulated in the relevant sections.

(6) Print

The document is printed, if necessary.

(7) Self Training

Self training is one of the important tasks to develop the ability of analysis and information collection.

IV-3 Outputs of Research Job

The outputs of the research job are the following documents.

(1) EXTRACT/ABSTRACT

They are outputs produced by the task of information collection. They are made by extracting, abstracting the information relevant to the Canal planning from regular publications.

(2) BULLETIN

After the completion of Extract/Abstract, a bulletin is prepared which has some of completed EX/AB important to the Canal planning.

The contents of a BULLETIN is roughly as follows.

- Job report and job planning of E.U.
- External environment to the Suez Canal
- Internal environment to the Suez Canal

(3) SHORT REPORT

Analytical reports are completed which are specialized in

- Analysis of the effect of the information on the Canal planning
- Preparation of the data for the Canal planning
- Development of the method of the Canal planning

The theme dealt in the report are as follows.

- Internal environment
  - 1st expansion planning

- 2nd expansion planning
- Traffic forecasting
- Tariff analysis
- Convey system
- Canal cpapcity
- Traffic accidents

- External environment
  - World and Regional economy
  - Seaborne Trade
  - Ship tonnage
  - Maritime transportation cost
  - Shipping market condition
  - Modes of transportation which supplement or complete with seaborne transportation
  - Technology forecast

(4) Annual Report

Annual report is completed to summarize the job results of the year and to review a comprehensive movements of the external and internal environment of the Canal.

The report has the following contents.

- Annual job report of E.U.
- External environment
- *Internal environment*
  - Review of the traffics of the year
  - Outlook of the traffics of the next year
  - Review of the Canal revenue of the year
  - Outlook of the Canal revenue of the next year

IV-4 Job Procedure

The procedure for compilation of job results will be shown as a work procedure. The work procedure utilizes the methods which are already established. The next to this section will contain a method manual explaining the operating procedure for these related methods.

IV-4-1 How To Prepare Extract/Abstract

In performing its immediate task of analyzing problems, the Economic Unit must collect information and data ranging over as wide a field as possible, make extracts or abstracts of the collected information, process the information or add comments to it if necessary, classify and store the information according to subject.

To do this, it is necessary to read and digest information which ranges over as wide a field as possible. However, it is physically impossible for one person to cover and follow developments in all fields. Therefore, the first thing that needs to be done is to fix specific fields to be covered by specific persons. This division of labor reduces the volume of reading per person and enables each one to conduct intensive reading.

The format of the Extract and Abstract sheets must be fixed. The format is optional but the date of compilation and the source or sources of the information must be clearly indicated, and an appropriate title must be put on.

Documents vary greatly in length and it is quite difficult to condense the gist into a single sheet. Unless the title can convey the gist, it is meaningless.

Extract

In the Extract, the contents of a relatively short article or document are condensed to the minimum necessary without destroying its logical construction. In so doing, it is not necessary to rephrase the original sentences. The aim would be to extract the most important parts of the original article.

Abstract

An Abstract is a rephrasing in shortened form of the main points of a relatively long article or document. The work involves abstracting and summarizing the important points in a meaningful way. Thus, one should use his discretion sometimes to express in itemized form or a table or a chart the contents of a long prose passage in order to make the points easily understandable. Moreover, sometimes it may be useful not only to summarize the original but also to supplement it with a different viewpoint or the personal opinion of the person compiling the Abstract. In this latter case, it is necessary to indicate clearly which part is one's own opinion.

Next, we show an Extract/Abstract sheet format and examples of an Extract and an Abstract.

Table IV-4-1 Illustration of Extract/Abstract Sheet

ECONOMIC UNIT

EXTRACT/ABSTRACT SHEET

DATE / / EX/AB No. -

ORIGINAL DOCUMENT

TITLE

DATE OF ISSUE

PAGE

EXTRACTED/ABSTRACTED BY

TITLE OF THE SUBJECT

EXTRACT/ABSTRACT

CLUE WORD

Comment

Table IV-4-2 Example of Extract – Text 1 –

New U.S. President

Ronald Reagan won a landslide victory in the U.S. presidential election, gaining far more votes than had been expected. The United States is about to make a great shift to the right.

The American people seem to have decided to make a break with the stagnant Carter Administration even at the risk of danger. The election of a president who is so definitely conservative has not often happened in the past, and it will have enormous repercussions throughout the world.

It would perhaps be courteous for us to confine ourselves to extending our felicitations to the new president of a friendly country, and to say that we have high hopes in him, but we should prefer to voice our misgivings and make some requests of him. Among the Japanese people there is considerable doubt whether Reagan is qualified to be the leader of the Western camp and to have the authority to press the button to launch nuclear weapons.

The principal concern is the naivete of Reagan's views on foreign and economic affairs, and his obvious lack of knowledge. The political views that he expressed during the election campaign were remarkable for their superficiality and incoherence. He was particularly illogical in calling simultaneously for a tax reduction and for an increase in military expenditure.

It seems that Reagan was elected not because his policies were supported by the people but because President Carter was abandoned because of his failures—particularly in dealing with inflation and unemployment and in the field of foreign affairs.

The second concern is that Reagan is excessively conservative and inward-looking. The problems of the free world cannot be solved by conservative policies. His mistrust of detente, and his tendencies to favor trade protectionism, to oppose spending on welfare and to belittle the voices of the Third World and the younger generation—all these go against the current of the times.

The third concern is Reagan's hawkishness. His advisers, it is said, can be classified into those who are hawkish and those who are very hawkish. There is much talk of taking a stronger line toward the Soviet Union, and, for example, renegotiating the second U.S.-Soviet Strategic Arms Limitation Treaty (SALT II). And the Reagan administration is certain to increase military expenditure. Relations between the United States and the Soviet Union are extremely poor as it is; Reagan's victory makes a relaxation of tension even more unlikely than before.

We should like to make the following requests of the new president:

(1) He should realize that he is unfamiliar with Washington and form a team of experienced and far-sighted men. He should not rely on a "California Mafia."

He should also be careful about acting arbitrarily on his own authority. He should pay heed to the opinions of members of Congress and civilians, and he should not look at things in black and white terms.

(2) He should not attempt to make the Soviet Union back down by means of force. Neither should he adopt isolationist policies. His diplomacy should be conducted from a long-term perspective and should be designed to maintain peace. He should not ignore the North-South problem.

(3) He should keep in close contact with America's allies and take into account their views. President Carter unilaterally decided to take economic sanctions against Iran and to boycott the Moscow Olympics, and subsequently asked the allies for their cooperation. This kind of thing should not happen again.

The nations of the world are becoming more dependent on one another than ever before, and arbitrary actions on the part of the United States will only arouse mistrust and work to the disadvantage of the United States.

The United States under Reagan is likely to put much more pressure on Japan over defense. Although Reagan is likely to want to maintain the special relationship with Japan, Carter's flexible and understanding approach, which is symbolized by the attitude of Mike Mansfield, the American ambassador to Japan, is likely to be changed very much.

The Government must ascertain the intentions of the Reagan administration and prepare to cope with the new policies. And Japan must remain in close contact with the Western European countries and China and give advice that will prevent the United States from becoming isolated.

Neither can Japan afford to be unconcerned about American inflation and energy policies. Reagan's prescriptions are likely to encourage inflation. As for energy, he has no real policy at all.

Reagan's economic thinking appears to be based on the classical theory according to which the government should intervene as little as possible, enterprises should be given free rein and the forces of the market should be allowed to control things. Thus, Reagan has pledged to reduce income tax and to introduce a system of taxation that gives preferential treatment to enterprises. He seems to expect that enterprises will develop new sources of energy without assistance from the State.

If the difference between the economic performances of Japan and the United States is one of the factors in the economic friction between the two countries, Reagan's policy of trying to revitalize private enterprise is welcome. But if the United States simultaneously increases its expenditure on defense and makes a sizable tax reduction, the State's deficits will burgeon. And if the development of new energy sources is left to private enterprise, there is the danger that this will lead to the adoption of policies based mainly on self-interest. Failure to curb inflation will undoubtedly encourage trade protectionism.

America's inflation is being "exported" to Japan and other countries in the world, and the inadequacy of the U.S. energy policy is reflected in the soaring of petroleum prices. Reagan should realize that these problems cannot be solved by leaving everything to private enterprise and the forces of the market. The key to the reconstruction of the U.S. economy lies in international cooperation and fair competition, and not in dreaming of past glories and adopting an attitude of confrontation toward other countries.

Nevertheless, why is it that in a democracy so mature as the United States a presidential election takes place in which the victory of neither candidate can be welcomed?

After looking at the list of more than 30 U.S. presidents since George Washington, one scholar is said to have remarked that Darwin's theory of evolution obviously doesn't apply to presidents. When one thinks of such presidents as Dwight Eisenhower, John F. Kennedy, Lyndon Johnson, Richard Nixon, Gerald Ford, Jimmy Carter and Reagan, one cannot help but say that the reputation of U.S. presidents has been dropping in the world for many years.

Table IV-4-3 A Model of Extract (1)

[Extract] EE/AB NO.

ECONOMIC UNIT

EXTRACT/ABSTRACT SHEET

DATE / /

ORIGINAL DOCUMENT

TITLE The Asahi
New US President

DATE OF ISSUE Nov. 5, 1980

PAGE

EXTRACTED/ABSTRACTED BY

TITLE OF THE SUBJECT Reagan, New U.S. President

EXTRACT

Reagan's Victory

Conservative Republican candidate Reagan beat moderate, centrist Democratic candidate Carter in Tuesday's U.S. presidential election. His landslide victory indicates that the United States is going to turn sharply to the right.

The birth of a distinctly right-wing 'American' president is perhaps the most noteworthy event this year in view of its impact on international politics.

We would like to express frankly both our concern and initial impression on the occasion of the election of a new president to our friendly nation. There is considerable uneasiness among the Japanese as to whether Reagan is suitable as the leader of the West, the man whose finger rests on the N-bomb button.

First, he appears to possess only amateurish knowledge and views on politics, diplomacy and economics. The political opinions expressed by him during the campaign seemed incoherent claptrap.

Second, he is too conservative, oriented toward domestic affairs at the expense of other issues. It will go against the times if he has a prejudiced view of detente, leans toward protectionism, stands against social welfare and slights the views of the Third World and the younger generation.

Third, he is too hawkish. His advisers are also hawkish, and they voice tough views against the Soviet Union, such as calling for 'renegotiation' of SALT II. His administration will increase military spending without fail. The framework of detente is as perilous as a candle in the wind.

Therefore, we would like to make the following proposals.

First he would be well advised to appoint well-experienced, broad-minded persons to Cabinet and other key posts.

Second, he should avoid both military confrontation with the Eastern camp and an isolationist view in order to promote long-range diplomacy for world peace.

Third, we hope that he will maintain close contact with American allies and heed their views. It will be a big minus if the U.S. acts on its own and loses the confidence of other countries. – Asahi Shimbun

Table IV-4-4 Example of Abstract – Text 2 –

Why OPEC Is Vulnerable

The organization, never as powerful as it looked, may crumble in the 1980s.

by WILLIAM M. BROWN and HERMAN KAHN

The Organization of Petroleum Exporting Countries is often depicted as one of the most effective cartels in history, able to manipulate oil prices almost at will. Everyone knows, of course, that there are tensions within OPEC, and that different members have different objectives. Nevertheless, the prevailing view is that the 13 member nations have enough interests in common to ensure that they will ultimately stick together and continue to jack up prices. The OPEC meeting in Algiers earlier this month seemed to reinforce this view. Despite some powerful initial resistance from the Saudi delegates, the organization decided once again to raise the ceiling on prices. These prices were about 500% higher in real terms than they had been in mid-1973.

Our view of OPEC differs substantially from the prevailing one. Despite that 500% increase, we do not believe that OPEC has been an effective cartel. The record shows, we believe, that it has been a price follower more than a price leader.

Furthermore, there are reasons to believe that in the 1980s the worldwide supply-demand balance may not be as favorable to OPEC as is often assumed. Indeed, it is likely that in the not too distant future we will be witnessing major oil gluts, tumbling OPEC prices, and sharply reduced OPEC shipments. We estimate that within a year shipments will fall by some four million barrels a day (to around 25 million barrels). And as the decade draws to a close, demand for OPEC oil is still apt to be falling.

Brown is director of energy studies at the Hudson Institute. Kahn, founder of the institute, is now its director of research. This article has been adapted from their forthcoming paper, "An Energy Perspective for the 1980s and 1990s."

OPEC was certainly not a price leader in the five-year period from January 1974 to December 1978. During those years, official OPEC prices *declined* in real terms. In constant dollars the decline was about 25%, in D-marks it was about 40%, in yen about 50%. Moreover, during much of that five-year period, almost every OPEC country offered substantial discounts from the official prices in order to increase its own exports.

The cartel didn't do it

In short, OPEC's real income was slipping badly during 1974-78—hardly what one would expect of an effective cartel. The slippage ended late in 1978, but not because of any action by the cartel. What happened was that purchases by oil-importing countries (to avoid a possible turn-of-the-year price increase) combined with the outbreak of riots in Iran (which cut production sharply) to bring discounting to a sudden end.

Even the renewed price explosion last year was not the result of OPEC policy. The explosion was brought about by the trouble in Iran and magnified by the importing countries, which went on a buying binge and increased their petroleum stockpiles during the year by an estimated 500 million barrels. The binge, intended by its initiators to hedge against the threat of further production delays and consequent higher prices, ended up ensuring that prices would rise. Oil prices on the spot market rose far above the official contract prices negotiated by OPEC members, creating pressure to raise official prices. Most OPEC members, and the Saudis in particular, kept trying to *restrain* prices last year by underselling the spot market.

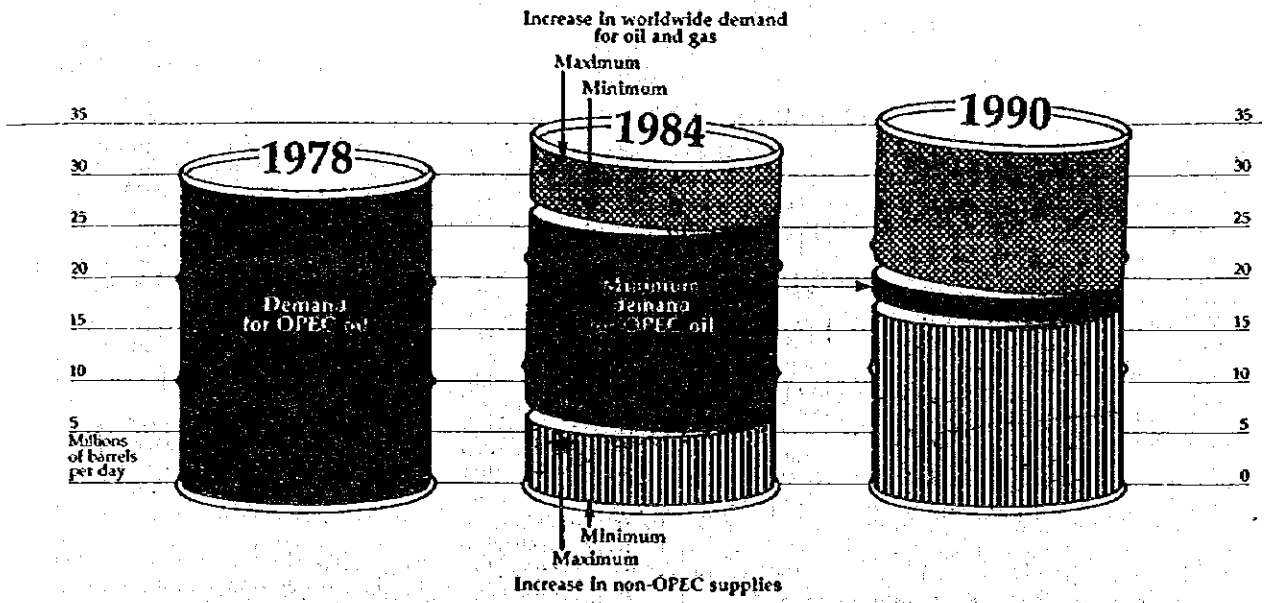
So the price explosion of the past year was not a triumph of OPEC planning but an unanticipated and in some measure unwelcome event that the organization was slow to comprehend, slow to come to grips with, and unable to deal with on a unified basis. Indeed, a somewhat similar analysis might be made of the original fourfold price increases of 1973-74. Then, too, OPEC was generally given credit for forcing the rest of the world to swallow huge increases. But in retrospect it is clear that in 1973-74, as in 1979-80, supplies were never reduced below the level of normal demand. In both periods, a surge of panicky buying by consumers—and a few speculators—created an extra demand.

In both periods, the official price hikes were triggered by the behavior of spot prices, which kept racing ahead of contract prices, conveying a powerful message to OPEC members about the real value of their oil. The persistence with which spot price exceeded the "cartel price" in both periods is a dead giveaway that soaring demand, not the cartel's muscle, has been the prime mover of prices.

In search of stability

In our view, OPEC is a loosely organized group of countries in which Saudi Arabia, with occasional assistance from Kuwait and the Emirates, attempts to furnish price leadership. When the market is strong, the price leaders tend to raise production in an effort to restrain prices; when the market is weak, the Saudis tend to cut production rather than give discounts. To oversimplify somewhat, the Saudis have not cast themselves as adversaries of market forces but as managers whose own interests lie with secure markets and long-term price stability.

Why OPEC's Prices Should Fall



The message of those barrels is that OPEC oil revenues can't grow very much during the 1980s and might shrink sensationally. As that shrinking middle layer indicates, at present prices OPEC oil shipments could be close to vanishing by 1990. This "minimum shipments" situation is one in which (a) worldwide demand for oil and gas holds at the modest 2% growth rate of recent years—which seems likely; (b) non-OPEC supplies grow at a 7% rate—which is entirely possible; and (c) real prices don't drop. If demand for OPEC oil was really falling that fast, of course, prices would come down too. OPEC's maximum shipments are indicated by the heights of the barrels. For the organization to hit those maximums, worldwide demand for oil and gas would unexpectedly have to rise at a 3% rate and non-OPEC supplies grow only at a 5% rate.

Right now there is a widespread belief that the years of Saudi leadership are coming to an end—that OPEC will come to be dominated by its "hawks." We believe that the opposite will be happening—that the Saudis will reassert their leadership. The reason is the coming oil glut. In a period when most OPEC members will be hungry for cash, and desperate to sell all the oil they can, any producer with surplus cash and an ability to cut output has tremendous bargaining power. The Saudis are clearly the only major producer with such leverage.

But even if OPEC did come to be dominated by the hawks, it would have trouble functioning as an effective cartel. Any new leadership would still have to deal with the problem that OPEC's members are sovereign governments with widely differing political needs. These needs will always take priority over those of the organization. No OPEC leadership will be able to dictate price and production schedules to individual members.

A guardedly optimistic view about future oil supplies and prices seems at least as rational as a guardedly pessimistic one. Forecasts of long-term oil supplies have been wildly wrong for a century. There has been a chronic tendency to see "shortfalls" that didn't materialize.

The U.S. government has been pessimistic about the prospects for finding oil in this country. In 1885, the U.S. Geological Survey said that there was little or no chance of finding oil in California; in 1891, comparable statements were made about Kansas and Texas. In 1939, the Interior Department said we had only enough oil to last another 13 years. In 1949, Interior said that the end of the U.S. oil supply was almost in sight.

Moving down at Exxon

In more recent years, the oil companies' forecasts of demand have also tended to overstate shortfalls—by overestimating demand. A 1973 Exxon projection put the non-Communist world's energy demand for 1985 at the equivalent of 163 million barrels a day of oil. Two years later, that was reduced to 130 million barrels. In 1977, and again last year, the forecast was further reduced, to 118 million barrels.

Many present forecasts, including our own, may turn out to need as much revision; serious difficulties are inherent in all such projections of supply and demand. Nevertheless, the information now available does not appear to justify the widespread gloom about our ability to deal with OPEC. Barring wars, insurrections, or replays of the Iranian debacle in other countries, there is no reason to expect endless increases in oil prices.

In developing a forecast of the supply-demand balance, we focus on prospects for natural gas as well as oil. Gas and oil can be substituted for each other to a large degree in heating, electric power, and industrial boilers, so we find it useful to combine the two when dealing with energy issues.

In the U.S., gas suitable for use as a fuel will be obtained from several different sources. Conventional sources, including offshore deposits, are generally

expected to produce about another 1,000 tcf (trillion cubic feet)—enough to last about 50 years at current rates of consumption, but not enough for substantial increases in production. Based on the historical tendency to underestimate future discoveries, however, there is a significant possibility that available gas will turn out to be two or three times as great as anticipated in the standard forecast. If so, natural-gas production in the U.S. will be increasing for decades.

Natural gas is also being sought in a variety of unconventional places, where it is known to be available in huge quantities but is hard to extract. Some gas is now being produced from the difficult "tight sand" formations of the Rocky Mountains and elsewhere. Enormous amounts come frozen in a loose association with ice in crystalline forms; these crystals, or clathrates, are found at moderate depths below the ocean floor in colder regions. Widely dispersed and at low pressures, a lot of gas is available in shale and coal deposits. The potential for these unconventional sources is huge, ranging from a few hundred tcf for gas from coal deposits to millions of tcf for the clathrates. Some of these processes still require a fair amount of development before commercial production is possible. On the other hand, there are now substantial commercial prospects for *non-natural* gas manufactured from coal and various organic materials.

From conventional sources alone, we believe, it is conservative to project a worldwide growth of natural-gas production of some 4% or 5%—about the rate that prevailed during the 1970s. This implies that by 1990 world supplies of gas will be the equivalent of more than 40 million barrels per day of oil (vs. around 28 million barrels today). During this century, gas supplies will probably provide the largest single alternative to OPEC oil.

In focusing on future price prospects, two other sources of supply must be considered: oil produced by the Communist countries and non-OPEC oil from the rest of the world. Our best estimate of Communist production during the 1980s is for annual growth of 2% to 4%. We assume that Soviet production will be essentially flat but that the Chinese, now making a major expansion effort, will have growth at a 10% rate.

