JAPAN INTERNATIONAL COOPERATION AGENCY

BUREAU OF MANPOWER AND JOB OPPORTUNITY DEVELOPMENT
NATIONAL DEVELOPMENT PLANNING AGENCY(BAPPENAS)

IN COOPERATION WITH MINISTRY OF MANPOWER(DEPNAKER)

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THE STUDY OF ENGINEERING MANPOWER DEVELOPMENT PLANNING IN THE REPUBLIC OF INDONESIA

FINAL REPORT (SUMMARY)

March 1996

CRC Research Institute, Inc

Daiwa Institute of Research Ltd.

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PREFACE

In response to a request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct the study of Engineering Manpower Development Planning in the Republic of Indonesia and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Republic of Indonesia a study team headed by Mr. Mayuki Takeno and composed of members of CRC Research Institute, Inc. and Daiwa Institute of Research Ltd. from March, 1994 to March, 1996.

The team held discussions with the officials concerned of the Government of Indonesia, and conducted field surveys in the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

March 1996

Kimio Fujita
President
Japan International Cooperation Agency

CONTENTS

SUMMARY

1. BACKGROUND

Indonesia is now at an economic take-off point, with the objective of changing from a labor-intensive economy to a high technology economy.

Like in PJP-I and Repelita V, PJP-II and Repelita-VI emphasize the importance of improving Indonesia's manpower resources for boosting economic growth and employment opportunities.

With these objectives in mind in late 1989, the Indonesian Government requested cooperation from the Japanese Government regarding development plan of Engineering Manpower (EM: engineer, technician and skilled worker). The preparatory study and an additional study were done in September and December, 1993. The Scope of Work was agreed upon and signed on December 7, 1993 between Japan International Cooperation Agency (JICA) and Counterparts of this study in Indonesian Government. The Bureau of Manpower and Employment Creation, National Development Planning agency (BAPPENAS), and the Ministry of Manpower (DEPNAKER) are responsible for the Indonesian Government's part in the Study, and are full Counterparts for the Study. The study team was organized by eleven staffs of CRC Research, Inc. and Daiwa Institute of Research Ltd., both assigned by JICA. The study was commenced in March, 1994 and is expected to complete in March 1996.

2. STUDY OBJECTIVES

The study has the following objectives;

(1) EM development planning, based on the estimation and forecast of present and future EM supply and demand are undertaken.

(2) The enterprise manpower survey methodology and the supply & demand forecast model for EM by engineering and occupational classification are transferred to Indonesia for its future utilization.

3. STUDY COVERAGE

(1) Engineering specializations covered by the Study are those in the fields as chemical, civil, electrical, industrial, mechanical, metallurgical, mining &

petroleum, aeronautical, electronics, nuclear, biotechnological, information & computer, and architecture.

(2) The study investigates engineers, technicians and also skilled workers.

4. TASKS IN THE STUDY

The study comprises of six main tasks - Macroeconomic Research, EM Development Organization Research, Evaluation of Industrial Technologies, Research of other countries in Asia – Malaysia, Korea and Japan, Establishment Survey, Forecasting Future EM Supply and Demand.

These six tasks can be divided into two categories. One as a Micro access is the Field research done in Evaluation of Industrial Technologies, EM development organization Research, and Research of other countries in Asia is concluded in analysis of Indonesian status quo of EM development. Establishment Survey also prepares initial values for EM supply & demand forecast. And another as a Macro access is the Macroeconomic Research and Forecasting future EM supply & demand presents future vision of circumstances surrounding EM in future Indonesia. Issues extracted from these status quo and future analyses are materialized as future EM Development Planning.

5. THE FUTURE SOCIAL FRAMEWORK AND ENGINEERING MANPOWER DEVELOPMENT (PART I)

(1) Future social framework

According to the National Development plan PJP-II (1993/94～2018/19), the economy is projected to grow at an average annual rate of *7.1*% from 1993/94 to 1998/99, and *6.6*% per year from 1998/99 to 2003/04. (Italics are used here to make clear the figures in PJP-II.)

Indonesia's 1994 per-capita GDP is *1,188,000* Rp (US$*676*). Over the next ten years, per-capita GDP will increase to *1,908,000* Rp (US$*995*). In 2018 per-capita GDP is projected to grow to *5,046,000* Rp (US$*2,631*).

Working from the framework of PJP-II and using the Study Team's model, we broke down GDP growth and analyzed it by its demand components. In order to safely reach the economic growth targets put forward in PJP-II, a somewhat higher forecast regarding employment numbers is needed.

Table 1 Adjusted Employment Forecast Based on PJP-II GDP Growth Rate

[Unit: %]

Year	1993/1994	1998/1999	2003/2004	2008/2009	2013/2014	2018/2019
GDP	8.3	7.1	6.6	6.8	7.7	8.8
Increase in employment	2.3	2.5	2.7	3.0	3.0	3.3

Source: the Study Team

The Study Team examines how much of an increase in employment would be required in order to safely achieve the economic growth targets of PJP-II (see Table 1).

