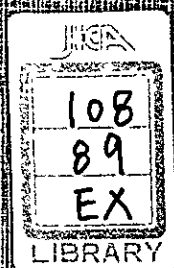


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**REPORT ON GENERAL MANAGEMENT
FOR
IMPROVING ENVIRONMENT OF CONSTRUCTION
INDUSTRY AND ENTERPRISING UNITS
IN
INDONESIA**

DECEMBER 1971

**OVERSEAS TECHNICAL COOPERATION AGENCY
GOVERNMENT OF JAPAN**



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1. FOREWORD

In connection with the Five Year Development Plan, the Department of Public Works and Power has stated in its general policy's outline that nearly all of the development projects always consist of civil engineering works and considering this fact it will be urgent and very important to promote the Construction Industry in Indonesia.

The Department of Public Works and Power as a development agency in the field of Construction Industry has to develop the construction enterprises, instead of doing the job itself by the existing organization of the Government. In this connection, project formulations about the Government's policy must be composed, comprising the following aspects:

- A. System and procedure for the planning and execution of the development projects
- B. Capital and Credit
- C. Equipment
- D. Education and manpower upgrading

All these are necessary in order to develop the potentials of the organization units and to achieve a conducive and favourable climate or environment in which these units will be operating.

For the purpose of these project formulations, technical assistance from one of the IGGI donor countries was requested, to accept the application of the Government of Indonesia for dispatching an expert under the scheme of Colombo Plan.

The writer, Dr. Yasuji TAHARA, President of JAPAN BRIDGE AND STRUCTURE INSTITUTE, INC. and member of the counselor committee of THE ASSOCIATION OF OPERATION RESEARCHES OF JAPAN participated in this duty, and was loaned by the Government during the designated period of his obligation from 7th to 21st July, 1971.

He was also required to keep close connection with the authorities in the Department of Public Works and Power, the Board of Directors, State Contractors and Consulting Engineers in making his initial survey and in composing the complete design/project formulations about the Government's policy concerning the four subjects mentioned above, indicated as articles A, B, C and D.

The tentative report which has been submitted already was drawn up with attentive cooperation and coordination of the counterparts and key members in said organization of the Government, whose names follow:

Coordinators

Ir. S. Danunagoro

First Director, Board of Directors

State Contractors and Consulting Engineers

But, unfortunately, he could not confirm to secure any possible assurance for the propulsion of this newly proposed movement by all means, until he completed his final report in which only a few supplemental description can be referred in addition to the tentative one, owing to the reason.

2. BACKGROUND INFORMATION

Within the short time available, of course it is not possible to get all the necessary data to present the complete picture and analyze the conditions and situations of the construction industry of Indonesia at present. However, it might be desirable for the purpose of the Government itself, especially in planning the expansion of the industry and improving the status and technical ability of the Enterprising Units, to begin the systematic collection and analysis of data pertaining to the general situation of the construction industry. This continuous compilation and rearrangement of backdata by the responsible organization of the government will serve very well in making the decisions later on concerning ways to improve the industry, and also eliminate waste labour in doing the same job again and again.

While supporting quantitative and more accurate data should be available in future times, some observations could be made as follows:

2-1 Present Status of the Construction Industry

a. Corporate forms

The larger Enterprising Units are those owned and operated by the government under the corporate form of State Enterprise (Perusahaan Negara, PN). Mostly, or all, are the nationalized Dutch companies, reorganized into PNs under Public Law No. 19, 1960. According to each specific field of operation, each enterprising unit is placed under control of the appropriate department of the Government of Indonesia.

The Department of Public Works and Power exercises control over the engineering PNs (consulting, contracting, and construction materials manufacturing) consisting now of 14 Enterprising Units. It has done this through the organization of the Board of the Directors, State Contractors & Consulting Engineers (Badan Pimpinan Umum Perusahaan Bangunan Negara).

Traditionally the Department of Public Works and Power is in charge of building, highway, and irrigation works (more recently also includes electric and gas power), and this seems to determine also the type of the PNs placed under its auspices. Thus, for example, the designing and construction of railways, harbours, airports and their facilities may be done by the PNs under the Department of Communication, while some of the construction materials manufacturing and factory constructing may be done by the PNs under the Department of Industry. In some cases of course there may be overlapping of work, because of the general nature of the engineering.

Private corporations in construction industry seem to be less powerful, but their role should be examined in further developments. Also noticeable are the joint venture units, such as the Pembangunan Jaya group of the City Government of Djakarta.

b. Scope of the enterprising units

The PNs of the Department of Public Works and Power employ engineers ranging from 20 to 90 persons in number, with educated technicians usually three times the number of engineers. The average number of administrative and other supporting personnel is in the ratio of slightly less than one to one, with respect to the technical personnel.

Four of the larger enterprises account for more than 10,8 milliard rupiahs revenue in contracting works in 1970, which is almost ten times the volume of 1967. It is noted that in general all the PNs are beginning to stand up again after the uncertainties created by the political and economic situation of the country in 1965.

Most contracting units have an adequate supply of equipment, but its full employment for productive purposes still remain a problem of each unit.

The larger units have branches all over Indonesia, from Sumatra to Irian Barat. The types of work done follow closely the traditional boundaries of the jurisdiction of the Department of Public Works and Power, but noticeable extensions have been made also to construction of piers, dredging, railway bridges and airport aprons and runways.