Oil from other non-OPEC countries will play a somewhat larger role in reducing OPEC shipments during the 1980s. The annual production increases for the first half of the decade can be estimated fairly closely, since in this period we are essentially talking about planned development of fields already discovered. Mexico should increase production by a minimum of 250,000 barrels a day and a maximum of some 400,000 barrels. In the United Kingdom, the range is 350,000 to 450,000 barrels. For the non-OPEC free world as a whole, estimated growth ranges from a shade over one million barrels a day to 1.85 million barrels. These figures represent growth of 5% to 7% a year.

The records are being broken

What about the second half of the decade? For this period, we can no longer rely on the development of known oil fields. We must project the amount of producible oil that will be discovered during the next few years. However, there are some solid reasons for making the projections optimistic.

The main reason is that the 1979-80 rise in oil prices has already given major impetus to the search for new supplies. The exploration budgets of the major oil companies are at all-time highs. The number of active seismic crews is growing rapidly; in the U.S., it reached a 22-year high in 1979 and is still rising. The number of active drilling rigs is expected to set a new record each year.

The technology available to searchers for oil has recently undergone major improvements, the most significant resulting from the application of high-speed computers to the processing of seismic data. This technology has apparently made possible several exciting new discoveries, including the Overthrust Belt in the U.S. Exploration will be further aided by such advances as self-contained seismic instruments that can be dropped from helicopters into relatively inaccessible areas, with the required data then transmitted by telemetry.

Against this background, it seems reasonable enough to assume that present price levels would leave non-OPEC free-world oil production in the late 1980s growing at the same 5% to 7% rate that is foreseen for the earlier part of the decade. This would imply a growth of such production to a level of 30 million or even 40 million barrels a day by 1990, compared with about 20 million at present.

Combining this figure with our projections for Communist oil supplies and worldwide gas supplies gives us total non-OPEC supplies that are the equivalent of around 100 million barrels a day by 1990, compared with around 60 million barrels now. These projections imply major problems for OPEC in the years ahead. If worldwide demand for oil and gas continues to grow at the 2% average annual rate that has prevailed since 1973, OPEC shipments will decline steadily. Even if supplies grow only at the lower end of our projected ranges, the organization's exports would shrink each year by about 3% (a million barrels a day).

A time to cut prices

And if supplies grow at our maximum rates, there would be virtually no demand for OPEC oil by 1990—at least, there would be no demand at present prices. In reality, of course, OPEC would be cutting prices in this situation. OPEC as an organization would plainly come under severe strains, and it seems possible that these could reduce cohesiveness and discipline still further.

We believe that the U.S. should be furthering this process—and hedging against the possibility that demand for imported oil will be stronger than expected—by implementing energy policies designed to encourage conservation and foster production. But even without such policies, the illusion of a strong OPEC cartel is apt to be crumbling in the years ahead. F

Table IV-4-5 A Model of Abstract (2)

ECONOMIC UNIT

EXTRACT/ABSTRACT SHEET

DATE / /	EX/AB No.
ORIGINAL DOCUMENT	Fortune
TITLE	Why OPEC is vulnerable
DATE OF ISSUE	July 14, 1980
PAGE	PP. 67 – 69
EXTRACTED/ABSTRACTED BY	OPEC able to hold its strong
TITLE OF THE SUBJECT	power for oil prices from now on?

ABSTRACT

The Organization of Petroleum Exporting Countries (OPEC) is often depicted as one of the most effective cartels in history, able to Manipulate oil prices almost at will. And the oil prices were about 500% higher in real terms than they had been in mid-1973.

However OPEC was certainly not a price leader in the five-year period from January 1974 to December 1978. During those years, official OPEC prices declined in real terms. In constant dollars the decline was about 25%, in D-marks it was about 40%, in yen about 50%.

The slippage seemed to be ended in 1978, but not because of any action by the cartel, what happened was that purchases by oil-importing countries (to avoid possible turn-of-the-year price increase) combined with the outbreak of riots in Iran (which cut production sharply) to bring discounting to a sudden end.

The forecast for demand have tended to overstate shortfalls, but many present forecast may turn out to need as much revision; serious difficulties are inherent in all such projections of supply and demand.

Gas and oil can be substituted for each other to a large degree in heating, electric power, and industrial boilers, and in the U.S., for example, gas suitable for use as fuel will be obtained to last about 50 years at current rates of consumption, moreover the exploration budget of the major oil companies are at all-time highs. So that the illusion of a strong OPEC cartel is apt to be crubling in the year ahead.

CLUE WORD

Price Cartel

Natural gas

Table IV-4-6 Example of Abstract – Text 3 –

Prolonged slump in oil demand forecast

By Roy Dafter, Energy Editor

OIL COMPANIES face a severe and prolonged slump in demand for their products, according to new Government figures.

Consumption of oil products, ranging from petrol to heavy fuel oil, fell by 14.5 per cent, from 43.7m tonnes to 37.4m tonnes, in the first six months of this year against the January-June period of 1979.

The fall in demand, arising from the recession and from conservation measures, was felt more sharply in the oil sector than in any other fuel and power industries, said provisional statistics published yesterday by the Energy Department.

The overall drop in energy consumption was 8.1 per cent, from 112.1m tonnes of oil equivalent (190.6m tonnes of coal equivalent) to 103.1m (175.3m).

Coal demand fell by only 4.4 per cent, from 67.7m tonnes to 64.7m tonnes, owing to an increasing emphasis on coal-burning in electricity power stations.

Natural gas consumption fell by 2.8 and nuclear and hydro-electricity output by 5.4 per cent.

There is no sign of the trend being halted. If anything, the drop in overall energy demand is accelerating. In the April-June period total energy consumption was 9.2 per cent lower than in the corresponding quarter last year.

Oil demand was down 13.1 per cent and consumption of coal and natural gas between 6 and 7 per cent.

The figures confirm that the UK has reached oil self-sufficiency.

In May and June North Sea production exceeded UK use of oil products. May's production rate, 6.83m tonnes, was 237,000 tonnes greater than the oil consumption level. Output in June, 6.5m tonnes, exceeded demand by 440,000 tonnes.

But the self-sufficiency was achieved only because of lower demand. North Sea production in the April-June quarter was 1.3 per cent lower than in the same three months of 1979.

The fall in indigenous production was largely due to maintenance work on some North Sea platforms.

Table IV-4-7 A Model of Abstract (3)

ECONOMIC UNIT

EXTRACT/ABSTRACT SHEET

DATE 28/9/1980 AX/AB No. -

ORIGINAL DOCUMENT Financial Times

TITLE Prolonged slump in oil demand Forecast.

DATE OF ISSUE Aug. 7, 1980

PAGE

ABSTRACTED BY

TITLE OF THE SUBJECT Oil Demand in U.K., forecasted prolonged slump

ABSTRACT

Oil companies in the U.K. face a severe and prolonged slump in demand for their products, due to the recession and conservation policy.

The percentage of decrease in demand of energy and energy sectors in 1980 against the same period in 1979 were as follows:

	Energy	Oil	Coal	Natural gas	Nuclear & Hydro
First six months	8.1%	14.5%	4.4%	2.8%	5.4%
April – June	9.2%	13.1%	6–7%	6–7%	–

At the same time North Sea production exceeded UK use of oil products by increasing values.

	Production	Production-Demand
May 1980	6.83 m tonnes	237,000 tonnes
June 1980	6.5 m tonnes	440,000 tonnes

The Figures confirm that the UK has reached oil self-sufficiency, because of the lower demand only.

CLUE WORD

1 – Energy demand

2 – Energy conservation

3 – Oil consumption

4 – North sea oil production

IV-4-2 How To Prepare Bulletin

Extract/Abstract sheets will be accumulated as a result of routine work related to

(1) gathering of information

(2) putting information in order

(3) storing of information.

The Extract/Abstract sheets are

(4) analyzed

(5) evaluated

(6) processed

and edited into the Bulletin.

The main purpose of the Bulletin is the same as that of the Short Analysis Report and Annual Report. In other words, on the basis of analyses of the volume of traffic through the Canal, the Bulletin provides information which will lead to the establishment of an appropriate toll system and will prevent mistakes in the investment plan for maintaining and bolstering the capacity of the Canal in accordance with an increase in the volume of traffic.

Consequently, the contents of the Bulletin will be limited to

(1) information relating to the external environment of the Suez Canal, confined mostly to information of relatively short-term singificance

(2) information relating to internal matters of the Suez Canal.

Here we shall discuss (1) in greater detail. Information relating to the external environment of the Suez Canal, however, ranges over a very wide field, such as

Shipping
Shipbuilding
Ports and harbors
Natural resources
Politics, economy in general, etc.

This classification can be segmented further into such items as

General
Economy
Law
Treaties and conventions
Insurance, marine accident, pollution
Shipping policy
Ship's crew, labor
Shipbuilding
Air transportation
Ports and harbors
Vessels
Seaborne cargo
Freight market
Liner conferences
Other means of transportation competing with shipping.

There are many other items which we cannot afford to miss in order to assess shipping trends, such as trends among shipping companies, mergers, trends of consortiums and conglomerates, flag

of convenience ships, shipping and port strikes, etc.

The above is merely one example of itemization of information which is necessary for grasping current shipping activities. In order to grasp as accurately as possible the prospects of the volume of traffic in the Suez Canal, the priority ranking of these items of information relating to the external environment would change in accordance with the prevailing situation. Similarly, items can be grouped and regrouped as occasion demands.

The work of classifying and storing Extract/Abstract sheets under separate subject headings in the information file constitutes the foundation of the work of preparing the Bulletin.

Now, let us see the procedure for actually editing the Bulletin.

Editing the Bulletin

- An editorial conference will be held matching the publication frequency (monthly, semimonthly, weekly) of the Bulletin.
- Select from among the stored Extract/Abstract sheets, those items which have high news value (topical) and those which may not be so newsy but which are considered to be valuable as information.
- The significance of some items picked up may change due to subsequent development. In such a case, appropriate comments or interpretation must be added.
- It is preferable that the departmentalization of the contents of the Bulletin be the same in each issue. For instance, it could be fixed in some such way as

  News
  Trade & Shipping
  Government Policies
  Market
  Data Bank.

  In each issue, it is best to carry items which fall under these departments.
- "News" will consist of items which are topical in nature, such as for instance, the outbreak of war between Iran and Iraq and its impact on Suez Canal, a report that absolutely no orders have been placed for ULCC, etc. A limit should not be set on the number of news items to be carried in each issue.
- *"Trade & Shipping" items shall be information which will affect the freight market, such* as a report that the growth rate of oil movement has slowed down becuase of import curtailment by the advanced nations or that the tonnage supply-demand gap is narrowing as a result of increased scrapping.
- Under "Government Policies", articles will deal with such subjects as the shipping policies of various governments, the demand of the developing countries at UNCTAD for a share of the shipping market, etc.
- Under "Market", articles will carry information on the freight rate level of tankers and tramps, factors causing fluctuations in the freight rate and the effect of the fluctuations on Suez Canal traffic, etc.
- "Data Bank" will include freight rate indices, data on laid-up tonnage and ship completions, etc. Data, of course, may also be provided in the other sections. An example of an actual Bulletin is given below.

Table IV-4-8 Example of Contents of Bulletin (1)

LLOYD'S SHIPPING ECONOMIST VOL. 2 No. 10 OCTOBER 1980

CONTENTS

Table IV-4-9 Example of Contents of Bulletin (2)

February 5, 1981 No. 494

Contents

page

IV-4-3 Procedure for Compilation of Short Reports

(1) List up Study Themes

- Basic research (development of methodologies, data updating, etc.)
- Planning and evaluation of canal management system (study of tariff structure, feasibility studies, etc.)
- Data compilation or the foregoing items
  (forecast of Canal traffic, etc.)
- Analysis of effects by changes in external environments
  (impacts of market on Canal traffic, etc.)

Based on the foregoing items, those that require an analysis for the moment will be listed.

(2) Selection of Study Themes

- Urgency of study
- Relationship with the Canal
- Timewise, costwise, and abilitywise possibilities for accomplishment of study

Assign a priority ranking to the themes listed in 1) and implement the study in the order of priority after taking the items listed in 2) into consideration.

(3) Structure of Study Specification

- What will be the study output?
- What will be the required input data?
- What will be the work procedure outline to derive output?
- What will be the existing techniques to primarily rely upon?
- What will be the study objectives, that is, use significance of study output?

The foregoing items should be clarified, and orms as exemplified will be made after assigning study names.

Example of Study Specification Format

Table IV-4-10 CONTENTS OF SHORT REPORT

Title	• S.C. traffic parameters
Purpose (How to use the results of analysis)	To develop Forecasting methodologies
List of Contents	1. Introduction 1.1 Objectives 1.2 Summary 1.3 Conclusion 2. Methodology 2.1 Method of Approach 2.2 Sample Selection 2.3 Regression Analysis 3. Results 3.1 S.C.N.T and DWT Equation 3.2 G.T. and DWT Equation 3.3 4. Conclusion Appendix
Main Output	1 – Relations between S.C.N.T. and DWT. 2 – " " G.T. and DWT. 3 – Load factor
Data source	1 – Details of ships' transit 2 – LIOYD's shipping index 3 – S.C.A. reports.
Duration of Research	2 months (From 1st Nov. to 31st Dec. 1980)

(4) Setting of Study Implementation Organization

i) The entire work procedure for the study is classified into sections that can be and cannot be accomplished peculiar to the Unit judging from:

- Technical standard of unit members
- Required time
- Required cost

ii) Of sections that can be accomplished within the Unit, job assignments shall be given to individual members after considering:

- Specialized areas of members
- Technical standard of members
- Size of process volume

iii) Of sections that cannot be accomplished within the Unit, data shall be supplemented by undertaking hearings, asking to submit data, and asking to make studies to

- Related departments and divisions of SCA
- External survey and educational organizations

iv) Estimate required time schedules and expenses for individual components in the work procedure based on the foregoing assignments.

A study flow chart shall be made by detailing members assigned and scheduled completion time by work procedure.

(5) Execution of Study

i) The principal methods for the study (the principal methods in the study specification in (3)shall be referred to from the "Method Manual" based on the following:

Areas of Principal Methods	In "Method Manual"
• Related to the Canal traffic	IV-5-1
• Forecasting of tanker traffic	1.1
• Forecasting of non-tanker traffic	1.2
• Related to tariff analysis	IV-5-2
• Forecasting of revenue	2.1
• Study of tariff structure	2.2
• Related to evaluation of the First Phase Canal Expansion Project	IV-5-3
• To analyze traffic expansion and impacts of a change in tariff structure	3.1
• Related to evaluation of the First Phase Canal Expansion Project	3.2
• Related to drawing up and evaluation of the Second Phase Canal Expansion Project	IV-5-4
• General method for a feasibility study	4.1
• Method for a feasibility study on the Second Phase Expansion Project	4.2
• Related to Canal capacity	IV-5-5
• For calculations of Canal capacity	5.1
• For study on convoy	5.2
• Related to risk analysis	IV-5-6
• Related to regional economy	IV-5-7
• Related to maritime trade flows	IV-5-8
• Related to ships	IV-5-9
• Related to maritime transportation cost	IV-5-10

ii) Output is generated according to the methods referred to above.

iii) Commission external organizations to undertake a study if necessary conforming to the study structure described in (4) above.

(6) To coordinate study

i) To study whether or not the output fulfills the study objectives.

ii) To study whether or not there has been an error in the derivation process in reaching conclusions.

iii) To consolidate data used.

iv) When necessary, check and compare with the results of studies made by outside organizations.

(7) To compile report

i) To determine an editorial policy

a) To determine assignments of chapters

b) To determine the appearance for the binder

- Handwriting
- Typing and copying
- Typing and printing
- Binding of cover

ii) To complete manuscripts

a) To write an introductory message

- Significance of study, use objectives for the output
- Summary of the entire study

b) To write study details according to the assignments of chapters made

- Assumptions and methodologies
- Partial conclusions
- Data used

and others

c) To write conclusions

- Summary of output
- Application range for output
- Problems that require a further study

and others

iii) To prepare diagrams and tables needed

iv) To bind the report according to the binder appearance planned

(8) To distribute the study report to the departments and divisions concerned

IV-4-4 Procedure for Compilation of Annual Report

(1) Review annual activities in E.U.

Summarize the comprehensive activities in Economic Unit in the year, focusing on followings.

- Organizational activities
- Cooperation with other organizations
- Jobs completed in the year
- Training of the members, etc.

(2) Review external environments

The movements of factors which seems to have effect on the canal traffics should be summarized.

- World economy as a whole
- Energy consumption
- Demand and supply condition of crude oil
- Technical development of the alternative transportation such as pipeline
- Shipping market condition

- Fleet mix, etc.

A rough outlook on the movement of these factors should be added in the report.

(3) Review Suez Canal traffics

- Total number of vessels
- Constitution of ship size
- Constitution of ship type
- Constitution of cargo type
- Technical characteristics of vessels

are compared with those last year and any changes should be extracted. Then the durability of these changes is assesed by making clear the reasons of the changes. A rough outlook on the next year traffics should be prepared by considering this durability and the movement of the external environment.

(4) Review Revenues

Revenue obtained in the year is assessed by comparing with previous years. A rough outlook on the next year revenue should be prepared considering the comparison and the outlook in above (3).

(5) Compile Report

Complete an annual report by summarizing (1) ~ (4).

(6) Distribute the report to the relevant organizations.

IV-5 Methods Manual

In this Section, previously established techniques composing the methods are shown in the last part of the each method for convenience.

IV-5-1 Canal Traffic

A forecast of tanker and non-tanker traffic will be made. The number of ships sailing through the canal and types of them will be an important factor in the canal revenue. Therefore, the number of ships by ship type passing through the canal will be forecasted.

In all traffic calculations, two steps will be taken:

- Forecasting of cargo traffic
- Forecasting of the number of ships voyage

1.1 Forecast of Tanker Traffic

1.1.1 Crude Oil Trade Flow related to Suez Canal will be Calculated

(1) Zoning will be made to define originating ports and destinations

- Zoning of global statistics that can be used
- Geographical proximity
- Economical homogeneity
- Degree of relationship with the Suez Canal
- Convenience of analysis

The foregoing items will be considered in making a decision. When an economic forecast is made prior to the study, zoning at that stage will be required, and it will be the basis for the study.

(2) Representative crude loading ports in each zone will be determined

- Important ports in each zone (handling volume is large)
- A decision will be made after weighing geographical importance as centers

Table IV-5-1 Setting of Zoning and Representative Ports (Example)

O/D	Zoning	Representative Port
Major Oil Exporting Areas	Arabian Gulf	Ras Tanura
	(North Africa)	(Tripoli)
	(West Africa)	(Nouadhibou)
	(Caribbean)	(Aruba)
	[Southeast Asia]	[Jakarta]
Major Oil Importing Areas	Northwest Europe	Rotterdam
	Mediterranean Europe	Genoa
	U.S. East Coast	Philadelphia
	Gulf of Mexico	New Orleans
	U.S. West Coast	Los Angeles
	[Japan]	[Yokohama]
	(Others)	(–)

The table is an example in setting zoning and representative ports and incorporates the following.

The Communist block has been excluded from this zoning on an assumption that the block will continue to maintain a self-sufficiency state in the future as well. Japan is a major importing country. However, its import shipping routes do not concern the Suez Canal, and Japan has been excluded. For the same reason, Southeast Asia, which is a principal export region, has also been excluded. Exports from North and West Africa and in the Caribbean Sea region do not relate directly with the Suez Canal. However, these regions have been included in the zoning in view of the fact that they compete with the Arabian Gulf region regarding imports of Northwest Europe. Europe has been divided into the Northwest and Mediterranean Sea regions. and the United States, into the East, West, and Gulf of Mexico coasts, becuase these regions are geographically separate and have different degrees of relationship with the Suez Canal (e.g., selection of the canal by tankers).

(3) Crude trade flows between zones will be calculated. A methodology for calculations of trade flows between two zones will be selected based on the following viewpoints:

- Have new crude oil supply ports been assumed?

(Current supply quantity = 0)

- Are there any zones with an anticipated change in customers, that is, distribution of supply?
- When new supply ports are assumed, are their sales outlets clear quantitatively?
- Are an interzone export total and interzone import total equally set?

The procedure described below shall be used in calculations:

i) To calculate import and export quantities (Pi and Di) of crude oil for each zone. (Refer to IV-5-8)

ii) To adjust pre-forecasted quantities (Given trade flow known in advance)

In the following cases, part of trade flows is fixed and is deducted from Pi and Di:

- New supplies have been assumed, and their sales outlets are known.
- Change quantities of customers from their present patterns are known.

Examples:

- The supplyable quantity of North Sea oil will increase by "a" tons/day compared with the present. This increase will be diverted to the domestic supply quantity of England.
- The United States is expected to depend b% of its total crude oil imports on Mexico.

The following equations shall be obtained:

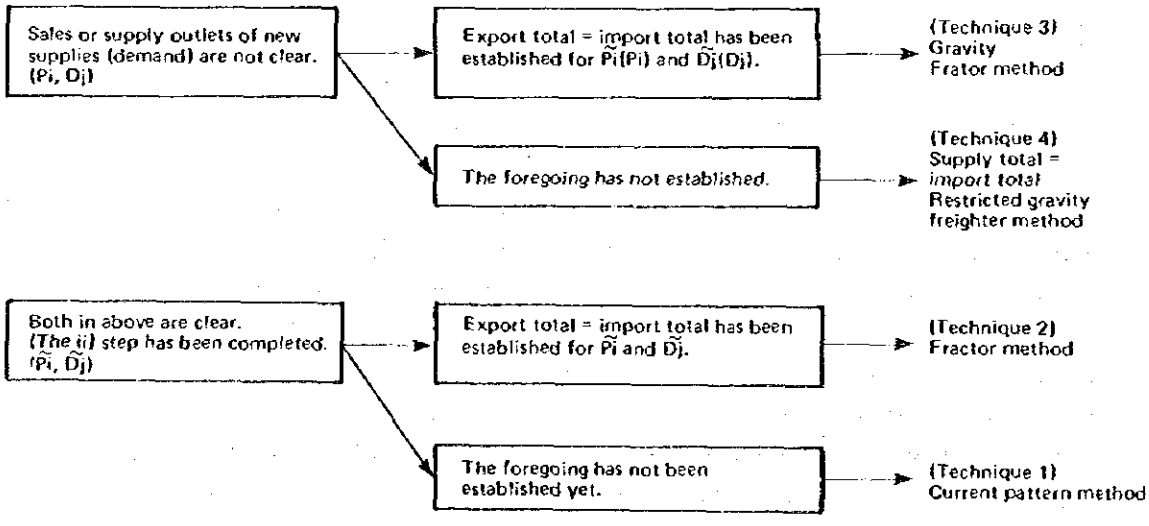
$\widetilde{Pi} = Pi - Qij$

$\widetilde{Dj} = Dj - Qij$

where $\widetilde{Pi}$, $\widetilde{Dj}$ ..... Demand and supply quantities after making adjustments

Qij ..... Given trade flow between i and j

iii) To realize a method to calculate a trade flow between i and j based on $\widetilde{Pi}$ and $\widetilde{Dj}$ (Pk and Dj when no adjustment of quantity is needed) in accordance with the instructions given below:



iv) The OD table between zones will be compiled based on the presently available data.