(2) Present Situation of EM in Indonesia

In Indonesia, the technology introduced by local companies or brought home by exchange students is not adequately disseminated to other sectors of industry. In addition, nearly all of the engineering students who study abroad at government expense return home to be employed by BPPT, one of 10 strategic companies, or some other government-run company, and in fact many end up being assigned to clerical posts in such companies. As a result, the advanced technology which they were fortunate enough to bring back to Indonesia is not being utilized. In Indonesia, workers with higher educations tend to take a dim view of the factory, and younger science and engineering graduates shy away from working on production lines. Further, society as a whole readily accepts this way of thinking as natural.

(3) Outlook for EM Supply

Within the Second Long-term Development Plan (PJP-II), the focus is being shifted to higher education, and the plan's 25-year goal is to bring the advanced education enrollment rate up to 25% by the year 2018/19. Projections of the future are presented in Table 2. Based on analysis of Part I, the following goals should be established for Indonesia's future engineer and technician development.

- **Engineering manpower must be developed to meet the needs of growth targeted in PJP-II.**
- **PJP-II plans economic growth which eliminates the "dual economy", boosts exports, expands and spreads industrial technology, and strengthens Indonesian application of technology.**

Table 2 EM Stock Projections (1998-2018)

[Unit:1000 persons]

Year	1994	1998	2008	2013	2018
Senior High School Graduates	14,429.6	17,602.6	26,859.8	31,770.5	36,715.8
Polytechnic Graduates (technical)	140.8	175.4	407.5	593.1	816.0
University Graduates (technical)	192.6	348.1	1,001.9	1,457.9	1,983.8
Total EM	14,763.0	18,126.1	28,269.2	33,821.5	39,515.6

Source : Complied using the Study Team estimates, based on BPS statistics in 1994.

6. EM SUPPLY AND DEMAND (Part II)

(1) Introduction

In Part II, those problems analyzed in Part I, are verified by the results of the 1994 establishment survey and estimates using forecast model and then, specific issues are extracted out of them, which are reconsidered in Part III in order to plan for development of EM resources.

In the text to follow, engineers graduating university, technicians graduating polytechnic, and skilled workers graduating high school are indicated in italicized letters like *engineers*, *technicians* and *skilled workers*.

(2) Present Condition of EM at Business Establishments

The Study Team conducted an establishment survey, which was the first attempt in Indonesia to conduct a nationwide survey covering all types of industry sectors. Based on the list of establishments which is prepared using reports that every company is obligated to do to the Ministry of Manpower (DEPNAKER) in accordance with Presidential Regulation No. 7, the Study Team picked up establishments by stratified random sampling and obtained valid responses from 3,156 establishments throughout the country. Samples were stratified by industry sectors, scales, and regions. One half of the establishments selected were those in the manufacturing sector that was considered to hold a large proportion of EM. As for scale, establishments were divided into three groups in terms of the number of employees: "large" (100 persons and more), "medium" (20 to 99 persons), and "small" (5 to 19 persons). Almost equal number of samples were picked up from each of the three groups. The distribution of establishments by

region was decided according to ratio of DEPNAKER lists.
Inquiries were made to each of the establishments about the recruiting, employment, training, technical evaluation, etc., of its employees, mainly university graduates majoring science/engineering, polytechnic graduates, and ordinary high school/vocational high school graduates and junior high school graduates engaged in 10 or more years in technical field work. The data showing correlation between EM academic career, EM engineering specialization, and job classification at the company were also requested.

The major findings are summarized below.