2-2 Expected Developments

In 1966 the Provisional Council of the People's Representative (Madjelis Permusjawaratan Rakjat Sementara) - the highest legislative body of Indonesia - passed a resolution requiring the government to release total control, ownership and operation of State Enterprises, and henceforth limit itself only to administrative and development support functions.

As the result, in 1969 laws and regulations were enacted, recognizing three forms of State Enterprise : Public Agency (PERDJAN - Perusahaan Djawatan), Public Corporation (PERUM - Perusahaan Umum), and Corporation (PERSERO - Perusahaan Perseroan). Each responsible Department must then prepare the conversion of its PNs into appropriate types.

All the PNs under the Department of Public Works and Power are in the process of conversion to PERSERO or PT. The safeguarding of the public capital will be entrusted to the Department of Finance, but the technical departments will be given substitutive power to exercise control and direct the development of the units.

Meanwhile, the year 1969 was also the beginning of the Five Year Development Plan of Indonesia. Considering that 50% of the development projects consist of civil engineering work, and also that the expected volume of work in 1974 will be two and a half times that of the 1969 volume, this task of the Department of Public Works and Power to develop the construction industry in Indonesia is very great indeed.

2-3 Some Environmental Problems

Non-standard procedure of tender and its requirements makes life very difficult indeed for the contractors. Competition in efficiency can rarely be judged on the basis of the present cost estimating system which was first introduced in 1940.

Different building construction codes and specifications exist in different parts of Indonesia, and modern constructions may require either DIN (German), ASTM, AASHTO (America), BS (British) or JIS (Japan) systems to be followed.

A non-competitive market in equipment leasing is created by official or unofficial leasing activities of many government and military units.

There is no standard classification system of the contractors, making the process of contract awarding very tedious and liable to unfair practices.

Competition from foreign companies, usually as a result of specifications attached to international aids, is increasing. Furthermore, technical upgrading of the domestic enterprising unit may cost too much in initial capital for machinery, equipments and components, while there is still a general feeling that labour is cheaper.

'Feudality' is still very strong, especially in skilled labour groups, resulting in foremen acting as independent subcontractors.

Finally, some problems have also been caused by non-standardized quality of building materials and component, and difficulties of transportation.

3. CONSTITUTION OF CONSTRUCTION INDUSTRY AND ITS PROBLEMS

The constitution of the Construction Industry is somewhat different from other modern industries such as mechanical, electrical and chemical ones, especially in respect to their characters. This special character of the Construction Industry may be expressed in a simple word, less advanced or left behind, which is caused by its process of growth and the distorted environment of the society around it. While the engineering usefully applied to it is a great source of all other engineerings prevailing in the world today: its name is Civil Engineering, as you know well.

Therefore, the essential manifestation of the constitution of this industry may be asserted as a limitation to its improvement of productivity, its promotion of modernization of management, and its amelioration of an environment in which it is breathing.

It might be suggested that this limitation be resolved into components discussed below.

3-1 Administrative limitations

a. Feudality

If we at a glance trace back the history of Construction Industry to its origin, we could easily find its basic constitution built around the suppliers of labour and the agencies of employment so as to cause growing boss and inspiring natural jurisdictions.

This basis still remains as an offensive odour of feudality in its body.

b. Humanness

The construction industry is likely to be subjected to sustain the unavoidable influence of humanness, like those of human intuition and human relation through all routines of its operations of trading, contracting, manufacturing, constructing, and financing. This is the opposite reason why the ordinary rules and theory of productive industries may not be conformable to the construction industry in usual cases when we set up planning and execution of the intended project.

c. Multiformity

The construction industry involves too many kinds of branch industries of civil engineerings (such as the engineerings of roads, bridges, railways, harbours, and many other kinds, besides architectural engineering) confusedly mixed in a vessel.

The conspicuous variety among each kind of industry can be recognized by its own characteristics of source of the fund for a project, investment percentage for fixed capital against current assets and equipment, conditions for loan, duration of work and fluctuations of the execution, safety and insurance for the implementation of work, geographical situation and meteorological condition of the execution, besides the technical aspects itself.

Moreover, the traditional treatments of marketing, procedures of bidding, contract and payment are not the same for each kind, depending on the customs of both client and contractor. These are also due to the complicated kinds of quantity of the many results of the construction industry.

In connection with the matters mentioned above, we have to pay further attention to the fact that there exists so large a variance between the top and the bottom classes of contractor, in respect to their scales of productivity, in each kind of construction. Almost half of the total amount of output of the annual budget for the projects will be captured by a few of the top class contractors, while the rest will be divided among a lot of lower class ones.

It is very interesting to note that some groups of the low class working as sub-contractors might be very important and can not be substituted by others for the accomplishment of the work, simply because they are distinctly acquainted with a special technique of the profession.

These cause construction industry to be comprehensive in its kinds of quantity and always obstruct the improvement of its enterprising units.

d. Wandering of Work Site

Needless to say, almost all construction works are undertaken on the sites where they are to be built and these sites are often forced to wander from here to there according to the schedule of projects. Moreover, the average duration of a job seems to be comparatively short in general, so the construction enterprise cannot keep its permanent location anywhere and anytime like the other kinds of enterprise such as machinery, electricity, or chemistry.