Table IV-5-2 OD Table between Zones (Example)

Export Region (From) \ Import Region (To)		j		Total
j		Q_{ij}^{o}		P_{i}^{o}
Total		D_{j}^{o}		

The foregoing will be utilized as base values when using the present pattern, freighter, and other methods and as data for compiling trade functions in a gravity model.

v) Interzone trade flow Qij will be calculated after excluding the adjustment portion (Qij) by using a selected method.

vi) Final interzone trade flow ($\widetilde{Qij}$) will be calculated by adding the adjustment portion.

$\widetilde{Qij} = Qij + Qij$

(4) To select ODs related to Suez Canal

Those with a possiblity to pass through the Suez Canal in crude oil transportation from originating ports (representative ports in export zones) to destinations (import zones) will be selected as ODs related to the Suez Canal. In this process, ODs with even a slight possiblity of utilizing the Canal depending on the tariff for sailing through the Suez Canal provided that there is no restriction on the traffic possibility of ship types. (Those with a possibility to pass through the Suez Canal depending on the value of the route selection factor in a "Route Selection Model" in the next procedure.

By this, forecasting will be simplified by removing nonrelated ODs from subsequent procedural steps.

The following steps will be taken:

i) Distances between two representative ports will be studied as to:

Transit via Suez Canal (ds)

Transit not passing through Canal ($d\bar{s}$)

ii) The following ODs are made related ODs:

- Present origin and destination of present traffic through the Canal
- ODs which are $ds < d\bar{s}$

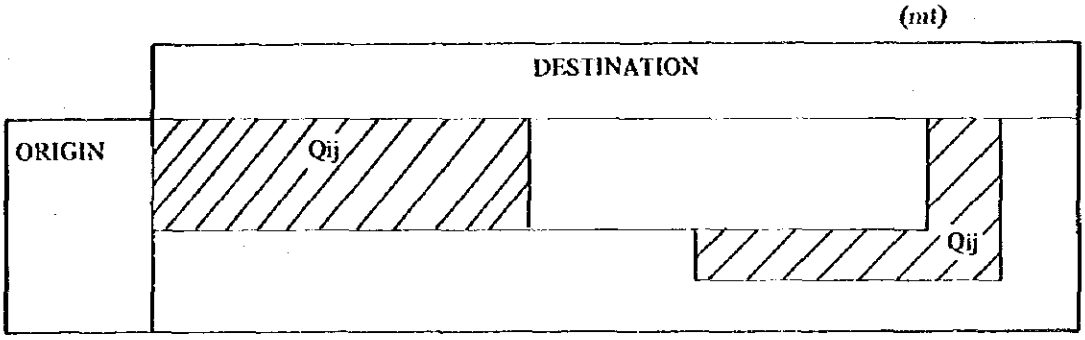
(5) To calculated potential crude oil traffic volume

The potential crude oil traffic volume is crude traffic in Suez Canal related ODs.

i) To calculate the crude trade volume (trade flows) between related ODs defined in (4) based

on the OD quantity for all the zones in (3). To consolidate the data as in the example.

Fig. IV-5-1 Potential Crude Oil Traffic (Example)



Shaded sections are potential crude oil traffic.

1.1.2 Calculate Crude Traffic Through Suez Canal

This is a calculation to obtain the quantity that will sail the routes navigating via the Suez Canal of the potential traffic calculated in 1.1.1. Major impacts on this traffic will be restrictions on passage through the canal, Canal fees, the extent of cost saving available by passing through the Canal compared with other routes, and other considerations.

(1) Calculate the difference in sailing distances when sailing through the Suez Canal and via Cape Town

dij (s) . . . . . Sailing distance via Suez Canal
dij (c) . . . . . Sailing distance via Cape Town
Δdij = dij (c) – dij (s)
(This is Canal related OD and is always > 0)

(2) Calculate the canal fee per cargo ton

Possible sailing routes (both ways) in transportation between related OD will be:

- O → Suez Canal → D/O → Suez Canal → D
  (Loaded) (Empty)
  (Hereinafter called the S/S route)
- O → Cape Town → D/O → Suez Canal → D
  (Hereinafter called the C/S route)
- O → Cape Town → D/O → Cape Town → D
  (Hereinafter called the C/C route)

i) Calculate the ship model (SCNRT) needed to transport a unit cargo ton by using the following equation:

$SCNRT = \alpha \times (1/L.F.)^{\beta}$

where LF: loading factor
α, β.: conversion parameter for DWT → SCNRT

Refer to Technique 5, 6 for these values (LF, α, and β)

ii) Calculate the canal toll per carton ton TOLL/CT by route by using SCNRT in i) and the

following equations:

TOLL/CT (S/S) = T_B x SCNRT + T_L x SCNRT

TOLL/CT (C/S) = T_B x SCNRT

TOLL/CT (C/C) = 0

where T_B, T_L: Canal tolls set by SCA for ships bare and loaded.

(3) Classify ship models into several categories.

i) Calculate maximum ship models that can navigate through the Suez Canal when ships are loaded and bare.

ii) Determine the category paying attention that the following points do not differ in ship models within the categories:

- Possibility to sail through the canal loaded with cargo.
- Possibility to sail through the canal unloaded.
- Canal tolls.
- Crude oil transportation cost.
- Freight market.

Example

Category	Range (DWT)
1	0~ 60,000
2	60,000~ 150,000
3	150,000~ 250,000
4	250,000~ 300,000
5	300,000~

This example is categories that considers canal traffic possibilities before and after the completion of the First Phase Canal Expansion Project needed to evaluate the First Phase Project.

(4) Calculate route cost

i) Prepare cost parameters.

To extract parameters a and b in a transportation cost function

c = a + bd (d is sailing distance – one-way)

by Technique 7 by category.

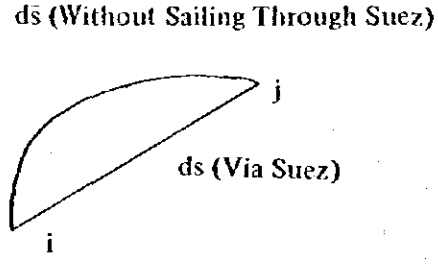
ii) Calculate one-way distance

By utilizing the distances shown in (4) i) via Suez and without sailing through Suez:

dij (C/C) = d_s

dij (C/S) = $\frac{1}{2}$ (ds + ds)

dij (S/S) = ds



dij (C/C), dij (C/S), and dij (S/S) are one-way distances to calculate C(C/C), C(C/S), and C(S/S), respectively.

iii) Calculate the route cost

Calculate transportation cost (including the canal charge) by route by using the equations below:

$C(C/C) = a + b - d$

$C(C/S) = a + b - d + \Delta (C/S)$

$C(S/S) = a + b - d + \Delta (S/S)$

$\Delta (C/S)$ and $\Delta (S/S)$ are canal charges per cargo ton calculated in (4) ii). d is the one-way distance of the route obtained in ii).

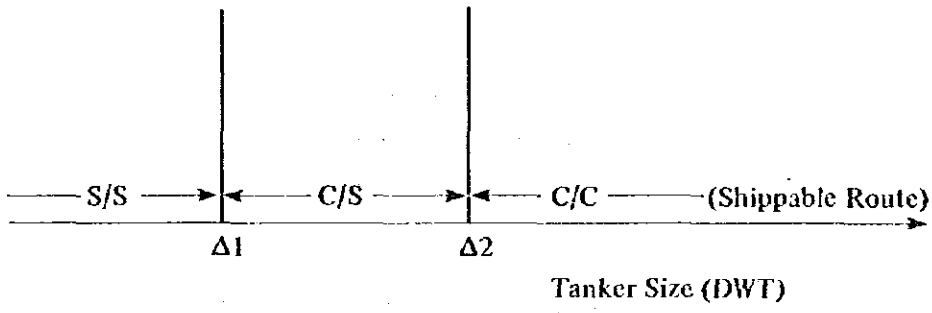
(5) Calculate the route cost incorporating the market

i) Make a market parameter (α) available by Technique 8.

ii) Calculate the route cost incorporating the market by using the route cost C (route) in (4) above and the foregoing market parameter (α).

MC (route) = C (route) $\times \alpha$

(6) Obtain shippable routes for each category size.



1. Maximum ship size passable loaded with cargo (DWT)
2. Maximum ship size passable without loaded (DWT)

Obtain shippable routes by ($< \Delta 1$, $\Delta 1 < \sim \Delta 2$, and $\Delta 2 <$) to see into which category the above graph tanker sizes of each category falls.

(7) Calculate a selection ratio of each route

This can be calculated for each size category.

i) Calculate rough costs (incorporating market) MC (C/C), MC (C/C), and MC (S/S) for each possible route.

ii) Set a selection function in Technique 9 or Technique 10.

Technique	Advantages/Disadvantages
Logit Type (Technique 9)	• No necessity to estimate parameters • Fitting may not be good as a function form is determined.
Resistance Type (Technique 10)	• A parameter (β) has to be set.

iii) Calculate selection ratios P(C/C), P(C/S), and P(S/S) for each route by using a predetermined method.

(8) Make available the fleet mix of tankers passing through the Suez Canal.
Consolidate the share of each ship model category in percentile figures.

Ship Model Category	1	2	– – – –	N
Ship Share	S_1 (%)	S_2 (%)	– – – –	S_N (%)

Percentages S1 . . . . . are calculated by the techniques shown below:

Techniques	Corresponding Premise
Technique 11 Present fleet mix	• When no significant change can be estimated in future for fleet mix in the world • When forecasting approximately
Technique 12 Increasing parameter method	• When a trend for larger ship models can be confirmed compared with before • When a strictness is required in forecast • When new ship construction and scrapping can be determined

(9) Forecast the number of ships N^1_{jk} loaded with cargo passing the Canal by ship type and ship model.

The number of ships can be calculated by dividing the number of ships passed the Canal by ship type and model by a representative size for each ship model.

$N^1_{jk} = Z^1_{jk} / rjk$

where N^1_{jk} is the number of ships of j-th ship type and k-th size category passed in an 1-th.

(10) Forecast the number of bare ships passing the Canal by ship type and ship model.

Calculate the number of bare ships sailing by ship type and ship model so that the number of ships balances in terms of north-and south-bound, and by ship type and model. The number of ships sailing north-and south-bound for the same ship type and ship model can be calculated in (8). Therefore,

$$M^{\ell}_{jk} = \begin{cases} \text{If } N^1_{jk} \geqq N^2_{jk} \rightarrow \begin{cases} M^1_{jk} = 0 \\ M^2_{jk} = N^1_{jk} - N^2_{jk} \end{cases} \\ \text{Otherwise} \rightarrow \begin{cases} M^1_{jk} = N^2_{jk} - N^1_{jk} \\ M^2_{jk} = 0 \end{cases} \end{cases}$$

where M^{ℓ}_{jk} is the number of bare ships of j-th ship type, and k-th ship size sailing in a ℓ-th direction.

(11) Forecast the traffic volume (SNT unit) of bare ships by ship type and ship model. The traffic volume is calculated by multiplying the number of bare ships sailed by a representative size.

$$B^{\varrho}_{jk} = M^{\varrho}_{jk} \cdot rjk$$

$$N^{\varrho} = \sum_{j=1}^{J} \sum_{k=1}^{K} \cdot N^{\varrho}_{jk}$$

$$M^{\varrho} = \sum_{j=1}^{J} \sum_{k=1}^{K} \cdot M^{\varrho}_{jk}$$

(12) Calculate the traffic by route

Vk (S/S) = T x fk x r (S/S)

Vk (C/S) = T x fk x r (C/S)

Vk (C/C) = T x fk x r (C/C)

where Vk(m) is the oil quantity carried by the k-th ship model through the m-th route. fk is the k-th fleet mix among tankers that sail on each route.

T is the total OD quantity, and r(m), selection ratio from 1.1.2 (7), respectively.

1.1.3 Calculate Number of Ships Passing Suez Canal

Nk (m) = Vk (m)/Ck

Ck = Lk x (DWT)k

where Nk(m) is the number of voyages of tankers of the k-th ship type on the route m.

The traffic volume is for a year, and the number of voyages is for one year. Ck is the average cargo load quantity of k-th ship-type ships and is represented by a product of a maximum loaded quantity (DWT)k and loading efficiency Lk.

(2) Calculate the number of tankers passing through the Suez Canal by direction by using the equation below:

$N_{k,n} = N_k$ (S/S)

$N_{k,s} = N_k$ (S/S) + N_k (C/S)

where $N_{k,n}$ and $N_{k,s}$ are the number of k-th ship-type ships passed north-and south-bound, respectively.

1.2 Forecast of Non-tankers Traffic

1.2.1 Calculate trade flows of the five major bulk cargoes related to the Suez Canal

(1) Make zoning to define origins and destinations.

Use the same method as that used in calculating oil trade flows.

(2) Determine representative ports in the zones.

Use the same method as that used in the oil trade flows.

(3) Calculate trade flows between zones

(i) Select Technique 14 or 15 by the following criteria:

Method 14	• When a strictness is required in forecasting the number of bulk carriers.
Method 15	• When a simplified forecast is used for bulk carriers • When forecasting for ordinary cargo

(ii) The trade flows are calculated by Technique 14 or by Technique 15.

1.2.2 Calculate Suez Canal Traffic

The procedure differs depending on the method used in calculating related trade flows in 1.2.1.

When the Method 1 (balanced trade flows) is used in 1.2.1, the trade flows related to the Suez Canal will have to be distributed to a quantity via Cape Town and to the Suez Canal traffic.

This distribution is based on the route distribution method of oil trade flows in 1.1.2. The Suez Canal traffic can be directly calculated when the correlation method is used in 1.2.1, and the procedure described here will not be needed.

1.2.3 Calculate Number of Ships Sailing Through Suez Canal

The transportation quantity to be carried by each ship type can be calculated when the balanced trade method is used in the foregoing procedure. The procedure to derive the number of ships is the same as that for tankers described in 1.1.3.

When the correlation method is used, the following procedure shall be followed by inputing the traffic volume T_{ij}^{ℓ} of the first kind in an ℓ direction calculated in 1.2.1.

(1) Estimate a ship type constitution P_{ij}^{ℓ} for each type of cargo based on past records. P_{ij}^{ℓ} is the proportion of i-th cargo in an ℓ direction being carried by a j-th ship type.

Table IV-5-3 A ship type constitution by Cargo type (Example)

(By Percent)

Ship Type / Cargo Type	Bulk Carrier	General Cargo Ship	Container Ship	LASH	RO/RO	Others	Total
Iron Ore	90.0	10.0	0	0	0	0	100.0
Cereals	48.3	51.4	0	0	0.3	0	100.0
Fabricated Metals	88.2	9.5	2.3	0	0	0	100.0
Cement	64.8	35.2	0	0	0	0	100.0
Fertilizers	62.2	37.8	0	0	0	0	100.0
Coal	90.0	10.0	0	0	0	0	100.0
Others	18.5	61.8	13.3	2.5	1.8	0.1	100.0

(2) Forecast cargo volume by ship type (by cargo type)

Distribute transit cargo volume calculated in the preceding chapter according to the ship type constituion.

$$X_j^{\ell} = \sum_{j=1}^{\ell} Tjl \cdot P_{ij}^{\ell}$$

where X_j^{ℓ} is transported cargo quantity in an ℓ direction by a j-th ship type.

(3) Conversion from cargo quantity to Suez Canal registered net tonnage (SNT) by ship type.

Calculate the coefficient f_j^{ℓ} based on past records by using the equation below:

$f_j^{\ell} = (SNT)_j^{\ell} / (CARGO)_j^{\ell}$

where $(SNT)_j^{\ell}$ and $(CARGO)_j^{\ell}$ are gross totals of Suez Canal registered net tonnage and cargo transported in two years by ships sailing in an ℓ direction of a j-th ship type.

(4) Forecast traffic by ship type in an SNT unit

The cargo quantity Y_j^{ℓ} by ship type will be converted into a traffic quantity (in an SNT unit) by using the foregoing conversion coefficient.

$Y_j^{\ell} = X_j^{\ell} \cdot f_j^{\ell}$

where Y_j^{ℓ} is traffic in an SNT unit of a j-th ship type in an ℓ direction.

(5) Forecast the ship model constitution Q_{jk} by ship type based on past data and future trends.

Follow the forecast procedure for a tanker fleet mix shown in 1.1 when calculating a future forecast value.

(6) Forecast traffic Z_{jk}^{ℓ} by ship type and ship model in an SNT unit for loaded ships.

$Z_{jk}^{\ell} = Y_j^{\ell} \cdot Q_{jk}$

where Z_{jk}^{ℓ} is traffic cargo in an ℓ direction on a j-th ship type of an k-th size category.

(7) Forecast a representative size γ_{jk} for each ship model based on past data and future trends.

γ_{jk} is a representative ship model of a j-th ship type in a j-th size category.

(8) Forecast the number of ships passing by ship type and by ship model for loaded ships.

The number of ships can be calculated by dividing the traffic by ship type and by ship model by a representative size for each ship model.

$N_{jk}^{\ell} = Z_{jk}^{\ell} / \gamma_{jk}$

1.3 Techniques used in Forecasting the Canal Traffics

Technique 1: Present Pattern

This method assumes that the maritime trade flows of crude oil varies in proportion to changes in oil importing quantities of consuming regions and that the regional distribution of importing destinations will continue to remain unchanged.

Therefore, the OD quantity (Qij) will be calculated by

$Q_{ij} = Q_{ij}^{0} \times \gamma_j$

where γ_j . . . . . Growth of imports in the zone j $(= \frac{Dj}{D_j^{0}})$

D_j^o, Q_{ij}^o . . . . . Present trade flows between i and j and imports of the zone j to serve as a basis

Technique 2: Frator Method

Convergent calculations are made to increase traffic between i and j in proportion to the growth of exports of the i zone and that of the j zone and to establish import and export limitations. (Convergence calculations by the freighter method)

The first step is as follows:

$$Q_{ij}^{(1)} = Q_{ij}^o \frac{D_i}{D_i^o} \frac{D_j}{P_j^o} \left[\frac{\sum_{j=1}^m Q_{ij}}{\sum_{j=1}^m (\frac{P_j}{P_j^o}) Q_{ij}} + \frac{\sum_{j=1}^m Q_{ij}}{\sum_{j=1}^m (\frac{D_i}{D_i}) Q_{ij}} \right] \frac{1}{2}$$

$$D_i = \sum_{j=1}^m Q_{ij} \ , \ P_j = \sum_{i=1}^m Q_{ij}$$

In general the modified quantity of cargo distribution at step s is as follows:

$$Q_{ij}^{(s)} = Q_{ij}^{(s-1)} \frac{D_i}{D_i^{(s-1)}} \frac{P_j}{P_i^{(s-1)}}$$

$$\times \left[\frac{\sum_{j=1}^m Q_{ij}^{(s-1)}}{\sum_{j=1}^m (\frac{P_i}{P(s-1)}) Q_{ij}^{(s-1)}} + \frac{\sum_{j=1}^m Q_{ij}^{(s-1)}}{\sum_{i=1}^m (\frac{D_i}{D_i(s-1)}) Q_{ij}^{(s-1)}} \right] \times \frac{1}{2}$$

where

$$D_i(s-1) = \sum_{j=1}^m Q_{ij}^{(s-1)} \ , \ P_j^{(s-1)} = \sum_{j=1}^m Q_{ij}^{(s-1)} \ .$$

If the following equations hold, the process of iteration is stopped.

$$\sum_{j=1}^m Q_{ij}^{(s)} = D_i$$

$$\sum_{j=1}^m Q_{ij}^{(s)} = P_j$$

where $Q_{ij}^{(s)}$ . . . . . traffic between i and j after repeating convergence for S times.

Q_{ij}^o, D_{ij}^o, P_j^o . . . traffic between i and j at present, j region imports, and i region imports

m . . . . . Number of zones

Technique 3: Gravity Frator Method

The size of Qij is stabilized in proportion to the size P_i of the supply power of the i zone and the size Dj of the consumption quantity of the J zone and in inverse proportion to the total cost (Cij) regarding transactions between i and j (economic distance, price, commercial customs and practices, friendly relations, etc. and other factors). The limitation on supply power and demand quantity limitation will also be considered. Therefore, instead of using the present value Qij of the freighter method in Method 2, an estimated value of traffic pattern after a structural change by a gravity model (the equation in i) below) is used.

i) $Qij = k\dfrac{(Pi)^{\alpha}(Dj)^{\beta}}{(Cij)^{\gamma}}$ (Gravity Model)

Parameters k, α, β, and γ are estimated by making the present trade (Q_{ij}^{o}) as a base.

Isn't the determination method for Cij unilateral?

- Cij = dij (it is customary to consider and shipping costs)
- Cij = F(dij, Pij, Xij) (When transaction price differs between zones, the same form as that of the economic distance can be considered. Assuming Xij = 1 or 0, political conditions, possibilities for transactions as seen from customs and practices of Japan can be considered.)