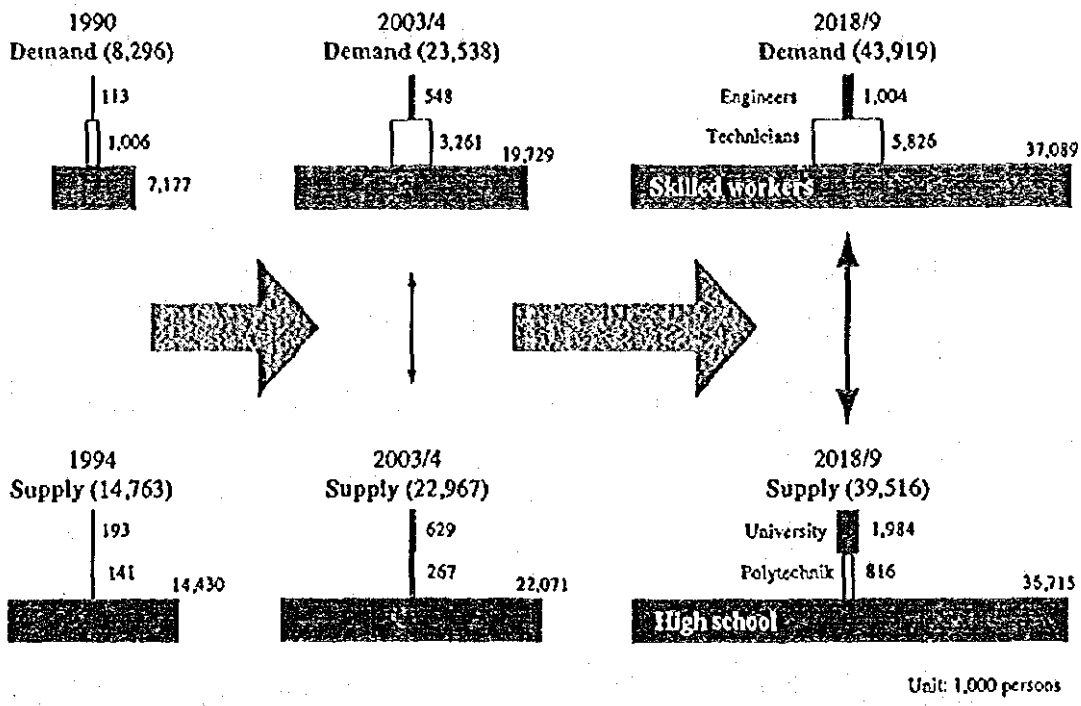
- **There is not much demand for engineers, except in a few large corporations.**
- **The correlation between the field of specialization at school and the job assignment at company is strong, and the technology demanded of engineers lacks in diversity.**
- **At many companies, *engineers* are guaranteed with much higher salaries than *technicians*, which seem to be paid regardless of *engineers'* performance.**
- **Share of technicians is inproportionally small. This tendency is intensified as establishment size gets smaller.**
- **There is tendency that the demand for technicians is met, by "vertical gap : e.g. a phenomenon the university graduates are working as technician or high school graduates are working as technician instead of matching their academic background to occupation ". This tendency is especially conspicuous at large establishments (university graduates as technicians) and small establishments (high school graduates as technicians).**
- **The correlation between the field of specialization at school and the job assignment at company is strong, and the techniques demanded of technicians lack in diversity.**
- **Only small proportions of small and medium-sized manufacturing companies provide in-house training for technicians.**
- **Dominating portion of EM demand in number of persons is occupied by skilled workers at present. This tendency is intensified as establishment size gets smaller.**
- **Many of *skilled workers* earn much less than *technicians*.**
- **The in-house training for *skilled workers* is less popular than that for *engineers* and *technicians*. And, the smaller the company scale, the less is the opportunity for *skilled workers* to be given in-house training.**

(3) Outlook for EM Supply and Demand

The first purpose of the EM supply/demand forecast is to clearly indicate the volume of EM employment in the total employment. The second purpose of the EM supply/demand forecast is to indicate future problems relating to EM supply and demand. The forecasting method is meaningful only as a tool for detecting problems within the framework of PJP-II. It is, therefore, assumed that the forecasting method shall be continually validated as the forecast premises will change in the future. The total demand for the three classes of EM is estimated to reach 24 million persons (1.2 times of the 1994 figure) in 2003/4 and 44 million persons (2.1 times of the 1994 figure) in 2018/19. They are shown in Figure 1.

(4) Extracted Issues

In terms of quantity, university graduates as EM are already oversupplied. With the increase in ratio of students going on to universities in the future, the supply-demand gap (oversupply) is expected to widen further. This situation is ascribable to the high ratio of students going on to universities–**higher than the demand level**–and the low levels of technical requirements of industry that cannot catch up with the volume of manpower intended to embrace high level of technology.The general problems concerning *engineers* are whether or not the existing supply system and plans can effectively respond to the sophistication of technical requirements of industry and what the EM can do to promote the improvement of technical levels of the whole industry. These problems must be grasped with due consideration given to the growing trend of oversupply of university graduates. The major problem concerning *technicians* is how to increase the supply and improve the capacities of technicians who will become undersupplied in absolute terms in every sector of industry in the future. In view of the supply-demand situation of engineers and skilled workers and the importance of technicians, the above problem should be positioned as the most important one in the present study. Solving this problem will call for a comprehensive policy which is consistent to measures to solve the problems concerning *engineers* and *skilled workers*. The major problems concerning *skilled workers* are, therefore, improving the capabilities of *skilled workers* and formulating a comprehensive industrial technology policy which is closely linked to measures to foster engineers and technicians. The former problem is specifically the task of fostering skilled workers at small and medium-sized manufacturing companies, which are now providing insufficient in-house training



Source : The Study Team

Figure 1 EM Supply & Demand in Future

for skilled workers despite the fact that the skilled workers account for a large proportion of the employment. The problems described above are those which have been extracted from analytical studies of "supply-demand gap." From the viewpoint of further pushing through the basic concept of EM development in this study, the EM supply and demand in the manufacturing industries which does not manifest itself as a specific gap can be a problem.