Therefore even in respect to the management for the execution of the work it is quite a difficult matter to control and administer all these wandering jobs simultaneously by the man who is responsible for the execution of all the works.

This disadvantage brings a certain limitation to our industry.

e. Procedure and Contract Form

For public works project, the government still takes its position on the side of the client while the new enterprising units will be always positioned on the opposite side. The procedure and the contract form between these two sides then will likely come to a unilateral result, despite the steady efforts of the contractors to bring these into the better form of a bilateral resultant.

This tendency gives an injurious effect to our improvement of the management of construction works and to the business of both the client and the contractor.

f. Expansion of Productivity

The orientation toward mechanization of the method of execution of construction works and adoption of modern techniques of course will be welcomed and agreeable, but it has a general tendency of inviting an excessive expansion of productivity, which will not balance the demand and cause the decrease in the ratio of profit to total amount of income, due to the heavy burden of depreciation of the resulting surplus of equipment.

This is one of the most significant points of the construction industry management: controlling the limits of maximum and minimum productivities by operating equipments so as to correspond with the demand of works. This propensity seems to be somewhat different from the general characteristic of other productive industries, where as a rule mass production techniques will be generally useful for letting down the unit cost of a product, by means of the enlargement of equipments.

This may also be called one of the limitations of the construction industry.

3-2 Financial Limitations

a. Marketing

Generally speaking the production in the field of construction industry is always made by the order of the client; the producer might not be able to stock some reserves of construction works for the purpose of speculation.

This peculiarity invites a rigid and conservative attitude of contractors in their business marketing. It causes, in addition, an unfair dumping of biddings owing to the lack of voluntary creation of their market and the resultant violent competition among themselves.

Such an unfavourable atmosphere will not be so remarkably observed in other fields of modern productive industry.

b. Investment of Capital and Credit

It is indeed a very important matter of interest to the investors to check the efficiency of their contribution of capital constantly.

The amount of net profit per fiscal year due to the annual activity of the productive or industrial unit must be referred to the total amount of capital invested by

the investors and the debt within a corresponding year, as an index of the efficiency of their investment. It will serve also to suggest an index for paying dividend to the investors, according to their respective amounts of contribution to the capital.

This index factor may be expressed as a product of the other two independent factors:

$$\begin{aligned}
 & \frac{\text{Amount of net profit per a fiscal year}}{\text{Total amount of the capital and the debt within a corresponding year}} \\
 = & \frac{\text{Amount of net profit per a fiscal year}}{\text{Total amount of income owing to the completion of works per a corresponding year}} \\
 \times & \frac{\text{Total amount of income owing to the completion of works per a corresponding year}}{\text{Total amount of the capital and the debt within a corresponding year}}
 \end{aligned}$$

Obviously, the first term of the product in the right half of the equation means the ratio of interest against the cost needed to perform the works throughout the year, where we can assume that the total amount of income per respective year is always the algebraic sum of the cost plus profit of that year and both are nearly the same in their values.

On the other hand, the second term of the product means the efficiency of the fixed capital invested as a revolving fund, to the objective works done in the respective year, so this factor will be expressed by a number of the rotation of fixed capital and debt necessitated to perform the works.

The former factor is generally independent of the function of time and its value will only be subjected to the productivity and technical ability for the execution of works. While the latter factor is much influenced by the time function in the technique of operating the finance, especially in respect to economic standing point of view.

It is interesting to note that the value of the former factor is comparatively small and the latter relatively large in the case of the construction industry, in comparison with other modern productive industries. Furthermore, the larger the value of the former factors grows up, the smaller the latter becomes: in obedience to the trend of the improvement of the construction industry, where the degree of improvement in modernization or mechanization of the execution of works within the industry will of course spontaneously serve to accelerate the speed work.

For instance, it might generally be said in the business world of Japan that the numerical value of the former factor ranges between 2.6% and 6.8%, while that of the latter varies according to the kind of construction industries themselves, like as ranging between 90% and 120% for general contractors and about 50% for the bridge makers.

Thus you can conclude in general, the ratio of net profit to the total amount of capital and debt necessitated to perform the given works within a corresponding fiscal year, we may compute it at the maximum 6.5% and the minimum 3.0% for the general construction industries dealt in by contractors, but can assess it at only 1.5% in average for the normal bridge-fabrication enterprises, in status quo of Japan.

c. Accounting and Depreciation

Cost estimation and assessment in construction industry seems to be am-

biguous in comparison with that in other modern industries. It is difficult to make it on the basis of the principle and rules of general cost accounting because the standard rate of the elementary unit-job for various resources of works, so called unit cost, fluctuate considerable in wide range of variance according to each condition of work. Moreover, the miscellaneous allowance for the incidental and temporary payment cannot be determined precisely before the beginning of work, and thus is often neglected by the ordinary accounting codes. This then results in the ambiguity of the estimation and assessment of the amount of profit in overhead.

New proposals of more reasonable method of cost analysis, as an accounting system for the construction industry, may be expected in the future.

It is one of the reasons why the bank, as a Government's agent, will not easily sponsor such kind of an enterprise, and this surely can be called another limitation of the construction industry.

In connection with the accounting of costs, we have to not also the depreciation of the equipments. This depreciation can be divided into two categories as follows.