A determination is made to improve the estimation force in the above form.

where dij Sailing distance

Pij Transaction price between i and j

ii) $Qij^{(1)}$ is calculated by using functions and parameters of estimated import and export quantities (Dj and Pi) and transaction cost (i by ij).

iii) $Q_{ij}^{(1)}$ will be $\sum_i Q_{ij}^{(1)} = Dj$ and $\sum_j Q_{ij}^{(1)} = Pi$

when totaled for the supply and demand locations. By making a convergence calculation by using the same frator method as in Technique 2, and $Q_{ij}^{(S)}$ as shown below will be made a trade volume.

$\sum_i Q_{ij}^{(S)} \fallingdotseq D_j$

$\sum_j Q_{ij}^{(S)} \fallingdotseq P_i$

In the foregoing equation, $Q_{ij}^{(S)}$ will be the traffic volume between i and j in the freighter method after replicating S times.

Technique 4: Gravity Frator Method with Import and Export Limitations

In this Technique, the traffic volume is decided while deciding import and export quantities at the same time. In Technique 3, the traffic volumes between regions are regulated by imports and exports as predetermined control totals.

Technique 5: Method to determine a load factor

Regarding Lk,

$$Lk = \frac{Qk}{(DWT)k}$$

is calculated based on existing data. It is set by estimating average data when no change in trends can be noticed, or by estimating a time series equation as shown below, when a significant change can be forecasted:

$Lk = Fk(t)$

(Example) $Lk = at + b$

Technique 6: SCNRT Conversion Parameters (α, β)

A function form as shown below will be used:

$SCNRT = \alpha(DWT)^{\beta}$

Linear regression stimation will be made for α and β based on data of tankers by using the equation shown below:

$\log (SCNRT) = \beta \log (DWT) = \log \alpha$

Data No.	DWT	SCNRT	CT
1	X_1	Y_1	CT_1
:	:	:	:
:	:	:	:
:	X_N	Y_1	CT_1
:	.	.	.

Technique 7: Cost parameter

Suppose that the one-way distance of a voyage is d miles and the vessel moves at the speed S1 mile/h on a forward voyage and S2 mile/h on a return voyage.

Then it takes $[(\frac{d}{S1} + \frac{d}{S2}) \frac{1}{24}]$ days for the voyage.

It is convenient to obtain the costs per day of a vessel according to the working conditions. When a vessel moves, it costs (using the same concept as in Fig. IV-5-2)

$$\frac{(1+E)\cdot Pr\cdot(R_d+R_i+R_r) + (C_r+M_s+A_d+L_b+R_p)}{Da} + P_B \cdot B_2$$

per day. When a vessel is at anchor only the bunker consumption rate is different: then the cost is:

$$\frac{(1+E)\cdot Pr\cdot(R_d+R_i+R_r) + (C_r+M_s+A_d+L_b+R_p)}{Da} + P_B \cdot B_1$$

It is probable that B1 is lower than B2, but port charge and loading/unloading costs are added to the daily costs when the vessel is in a port. Nothing that moving days are $[(\frac{d}{S1} + \frac{d}{S2}) \frac{1}{24}]$ and days at anchor are (Dt + Do), the shipping costs per cargo ton C is expressed by a linear function of voyage distance d (one day).

$c = a + bd$

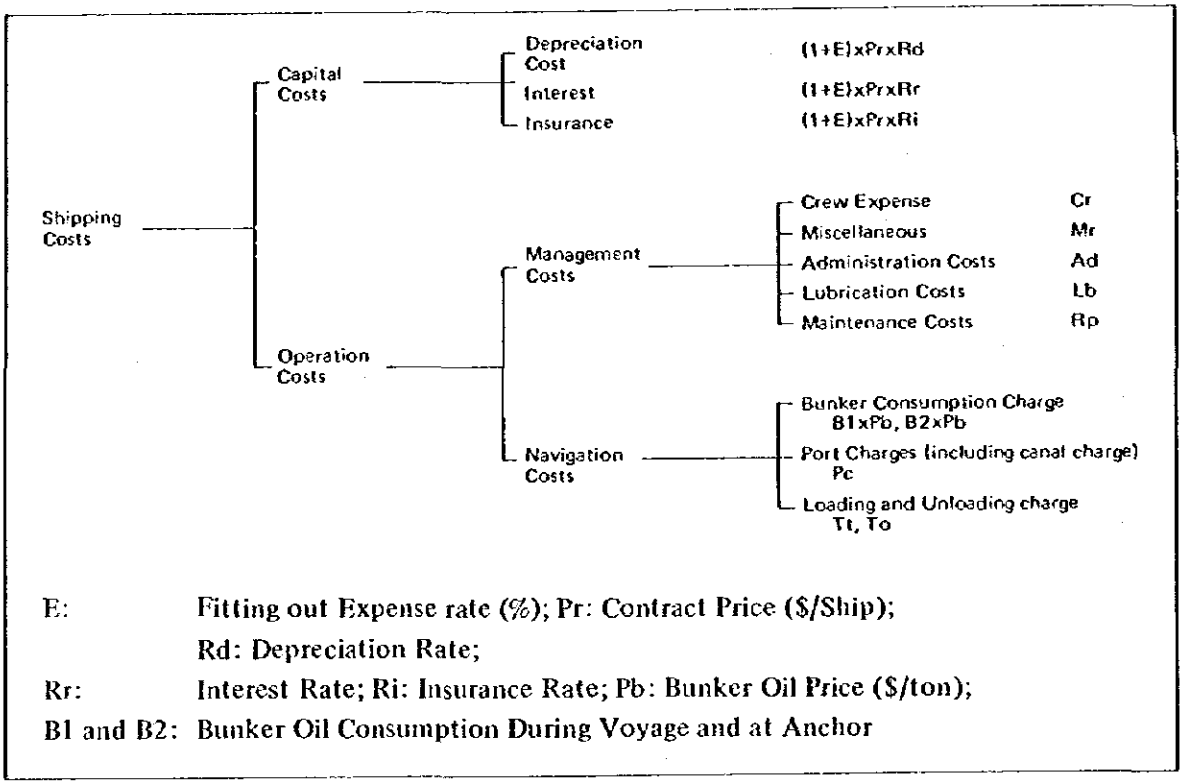
$$a = [\frac{(Pr.s+Cr+Ms+Ad+Lb+Rp)\ (Dt+Do)}{Da} + B_2\cdot Pb\cdot(Dt+Do) + Tt + To\ ] \frac{1}{DwR}$$

$$b = [\ \frac{(Pr.s+Cr+Ms+Ad+Lb+Rp)}{Da} + B_1\cdot Pb] \cdot (\frac{1}{S_1} + \frac{1}{S_2}) \cdot \frac{1}{24} \cdot \frac{1}{DwR}$$

where d: distance (mile)

a, b: coefficients

s: (1+E) (Rd+Ri+Rr)



E: Fitting out Expense rate (%); Pr: Contract Price ($/Ship);
Rd: Depreciation Rate;
Rr: Interest Rate; Ri: Insurance Rate; Pb: Bunker Oil Price ($/ton);
B1 and B2: Bunker Oil Consumption During Voyage and at Anchor

Fig. IV-5-2 Constitution of shipping costs

Technique 8: Market parameter

The World Scale Ratio is an index expressing the market condition by a percentage of the freight rate, based on the shipping costs of a 19,500 DWT tanker. Using the World Scale Ratio System, the freight rate can be approximated by the fluctuating level of the shipping cost per cargo ton.

Then

$MC = [a+(bxd)] \times \alpha$

where, MC is the freight rate, a and b are parameters of shipping cost, and α is a market condition parameter.

In this formula, when $\alpha = 1.0$, $MC = [a+(bxd)]$, and the freight level just covers the shipping costs. Thus, if the size of a given vessel is 19,500 DWT, α is equal to the W.S. ratio.

Technique 9:

Logit Model

It is assumed that the disutility (or cost) TCm is composed of two parts, a deterministic part

$Cm = \Sigma W_i S_{mi}$

and a random part E:

$TC_m = C_m + E = \Sigma W_i S_{mi} + E$

If it is assumed that the mode with the least costs (the k-th mode) is randomly chosen, as if often the case, the probability of chosing this k-th mode is denoted by r_k, and is expressed by the equation:

$r_k = \text{prob}\ (TC_k < TCj, j = k)$

In addition, if we assume that the probability distribution of E has a Weibull Distribution, then the following results are obtained:

$$r_k = \frac{e^{C_k}}{e^{C_1} + e^{C_2} \ldots e^{C_M}}$$

To obtain r_k, the Cm's must be calculated using Wi's from Equation 5.5. With these calculated values, a theoretical r_k (equation) will be generated, which fits the observed data. Under the assumption that E is normally distributed, the model is called a Probit model. This was the method used in the Final Report, to establish the proportioning of routes between one-way voyages. Though the Probit model also is used widely, it is a specialized method, utilizing binominal choice.

Technique 10:

Resistance Model

Another form of the multinominal model is called the Resistance model, and is expressed by the following equation:

$$r_k = \frac{(C_k)^{B_k}}{(C_1)^{B_1} + (C_2)^{B_2} \ldots\ldots (C_m)^{B_m}}$$

Empirically, this model has a good fit, although the distribution of E cannot be expressed explicitly. For this reason, the W_is in C_m and B_is (Equations 5.4 and 5.8) has to be estimated by using observed r_k values. In many cases, assumptions can be made about the ratio between W_is or B_is and these parameters, to simplify the model. For example, in the forecast which is discussed in the Chapter 6, $W_i \ldots W_m = 1.0$ and $B_1 = \ldots = B_m$ are assumed.

Technique 11: Present fleet mix

Use the fleet mix of existing tankers of the world.

Technique 12: Increasing parameter method

Used a parameter for larger ship models for fleet mix of tankers of the world

(1) Define a parameter for large ship models by the equations below.

$$S_1^{t+1} = S_1^t - S_1^t \cdot \alpha$$
$$\vdots$$
$$S_k^{t+1} = \alpha \cdot S_{k-1}^t + S_k^t - \alpha \cdot S_k^t$$
$$\vdots$$
$$S_N^{t+1} = \alpha \cdot S_{N-1}^t + S_N^t$$

(2) Estimate average values for the above parameters by using past data.

Technique 13: Scrap and build method

Method 3 Incorporate ships to be built and scrapped in fleet mix for tankers of the world.

(1) Estimate future tonnage by the equation below:

$X_i^t = X_i^o + B_i^{o-t} + C_i^{o-t}$

where X_i^t ..... Tonnage of i-th ship size category of t-th term

X_i^o ..... Tonnage of i-th ship size category of the current to t-th terms

B_i^{o-t} ..... Tonnage of i-th ship size category to be built in the terms 0–t

C_i^{o-t} ..... Tonnage of i-th ship size category to be scrapped in the terms 0–t

Technique 14: Balanced Trade Flow Method

Perform the following procedure for each commodity:

i) Make available a consumption elasticity value e_k of the region i.

Estimate C_k in the equation below by a regression method based on the past time series data:

$Ck = Ck \log (GDP)_k + b$

ii) Make available the growth rate (GR_k) of the regional gross product in each region. Prepare the data based on forecast results by various forecast organizations such as UN and OECD.

iii) Forecast the consumption by the equation below:

$C_k^t = C_k^t (1+C_k \cdot GR_k)$

where C_k^t ..... consumption in k region in t-th term

C_k^o ..... present consumption in k region

GR_k ..... GDP growth rate (0 → t-th) period

iv) Make available production capacity CP_k of each region. Prepare based on forecast results by such forecast organizations as UN and OECD incorporating resource deposits and policies of exporting countries.

v) Modify either gross consumption quantity or gross production so that both would be equal.

- When gross consumption $\geqq$ gross production capacity

  Modify C_k downward by making a proportional distribution according to consumption in each region by making the gross production capacity as a control total.
- When gross consumption $\leqq$ gross production capacity

  Calculate the production volume P_k by making a downward modification by making a proportional distribution according to the production capacity CP_k in each region.

vi) Calculate import and export quantities

- When $C_k \geqq P_k$

  Export quantity $X_k = 0$

  Import quantity $M_k = C_k - P_k$
- When $P_k \geqq C_k$

  Export quantity $X_k = P_k - C_k$

  Import quantity $M_k = 0$

vii) Calculate interregional trade flows by the Frator method (Technique 2)

The steps i) to vii) in Method 1 can be expressed as shown in the following Figure.

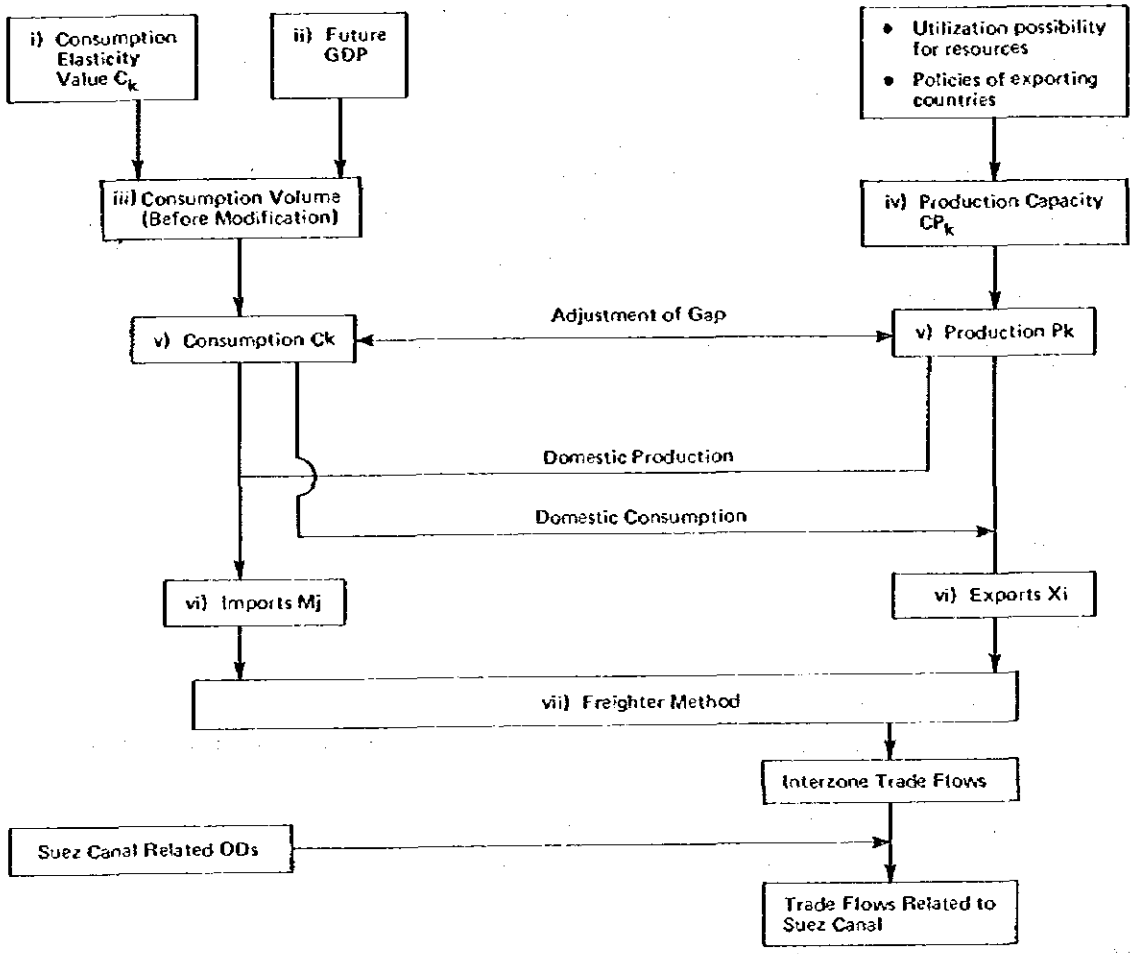


Fig. IV-5-3 Balanced Trade Flow Method

viii) Calculate ODs related to Suez Canal

The same procedure as in 1.4 for the method to forecast oil trade flows.

ix) Calculate trade flows related to Suez Canal

Calculate based on the calculation results of trade flows among related ODs calculated in (4).

Technique 15: Correlation Method

This method is based on a premise that the maritime trade flows of the world and Suez Canal traffic are in a fixed proportion. Follow the procedures shown below for each cargo type:

i) Forecast growth rate of GWP (Gross World product)

Calculate based on forecast results made by OECD, UN, World Bank, etc.

ii) Calculate an elasticity value C_s of the maritime trade of the world relative to GWP.

The same method as that in i) of Method 1.

iii) Forecast the maritime trade flows of the world by the equation shown below:

$$Q^t = (1+Cs) \cdot GR^t \cdot Q^o$$

where Q^t ..... Maritime trade flows of the world in the forecast year (after t years)

Q^o ..... Maritime trade flows of the world at the present time (at the time of forecast, 0 year)

GR^t ..... Growth of GWP from O year to t years

iv) Calculate the ratio between maritime trade flows of the world and Suez traffic by north- and south-bound based on the past data:

$T_\ell^t = \alpha_\ell \cdot Q^t$

Averages in the past data are used for α_ℓ when time series trends are not clear.

When time series trends are clear, calculate α_ℓ after estimating parameters a and b of a time series equation (e.g., α_ℓ (t) = at + b) that indicates such a trend. (ℓ = 1 ..... north-bound, ℓ = 2 ..... south-bound)

v) Forecast Suez Canal traffic by using the equation below:

$T_\ell^t = \alpha_\ell^t \cdot Q^t$

IV-5-2 Tariff Analyses

2.1 Forecast of Revenue

Revenue is forecasted for the following purposes:

- To forecast the revenue for the budget plan of each fiscal year of the Suez Canal Authority.
- To use the results for the canal planning (expansion plan, establishing the toll system).

Revenue is forecasted in accordance with the following procedure:

(1) Prepare the forecast values of traffic of ships.

Forecast values of traffic volume determined in Section 1 are to be used.

- The number of tankers passing through the canal (by northbound and by southbound).
- Traffic volume of non-tankers (SNT unit) (by ship types, by loading condition).

(2) Prepare the toll for ships.

Toll corresponding to the forecast values stated above is to be used.

(3) Convert the traffic volume through the canal to the value in SNT unit (only for tankers).

i) Determine the convertion parameter of DWT → SNT.

ii) Convert the average size of ship $(DWT)_k$ of each category to SNT unit by using the parameter of i).

Example:

$(SNT)_k = \alpha(DWT_k)^\beta$

where, $(SNT)_k$ is the value of SNT of the average size of ship with k-th size.

(4) Calculate the revenue.

i) Tanker revenue

$$R_T^1 = (TOLL)_T^1 \times \sum_k (SNT)_k \times N_{k,n}$$

$$R_T^2 = (TOLL)_T^2 \times \sum_k (SNT)_k \times N_{k,s}$$

where, R_T^1, R_T^2: Revenue from northbound and southbound tankers respectively.

$(TOLL)_T^1, (TOLL)_T^2$: Toll for loaded and no-loaded tankers passing through canal respectively.

$N_{k,n}, N_{k,s}$: Number of northbound and southbound tankers passing through canal respectively.

ii) Non-tanker revenue (loaded tankers)

$$U = \sum_{l=1}^{2} \sum_{j=1}^{J} \sum_{k=1}^{K} Z_{jk}^{l} \cdot U_{jk}$$

iii) Non-tanker revenue (no-loaded tankers)

$$V = \sum_{l=j}^{2} \sum_{j=1}^{J} \sum_{k=1}^{K} B_{jk}^{l} \cdot V_{jk}$$

iv) Gross revenue R

$$R = R_T^1 + R_T^2 + U + V$$

where, Z_{jk}^{ℓ}: The traffic volume of ships passing through canal with ship's kind j and size of ship k (loaded ships) (SNT unit).

B_{jk}^{ℓ}: The traffic volume of ships passing through canal with ship's kind j and size of ship k (no-loaded ships) (SNT unit).

U_{jk}: Toll for ships passing canal with ship's kind j and size of ship k (loaded ships) (Unit: $/SNT).

V_{jk}: Toll for ships passing canal with ship's kind j and size of ship k (no-loaded ships) Unit: $/SNT).

2.2 Examination of Tariff System

Toll system should be so determined as to increase the revenue of the Suez Canal Authority by taking account of the impacts of the toll system on the ships passing through the canal and on the economy of ports of departure and delivery.

(1) Determine the range of chargeable tolls.

Determine the difference in transport cost $(DS)_{ij}^{k\ell}$ between the transport using Suez Canal and the transport via Cape, basing upon the results of questionnaire returned from enterprizes related to shipping or upon the transport cost curve for which the calculating method was described in Paragraph 1.1.

$$DS_{ij}^{k\ell} = SC_{ij}^{\ell,k} - CC_{ij}^{\ell,k}$$

where, $SC_{ij}^{\ell,k}, CC_{ij}^{\ell,k}$: Transport cost of a ship with ship's kind ℓ and k-th ship's size passing through Suez Canal and travel via Cape for OD between (i-1), respectively.

Using the above, the range of possible toll is given by

$$0 \leqq \mathrm{TOLL}_{ij}^{\ell k} \leqq \mathrm{DS}_{ij}^{\ell k}$$

where, $\mathrm{TOLL}_{ij}^{k\ell}$: Toll to be charged to a ship with ship's kind ℓ and k-th ship's size traveling between (i-j).

(2) Examine the discriminating tolls.

The possibility of making discriminating tolls for the following items of ships passing the canal should be reviewed:

- OD
- Ship's size
- Ship's type

Generally, discriminating tolls for OD is difficult in view of collecting technique of tolls. However, the properness of discriminating tolls based on OD should be examined for the following cases:

- If discriminating tolls based on OD may result in a great increase in revenue; or
- If OD is obvious from the loaded cargoes or others.

Increase in revenue due to the discrimination of tolls should be calculated.

(3) Examine the impact of change in toll on the revenue.

This impact will be discussed hereinafter for the case where the tolls are not discriminated depending upon OD and ship's size. The same method can be used for all calculations.