One of the problems involved in EM development should be what the EM can do for the manufacturing industries to achieve a value added as sufficient as to bring about large employment exceeding the improvement in labor productivity. Promoting the improvement of overall capabilities of EM to free the machinery industry from dependence on foreign production technology can be a specific issue.

(5) Measures Extracted

The following four measures extracted from the results of the establishment survey and EM supply/demand forecast are proposed as fields where countermeasures will reside:

- **Measures to cope with the shortage of *technicians* in absolute terms.**
- **Measures to cope with the expanding oversupply of *engineers* in terms of quantity and with the shortage of *engineers* in terms of quality.**
- **Positioning the fostering of *skilled workers* in a comprehensive industrial technology policy.**
- **Measures to improve the overall capabilities of EM for the development of manufacturing industries, mainly the machinery industry.**

7. STRATEGY AND ACTION PROGRAMS FOR FOSTERING EM(Part III)

(1) EM Fostering Strategy

It is expected that the total supply of EM will fail to meet the total demand for EM in the future as shown in Figure 1. While university graduates as candidates for engineers are rapidly increasing in number, polytechnic school graduates as candidates for technicians remain absolutely deficient in number and technical high school graduates as candidates for skilled workers too remain inadequate in number.

These trends, which are the result of an uneven distribution of human resources, are a serious problem which can impede the future growth of Indonesia.

When EM is grasped as a group of human resources having different academic careers, restraining the current movement toward a society of higher academic career or improving the level of industrial technology may be considered as a means to solve the above problems. However, neither of these can be a realistic solution. The future EM fostering program must be based on the premise that Indonesia continues to move toward a society of higher academic career. It can hardly be expected that the industrial technology of Indonesia will develop so fast that it will be capable of absorbing all the EM having higher academic career.

What must be recognized at this point is that all the problems can be traced back to the rigid old paradigm that assumes university graduates as engineers, polytechnic graduates as technicians, and high school graduates as skilled workers. The truly effective solution for the problems is, therefore, to strive to expand the total size of EM while establishing a new paradigm for the fostering of EM. It is "Practical Paradigm" and "Networking" that are the strategic goals for solving the above problems.

—PRACTICAL PARADIGM—

A new paradigm for the fostering of EM must be capable of responding flexibly to any change on the EM demand side. It is essential for the new paradigm to assure that the EM supply side always supplies EM that is really needed by the demand side. This strategic goal shall hereinafter be referred to as (the establishment of) Practical Paradigm.

When a good number of small and medium-sized enterprises in Indonesia succeed in improving their production techniques and growing to become the base of Indonesia's supporting industries, the competitiveness of the country's whole industry improves and the level of its industrial technology becomes sophisticated accordingly. To that end, it is indispensable to foster EM specially adapted to the needs of small and medium-sized companies.

—NETWORKING—

The support for the fostering of EM, mainly for small and medium-sized companies, effected through the activation of the above exchange to realize a linkage between different industrial structures, shall hereinafter referred to as (the propulsion of) Networking. Networking is not a concept which is confronted with the concept of Practical Paradigm.

(2) EM Fostering Plan

The ideal image of EM fostering of the future to be aimed at in the effort to attain Practical Paradigm and Networking under the conditions assumed in the present study is as follows: 1) "by implementing Practical Paradigm, the problem of distribution of EM resources is dissolved into a labor market problem which is confined within each individual company", and 2) "by propelling Networking–the other strategic goal, competent EM will develop mainly in a large number of small and medium-sized companies. As they form supporting industries, the competitiveness of the whole industry of Indonesia will improve".

(3) Future EM fostering plans – Five Proposals

As the results of the Study, the Study Team made five proposals: the Reform in the Education of EM, the Developing EM Job Organization Models, the Structuring a New Scheme of In-House Training, the Reformation of BLKs (Public Vocational Training Centers), and an EM Supply-Demand Information System

8. OUTLINE OF THE FIVE PROPOSALS

The proposals concerning the upbringing of EM are as follows.

(1) Reform in the Education of EM

1) Outline of the proposals

The Study Team proposes to institute EM educational reform committee (hereinafter referred to as "the committee"). The committee will be held responsible to communicate with and discuss thoroughly with parties concerned with regard to [the improvement quality of the academic education] and [the promotion of vocational education and training].

2) Educational reform to be explored

a. Improvement of the academic education

Universities should develop these measures so forth, ① to secure excellent science and technology teachers with high academic career, ② to invite expatriate teachers who have learned state-of-the art technology, ③ to enrich curriculum, ④ to renovate as quickly as possible experimental equipment/facilities, ⑤ to implement measures such as increase of the highly qualified management staff. In particular, enrichment of curriculum would have to encompass not only special subjects of study but also to intensify learning of science and technology related basic courses of study such as mathematics, physics, dynamics, chemistry and so forth from the improvement of basic scholastic ability point of view as well as to pay more attentions to the linguistic ability of English language which is vital in the introduction/digestion of foreign technology.

b. Promotion of vocational education and training

Reinforcement of education in practical technologies in the universities (science and engineering department)

The universities shall, while continuing to focus on the education in basic studies for the fostering of research and development engineers, reinforce the education in practical technologies and the off-the-campus training to make their students equipped with knowledge of work on the industrial scene.