The first category of the depreciation is that for equipments in operation, accounting of which must be considered as a part of the direct cost. The other category of the so called depreciation must be applied to the expenses for equipments in waiting, including the costs of maintenance and repair, salary and running cost of the waiting drivers and operators, which should be covered under the corresponding account code as overhead.

If the demand of works is not sufficient for providing and operating a majority of existing equipments, then the efficiency of the operation of total equipments will decrease, and finally it causes an unfavourable yield of the operations of fund due to the heavy burden of the idle liability.

The last problem I want to point out is concerned with the treatment of those expenses pre-invested for the future development of construction industry, under the codes of cost accounting. This is also one pending problem not clearly solved, yet it is very important especially in respect to this field of construction industry.

All the problems mentioned above compose a bottleneck limiting the future progress of the construction enterprising units.

3-3 Technical Limitations

a. Experimentalism

Generally speaking there are no other kinds of productive industries which depend so much upon the experimental technique as the construction industry. Theories which are applied to actual works must always be amended in practice, according to the operational conditions.

This tendency fosters the experimentalism in the engineering within the construction industry.

b. Dependency

The progress of the techniques in construction industry cannot be independent from those in other productive industries such as electric, electronic, chemical, metallurgical and mechanical ones, so that the development in the latter always has a leading position in promoting the construction industry, any time and anywhere in the world.

c. Manufacture against Nature

The construction industry is always striving against the nature, in building anything on the globe. It is also strongly opposed by the powers of nature, while other modern industries such as mechanical, electrical and chemical ones are supposedly under the perfect control of artificial techniques, being able to manufacture any kind of artificial products by their own systems and powers.

This is also a kind of technical limitations of the construction industry.

4. SPECIAL DESCRIPTION FOR THE IMPROVEMENT OF ENTERPRISING UNITS

Following are the special descriptions on the nature of the Enterprising Units which will preferably be established in the not too distant future in Indonesia, instead of the present State Contractors and Consulting Engineers.

4-1 Constitution of the Proposed New Enterprising Units

The necessary subjects on which the proposed Enterprising Units should be founded are listed below.

- a. The purpose of the establishment is the achievement of a sound management and upgrading of the technical power of the Enterprising Unit as a working organization of Construction Industry.
- b. The new Enterprising Units must mainly be based on the existing organizations and system of the State Contractors and Consulting Engineers, but the number of units in each type of engineering fields (consulting, construction, and manufacture) should be the fewer the better.
- c. The scope of the new Enterprising Units has to be determined within the State Contractors and Consulting Engineers principally, according to each kind and volume of work being executed in fact. It might be recommended rather to reduce the existing manpower, equipments and funds at the beginning stage.
- d. The new Enterprising Units must be managed and operated within bounds of their own faculties, but both financial and technical aids by the Government should be still available to the utmost.
- e. Investment of capital and credit for the new Enterprising Units and the contribution to the upgrading of technical power from foreign donor countries may be welcomed, especially in the initial several years.

4-2 System and Procedure for Planning and Execution

A new BIRO for the administration of the new Enterprises must be provided in the Government system, preferably conducted by the Minister and his staffs. This BIRO will be responsible for the general affairs, registration, qualification and classification of contractors, and administration of the execution of works, the welfare of the contractors, and all the necessary affairs of the construction industry and its enterprises, providing new laws and regulations, etc.

Also in this paragraph, some discussions must be made in respect to the effects of the application of the electronic system and operations research technique. The BIRO for operating electronic computer is the existing organization called BIRO of Science and Technology with its Computer Centre.

a. Organization and Function of the Central Controlling System

The main skeleton of the central controlling system for the proposed new organization of construction enterprising units is shown by Figure 1.

The new BIRO of Administration for Construction Industry and Enterprise should be established as an organization of the Government which is responsible mainly for the field of administrative and assistant works of the business of construction industry and its enterprising units, involving such works as: general affairs and welfare of the enterprising units; registration, qualification, classification of contractors; bidding procedures for tenders; contract and payment system, etc. It is also responsible for the enactment of laws and regulations necessary for the administration of the construction industry and its enterprising units.

The existing BIRO of Science and Technology is of course responsible for such duties as it already discharges presently, namely an allotment of technical administrative and assistant works for the construction industry and its enterprising units, involving such works as: establishment of standard specifications and standard designs, general application of electronic system and operations research technique (PERT, CPM, etc) to engineering and management of works (planning, design, and execution of the PROJECT), feasibility studies and priority setting of the proposed projects, budget allocation and control for planning and execution of the projects, personnel administration and equipment control system, etc.

Both BIROs will act as a pair of wings of central administration by the Secretary General under the direction and supervision of the Minister, each according to their designated territories.

The Central Committee will be responsible for the setting up of policy and recommending it to the Government, with the assistance of Sub-committees which will be responsible for the same work in respect to each engineering type. Both committees will act as counselors and will likely consist of an adequate number of Government representatives, the Director of the Enterprising Unit, Banker or Investor, and men of special knowledge and experience in the construction industry.

We must also refer to the terminal organization of each group of the Enterprising Units.

It might be suggested that the member from the Enterprising Units in each group should desirably be selected in respect to the present status within the State Contractors and Consulting Engineers (see Figure 1), especially at the initial stage of its establishment.