When examining the above, the forecast for non-tankers should have been performed by method 1 (balanced method) stated in Paragraph 1.2.

i) Determine the maximum value $(\mathrm{MDS})^{\ell}$ of the difference in transport cost.

$$\mathrm{MDS}^{\ell} = \max_{(ijk)} (\mathrm{DS})_{ij}^{k\ell}$$

ii) Determine several alternative tolls for ℓ-th kind of ship.

Divide O to MDS^{ℓ} by the number "m" (m=5 to 6), then use $0, \frac{\mathrm{MDS}^{\ell}}{m} \ldots\ldots \mathrm{MDS}^{\ell}$ as the alternative tolls.

iii) Calculate the revenue for each alternative toll, by using the methods of Paragraphs 1.1, 1.2 and 2.1.

iv) Find the toll that brings the highest revenue out of the alternative tolls.

v) Repeat the above procedure for each kind of ships.

(4) Examine the economic impact when the above toll system is established.

i) Examine the impartiality of toll in view of the world economy.

When $(\mathrm{TOLL})^{\ell}$ that brings the maximum revenue is actually adopted, the benefit $B_{ij}^{k\ell}$ expected from the traffic of ships through the Suez Canal can be given by

$$B_{ij}^{k\ell} = (\mathrm{DS})_{ij}^{k\ell} - (\mathrm{TOLL})^{\ell}$$

In this case, the difference in transport cost varies depending upon the OD but the toll is constant, so that the benefit will vary depending upon the OD. This difference is created

depending upon where the benefit is brought in the ports of departure and delivery. The impartiality in the distribution of this benefit should be taken into account.

ii) Examine the efficiency of the world economy.

Since the maximizing the revenue does not necessarily maximize the benefit to the world economy, the balance between the world economy and revenue should be examined.

iii) Examine the relation between the change in the world economy and the amount of trade related to the Suez. If the level of revenue is too high, it will badly affect the world economy as stated in Paragraph ii). In this case, the effects of reduced economic activities and the reduced amount of trade on the traffic through the Suez Canal should be taken into account.

(5) Examine the toll system by taking account of the revenue of the Suez Canal Authority and the contribution to the world economy.

IV-5-3 Items Related to the First Phase Canal Expansion Project

3.1 Analyze the effects of deepening and of the change of the tariff system.

(1) Collect the actual data of traffic through the canal upon completion of the First Phase Canal Expansion Project.

(2) Classify the collected data into the category for the object ships for the First Phase Canal Expansion Project and the category for other ships.

- Concerned ships: Loaded tankers greater than 60,000 DWT, and unloaded tankers greater than 200,000 DWT.
- Non-concerned ships: Tankers and non-tankers with their sizes other than those shown above.

(3) Examine the significance of change in traffic volume in new stage, using the data stated in Paragraph (1) above.

- Check whether the tankers of the concerned sizes are able to sail through the canal (the effects of deepening).
- Check whether the increase in the number of non-concerned ships passing through the canal can be recognized compared to the previous stage.
- Check whether the sizes of ships and the composition have been changed.

(4) Analyze the factors that caused the change in traffic volume.

In order to find the effects peculiar to each factor, the effects due to the trends of world economy and market have to be first eliminated.

(i) Analyze the effects of deepening.

Passing of the tankers with object ship's sizes through the canal is possible only by deepening. Therefore, various kinds of benefits shown below brought by the object tankers are considered to be achieved only by the deepening.

- o Increased revenue.
- o Benefits enjoyed by the object tankers (saving in transportation cost – toll).

- Increased trade and economic development in ports of departure and delivery of tankers that pass the canal.

Since it is difficult to determine the effects due to only the deepening on the regional economic development, they will be analyzed only qualitatively.

(ii) Analyze the effects of change in toll.

One of effects caused only by the change in toll is the change in the number of non-tankers. In case of tankers, particular effects caused only by the change in toll cannot be determined since the effects caused by the increased sizes of tankers due to the raised draft limit are also contained in such effects. The following formula should be used for eliminating the effects of trends of the world economy and market.

$$\Delta N_j = N_{pj} - N_o \times G_{wj}$$

where, ΔN: Increase in SNT due to change in toll system (j-th ship's kind).

N_{pj}: Amount of SNT due to (1) (j-th ship's kind).

N_{oj}: Amount of SNT in the same month of previous year, or in a month of previous year when about the same W.S. value is achieved (j-th ship's kind).

G_{wj}: Ratio of world trade flows of j-th ship's kind between the same months in last and this years.

The change in the world trade is expressed by G_w in the above formula. If usable data are available for G_w, such data can be used. But, if not available, the following formula should be used:

$$(G_w)_j = \Sigma W_{kj} \cdot (G_o)_k$$

where, W_{kj}: The percentage of k-th cargoes to total cargoes shipped by ships of j-th kind.

$(G_c)_k$: Rate of increase of k-th cargoes shipped in the world.

(iii) Analyze the combined effects of both the change in tolls and deepening.

Tankers of non-object sizes are likely to be affected by the change in toll and to be shifted to larger sizes. But it is difficult to separate these effects from each other.

In the same manner as done for the effects of toll on the non-tankers, the combined effects can be grasped in the form of increment of the number of ships passing through the canal after eliminating the effects of economic and market trends by the following formula:

$$\Delta NT_k = NT_{pk} - NT_{srk} G_w$$

where, ΔNT_k: Effects of tankers of k-th size category.

NT_{pk}: The number of tankers of k-th size passing through the canal upon completion of project.

NT_{ok}: The number of ships passing through the canal in the same month of previous year, or in a month of previous year when about the same WS value is achieved.

G_w: The ratio of world trade flows of crude oil between the same months in last and this years.

3.2 Items Related to the Evaluation of the First Phase Canal Expansion Project

(1) Forecast the costs and benefits resulted from the execution of the First Phase Canal Expansion Project.

i) Forecast the costs.

- Construction costs (they are already known).
- Maintenance and managing costs.

ii) Calculate the increase in revenue (DR) by using the following formulas:

$$DR_1 = \sum_k (NT_{pk} \times Toll_k - \overline{NT}_{pk} \times TOLL_k) \times rSTN_u$$

$$DR_2 = \sum_k \overline{NT}_{pk} \times TOLL_k \times rSTN_k$$

$$DR_3 = \sum_j N_{pj} \times (TOLLG)_j - \overline{N}_{pj} \times (TOLLG)_j \qquad DR = DR_1 + DR_2 + DR_3$$

where, the line " " shown above the symbol of formula indicates the value when the project would have not been carried out. That is,

$$\overline{NT}_{pk} = NT_{pk} - \Delta NT_k$$

$$\overline{N}_{pj} = N_{pj} - \Delta N_j$$

where, TOLL indicates the toll before the project. DR_1 is the increase in revenue by non-object tankers, DR_2 is the increase in revenue by object-tankers, DR_3 is the increase in revenue by non-tankers, and DR is the total of increases in revenue. Also, $rSTN_k$ is the representative value of SNT of k-th size tankers.

iii) Forecast the future increase in revenue.

$$DR_t = (1 + FG)^{t-1} r_y \cdot DR$$

where, DR_t: Forecasted increase in revenue t-years later.
FG: Assumed rate of growth of world economy.
r_y: Value converted for the whole year (=12.0).

iv) Calculate the increase in benefits enjoyed by ships passing through the canal.

Increase or decrease in benefits of ships passing through the canal whose ports of departure or delivery are obvious can be calculated by the following formulas:

$$DBT_1 = \sum_k (NT_{pk} - \overline{NT}_{pk}) \times SC_k - DR_1$$

$$DBT_2 = \sum_k (NT_{pk} \times SC_k) - DR_2$$

$$DBT_3 = \sum_j (N_{pj} - \overline{N}_{pj}) \times SCG_j - DR_3 \qquad DB = DBT_1 + DBT_2 + DBT_3$$

where, DBT_1, DBT_2, and DBT_3 is the benefits enjoyed respectively by non-object tankers, object tankers and non-tankers.

SC_k and SCG_j respectively means the amount saved in transportation costs by k-size tankers and non-tankers of j-th kind passing through the Suez Canal.

v) Forecast the future increase in benefits.

$$DB_t = (1 + FG)^{t-1} r_y \cdot DR$$

where, all symbols and codes are the same as those for iii).

vi) Using the increase in toll, increase in benefits and costs as data, perform the economic evaluation and the analysis of income and expenditure in accordance with the same methods described in Paragraphs 4.2.2 and 4.2.3 of this manual.

IV-5-4 Items related to the second phase expansion project

4.1 General process for the Feasibility Study

(1) Objective of Feasibility Study

The concept of "feasibility study" is not yet clearly established. However, a feasibility study can be simply defined as a study which assists in answering the question of whether or not a project should be carried out, judged mainly from the viewpoint of national economy.

This question must be asked because; (1) a government and/or other public authorities must have the information relevant to the decision to be made on whether or not a project is beneficial, and on which of the projects should be carried out if there have been several alternative projects conceived concerning the timing, size of location, method of construction, and son on; (2) international financial organizations, such as the World Bank, needs to know whether a project qualifies for a loan and or financial aid.

In the case of the Second Stage of Suez Canal Development, the latter point should be judged more important than the former, because to meet the criteria of the World Bank for financial aid is a prerequisite for the implementation of the Development plan. Hence, the remainder of this Chapter will focus upon the method of project evaluation, mainly taking into account the World Bank criteria.

(2) Aspects of Project Evaluation

As mentioned in (1), the feasibility study on the Suez Canal Development Project has three phases of procedure which are:

- Determining the various expansion schemes for the Suez Canal,
- Forecasting Canal traffic,
- Project evaluation.

Of these three, this chapter focuses on project evaluation (or project appraisal). Project evaluation mainly covers six aspects of the project; i.e., the technical, economic, commercial, financial, managerial and organizational aspects. Technical evaluation examines all the features of the project design, the cost estimates and construction schedule.

Economic evaluation is the same as "Cost Benefit Analysis" which is concerned with the economic effectiveness of the project judged from the viewpoints of both national and world economies as a whole. Commercial considerations cover all the arrangements for buying-input and selling-output of the project including an evaluation of market demand for project output. The Canal transit fleet mix and related revenue will be subject to commercial evaluation in the case of the Suez Canal Development Projects. The financial aspect, which is closely related to the commercial, focuses on two issues. The first is whether or not sufficient funds are available, and

the second is whether the enterprise (SCA) will able to meet all its financial obligations. The managerial aspect deals with the adequacy of the top management to direct the construction and operation of the project. The organization aspect is concerned with the administrative structure of the enterprise carrying out the project.

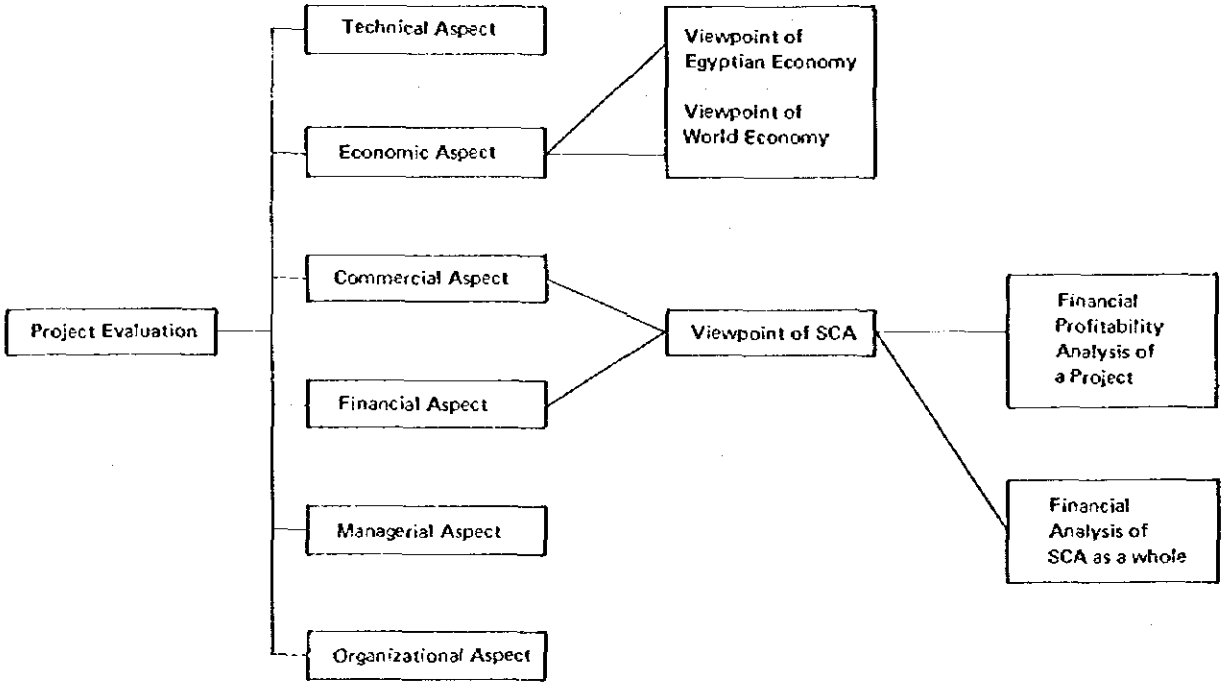


Fig. IV-5-4 Aspects of feasibility study

4.2 A methodology for the Second Expansion Project

4.2.1 Define the project

A project is a set of minimum activities which are economically and technically feasible in themselves to achieve its objectives. Examples of such projects concerning SCA are as follows:

- Expansion of Canal Cross Section
- Improvement of Convoy System
- Change of Tariff Structure
- Construction of Houses
- Improvement of Port Facilities
- Expansion of Shipyards
- Installation of Weather Forecasting Facilities, etc.

A specified theme should be chosen among these as an objective project.

4.2.2 Economic evaluation

(1) Pick up benefits and costs to evaluate the project

The benefits and cost in the velow table are possible to be considered. These benefits and cost should be categorized to prepare for the evaluations from the different point of views.

Table IV-5-4 Benefits and Costs for economic evaluation

	Egyptian Viewpoint	World Viewpoint
Benefits	o Increase of SCA Revenues o Cost reduction for Egyptian ships o Saving of time of Egyptian ships o Fewer accidents and reduced damage concerning Egyptian ships and cargo.	o Increase of SCA Revenues o Cost reduction of shipping o Reduction of time of shipping o Fewer accidents and reduced damage
Costs	o Capital Costs Dry excavation Revetment Dredging Breakwater extention Offshore bollards Construction of berths Equipment o Additional Operating and Maintenance Costs Administration and general expenses Canal and portside working expenses Canal and portside maintenance expenses Maintenance and replacement of equipment o Other Incremental Costs Consulting and technical assistance Environmental damage costs	

(2) Calculate the project benefits

Among those benefits which would be derived from such projects as (a) the expansion of the canal cross section, (b) the improvement of the convoy system and (c) the change of tariff structure, the most important benefits would be:

- Increase of toll revenues and
- Savings in ship costs.

The former benefits the Egyptian economy, and the latter the world shipowners. From the viewpoint of the Egyptian economy the former is obviously of considerable importance but for the world economic evaluation both the former and the latter should be regarded as significant benefits. This study is mainly concerned with these two main benefits and describes methods to measure them.

Measurement of benefits can be divided into two stages; firstly the calculation of estimated annual benefits to be accured in a given year, and secondly the production of a time-stream of benefits.

The procedure for calculation of annual benefits can be divided into three parts: (a) calculation of main Egyptian benefits, (b) calculation of Canal users' benefits, and (c) calculation of global benefits. Each of the calculation procedures is shown in Figs. IV-5-5 ~ IV-5-7 and ex-

plained below.

(3) Calculate Main Egyptian Benefits

i) Ascertain the Canal situation that will result from a given project and the situation without the project in terms of

- Daily canal capacity
- Canal transit time
- Canal transit regulation
- Canal tariff structure.

ii) Input into the forecasting model the two sets of output values derived from Step 1, i.e., with and without the project.

iii) Forecast two sets of values of annual Canal traffic volume, for with and without the project. The output should comprise the number of ships and of ship tonnages, and should be categorized by route, type of ship and by laden or in-ballast.

iv) By using 2.1, calculate the toll revenue for the two cases, with and without the project respectively, by multiplying each value of tariff by the corresponding Canal traffic volumes.

Subtract from the revenue with-the-project the value without-the-project. The result gives the increase in toll revenue derived from the project, this being the Egyptian benefit from the project.

(4) Calculate Main Canal User's Benefits

i) Same as in the case of the Egyptian benefits

ii) Same as in the case of the Egyptian benefits

iii) Forecast two sets of values of annual traffic volumes for each route relevant to the Suez Canal with and without the project. The output should comprise the number of ships and of cargo tonnages, and be categorized by the kind of cargo, by the route and by the type of ship.

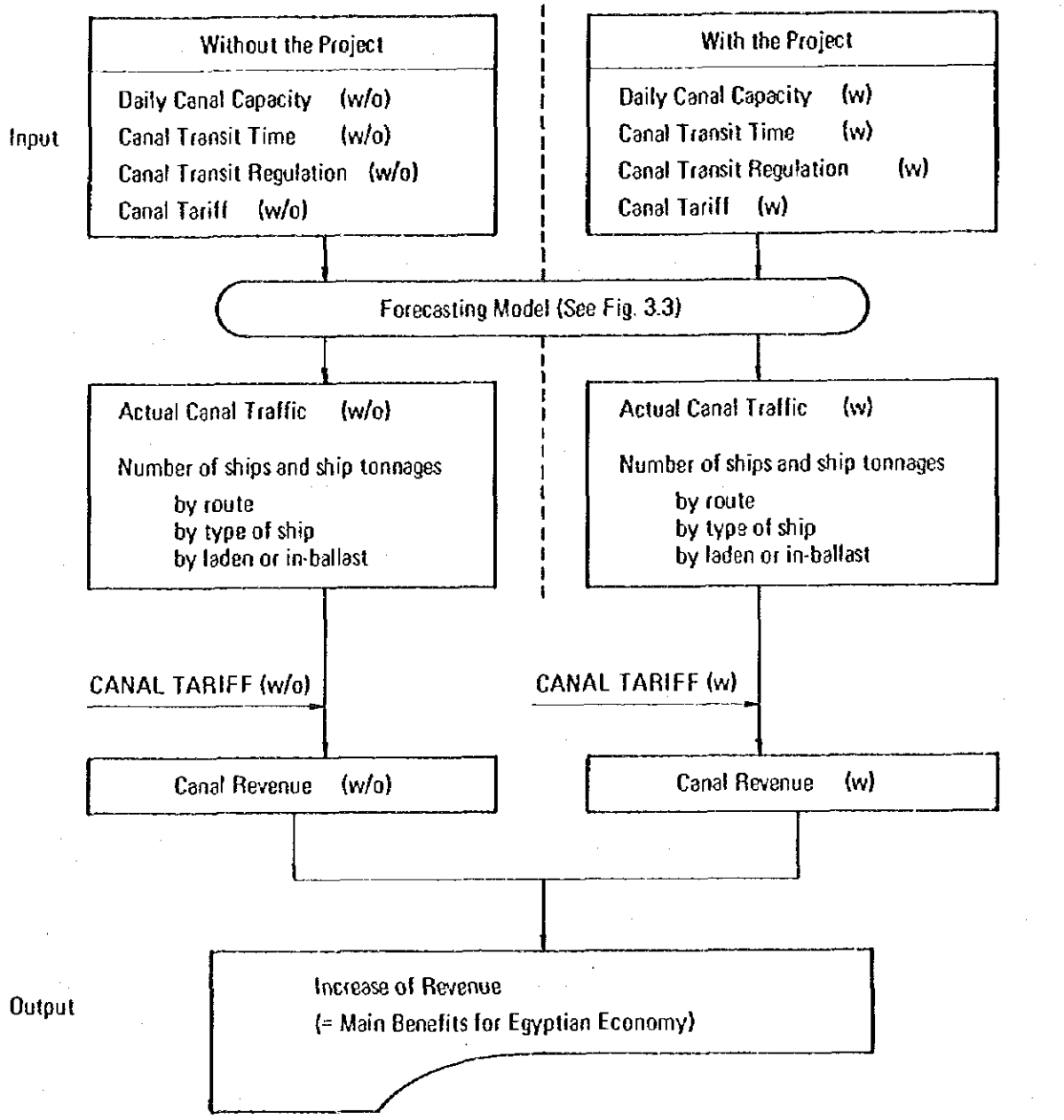
iv) At the same time, as Step 3, forcast two sets of values of route costs for each route relevant to the Suez Canal, with and without the project, respectively. Each route cost shall include the respective Canal tariff depending on the situation; with or without the project. The output should have the dimension of $ per cargo loaded and should be categorized as in the case of traffic volume.

v) Calculate the total shipping costs for the two cases, with and without the project respectively, by multiplying each route cost by the corresponding value of annual traffic volume.

vi) Subtract from the total shipping costs of without-the-project the total costs of with-the-project. The result gives the saving in shipping costs, which is the users' benefit derived from the project.