– In order to enrich vocational education and training curriculum, four years polytechnics curriculum would have to be fully executed.

By graduating from four years polytechnic curriculum, the new degree based on technique/technology (Provisionally called "SX") will be conferred to the graduates. SX degree shall be equivalent to university bachelor degree (S1).A path shall be provided for the transfer of those who have completed the three-year polytechnic course to a specialized course of a university and for their obtaining an S1 there. Advancement to polytechnics shall be as a general rule from vocational high schools. As the result, vocational high school will be positioned as such to be identified more clearly as [basic vocational training educational institution with advancement to polytechnics as the basic rule]. In accordance with the enhanced appreciation by the industrial community of vocational training program and/or upgrading of status, degrees of D1, D2, D3 and diploma will be abolished gradually when degree of SX has acquired social recognition.

—Existing graduation tests will be dissolved into the educational qualifications to be newly introduced which would have stronger compelling power with respect to the advancement to higher educational institutions.
This system may be explained as follows by referring intentionally to the actual examples of Malaysia for easier understanding.

—In prior to the enforcement of certified skill qualification system, NVTC (National Vocational Training Council) which would have authority and compelling power to implement certified technique qualification will be established through the cooperation by and between government agencies, academic community, industrial community and men of learning and experiences.

—BLK will be reorganized. Those students admitted to BLK would be skill-trained under the Specialized Skill Training Center (New BLK) to be recommended in the chapter to follow as a new function of BLK and/or would acquire afore-mentioned certified skill qualifications and would continue to hone their skill as semi-skilled and skilled workers respectively. In adoption with these proposals, the above concept is embodied in "Figure 2" as the Flow Chart of EM Supply and Demand based on Practical Paradigm in Future of Indonesia.