It might also be suggested that in principle the number of Units in a group should be as few as possible in consideration to the soundness of the enterprise. Special attention to each group should be based on these considerations:

- for the group of CONSULTING ENGINEERS, we have to esteem the specialized faculties and technical authorities of each unit,
- for the group of CONSTRUCTIONS, it is better to reduce the number of Units if possible,
- for the group of MANUFACTURES, it may be considered to provide two different sorts of Units, steel manufacturing unit and concrete products (precast piles, pipes, prestressed concrete beams, slabs and blocks) unit. Presently there exists only one unit for the former, none for the latter. This enterprising group, especially the unit of steel manufacture, has a close relation to the jurisdictions of the Department of Industry, so as to be recognizable as dissimilar in quality from other groups.
- and for the group of LEASE OF EQUIPMENTS, we do hope to realize its establishment by any means, because this group might be able to save the group of CONSTRUCTIONS from a heavy burden of compensation due to their retaining a lot of unproductive equipments.

b. Application of Electronic Data Processing System and Operations Research Technique

An EDP (Electronic Data Processing) system for any organization is based on electronic computers which are presently available in many types and makes (from manufacturers such as IBM, NCR, CDC, Burroughs, Honeywell, General Electric, Telefunken, etc.). Just like any other machines or tools, each computer has also different operating characteristics and utility, according to its specified purpose.

It is true that a management information system or even ordinary computing/calculating jobs are dependent upon the type of computer used (i. e. its "hardware configuration"), because such system necessary have to be built "around" to hardwares. However many computers now exist of the "general purpose" type and very wide range of applications.

Thus an organization planning to use the EDP system can now choose the computer most suitable for its conditions, without great risk of obsolescence.

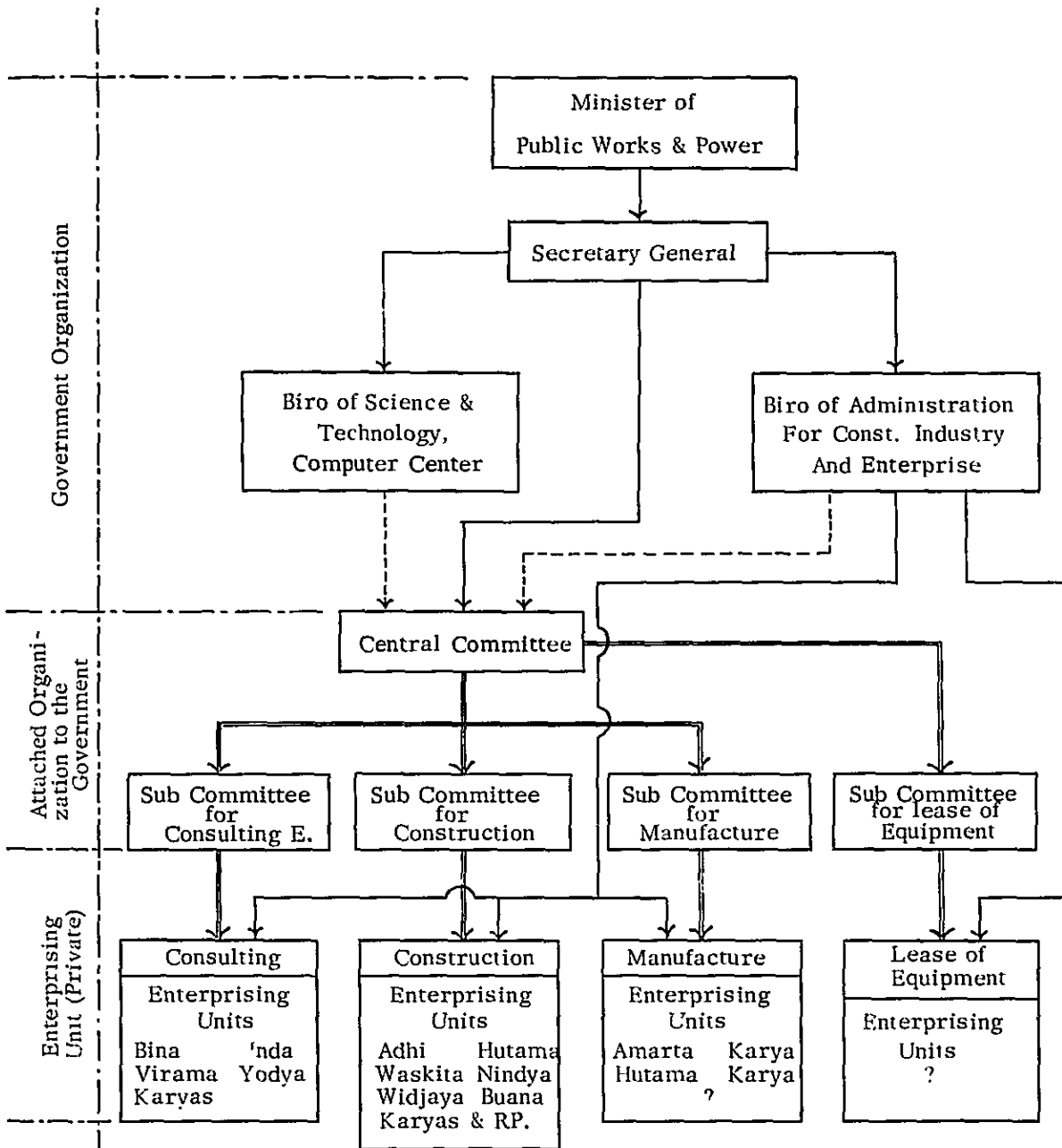
Basic capabilities of computers

In principle there are three basic capabilities of a computer which are utilized within the data processing environment:

1. Stores program or "memory"
2. Large data storage
3. Fast computations

The "stored program" concept makes it possible for the user to instruct or "program" the computer only once, and it will continue to do the same operation

ORGANIZATION AND FUNCTION OF
CENTRAL CONTROLLING SYSTEM



Note: — Black line shows the line of Administration System.
 - - - Black dotted line shows the line of Coordination System.
 = Double line shows the line of Counseling and Consulting System.