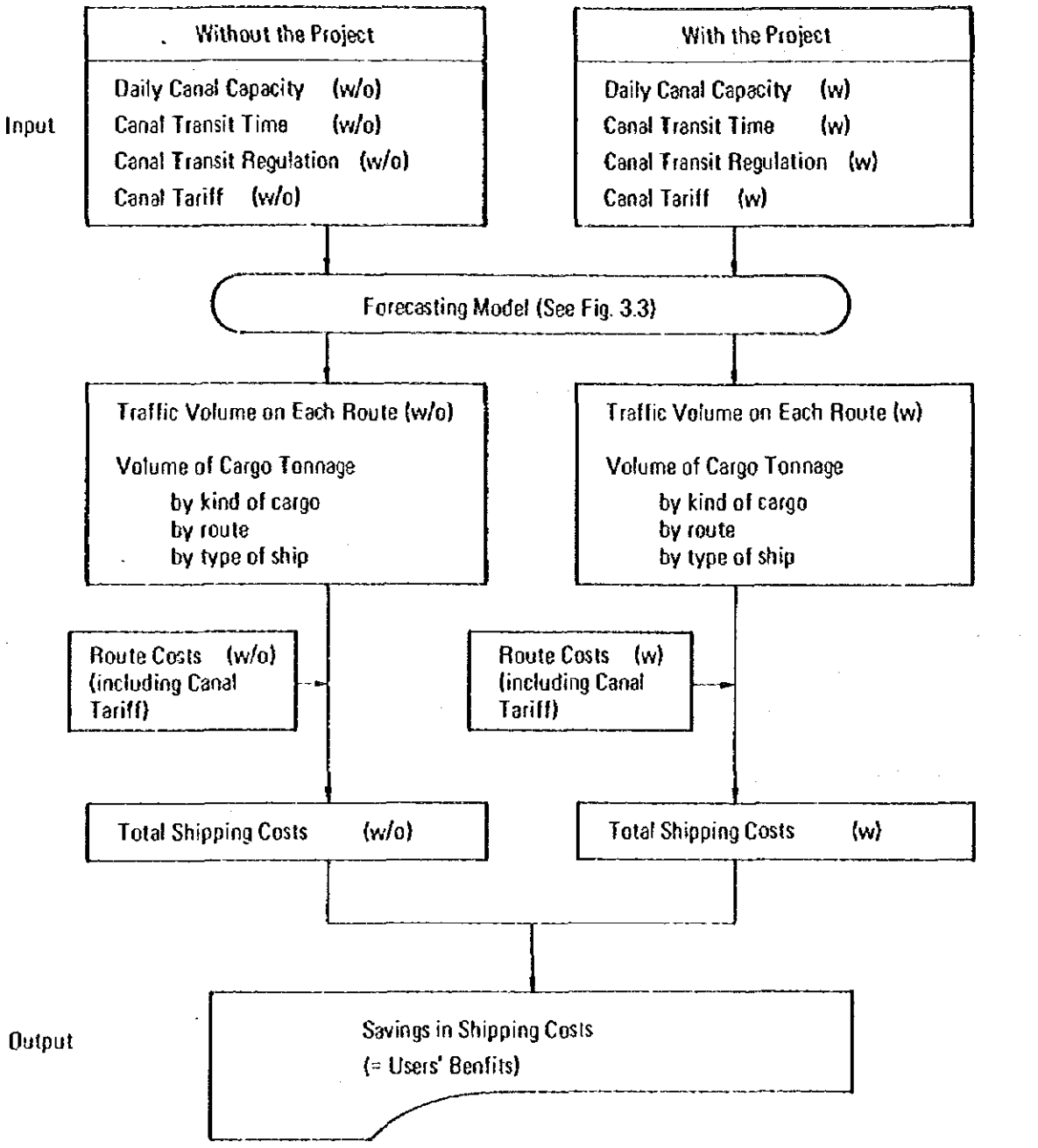
(5) Calculate Global Benefits

Sum up the increase of toll revenues and the savings in shipping costs. The result is the global benefit which is the main benefit for the world economy.



Note: w/o = Without the project.
w = With the project.

Fig. IV-5-5 Calculation Procedure for Main Egyptian Benefits



Note: w/o = Without the project.
w = With the project.

Fig. IV-5-6 Calculation Procedure for Users' Benefits

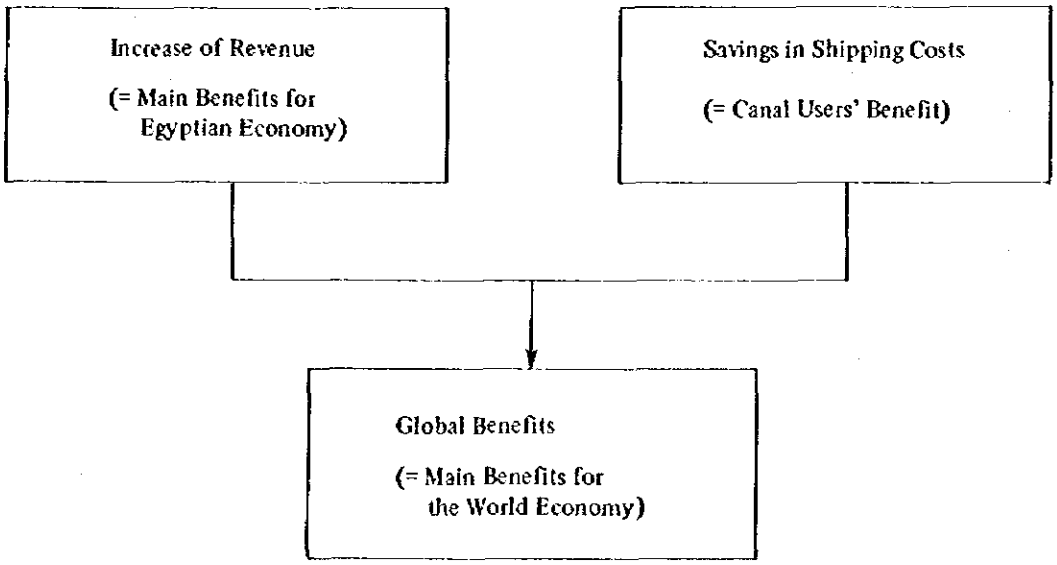


Fig. IV-5-7 Calculation of Global Benefits

(6) Produce Time-Stream of Benefits

There are two ways by which a time-stream of benefits could be produced;

- Carrying out the full calculation of the annual benefits, above in (1), for every year during the project life.
- First, carrying out a full calculation of the annual benefits for only a few important years, and then estimating benefits of each year by means of extrapolation and/or interpolation as shown below:

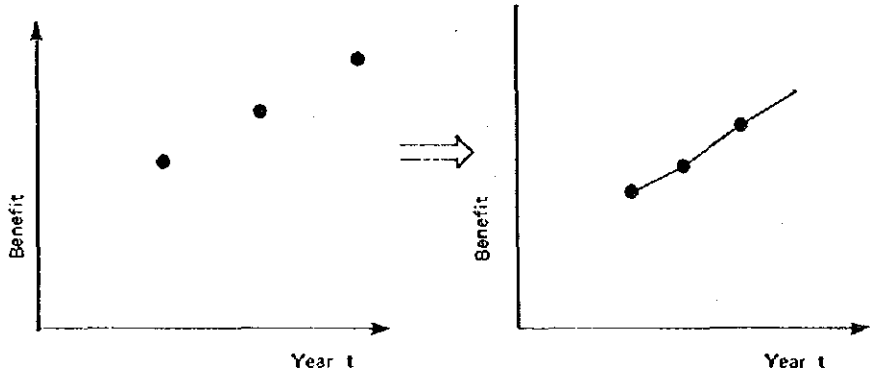


Fig. IV-5-8 Interpolation for time-stream benefits

The choise between the two methods depends on the conditions f the analysis.

- Availability of time, labour and other resources
- Stability of world economy

(7) Estimate Costs

Given the concrete project design, the estimation of economic costs can be made in three stages:

- Estimation of total project costs
- Division of total costs into the categories of foreign and local currency
- Division of project expenditures into yearly expenditures
  (= Giving a time-stream of project costs).

There are two important rules concerning the estimation of costs: firstly the "with and without comparison", and secondly consideration of the "economic evaluation".

Regarding the with-and-without comparison, the capital costs could be estimated with relative ease once the engineering specifications of the project are known. However, one must be careful in the estimation of operating and maintenance costs, since only incremental costs accrued from the project should be identified and estimated.

As to the second rule of the economic evaluation, the following must be taken into consideration; first the analyst must be careful of how tax, subsidies, the payment of interest, and depreciation are treated, as if there is considerable unemployment; and third, the shadow value of the foreign exchange rate should be used if there is a fixed exchange rate. In the event that a shadow value of the foreign exchange rate is required the world market exchange rate should be used.

(8) Estimate Costs

(9) Compare Costs and Benefits

There are at least three criterion indices for measuring the performance level of a project:

- Present Net Worth (PNW)
- Internal Rate of Return (IRR)
- Benefit Cost Ratio (B/C)

Each index can be represented by the following equations, given the timestreams of both benefits and costs, as shown in Figure IV-5-9.

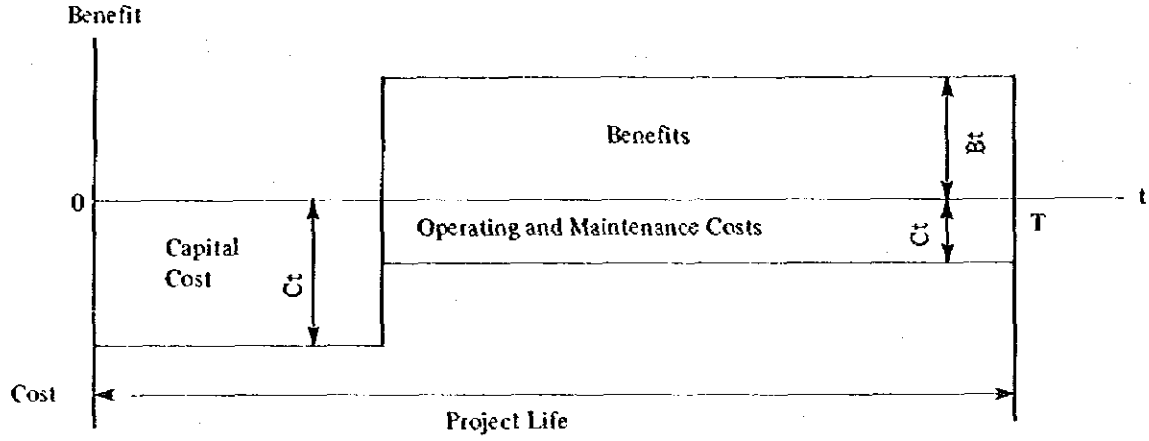


Fig. IV-5-9 Time-Streams of Costs and Benefits

- Present Net Worth (PNW)

$$PNW = \sum_{t=0}^{T} \frac{Bt - Ct}{(1+r)^t}$$

- Internal Rate of Return (IRR)

IRR is the value of x such that

$$\sum_{t=0}^{T} \frac{Bt}{(1+x)^t} = \sum_{t=0}^{T} \frac{Ct}{(1+x)^t}$$

- Benefit Cost Ratio

$$B/C = \left(\sum_{t=0}^{T} Bt/(1+r)^t \right) / \left(\sum_{t=0}^{T} Ct/(1+r)^t \right)$$

where, t : year
T : project life
Bt : benefit in year t.
Ct : cost in year t.

i) Choose criteria for the evaluation

Three propular criterion all have both merits and demerits. A criteria ahould be chosen considering these points.

Table IV-5-5 Merits and Demerits of the three criterion

Index	Merits	Demerits
PNW	The most precise	Difficult to estimate the Social Discount Rate (SDR)
IRR	The World Bank prefers Shows the efficiency of capital No need to use the value of the SDR	Difficult to estimate the OCC
B/C	Shows the efficiency of capital	Difficult to estimate the SDR

ii) Calculate the value for the criteria

Using costs and benefits already estimated, the criteria value is calculated according to its formula.

iii) Assess the feasibility of the project

Judge the feasibility of the project with following directions.

- Present Net Worth

  If PNW $>$ 0, the project should be recommended

  If PNW $<$ 0, the project should be rejected

- Internal Rate of Return

  If IRR $>$ OCC, recommended

  If IRR $<$ OCC, rejected

  Where the OCC is denoted by the opportunity cost of capital (usually 3–14%).

- Benefit Cost Ratio

  If (B/C) $>$ 1, recommended

  If B/C $<$ 1, rejected

4.2.3 Financial Evaluation

(1) Pick up Revenues and Expenses for the S.C.A.

Financial evaluation is made from the S.C.A.'s point of view. The revenues and expenses in the below table are the examples to be considered for the evaluation.

Table IV-5-6 Revenue and expenses for financial evaluation

	Only SCA Viewpoint	
Revenues	o Increment of Toll Revenues o Decrease of Compensation for Accidents	
	o Subsidies from Outside of SCA	
Expenses	o Capital Costs o Additional Operating and Maintenance Costs o Other Incremental Costs	
	o Taxes o Custom Duties	o Payment of Interest o Royalties

(2) Measure Revenues

Among these revenues, the most important are:

- Increase of toll revenues, and
- Subsidies from outside of SCA.

Calculation of the former is made, in exactly the same was as in the already explained economic evaluation except for one point. In the case of the economic evaluation, "real price" should be used, however, in the case of the financial evaluation the fixed foreign exchange rate and the inflated price should be used if they are available.

As for the calculation of the latter, the amount can easily be abstracted from the project plan. Note that in this case the market price should be used.

(3) Measure Financial Costs

In addition to the increment in capital costs and the operating and maintenance costs which are evaluated using market prices, it is necessary for the estimation of the financial costs to include tax, import duties and the payment of interest.

It must be noted that in the case of the financial evaluation the costs should be represented by the inflated prices if they obtain. It must also be noted that depreciation should be excluded from the financial evaluation, because it has already been accounted for by the increment in capital costs.

(4) Compare Costs and Revenue

The types of criterion indices and the way in which these indices are used, are exactly the same as in the economic evaluation except for two points.

- market interest rate is used instead of social discount rate
- market interest rate is used instead of the opportunity cost of capital (OCC)

IV-5-5 CANAL CAPACITY

Canal capacity is determined by the type of layout of the Canal, the manner of operation and other factors. The numbe;of ships which transit the Canal in a given period cannot exceed the capacity.

If a number of transits exceeds the capacity, a delay and/or extension of transit time occurs, which cannot be accepted by ship operators. Further more demand may fall. This will have a detrimental effect on the revenue of the SCA.

On the other hand, if the capacity of the Canal were much larger than the demand, the utilization of the Canal would be low and this would have an undesirable effect on the management of the SCA too.

Therefore it is very important to properly evaluate Canal capacity and to correctly assess the time schedule of the Canal expansion schemes.

5.1 Calculation of Canal Capacity

The capacity of the Canal is defined as the number of ships that are able to transit the Canal in a given period. The capacity of the Canal depends upon the following factors:

- the physical layout of the Canal
- the manner in which the Canal is operated
- the transit rules (vessel speeds, arrangement of vessels in convoys, etc.)

(1) Draw a diagram (Refer to Fig. IV-5-10)

i) Draw a frame with two axes on section paper. The X-axis indicates the distance from Port Said Lighthouse, and the Y-axis time equal to cycle time.

ii) Draw vertical lines at both ends of each by-passes.

iii) Decide the manner in which the Canal is operated.
It is assumed that a three convoy sustem is used (one is northbound without stopping at by-passes; the others are southbound) in the following explanation.

iv) Draw an oblique line AB with a positive gradient of 14 km/h (the speed of a standard ship) from A.

v) Draw an oblique line EF with a negative gradient of 14 km/h from E. F is located at the southern end of by-pass II.

vi) Draw a line CD a little below F which is parallel to AB.

vii) Draw a line GH parallel to EF.

viii Draw a line IJ parallel to EF.

ix Draw a line KL parallel to IJ so that the length of JL equals that of EG.

x) Draw a line DM parallel to EF. Mark M' at the side opposite M.

xi) Draw a line M'N parallel to EF.

xii) Draw lines OP and RS parallel to EF.
Mark P' at the side opposite P.

xiii) Draw a line P'Q parallel to EF.

xv) Mark T so that the length of TS equals that of QD.
Draw a line TU parallel to EF.

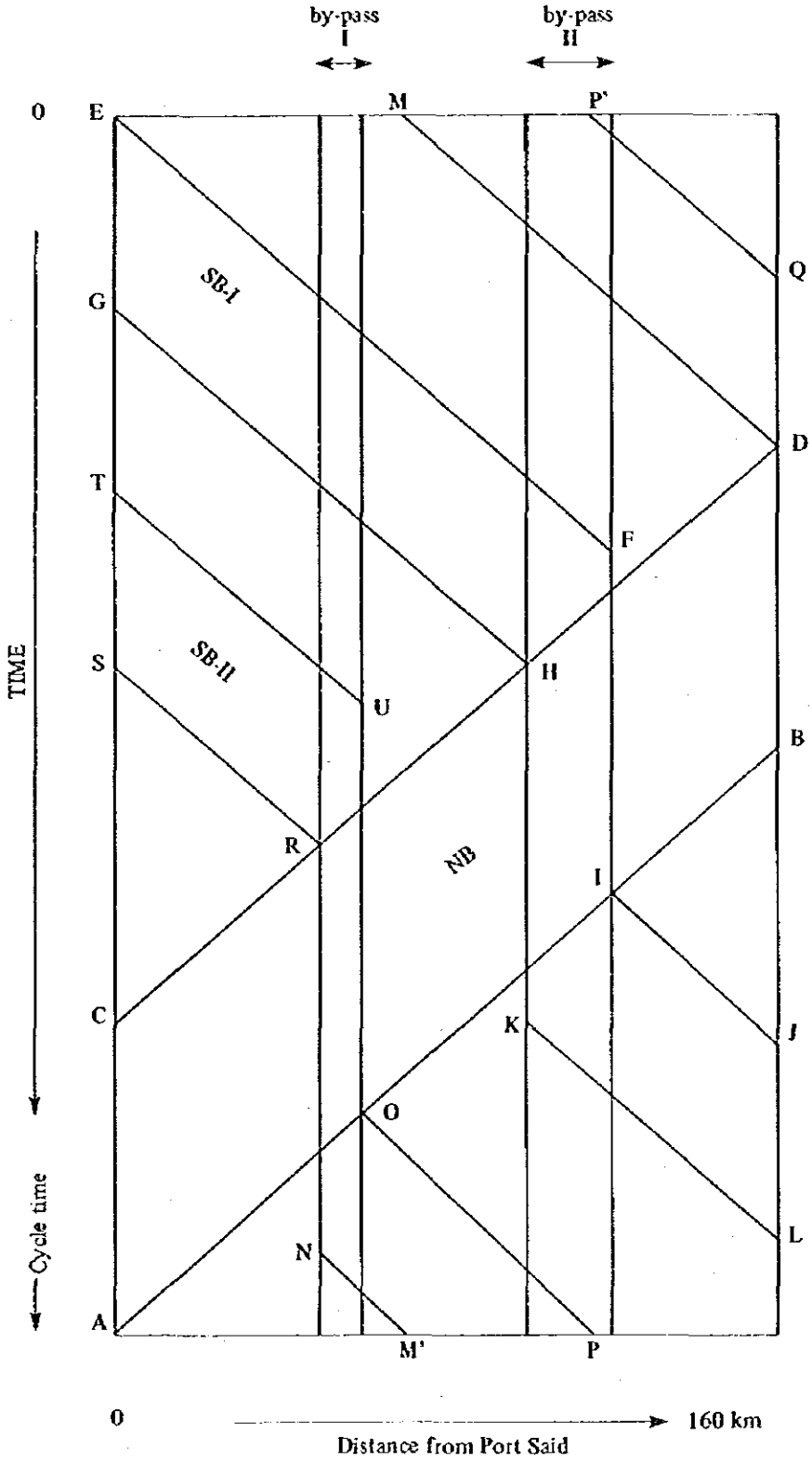


Fig. IV-5-10 Diagram of Convoy System

(2) Calculate the number of ships n which pass a given point (excluding by-passes per hour) as the inverse of the interval between successive ships. If each ship is separated by an interval of 10 minutes, then n equals 6ships/hour,

(3) Calculate number of ships in each convoy N_1, N_2, and N_3

N_1 (northbound convoy) = AC x n

N_2 (first southbound convoy) = EG x n

N_3 (second southbound convoy) = TS x n

(4) Sum up (N) the numbers in each convoy.

$$N = N_1 + N_2 + N_3$$

N is the theoretical number of ships which is able to transit the Canal in a given cycle time.

(5) Calculate actual capacity

The actual capacity is reduced by the following factors.

- Tolerance time at the by-passes; the time interval that must be allowed between the time when the last ship of a northbound convoy passes the entrance of the by-pass and the time when the first ship of a southbound convoy leaves the by-pass.
- The randomness of ships' transiting speeds and other unexpected factors

The actual capacity C is assessed as N multiplied by a because of these reducing factors.

$$C = N \times a$$

- The value of a = should be determined by experience.

5.2 Assess the convoy system

A convoy system is evaluated by the canal capacity that the system allows. Therefore, a suitable convoy system is designed to obtain the capacity which is set based on a certain criteria. To evaluate a canal capacity, the number of the days in which ships arrive more than the capacity.

(1) Decide the Canal Capacity

i) Calculate the average number of ships wishing to transit the Canal per day Naa using number forecasted per month (or year).

$$\sigma = \sqrt{Naa}$$

iii) Give a temporary canal capacity C

The probability β that the number of ships wishing to transit the Canal will exceed Canal capacity C is given by the following expression.

$$\beta = \frac{1}{\sqrt{2\pi\sigma}} \int_C^{\infty} \exp\left(-\frac{x^2}{2\sigma^2}\right) dx$$

Calculate α to obtain β without integration

$$\alpha = \frac{C - Naa}{\sigma}$$

Use Table IV-5-7 to find α and β corresponding to α.

Table IV-5-7 Relationship between α and β

α	β
0.0	0.5000
0.5	0.3085
1.0	0.1587
1.5	0.0668
2.0	0.0227
2.5	0.0062

iv) Calculate how many days M per month (or year) the number of ships wishing to transit the Canal will exceed Canal capacity.

$$M = 30\beta$$

v) Consider if the exceeding days M is allowable or not.

- If yes, the temporary C is set as a designed canal capacity.
- If not, the processes iii) ~ v) are repeated untill the satisfactory canal capacity is obtained.

(2) Design a convoy system

The convoy system to obtain the designed capacity should be decided by using the method 5.1. Then.

- Ship speed
- ship interval
- cycle time,

should be suitably set together.

(3) Assess the present convoy system, comparing with designed system in above (2).

IV-5-6 Risk analysis

A safer navigation through the Canal promotes its use. Therefore, it is important to analize the factors of canal accidents.

6.1 Pick up causes of the canal accidents

(1) Related to ships
- Ship category
- ship size.