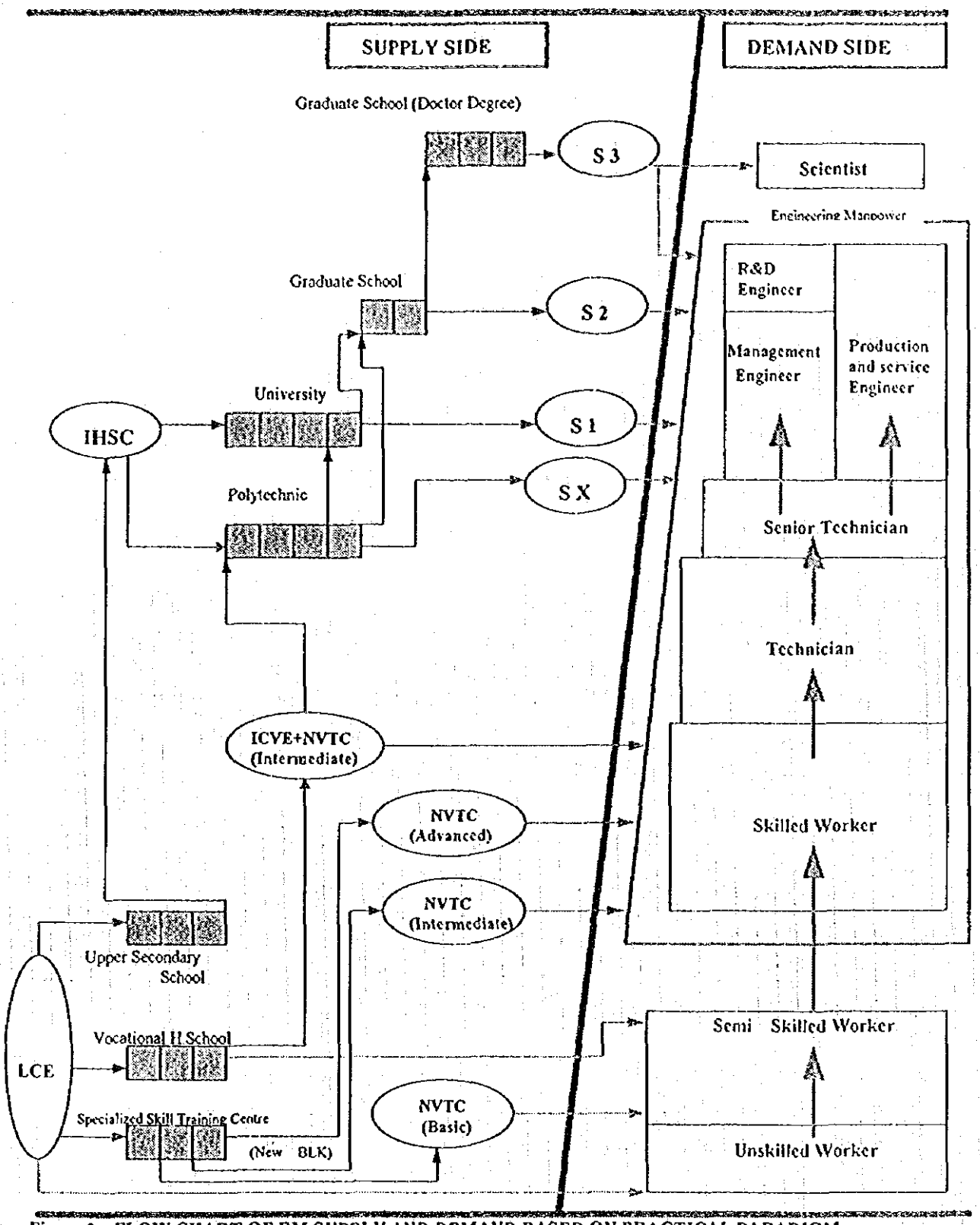


Figure 2 FLOW CHART OF EM SUPPLY AND DEMAND BASED ON PRACTICAL PARADIGM IN FUTURE OF INDONESIA

Remark;

ICE:Lower Certificate of Education
ICVE:Indonesian Certificate of Vocational Education
IHSC:Indonesian Higher School Certificate
NVTC:National Vocational Training Center
→ : Leading line to each educational institutions

S_1:Strata-1/Bachelor degree
S_2:Strata-2/Master degree
S_3:Strata-3/Doctoral degree
SX:Newly introduced educational certificate
→ :Leading line to candidate for a position as EM

Note; All the ordinary high school graduates going on to universities represents an extremely simplified model. Actually, it is quite possible that some of them enter polytechnic according to their choice, aptitude, etc.

Source : The Study Team

(2) Developing EM Job Organization Models

1) Purpose

Establishing the job organization is primarily the responsibility of each individual enterprise. Therefore, the government's support recommended in this report should be interpreted as a model intended primarily for enlightenment. Namely, each individual enterprise is supposed to create its own optimum EM job organization by modifying the model presented by the government.

The government's proposal must be so full of realities and advanced ideas that private enterprises are willing to adopt it. It must also incorporate compulsory and non-compulsory qualification systems, such as a licensing system, so as to positively induce even indifferent enterprises into action.

2) Outline of the Proposal-Installation of Job Organization Model Propulsion Committee

The job organization model that is recommended in the present proposal is not intended for a particular industry, size, or region. Building job organization models appropriate to particular conditions of individual enterprises, such as industry, size, and location, requires a considerably long preparatory period.

When the proposed job organization models are built, they should be publicized, disseminated, and periodically reviewed by a permanent organ.

Here, the Study Team recommends that all the above work be executed by a public committee tentatively named the Job Organization Model Propulsion Committee (hereinafter simply called the Committee). From the viewpoint of keeping the job organization model realistic and spreading it throughout the country, the Committee must be managed jointly by the government and industry in a manner to meet the objectives of networking and the conditions for deregulation. The work to be executed by the Committee is building, disseminating, and reviewing job organization models. The building of a job organization model consists of three tasks-setting up a basic job organization; providing a career path linked with the educational and training system; and reviewing the existing qualification systems.

3) Tasks of the Committee

a. Setting up EM model job organization

The composition of EM should be diversified according to industry type, scale, and stage of development of individual enterprises, and each enterprise must

develop its own useful human capital for itself. In order to disseminate the above conception and present a job organization to be pursued by enterprises, the Committee shall create a model job organization appropriate to a particular industry, scale, and region.

The names "Engineer," "Technician," "Skilled Worker," etc. and the classification of EM should also be reviewed.

b. Study of flexible path to Educational and Training System

In the EM job organization model for each industrial category, each class of EM will be associated with more than one class of academic career and the EM job-academic career relations will be made more flexible by the career path.

Setting up a path to the educational system associated with the model job organization can be a guide to each enterprise in recruiting new EM.

To those enterprises which cannot afford to provide adequate in-house training that determines a suitable career path, the Committee must present an alternative plan for training by an outside organization which is interlocked with the new scheme of in-house training discussed in (3) and the BLK reform proposed in (4).

c. Review of EM Qualification Systems

The new qualification system also serves as a means to diffuse the model job organization among the enterprises. Therefore, it must be so appealing that Indonesian enterprises will be willing to adopt it. In this respect, it is considered effective to make the new qualifications comparable to those of advanced nations so that they will receive international recognition. Therefore, negotiations with various foreign organizations which certify qualifications are included in the tasks of the Committee.