Fig. 1

over and over again if required. This makes it very useful for applications to repetitive tasks/computations, such as weekly or monthly payroll, periodic purchasing, inventory control, project monitoring, or even standardized engineering calculations. It is then conceivable that in combination with the computer's other capabilities (i. e. very large data storage and fast computations) very efficient data processing should result.

When to apply a computerized system

This is a very difficult question to answer, mainly because the benefits of computer usage are not easily measured in terms of hard cash, while the investment looks very considerable at first glance. However, if it was possible at all to measure the present organization's expenditures in getting the right data for management (i. e. cost per data unit), cost in time delays, cost of doing repetitive data processing jobs manually, and cost of general confusion, then the management should be able to get an idea of the computer benefits.

In general then, it is time to consider the utilization of a computerized system when:

1. Your organization's paperworks is increasing tremendously and in danger of getting out of hand.
2. You are not getting complete accurate and timely information for decision making.
3. You want a tighter control of your operations.
4. You want to continuously improve your competitiveness in relation with similar enterprises within the industry.

Some problems in systems development

As an EDP system will radically change all procedures and operational system of the organization, it is well to study thoroughly all the implications it will bring beforehand. No two organizations are exactly similar, and so are the applications of computer methods. The time and recourses spent in studying computer applications within your own environment will be more than justified by a well-designed and well-adapted EDP system your organization requires.

c. Communication System

It is an urgent problem of the Department of Public Works and Power to consolidate the plan for, and undertake the project of reinforcement of the communication system in the whole area of this country.

The existing electronic system which is operating in the BIRO of Science and Technology will turn into a maimed brain, if the nerve-system of this country does not undergo a medical treatment.

The planning and lay-out of the network of this communication system must be suggested not only by the expert on communication engineering of short waves, but also by the specialist in Operations Research Technique of Information and Control System.

The institution of the communication system is nothing but a part of the electronic data system.

d. Judgement of Authority and Flexible Operation

The result gained from the electronic system will give us only the information of possibilities. The decision must still be made by the judgement of the authority who is responsible for that matter.

It is suggested that desirably the judgement of the authority is always flexible, so as to make the result of his decision useful to the improvement of the new Enterprising Units and the upgrading of the level of construction industry in Indonesia. This is the principle of judgement which is most necessary, especially in the earlier period of establishment of a new system.

The activities of the committees can serve in adjusting the view of the authority to the result of the computer. In connection with this point, it is preferable to fix the scope of the activity of each committee before the beginning of its operation.

The followings are particularly considered, in addition:

- Interchange of informations about the planning and execution of projects between the Government and the enterprising units as frequent as possible, through the committee,
- Interchange of personnel between the Government and each unit in the same group of enterprising units,
- Interchange of techniques between of the Government and the enterprising units, and between each other,
- Flexible use of consultants group to meet both the demands of the Government and other groups of the enterprising units, though the consultants group is consistently independent from the others,
- Flexible operation of fund and equipment between the enterprising unit which undertake similar projects, and
- Flexible procurement of materials for the execution of works between the Government and the enterprising units, including their disbursement.

4-3 Consolidation of Manufacturing Units

These manufacturing units are separated into two groups: steel manufacturing group and concrete products manufacturing group.

a. Steel Manufacturing

As regards the scope of the units, the principle of its management, and the upgrading of its technical ability, we may suggest as follows:

The initial scope of this enterprising unit must be limited to correspond to the actual or possible demand at the time, but in future the scope will be revised

according to the variations of the demand. Within this limitation, a steady effort to improve the productivity, for example by renewing the tools and equipment and adopting new techniques of fabrication, should be launched for the betterment of its economy. It can be expected that future demands from the public works for this kind of product will increase, and so will support the growth of this kind of enterprise.

Strong back-up from both the Department of Public Works and the Department of industry would be expected, because of the enterprise's character. Owing to the circumstances, it might be suggested that this kind of enterprise should put it self under virtual administrative territory of the Department of Industry, in respect to the engineering aspects.

Training Centres and Testing Laboratories of materials for the fabrication of steel and welding shall be necessary provided by the Government; also an urgent problem is the establishment of an institution for licensing and registration of certification to secure the safety of the products.

The location of the manufacturing plant should be checked from the point of view of the convenience to transport raw materials and products.

Above all, on-the-job professional guidances for the modernization and rationalization of the management of the enterprising units must be required as soon as possible.