(2) Related to the navigation
- ship speed
- ship interval
- loading condition
- fag boad (with or without)
- skills in the navigation technique

(3) Related to the physical characteristics of the canal
- depth
- width
- cross section ration
- shape of the cross section

(4) Related to the natural conditions
- weather (winds, fogs)
- tidal condition
- sight

6.2 Collect records about canal accidents.

Cover the time as much as possible, and investigate the following items.
- A category of the accidents
- conditions of the possible caused shown in 6.1
- places of accidents

6.3 Assess the causes of canal accidents

(1) Investigate the distribution of the causes by assembling the data the cause of which are clear.

(2) Try a quantitative method such as following (0.1) regression analysis.

(i) Estimate a following regression model

$Y = a_0 + a_1 X_1 + \ldots\ldots + a_n X_n$,

where, Y is a dependent (0-1) variable expressing an accident occurence (when accident happens, Y=1, Otherwise Y=0). X_1, ... Xn are independent variables using the conditions of each navigation. And a_0, ... a_n are regression coefficients which

represent the statistical significance of each inteinreginable causes x_1 ....x_n.

(ii) Pick up the important factors by considering the values of a_0,....a_n.

(4) Make a factor analysis for different group of collected data, when a significant regression model can not be obtained. Factors with which data are classified are, for example

- ship type
- ship size.

(5) Sumarizing above analysis, devices to improve the canal environment should be assessed.

IV-5-7 How To Deal with Information Related to World and Regional Economies

To grasp the world's economic situation in the current year is to know the factors which cause changes in the trade volume, seaborne trade, and the demand for tonnage. However, it is difficult to say what constitutes the world economy because each country is engaged in its own economic activities which, taken as a whole, become the world economy. Therefore, it would be convenient to attempt some sort of classification. For instance, economies may be grouped according to

1. Region
   - North and South America
   - West Europe
   - East Europe
   - North Africa
   - Asia and Oceania
   - Near and Middle East, etc.
2. Economic system
   - Capitalist countries
   - Communist countries, etc.
3. Degree of economic development
   - Highly advanced countries
   - Newly industrialized countries
   - Developing countries, etc.
4. Compound characteristics
   - Advanced capitalist countries, etc.
5. Economic community, federation
   - EC
   - ASEAN
   - LAFTA, etc.
6. At times it might be more convenient to group according to differences in fundamentals such as "capital surplus oil exporting countries" and "non-oil producing developing countries". In short, the kind of grouping to be adopted will be determined automatically by the main theme of the economic analysis.

Economic Indices

After the Second World War, the national policy of all countries, whether advanced or developing whether capitalist or socialist, was aimed at one target – economic growth. And, as a means of assessing each national economy, the growth rates of national income, capital stock and gross national product (GNP) were measured.

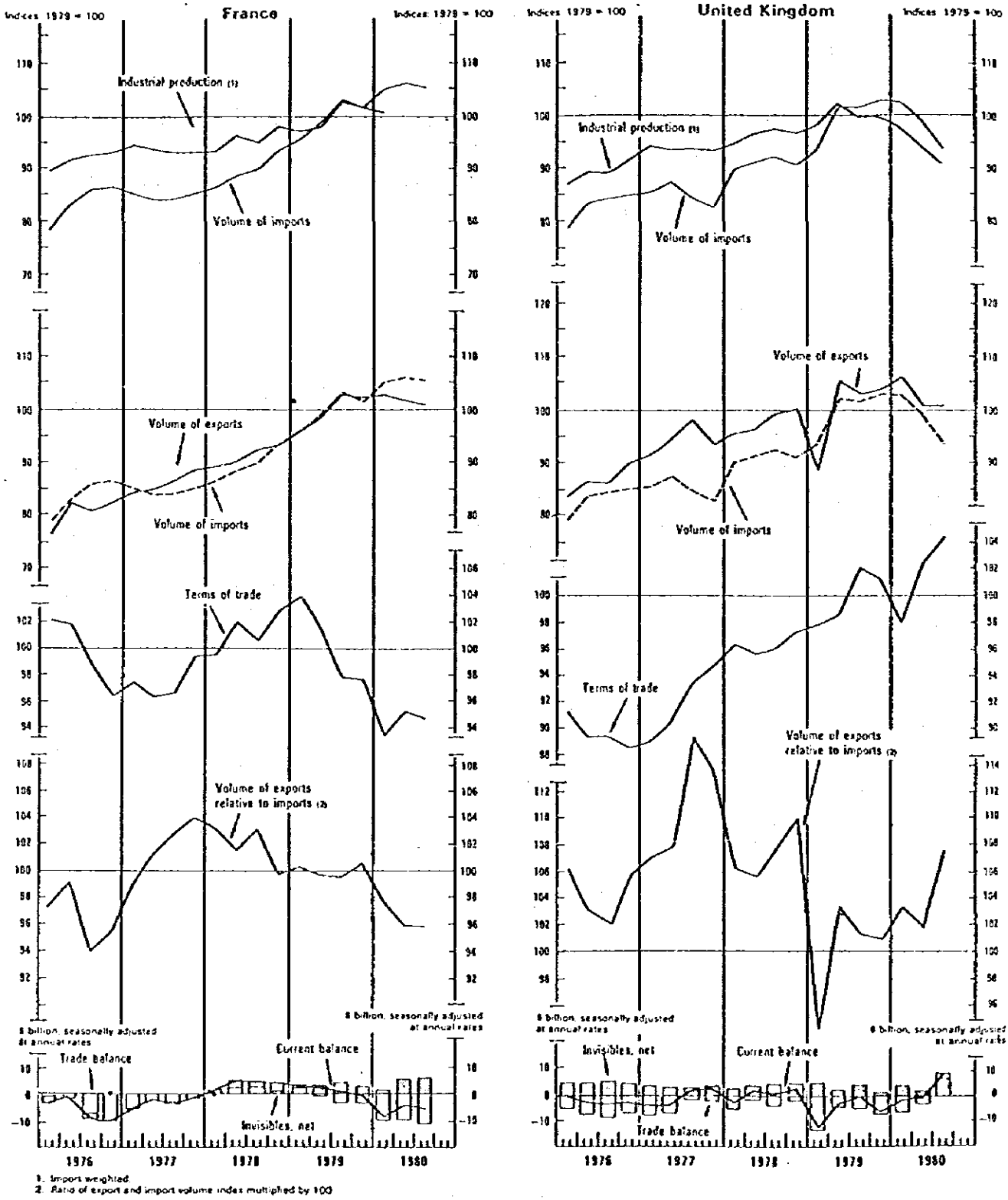
The indicators which are normally used in economic analysis concern the following:

National economic accounting
Business trend indicators (mining and manufacturing production index, inventory index)
National finance – fiscal scale, fiscal funds
Finance
Trade
Balance of international payments
Commodity prices
Labor, employment

Statistics and indices pertaining to the above constitute the basic data for grasping the actual picture of the economy.

For instance, an important indicator to help judge the trend of business in Britain is the British Industrial Production Index. If industrial production expands at too fast a pace in Britain, imports increase and there is a fear that this will reduce gold and foreign currency reserves, thus leading to a fluctuation of the pound sterling. Thus, in order to defend the pound, the British Government has no recourse but to adopt a tight-money policy. For this reason, the industrial production index serves as one of the keys to predict the course of the British economy.

INDUSTRIAL OUTPUT, FOREIGN TRADE AND CURRENT BALANCE IN THE SEVEN MAJOR OECD COUNTRIES



1. Import weighted.
2. Ratio of export and import volume index multiplied by 100

Fig. IV-5-11

IV-5-8 How To Deal with Information Related to Seaborne Cargo Movement

Although this is the field in which data is most restricted, it is possible to obtain a matrix of data on the loading and unloading of the five major bulk cargo (coal, iron ore, bauxite/alumina, grain and phosphate) and petroleum by region and by main countries. By taking this data in correlation to time, it will be possible to perceive the course of trade and to anticipate future economic trends by applying elasticity values such as that showing the relationship between the volume of oil consumption and economic growth.

However, very little data is available for other cargo. The so-called minor bulk cargo, consisting of raw sugar, iron scrap, salt, non-ferrous metals, manganese ore, etc., the only data available are those for the principal routes. With respect to general cargo, too, country-wise and region-wise data are not available.

Let us look at the data situation regarding the major items.

1. General cargo

There are no data which show the year-to-year liner shipment of general cargo. However, UN statistics on the volume of industrial products imported by 11 main countries are highly informative. The volume of seaborne trade in general cargo can be obtained by using the following formula:

All items – (5 major bulk + part of minor bulk) = general cargo

All items are taken from UN statistics and Fearnley & Egars gives the data on the other half of the equation.

2. Oil

Regarding oil cargo, attention must be paid to the economic trend in the place of consumption and the import destination which affects the volume of oil movement in terms of ton-mile base. To forecast future trends, attention must be paid to information on industrial regions which are to be newly developed and to changes in the elasticity value between the real economic growth rate and increase in oil consumption. For the Suez Canal, oil movement on the Middle East/Europe, America route is of particular importance.

3. Iron ore and coal

The cargo movement of these two items which are the raw materials for steel closely correspond to the trend of the Index of Industrial production. Even more concretely, it is reflected in the production trend of crude steel. The most important consuming regions of iron ore and coal are Japan, West Europe and the U.S. Together, these three regions account for 90–95% of all movement of these items.

Because the demand for steam coal in the place of oil is increasing recently, it is also necessary to pay attention to the demand for electricity in each country. Attention should be paid especially to Australia/West Europe trade volume of both coking and steam coal for the Suez Canal.

4. Grain

Grain production is easily affected by the weather and has no direct link with economic trends. In the long term, grain volume is affected by population trends. It is extremely difficult

to trace the factors for changes in grain trade arising, say, from an increase in income spurring demand for animal protein and consequently affecting the trade volume of feed grain. Therefore, it is necessary to pay very close attention to changes in eating habits and agricultural policies aimed at enhancing self-sufficiency. Furthermore, a grain producer nation may suddenly become a grain importing nation in an emergency caused by a drought. Therefore, utmost care must be exercised in making a short-term forecast.

In relation to the suez Canal, attention must be paid to the food self-sufficiency rate of the Middle East countries and to trends in importing countries.

5. Other bulk cargo

Among other bulk cargo, those linked closely to the Industrial production Index are bauxite/alumina, manganese ore, non-ferrous metals and cement.

6. Modes of transportation which supplement or compete with seaborne transportation

Modes of transportation which supplement or compete with seaborne transportation, leaving aside air transportation, include pipeline and landbridge.

The laying of pipelines greatly changes trade routes, and the vessel size becomes restricted by the capacity of the loading port and pipeline. The construction of a pipeline ordinarily tends to reduce the necessary tonnage of tankers. Therefore attention will have to be paid to the construction of pipelines and to plans for construction. The pipelines which affect the Suez Canal include SUMED, ICOO, TAL Line, TIP Line, Iraq/Turkey, and Trans-Saudi Line.

As for landbridge, there are the Siberian Landbridge and the mini-landbridge via the North American continent. These landbridges join the Far East to Europe with Japan as the main base and constitute a threat to the traditional sea route to Europe. For instance, the insecurity of the sealane resulting from the war between Iran and Iraq has caused a conspicuous shift from the sea route to the Siberian landbridge in the cargo destined for the Middle East.

A comparison of the three Yokohama/Rotterdam routes is as follows:

	Distance	No. of days required
Siberian Landbridge	13,000 km	28--35 days
Sea route via Suez	20,700 km	23--26 days
American Landbridge	20,240 km	35 days

IV-5-9 How To Deal with Information Related to Fleet Tonnage (Manual IX)

There are various kinds of tonnage, such as

Existing tonnage
Total order book
Newly contracted tonnage
Commencement, launched and completed tonnage
Scrapped, lost tonnage
Laid-up tonnage.

The point is how to grasp the current situation of each type and size of vessel.

For instance, as a result of the oil crisis of 1973, the orders placed for such mammoth ships as

ULCC and VLCC decreased steeply. Subsequently, the tonnage of these types of ships showed no increase. Not only that, the sluggish tanker freight following the oil shock greatly reduced the opportunity for operation of mammoth ships. Consequently, their laid-up tonnage increased, and a large tonnage of comparatively aged ships for which there is little hope of market recovery has been scrapped.

On the other hand, the form of crude oil transactions changed and demand centered on the medium and small-sized tankers. Moreover, because of the relative shortage of tankers of these sizes in the existing fleet, new building orders were concentrated in this category.

This fact is highly valuable information for forecasting the future trend of the tanker freight market.

1) Existing tonnage

Table IV-5-8 shows the tonnage composition by ship category of Japanese flag ships according to basic classification.

However, they can be consolidated into 12 categories as shown in Table IV-5-9 because, for instance, lumber carriers, pulp carriers and chip carriers can be grouped under the category of lumber carriers. However, in conducting an analysis, ships are often divided into the broad classifications of

Oil tanker
Combined carrier
Ore and bulk carrier
Others (general cargo ships { conventional type ships) / containerships)}

It is necessary to examine the above categories of ships from many angles such as nationality, ship size, age, etc. Fundamental to an analysis of the tonnage trend is a study, year after year, of the types, sizes and ages of ships. In relation to the Suez Canal it is necessary, particularly with respect to tankers, to classify ship size also according to draft and hull breadth.

The ratio of tonnage in operation and idle tonnage of the existing fleet tonnage will change in accordance with the widening or narrowing of the supply-demand gap. There are also vessels which are remaining active by means of inefficient operation such as slow-steaming.

The fleet tonnage fluctuates from day to day in accordance with newbuilding orders, completions, scrapping and loss. Therefore, these, too, have to be given careful attention.

The existing fleet tonnage is obtained as follows:

$$Vn = V_{n-1} + CV_n - S \cdot L_n$$

with Vn = existing fleet tonnage

V_{n-1} = tonnage at start of current term

CV_n = tonnage completed in current term

$S \cdot L_n$ = tonnage scrapped and lost in current term

2) New orders, order backlog tonnage and completed tonnage

Tonnage of new orders is a factor which determines the future tonnage supply. The pattern of new orders makes it possible to surmise the situation of the shipping market of the near future.

New orders tend to increase or decrease in accordance with the fluctuations of the freight market. Thus, in times of prosperity, a large volume of orders are placed, and the ship price increases. In times of recession, orders are slow, the order backlog decreases sharply and the ship price tends to decline. At the same time the laid-up and scrapped tonnage increases. The supply-demand balance gradually recovers and orders become active again. This cycle is repeated.

Therefore, in order to grasp the tonnage situation, it is necessary to grasp the freight trend of the shipping market and the shipbuilding trend all at the same time.

Table IV-5-8 Japanese Merchant Fleet Breakdown by Principal Types (July 1, 1979)

	Types	Japanese Merchant Fleet				JSA Member Fleet				
		No.	1,000 GRT	1,000 DWT	%	No.	1,000 GRT	1,000 DWT	%	Against Whole Japanese Fleet (%)
1	Oil Tankers	1,731	16,347	31,706	48.9	278	14,159	27,445	53.2	86.6
2	Ore/Oil Carriers	35	2,740	4,971	7.7	35	2,740	4,971	9.7	100.0
3	Ore/Bulk/Oil Carriers	7	551	960	1.5	6	511	896	1.7	93.3
4	Ore Carriers	48	2,372	4,273	6.6	43	2,300	4,140	8.0	96.9
5	Ore/Coal Carriers	12	636	1,118	1.7	12	636	1,118	2.2	100.0
6	Ore/Bulk Carriers	15	759	1,322	2.0	15	759	1,322	2.6	100.0
7	Coal Carriers	39	275	472	0.7	30	256	433	0.8	91.8
8	Nickel Carriers	3	41	69	0.1	3	41	69	0.1	100.0
9	Bauxite Carriers	3	59	96	0.2	3	59	96	0.2	100.0
10	Bulk Carriers	146	2,641	4,461	6.9	61	1,772	2,995	5.8	67.1
11	Grain Carriers	3	64	103	0.2	2	64	102	0.2	99.6
12	Lumber Carriers	48	343	577	0.9	20	151	252	0.5	43.7
13	Pulp Carriers	4	13	20	0.0	1	11	16	0.0	79.8
14	Chip Carriers	25	609	739	1.1	22	609	738	1.4	99.9
15	Car/Bulk Carriers	51	950	1,453	2.2	42	776	1,185	2.3	81.6
16	Pure Car Carriers	151	888	864	1.3	59	540	505	1.0	58.4
17	Steel Materials Carriers	88	60	123	0.2	4	18	33	0.1	26.7
18	Cement Carriers	161	385	636	1.0	57	212	345	0.7	54.2
19	Cokes Carriers	8	3	5	0.0	–	–	–	–	–
20	Limestone Carriers	36	119	193	0.3	15	73	113	0.2	58.4
21	Gravel Carriers	689	240	424	0.7	3	8	14	0.0	3.2
22	Reefer Carriers	142	414	517	0.8	31	124	150	0.3	29.0
23	Chemicals Carriers	509	326	568	0.9	47	44	76	0.1	13.4
24	Liquefied Gas Carriers	178	606	663	1.0	33	427	478	1.0	72.2
25	Full Container Ships	68	1,473	1,361	2.1	54	1,387	1,246	2.4	91.6
26	General Cargo Vessels	3,093	3,821	6,686	10.3	280	1,824	2,744	5.3	41.0
27	Passenger Boats	234	164	68	0.1	18	63	29	0.1	43.5
28	Ferry Boats	477	905	340	0.5	24	103	47	0.1	13.8
29	Other (Tugs etc.)	832	187	32	0.1	38	11	4	0.0	11.2
	Total	8,836	37,992	64,821	100.0	1,236	29,677	51,564	100.0	79.5

Source: JSA Statistics.
Notes: (1) Steel Ships over 100 G/T, excluding Fishing Boats.
(2) % = against DWT

Table IV-5-9 Japanese Merchant Fleet grouped by representative type of ships

Type		Number	GRT	DWT	%
Oil Tankers	1	1,731	16,347,173	31,706,171	48.9
Oil/Bulk Carriers	2 – 3	42	3,291,469	5,931,338	9.2
Ore/Bulk Carriers	4 – 10	269	6,846,816	11,912,899	18.4
Lumber Carriers	12 – 14	77	964,817	1,336,029	2.1
Car/Bulk Carriers	15 – 16	202	1,838,241	2,317,448	3.6
Other Industrial Carriers	17 – 22	1,124	1,220,935	1,898,951	2.9
Chemicals Carriers	23	509	325,772	568,251	0.9
Liquefied Gas Carriers	24	178	606,192	662,559	1.0
Full Container Ships	25	68	1,473,018	1,361,481	2.1
General Cargo Vessels	26	3,093	3,821,352	6,686,312	10.3
Passenger Boats	27 – 28	711	1,069,157	407,775	0.6
Others	29	832	186,681	31,908	0.0
Total		8,836	37,991,623	64,821,122	100.0

IV-5-10 How To Deal with Information Related to Seaborne Transportation Cost and Freight Market (Manual X)

1. Maritime transportation Cost

Necessary Data to obtain the ship cost is shown below.

Table IV-5-10 Necessary Data to Obtain the Ship Cost

Name	Unit
ship size	DWT
load factor	ton/DWT
distance	miles
days in voyage	days/year
loading time	days/voyage
unloading time	days/voyage
speed in laden	miles/hour
speed in ballast	miles/hour
contract price	$
fitting out expense rate	%
depreciation rate	%
interest	%
insurance rate	%
crew expenses	$/year
miscellaneous	$/year
administrative costs	$/year
lubrication costs	$/year
maintenance costs	$/year
bunker oil price	$/ton
bunker oil consumption in voyage	tons/day
bunker oil consumption at anchor	tons/day
loading costs	$/voyage
unloading costs	$/voyage

but generally, the analysis of maritime transportation cost can be divided broadly into two parts:

(1) Calculation and analysis of voyage estimate;

(2) Calculation and analysis of per ton cost.

Voyage estimate is the calculation of the revenue and expenditure of one voyage of one ship.

The profit-and-loss balance is obtained from the freight income of the voyage, the voyage cost* and voyage days.

The figure resulting from the following formula:

$$\frac{\text{Freight-Voyage cost}}{\text{Voyage days}} = \text{Daily Net income}$$

* Voyage cost = $B_k + P_t + C_r + M_s + A_d + L_b + R_p$

where B_k = bunker oil price

P_t = port fee

C_r = crew expenses

M_s = stores

A_d = administrative costs

L_b = lubrication costs

R_p = repair expenses

In other words, the voyage estimate serves as a standard for determining route choice. It shows the merit and demerit of the route choice (for instance, whether via Suez or via Cape, in the case of the Middle East/Europe route) in the event the freight or fuel cost or Canal toll changes.

The per ton cost is the cost of transporting a ton of cargo over a certain route, and is calculated from the voyage cost, the capital cost and the ship cost. This makes possible a cost comparison of routes according to ship size. For the Suez Canal, it makes possible an estimate of the possibility of transit through the Canal and the tolerable Canal toll.

For an actual example of data and method of calculation of the voyage estimate, please refer to JICA System Analysis Report 1979.

2) Freight Market

The freight index is one of the indicators showing the relationship between transport volume and ships and is based on the chartering activities between the users and suppliers of ships. Charters are either single voyage fixture or time charter fixture. The respective charterage indices are published in the form of the chart and table shown below. The medium and long-term contract is for over one year and includes voyage charter, time charter and contract of affreightment.