(3) Structuring a New Scheme of In-House Training

1) Outline of Proposal

The new scheme of in-house training shall be addressed primarily to small and medium-sized companies, whereas large companies shall be encouraged to update and improve their own in-house training while supporting the scheme. The objective of in-house training is to improve productivity and secure delivery dates through establishment of a quality assurance system for products and services. To that end, EM must be trained in terms of 3 H's (*"Head," "Heart," "Hand"*). In addition, the new scheme of in-house training must enable human resources fostered by

educational institutions to be developed-in line with the Practical Paradigm-into EM who are equipped with technology and techniques which the demand side expects of the EM.

From the above requirements, the new scheme the Study Team proposes comprises measures to help the demand side upgrade their in-house training and measures to positively promote the in-house training from outside. The former consists of providing the demand side with a financial support for the fostering of EM and dispatching key persons (instructors and coordinators) to companies which need them, and the latter consists of specific measures to develop and maintain the in-house training environment, including the introduction of new systems, such as a consignment training system, and the expansion and improvement of outside training facilities, such as establishment of teaching companies.

2) Three Measures to Promote in-house Training

a. Support for in-house training by companies themselves

The basic form of in-house training is such that each company on the demand side has its EM acquire technology and techniques appropriate to the production of its products (supply of its services) and at the same time, trains the EM to become aggressive in improving their technology and techniques for themselves. Thus, it does not depend upon outside training institutes. Therefore, the basic objective of the new scheme of in-house training is to eliminate obstacles to the implementation of effective in-house training by the demand side. There are two major obstacles to effective in-house training on the demand side. One is the deficiency in time and money for the in-house training, and the other is the absence of competent instructors. The former is an obstacle common among companies on the demand side, and the latter is especially noticeable in small companies, most of which cannot find able instructors within themselves. The basic solutions the Study Team conceives are a government-led financial support for the former problem and the dispatch of instructors, mainly from economic organizations, for the latter.

b. System of "Entrust Training to Other Companies"

As the environment of in-house training, importance is often attached to physical conditions, including instructors and training facilities. More important, however, is the environmental factor in the fostering of "*Heart*" (enthusiasm and interest in one's job = INITIATIVE). It is certainly important for some companies to invite competent instructors from outside to train their EM. It is, however, more important

for those companies to dispatch their EM to training facilities having a better environment. By so doing, they can not only benefit from the better facilities but also increase the effect of in house training in terms of all the 3 Hs thanks to the favorable environment for the fostering of "Heart".

The favorable environmental conditions in terms of "*Heart*" bring about much better effect when supplemented by good facilities and high levels of technology and techniques. (Many of companies whose employees have admirable "*Heart*" demonstrate that those employees also have respectable "*Head*" and "*Hand.*") The basic objective of this system is, therefore, to augment the effect of in-house training in terms of all the 3 Hs.

c. Establishment of teaching companies

The teaching company is different from the vocational training center in that it is actually a production plant which provides training while manufacturing a certain product which should be sold as a merchandise. Namely, the salient characteristic of the teaching company is that it provides training not only in production technology and techniques but also in production control technology within the plant in productive operation. Thus, the teaching company provides training in "production technology" using OJT as the main tool.

(4) Reformation of BLKs (Public Vocational Training Centers)

1) Outline of the proposal

a. Necessity for BLK Reformation

The vocational training currently provided in the BLKs is confined within the limit of basic vocational training, the contents of which are uniform throughout the country. It cannot be said, therefore, that the present vocational training always meets the needs of local industries or conforms to the specific characters of localities. Besides, the revision of curriculums that is needed to respond to the sophistication of industry has seldom been made. As described in Part II of this report, Indonesia will be faced with a serious shortage of skilled workers and technicians, in the future. In order to cope with the predicted shortage of skilled and semi-skilled workers and technicians, the existing BLKs shall be restructured into training institutes which foster skilled and semi- skilled workers and candidate technicians and which pave the way for hard-working trainees to become technicians.

b. New functions of new BLK

New BLKs(SSTC)provide the following functions. Since each of the new BLKs is to provide training under the SSTC system described in 3.3.(1) "Reform in the Education of EM" the functions of existing BLKs need to be adapted to the new system. Under the SSTC system, the period of training to qualify for the skill examination by the National Vocational Training Council(NVTC)shall be one year for the basic class, two years for the intermediate class, and three years for the advanced class.

With the extension of the training period, the curriculum needs to be reinforced. In this case, it is important to include linguistics (English, in particular) in the new curriculum. In addition, in the curriculum for the NVTC advanced class of the mechanics course and electric/electronics course, respectively, training in CAD and CAM needs to be included. The objective of training is to make junior high school graduates qualified as candidates for skilled or semi- skilled workers in the future. In addition, each BLK shall focus on developing EM who are equipped not only with good "*Head*" and "*Hand*" but also with admirable "*Heart*," that is, highly motivated EM.