Further reference should be made to the report prepared by the experts on steel manufacturing, Messrs. Akira SHIRAHATA and Akifusa SEKIZAWA for the purpose mentioned above.

b. Concrete Manufacturing

Most important is the scope of the plant in respect to the demand, besides marketing and location. Generally it might be said that the proposed scope of each unit of plan should be the smaller the better, at the limit of its economical operation, and also has a variety of products (piles, pipes, reinforced and prestressed concrete beams, all precast in the plant) according to the situation of the demands. Furthermore, the condition or transportation of raw materials and the products should also be considered, deciding the location and the disposition of the plants.

Quality control of the products and the processing must be very important to this kind of enterprise, and an appropriate testing laboratory should be proposed for this purpose.

Finally, installation of a model factory near the most hopeful market may be recommendable as a trial.

Further information should be available in the report of the experts, Messrs. Tetsuo KUNIHURO and Akio FUKUOKA, for your reference.

4-4 Education and Training

It seems at present rather important for the engineers and technicians, specialists for management, economists for planning, and programmers of the electronic

computer, to be trained on-the-job rather than educating them in schools, because the lack of the power of operational techniques for the management both in administrative and technical fields is remarkable in the construction industry in this country. This environment needs the effective training on-the-job by experience.

Besides, the training centre must be provided for the upgrading of manpower, in respect to the expected increase of demand in accordance with the development of the construction industry of this country in the future.

It is proposed that such education and training should be executed by the Government, in the initial stage of the establishment of the enterprising units.

Foreign technical assistance for this purpose may be welcomed, to supply the trainers and experts at the request of the Government of Indonesia.

5. CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations of this report will be presented on these subjects:

5-1 Acknowledgement of the Constitution of Construction Industry,

5-2 Proposed System and Function,

5-3 Capital and Credit,

5-4 Management and Control,

5-5 Standardization and its Institutionalization,

5-6 Education and Training, and

5-7 Cooperation from Overseas.

Reference will be made also to Chapter 4.

5-1 Acknowledgement of the Constitution of Construction Industry

The essential constitution and limitations of the construction industry (Chapter 3) must be recognized.

5-2 Proposed System and Function

a. The Government Unit

A new organization, BIRO of Administration for Construction Industry and Enterprise is recommended to be established under the authority of the Secretary General.

This unit should coordinate with the existing organization, BIRO of Science and Technology with the function of a Computer Centre.

One Central Committee and four Sub-committee shall be provided, for smooth and flexible operation.

b. Enterprising Unit Group of Consulting

Its independent nature and authority must be important, but its flexible use should be considered.

c. Enterprising Unit Group of Construction

The new Enterprising Units should be composed mainly of the existing units of the State Contractors, but not be limited to these only.

The number of Units in this group should be the fewer the better, from the soundness of financial standing point of view.

d. Enterprising Unit Group of Manufacture

For the steel manufacturing unit, the scope of the enterprise and the renewing project of plant must be carefully examined at the initial stage of its pending operation. Demand from the Public Works should increase, more than at the present state.

Further reference might be available from the report of Messrs. A. SHIRAHATA and A. SEKIZAWA.

While the installation of the concrete products manufacturing plant is hopeful, the location and the disposition of the plant and the variety of products should be prudently decided, considering the demand.

The scope of the plant should not be too large, but of an adequate scale at the lower limit for its economical operation. A testing laboratory must be provided also, as an attachment to the plant.

The number of plants and the scope of each with a variety of products corresponding to the local demand should be determined according to a well planned schedule.

A model industry should be established at first, and a sufficient number of plants could follow later on, drawing on the experience of the former.

The Government should be a good customer to the best of its ability.

Further information about this subject will be in the report of Messrs. T. KUNIHIRO and A. FUKUOKA.

e. Enterprising Unit for Equipment Lease

Adequate operation of this organization must serve to lighten the excess loading of any construction enterprising unit. The operation must be conducted under the conscientious activity of the corresponding committee.

It might be preferably recommended that main equipments with their parts, attachments and tools which are now in possession of the State and under the administrative control of the Government should still be kept in its own, but both

duties for conducting their custodies, maintenances, repairs and any affairs for the right of their using and rents to the borrowers shall recommendably be transferred from the matter of the Government to the managerial job of the new Enterprising Unit, especially in respect to the beginning of the proposed system.

Positive aid by official power or any style of need from the Government should necessarily sustain the new Unit, so as to perform the aimed purpose, at the earlier stage of execution. For instance, free availability of the Government's Work-shop might deservedly allowed to the Unit, from this point of view.

5-3 Capital and Credit

a. Capital

The Government should contribute a greater part of the capital of the new Enterprising Unit, at least 51% of the total amount. This percentage of the share must be the larger the better, up to the limit of the Government's concern over the initial stage of the enterprising units.

For the rest of the share, investment of capital by official or private investors in Indonesia and foreign donor countries may be recommendably welcomed.

b. Credit, Loan, and Joint Venture System

Of course credits and loans for execution of the projects of the enterprising units should be recommendably welcomed as a suretyship obligation of the debtor, under the guarantee of the Indonesian Government or its Agent.

Credit and loan should be operated by pertinent banking system.

Joint venture system should be recommendable to these enterprising units which will need higher technical level and power for the execution of the projects.

Joint venture with foreign contractors should be recommended, especially in the earlier period of opening the enterprise's business.

Concerning the joint venture system for the manufacturing enterprise, the fore-going feasibility study of the project and its appraisal should particularly be required.