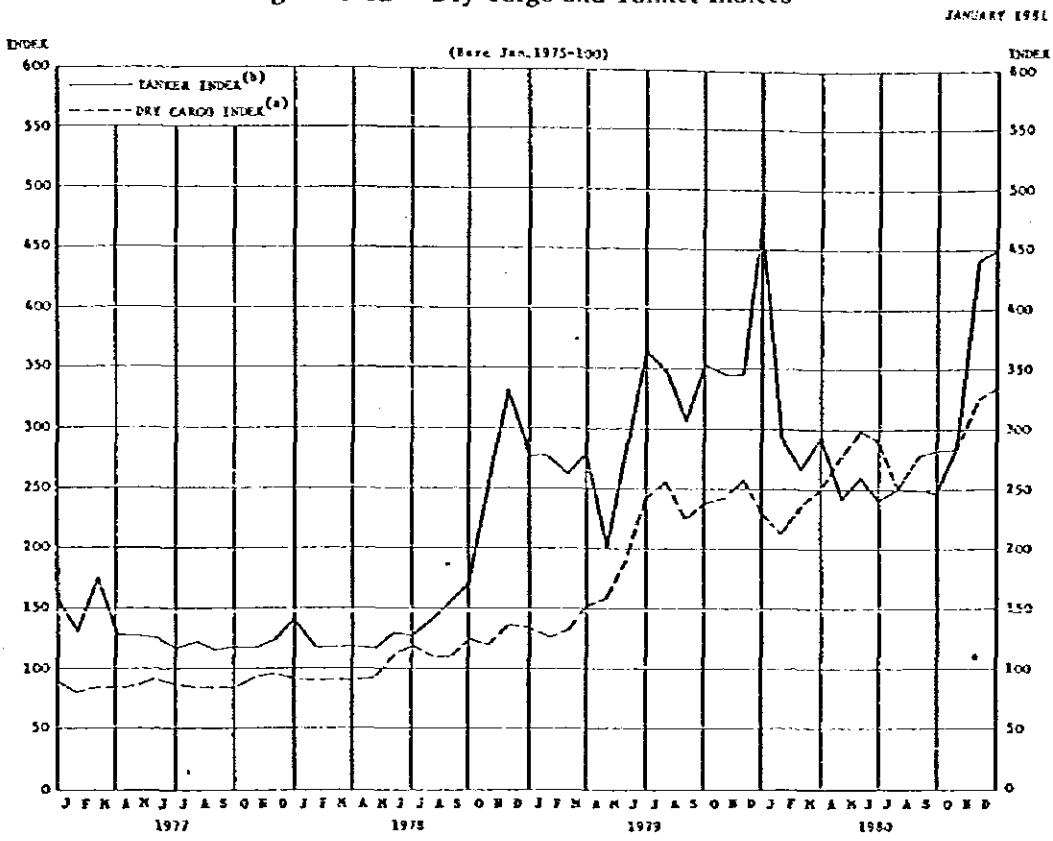
Because the charterer and the shipowner both enter into the contract believing that during the contract period the market will remain more or less at the same level as at the time of singing, the agreed charterage can serve as a guideline for forecasting the future.

The freight level, which is determined in particular by the spot market, relatively short-term voyage fixtures and time charter fixtures, directly affects the volume of Canal traffic, particularly of tanker traffic. This, therefore, is a more productive indicator for short-term forecasts.

With respect to the tanker freight, there is the AFRA (average freight rate assessment) rate which is the weighted average of all charter contracts under which ships were operated during that period. This includes long-term fixtures and ships owned by oil companies, and thus has the

character of an average freight. Therefore, it shows a more gentle movement than the spot market rate.

Fig. IV-5-12 Dry Cargo and Tanker Indices



(a) Dry Cargo Index is based on three trades (grain, US Gulf-Japan 20-40,000 DWCT; coal, Hampton Roads-Japan 50-60,000 DWCT; ores, Brazil-Continent 60-80,000 DWCT).

(b) Tanker Index is based on three trades (Caribs-USEC, dirty 40-69,999 DWCT; Med-Caribs/USEC, dirty 70-99,999 DWCT; AG-West, dirty 200-299,999 DWCT).

INFORMATION MANUAL

TABLE OF CONTENTS

TABLE LIST

FIGURE LIST

1. INTRODUCTION

1.1 Purposes

One of the important tasks of the Economic Unit is to collect data and information concerning the traffic of the Suez Canal and the external environments surrounding the Suez Canal, to prepare the informative materials required for the management and administration of the Suez Canal, and to submit them to various departments and sections requiring such materials in the Suez Canal Authority. And this information manual has been prepared as useful means for facilitating the collection, analyses, evaluations, storage and utilization of such data and information.

1.2 Configuration of Manual

This manual has the following configuration:

Chapter 2. Filing of Information

Outline of the filing of information is described in this chapter.

Chapter 3. Information Sources

The sources of data and information required for the work of the Economic Unit are classified and filed in this chapter.

Chapter 4. Analysis and Evaluation of Information. Mainly for economic research.

Chapter 5. Information System for Canal Traffic Forecasting Model. Mainly for system analysis.

Chapter 6. Storing and Updating Information. Methods for storing and updating data and information obtained in accordance with Chapters 4 and 5 are described, and actual filing system is proposed.

Chapter 7. Information Services

The form of information services to be performed by the Economic Unit is described in this chapter.

Chapter 8. Future System

Arrangement of the data bases is rapidly progressing throughout the world, and such data bases can be now utilized through the communication lines. The possibility of such utilization and the direction of installation of data bases by computer in the Suez Canal Authority are described in this chapter.

2. CLASSIFICATION AND RETRIEVAL

2.1 Roles of Information System in the Economic Unit

The relation between the analysis work by the Unit and the information system will be described hereinafter by making reference to Fig. 2-1.

These data must be constantly collected from the traffic data prepared by the Transit Department, and from journals, magazines and other sources published by various organs throughout the world.

Currently, the Unit obtained the traffic data from Suez Canal Report issued by the Suez Canal Authority and from traffic record issued by Transit Department. Information and data concerning the external environments are being obtained from various kinds of journals and manazines subscribed.

These informative materials contain a large amount of information and data, and excellent work output can be provided by effectively utilizing these materials. And, without utilizing these data and information, the daily work of the Economic Unit such as model analysis, economic analysis, preparation of bulletins and short reports cannot be carried out. In order to storing a large amount of these data and information in such a manner that they can be immediately utilized in the daily work, these data must be classified, indexes have to be prepared, and retrieval system has to be provided.

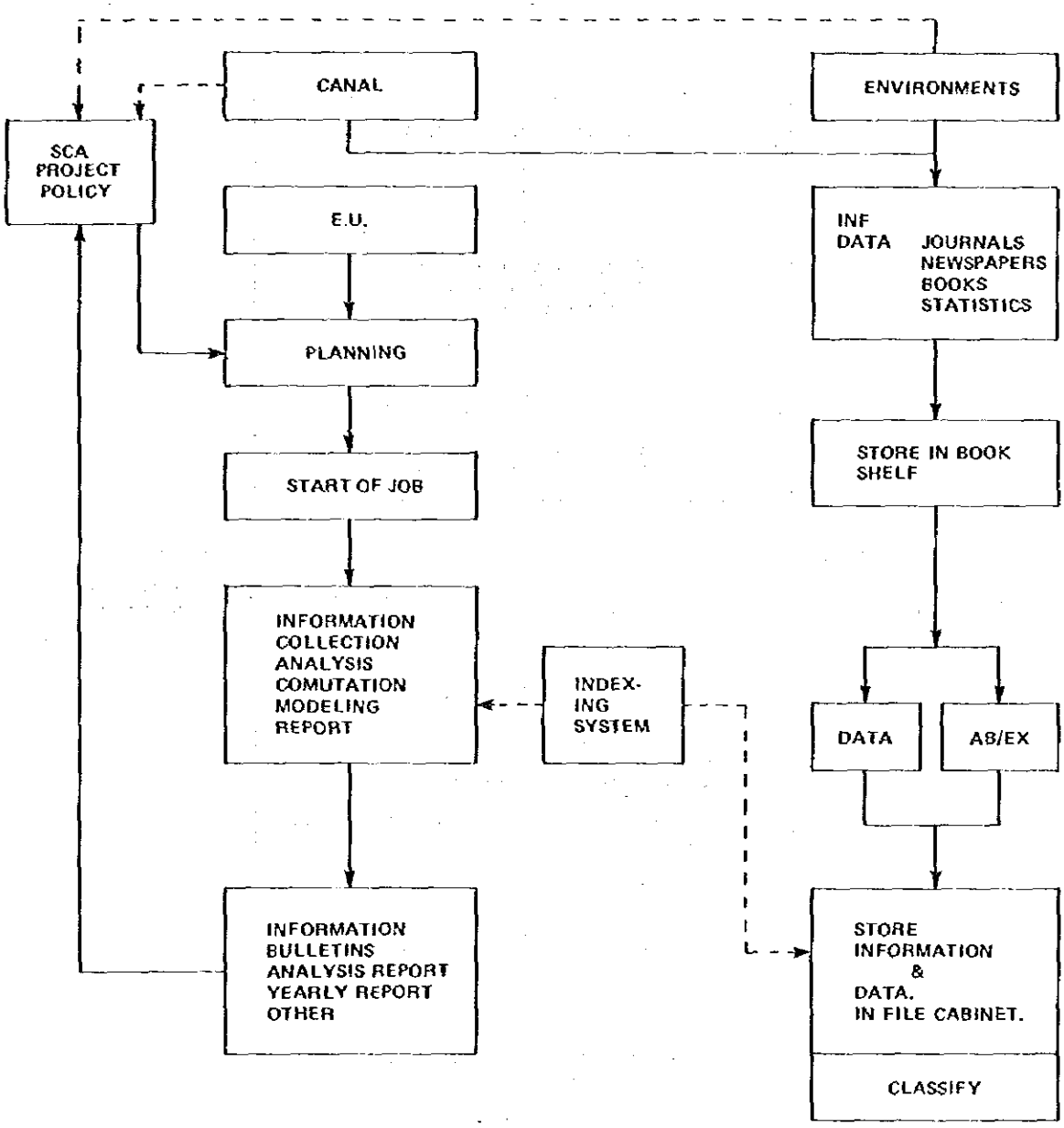


Fig. 2-1 E.U. & Its Information System

2.2 Indexing and Retrieving

For effectively utilizing, as required, a large amount of data and information collected, both indexing and retrieving have to be properly carried out as stated in foregoing paragraphs. The process of indexing and retrieving required for the work of the Economic Unit is shown in Figs. 2-1 and 2-2.

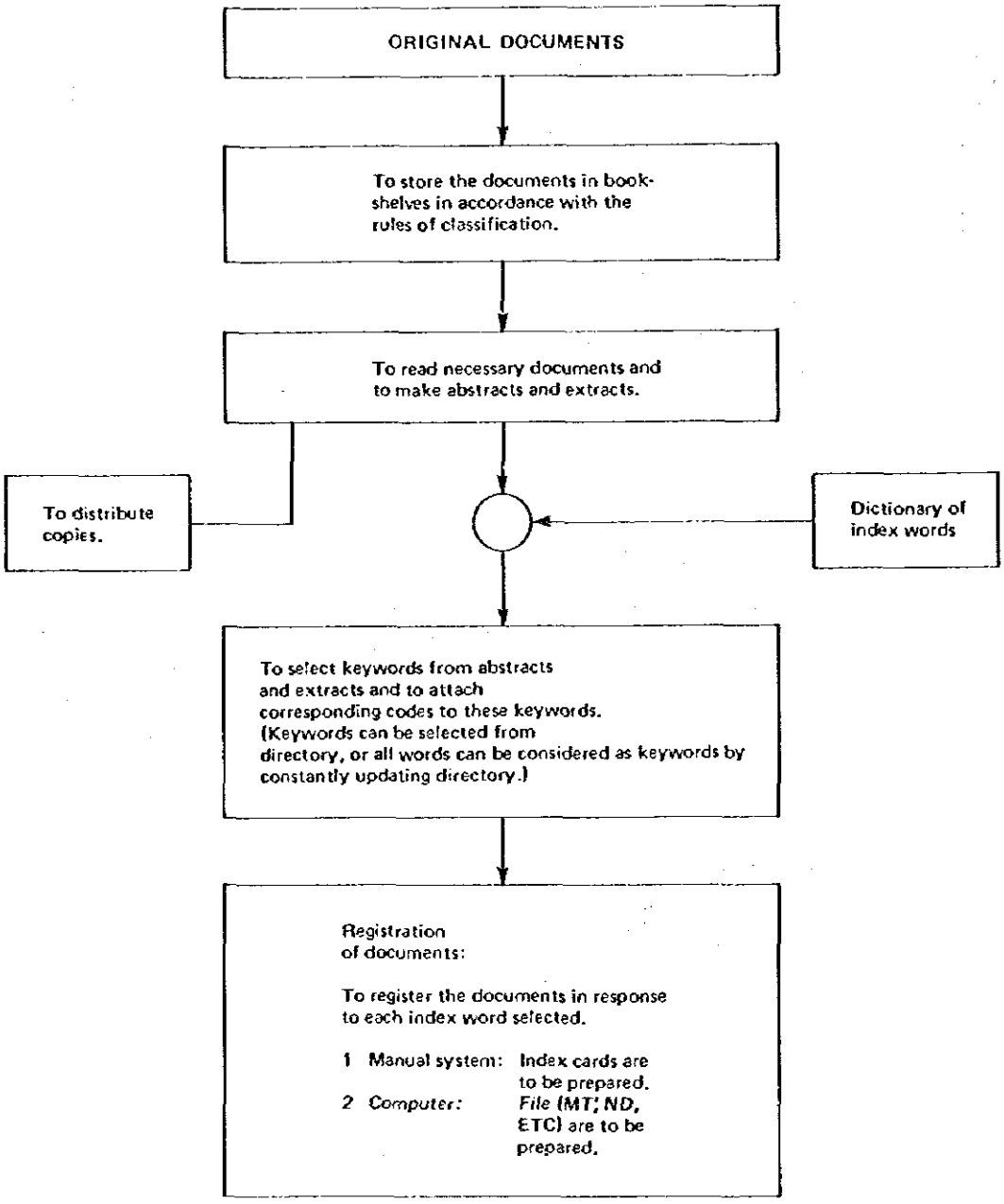


Fig. 2-2 Process of Indexing and Registration

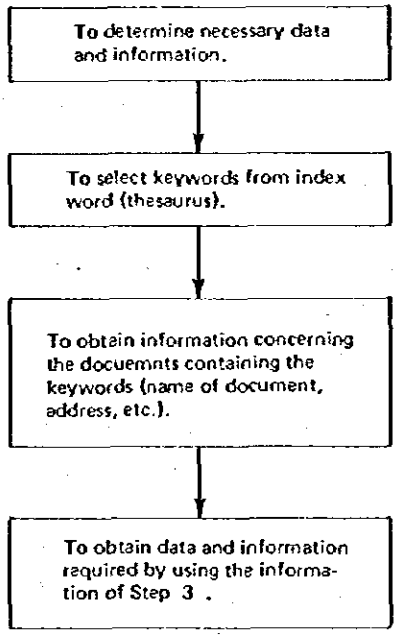


Fig. 2-3 Process of Retrieving

2.3 Preparation of Indexes

In order to quickly find specific information required from a large amount of data and information stored, it becomes necessary to attach a tag representing the contents of material to each of informative materials and to file these materials with reference to such tags.

For instance, author's name and title of book are considered to be few examples of such tags or indexes representing the document, and this document can be found after searching the lists arranged in alphabetical order. In addition to the method based on the author's name and title of book, the documents can be also classified on the basis of subjects. In this case, subjects such as world economy and tanker tonnages will be attached to the informative materials on hand depending upon their contents, and they will be filed basing upon these subjects.

Preparation of indexes is the basic matter when filing information, and its methodology will be briefly described hereinafter.

2.3.1 Assigned-Term and Derived-Term

Words for retrieval can be generally classified into assigned-term system and derived-term system. For the assigned-term system, a person who prepares the indexes must evaluate the contents of materials by himself and determine specific index words (descriptors) to be added to

such materials. In the derived-term system, all index words (descriptors) are taken out from the original documents.

Authors' list, list of book titles and list of natural languages are all used in the derived-term system, and subject list and subject indexes controlled by the thesaurus are required in the assigned-term system.

Typical index words listed below will be described in more detail hereinafter.

(1) Natural language system

(2) Alphabetical subject headings

(1) Natural language system

In the natural language retrieval system, the terms actually used in a document by author are utilized as descriptors (representatives of contents of the document). Therefore, as same as the derived-term system, a person who prepares the indexes can perform his work almost mechanically without thinking too much. Thus, new work can be easily started since index words and thesaurus are not needed in this work. This natural language system based on the utilization of computer has been widely utilized in recent years because of the following reasons:

① Words used in the abstract are all utilized so that there is no loss in information.

② New index words created can be immediately adopted.

③ Error due to person who prepares the indexes is not created (mechanically oriented).

④ Accuracy of retrieval is high since the terms used by author are utilized.

On the other hand, the natural language system has the following shortcoming:

1) From user's point of view, the probability of user's encountering with unrelated information and data is high.

(2) Alphabetical subject headings

This is the method used as index words by many libraries. One of good examples of this method is the dictionary type catalogs. The basic purpose of this method is to give at least one to two index words (descriptors) to the searcher, thereby allowing him to come closer to data and information. Though the level of specificity of this method is low, it functions very well since it was originally prepared for the retrieval of books in public libraries and scientific libraries. The advantages of this system are as follows:

① The number of documents to be retrieved is very large and the subject headings must be scanned by users.

② However, on the other hand, this system is advantageous in that many other related documents can be seen by the searcher.

③ Retrieval system of this type can be prepared easily, and many subject heading lists have been published.
(Such as Library of Congress List of Subject Headings, etc.)

④ Shortcoming of this method is the occurrence of synonyms and same-type antonyms and the necessity of attributes.

2.4 Retrieval

Various methods of information retrieval are available such as the simple card method or the computerized large system, and an appropriate method should be selected depending upon the amount of information and purposes.

Most of the basic problems in information retrieval processing will occur in the retrieval system using index cards. Thus, the information system using the index cards will be described below.

If there is a certain document (document No. 1981, for example), and the following four keywords are described in the information of the document:

Keywords of information described in document No. 1981:

TANKER
ARABIAN GULF
SHIPPING MARKET
CRUDE OIL

then one index card will be prepared for each keyword determined for this document. On this index card, at least this keyword and the address of the location where the document is stored have to be included. In the example shown in Fig. 2-4, four cards are prepared and the document No. 1981 as address and four keywords of TANKER, ARABIAN GULF, SHIPPING MARKET and CRUIDE OIL are indicated.

Index cards prepared as described above for each document will be then filed with respect to the order of keywords (such as alphabetical order) to create an index card file.

When searching the information, it is required to find the cards on which the keywords related to the specific information being searched are shown. Then, the location of the information can be determined from the document No. shown on the cards.

Generally, the following information is contained in the index cards:

1) Index: Shown in the form of natural language, symbols, figures, or codes.
2) Title
3) Bibliography: Title of magazine, name of author, volume, number, pages, year of publication.
4) Abstract
5) Location of original information

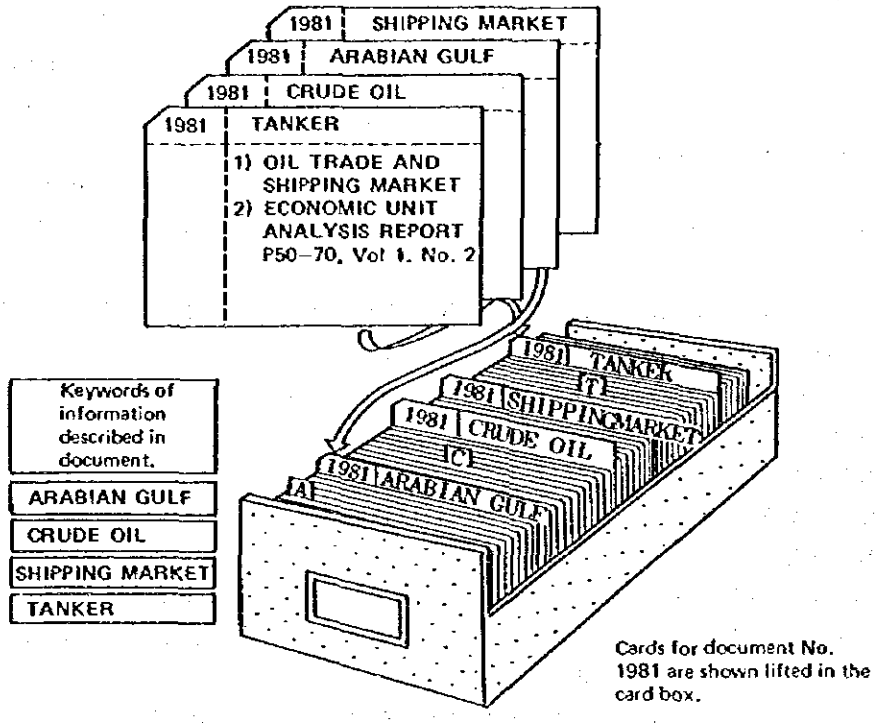


Fig. 2-4. Index File Using Cards

2.5 Thesaurus

Thesaurus is a tool for controlling the index words in alphabetical order, and controls the language in the following manner:

1 Determines whether the index work can be used or not, by which the size of vocabulary is restricted.

2 Indicates the relation between one word and other words. This can be done by indicating broad term, narrow term and related term for each word. Then, person who prepared the index and searcher will be able to know whether the retrieving and indexing in the possible range have been fully performed or not.

3 In addition, controls the size of vocabulary by replacing specific terms with more general terms by using UF (USE FOR).

Though the construction of thesaurus is performed empirically, its work is complicated and time-consuming.

3. INFORMATION SOURCES

3.1 Table of Information Sources

Find out information sources which contain necessary data and information required for the analysis of economic environments of the Canal, in the table. 3-1.

3.2 Items of Information Sources

The sources are classified and listed by the following items:

No.	
100's	World economy and trade
200's	Seaborne trade
300's	Energy and other resources
400's	Fleet, shipbuilding and maritime transportation cost
500's	Shipping market
600's	Ports and harbours
700's	Magazines
800's	Surveys and forecasts
900's	Directories and others

3.3 Classes of Information Sources

The sources are classed in three groups, A, B and C according to the level of their relationship with the Canal.

A: Basic and important sources, which should be referred to and analysed by the Economic Unit.

B: Sources of secondary importance, but useful for detailed analysis of specific items when necessary. It is recommendable to be treated as "A" in future.

C: Includes sources for analysis of rather specialized fields, which require very detailed data or informations.

3.4 Important Sources

1) The following are 'special A' which should be read by all members of the Unit.

UNCTAD:	Review of Maritime Transport
OECD:	Maritime Transport
Fearnley & Egars: (Fearnleys)	World Bulk Trade
" :	World Bulk Fleet
" :	Review
J.I. Jacobs:	World Tanker Fleet Review