The new BLK shall be equipped to provide re-education to EM of business enterprises, especially to EM of small and medium-sized companies. Budgetary constraint, lack of experimental equipment or instruments and instructors deprive of the opportunity for small and medium-sized companies' EM to be re-educated in their own companies. Accordingly, it is very important for the new BLK to provide them with chance of re-education positively instead of the companies

And others, they equip Function for technical support, Conducting consigned tests and processings, Providing guidance in local industrial technology. As a typical functions for the EM Supply - Demand Information System, these are followings ;

- Information on the contents of training at the new BLKs and the characteristics of each individual BLK
- Information on the number of new BLK graduates and the places of employment for each of the NVTC Basic, Intermediate, and Advanced classes.
- Information on small and medium-sized enterprises in particular localities and job offer from various enterprises for presentation of research papers, seminar etc. on technical development.

(5) EM Supply-Demand Information System

1) Necessity for EM Supply-Demand Information System

If the exchange of resources between the EM supply side and EM demand side is activated, the strategic goals of "substantialization" and "networking" can be achieved more effectively. Information is the most basic resources exchanged between them. As a basis of the reform in EM education, the diffusion of a job organization model, the promotion of in-house training, the restructuring of BLKs, etc., there must be an infrastructure for the exchange of information. The EM Supply-Demand Information System proposed here supplies information for supporting the human resources development that conforms to the new paradigm of EM education and meets the real needs of enterprises and information for supporting entrepreneurs who should become the core of Indonesia's unique technology-oriented companies in the future.

2) Outline of the Proposal

The EM Supply-Demand Information System offers an environment which makes it possible to easily utilize and exchange information supplied from the EM demand side, EM supply side, and intermediary.

a. Information supplied

- EM supply side

  Basic information about educational/training institutions, such as the subjects of study and training, contents of education, teaching staff, number of students/trainees, and facilities, and various types of statistical information, such as the condition of employment of new graduates each year.

- EM demand side

  Information about companies, such as the contents of businesses, EM job offers, working conditions, in-house training, and job organization.

- Intermediary side

  Various types of statistical information about EM compiled by the government agencies concerned; information about policies and budget for EM training; and information about the training and research institutes concerned.

b. In order to supply needed information at the right moment, it is necessary to edit the information to be supplied into an easy-to-understand form and update it constantly. Each supplier of information must know the location of information, the time to

update it, etc. and collect and supply needed information at the right time.

c. Under those conditions, the EM supply-demand network offers a mutual information exchange environment in which a transmitter of information can be a receiver of information at the same time.

3) EM Supply-Demand Information System Configuration

The EM Supply-Demand Information System consists mainly of the following three parts:

- **Data processing system for supply and exchange of information.**
- **Data supplied from various sources.**
- **Control & management of supply of information.**

9. TOWARD EM DEVELOPMENT(PART IV)

(1) Result of study

Through reviews of PJP-II and forecasts of the Study Team, it has been recognized that in order to develop the Indonesian industry, it is imperative to foster EM of sufficient quality in sufficient number according to the stages of development for the take-off of Indonesia aimed at by PJP-II and according to the stages of economic development through 2003/04 and 2018/19.

At present, in Indonesia, which aims to develop industry and reinforce international competitiveness, various measures are being discussed as to how to start a new scheme of vocational education and training for the development of EM amid the basic trends toward deregulation and privatization of state-owned enterprises. With respect to the fostering of EM, the primary objective of this Study has been to recognize that there are many problems to be solved by close cooperation between the EM supply and demand sides from a long-range perspective.

(2) Problems to be Solved for Implementation of Fostering EM

As the results of the study, following problem are actualized by the study team. It is strongly expected that the countermeasures against these problems should be taken as soon as possible.

1) One of the conclusions of the present study is that implementation of the plan to foster EM, largely responsible for the development of Indonesia in the future calls for a changeover from the conventional paradigm to an innovative new paradigm.

2) To that end, it is indispensable to install several committees composed of both sides. Those committees require considerable personnel, money, information and, etc. Taking the above into consideration, in executing the individual plans, the authorities concerned must take the initiative and seek utmost cooperation of the private sector.

3) With the basic philosophy that lifelong education is an essential factor in the fostering of EM, both the EM supply side and EM demand side should, in cooperation with each other, offer opportunities of education and training in technology and techniques to EM and those who want to join EM in the future.

4) The government should, in cooperation with the private sector, institutionalize national certification systems, including a technical qualification system, in diverse new fields from an international standpoint.
The common certification system for professional engineers (PEs) has become a world trend. In Indonesia too, it is important to establish its PE accreditation system based on the internationally established industrial classification.

5) The medium to long-term images forecast in this report are those assumed and presented on the bases of a fact-finding survey conducted in 1994. Any medium to long-term plan is subject to review, hence it is important to make suitable revisions to the above plan according to changes in external factors and other conditions.

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