5-4 Management and Control

a. Application of Electronic System and Operations Research Techniques

Application of Electronic system and operations research techniques to such field as the planning and execution of the projects should be very important, especially with respect to the establishment of the new enterprising units.

For the present, applications to those of the planning division shall be recommendably limited to the range of setting up the priority and studying the feasibility of the construction projects, besides the miscellaneous engineering parts of the work such as survey, design and cost estimation; due to the capacity and efficiency of use of the existing computer and operators for it.

Such operations research techniques as PERT, CPM, and PPBS, would be applicable to determine the priority and the most effective way of execution of work. Wider and deeper examination of usage of the electronic system for this purpose should be carried out by the Government.

Education and training on-the-job should be recommended for the upgrading and consolidation of such a special power of technique by the specialist to be invited from Japan in the near future as an expert of the field, under the scheme of Colombo Plan.

b. Flexible Operation

Flexible operation should be required, especially for the management and control system using electronics and the techniques of PERT, CPM, etc.

c. Urgent Reinforcement of the Communication System

Urgent reinforcement of the communication system by short waves should be required, in relation to the upgrading and consolidation of the application of electronic system and operations research techniques. The coverage of the communication system should be the whole area of the country, linked by a single network system.

d. Rearrangement and Consolidation of Backdata

It must be also an important matter to consolidate the rearrangement of any backdata which is useful for applying the electronic system.

The system and the form of rearrangement must be examined, as they are most fit to the general circumstances of this country, and simplified to eliminate waste of labor.

5-5 Standardization and its Institutionalization

a. Engineering Standards

The engineering standards for any kind of engineering work, such as road and bridge, building and housing, etc. should be urgently required to be furnished in this country.

Design standardization and specification should be recommendably made by the BIRO of Science and Technology for present time, with close coordination and co-operation of the appropriate organizations for Construction, City Planning, Housing and Building, Road and Bridge, Irrigation and River Control, besides the technical support of the research institutes in Bandung and Djakarta.

For this purpose, enlargement of the organization called the BIRO of Science and Technology should be considered in the future.

For the same purpose, foreign experts with thorough knowledge and experience in special fields such as bridge design could be invited in making the standard specifications or design for each respective field, if necessary.

b. Administration Standard and Institution

Preparation of the Administration Standard and its institution should be also the most urgent problem of the Indonesian Government. Such standard by-laws and regulations should be enacted according to the fundamental policy of improving the construction enterprise by the Government.

Foreign experts might be recommendably invited to consult with, as counselor to the Government, if necessary.

5-6 Education and Training

a. Knowledge and Practice

Of course both knowledge and practice are important to the upgrading of manpower, But at this stage practice is more important than knowledge, for the execution of actual works.

Education and training must be planned on the basis of this principle.

b. Training on-the-job and in the Workshop

The lack of the power of operational techniques of management and control seems remarkable in this country. Therefore, the training on the job or in the workshop is the most important thing for the trainee, to master the practical method of operation of work, and how to manage and control it.

This must also be one of the most important principle for the educator and trainer in this country.

5-7 Cooperation from Overseas

a. Technical Assistance

Technical assistance from foreign countries should be very much needed especially in the beginning stages of the establishment of the Enterprising Units; to meet both the requirements of the Government, and the Enterprising Units themselves.

For the technical assistance to the BIRO of Science and Technology, it is recommended to refer again to the terms mentioned above, 5-5 a and 5-5 b.

For the technical assistance to the newly proposed organization, RIBO of Administration for Construction Industry and Enterprise, please refer again to the above 5-5 b.

Based on the principle of education and training mentioned above, favourably the technical assistance for the guidance of trainees should be required to be performed by on-the-job system.

b. Joint Venture System

Joint venture between the Enterprising Unit of Indonesia and the foreign contractor shall be welcomed in general, especially in initial stages.

This must be considerable in number for any kind of group of the Enterprising Units, excluding the Equipment Lease group.

Joint venture for the steel manufacturing units seems still in question, because of the need for a considerable fund for the improvement of the plant in opposition to the scanty demand for the products. In order to solve the problem, more demand from the Government and the other groups of the enterprising units should be required urgently.

Meanwhile, the joint venture system for the concrete products manufacturing could be hopefully recommended, especially in respect to the future increase of demand.

c. Cooperation by Project Aid

In connection with the joint venture system between the enterprising units of Indonesia and foreign countries, it may be said project aid from donor countries for the infrastructure development of Indonesia could be expected to become more vigorous; this will improve both the Indonesia enterprising units and the joint venture system itself, which would be created for the well done execution of the projects.

As for the steel or concrete products manufacturing units it is not the exception,

Additional installation of necessary workshops by project aids covering over the fresh areas of each island of Indonesia should accordingly be considered for securing the useful maintenance and repair of construction machines or equipments which we will let out for rent according to the newly proposed deal of the Lease System.

Furthermore, the installation and technical services of the Pilot Manufacturing Centre of steel or concrete products by the aid of any foreign countries might effectively contribute to promote the progress of these kinds of industries in Indonesia and corresponding Enterprising Units themselves, provided that we scheme the double project aids system of both installation of the manufacturing centre and execution of correlative construction works in which the products from the centre will be contemplated to consume for the sake of works as a single program so scheduled in couples.

