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TECHNICAL ANALYSIS ON THE ESTABLISHMENT OF
AN ENGINEERING PROTOTYPE DEVELOPMENT
AND TRAINING CENTRE IN NEPAL

XP/NEP/88/113/11-01

NEPAL

Technical report: Mechanical engineering*

Prepared for the Government of Nepal
by the United Nations Industrial Development Organization

Based on the work of George P. Putnam
UNIDO Consultant

Backstopping officer: P. Prijapratama, Engineering Industries Branch

* This document has not been edited.

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1. MISSION OBJECTIVE

The mission objective is specified in detail in job description 11-01 (annexure A). For convenience this objective can be summarized and divided into the following components:

- 1.1 Visit a representative sample of workshops, institutes and agencies in order to determine capabilities and needs with respect to engineering design, product development and training.
- 1.2 Estimate national requirements and potential achievement with respect to these areas over the next 10 year horizon in view of current national planning objectives.
- 1.3 Assess the current capability of training institutions and their ability to respond to intermediate term training requirements.
- 1.4 Formulate a technical strategy to achieve desired engineering capabilities in terms of:
 - product design (including components)
 - responding to target group needs
 - providing relevant training programs
 - equipment required
 - institutional facilities required
 - organizational structure
 - human resources
 - feasible work plan
 - financial requirements
- 1.5 Prepare drafts of the following:
 - 1.5.1 Analysis relevant to the establishment of a Prototype Development Centre for parts, components, machine design and product development.
 - 1.5.2 A UNDP. Project Formulation Framework (PFF).
- 1.6 Discuss the PFF with the government and make appropriate recommendations for implementing the project it describes.

2. MISSION APPROACH

2.1 It has been decided to conduct the mission in two phases:

- One month in Nov/Dec 1989 to accomplish objective 1.1 through 1.3 above and to make some preliminary observations concerning objective 1.4.
- An additional month in Feb. 1990 to finalize the strategy described in objective 1.4 and to accomplish objectives 1.5 and 1.6, with the analysis mentioned in 1.5.1 being incorporated in 1.5.2.

2.2. During the time period elapsing between mission phases the government, UNIDO, UNDP and other interested parties will have an opportunity to review the contents of this report and be in a position to offer additional and appropriate input.

3. PERSONNEL CONTACTED

During the course of the mission 44 individuals from among 30 different UN, government, and industrial organizations were contacted in order to observe their operations, discuss their problems and hear their comments relative to the proposed center. Their names and organization are listed in Annexure B.

Particular thanks is due to Mr. I.S. Thapa, the National Project Director and counterpart, for providing an excellent summary of the project's origin and background as well as a very thorough analysis of the status and needs of the National metalworking industry. Appreciation is also expressed to Mr. B.K. Shrestha for arranging the extensive schedule of appointments.

4. BACKGROUND

4.1 A detailed background of the project and the status and problems facing Nepalese industry can be found in Annexure A.

4.2 It is important to stress one other important aspect of a problem facing Nepal as well as a number of other developing countries - that of the over reliance by developing countries on their inexpensive labor cost as a major factor in competing in the international market place.

4.3 Over the past decade-and-a-half industrialized countries have been applying computer aided design and computer aided manufacturing (CAD/CAM). This technology is being applied at an exponential rate and has the effect of reducing the labor cost components of products dramatically. In electronic products the labor cost

component is rapidly approaching zero. In automobiles and other similar products it is currently typically 15% of total product cost.

- 4.4 If developing countries do not begin to formulate plans to prudently use this advanced technology to achieve competitive cost and quality levels they will significantly diminish their ability to compete in the international market place. This is particularly important to Nepal since one of its articulated policies is to be outward looking. Because of Nepal's small population and low per capita income it must rely on producing products which have export as well as domestic appeal.
- 4.5 Producing parts and products for both the domestic and export markets will apply pressure to minimize cost and improve quality by producing in larger quantities thereby making it possible to achieve economies scale in manufacturing.

5. FINDINGS

5.1 Product Development

There is an urgent need by several groups for assistance in the design and development of products.

- 5.1.1 Graduates of the mechanical training institutes with entrepreneurial inclinations have ideas for products they would like to make and market. However they lack the capability to turn their ideas into designs and the ability to generate an efficient manufacturing process plan to produce the product once it has been designed.
- 5.1.2 The agricultural development community is also seeking sources that can design and manufacturing products for small farmers.
- 5.1.3 Small and medium size metalworking shops have managers who are overloaded with functions related to resource allocation, scheduling, marketing etc. They do not have the time or expertise (but they do have ideas) to design and develop methods, tools, jigs and fixtures to produce their products at lower costs with improved quality. Because of the limitations of time, makeshift methods are often used to produce items to meet schedule commitments.

5.1.4 Little appears to be happening in the way of feeding back user experience to product producers in an organized manner in order to improve product design.

5.2 Spare parts

5.2.1 There is a host of problems associated with spare parts, chief among them being:

- high cost for imported parts
- long lead times for importing
- original manufacturers discontinuing production, making spares unavailable
- lack of local spare parts producers
- lack of product standards leading to a proliferation of models and spares for these models
- inability to obtain locally made complex castings
- poor quality indigenous materials
- tariff policy which taxes raw materials at 55% and finished goods at 20%

5.2.2 Most shops react to the spare parts problems by crudely repairing broken parts themselves or by copying the part design and using inappropriate materials.

5.3 Basic Metalworking Manufacturing Problems

5.3.1 Those requiring little or no training or new technology to correct, such as:

- inadequate preventive maintenance
- poor house keeping
- lack of in-process inspection
- lack of gage control and calibration

5.3.2 Those requiring management training, money or added technology to correct, such as:

- machine loading and scheduling
- poor shop layout
- idle equipment
- low productivity
- lack of standards
- lack of jigs and fixtures (including assembly)
- high cost of capital equipment

5.4 Human Resources

- 5.4.1 Shop managers appear competent but overloaded with too many functions. In particular they lack access to good design and manufacturing engineering resources.
- 5.4.2 Machinists and other factory personnel seem to apply the proper effort but they lack proper guidance in the form of manufacturing instructions.
- 5.4.3 Few tool and die makers were in evidence.

5. CONCLUSIONS

These conclusions are preliminary and will be finalized (left "as-is", eliminated or revised) during the second phase of this mission.

- 6.1 There is a need to develop a central prototype development and test capability within Nepal to service the metalworking manufacturing industry.
- 6.2 The spare parts problems seriously hamper the ability of all industries to achieve proper levels of quality and productivity.
- 6.3 Additional training (or awareness) of managers should correct most of the basic metalworking manufacturing problems.
- 6.4 Additional manufacturing and design engineering resources made available to the metalworking manufacturing industry would definitely improve both productivity and quality. Such resources would particularly benefit small and medium scale industries.
- 6.5 The application of CAD/CAM technology would permit bringing on stream design and tool and die making capabilities in a fraction of the time it would take train personnel to accomplish these functions in a traditional manner.

7. RECOMMENDATIONS

- 7.1 A project should be developed to establish a prototype Development Training Centre in Nepal. While it should be designed to respond to the needs of all manufacturing industries to some degree, it should be designed to serve particularly and directly the needs of small and medium size metalworking manufacturing facilities. If this is done properly these facilities will, in turn, serve the entire spectrum of manufacturing industries.

7.2 This Centre should be designed to perform the following functions:

7.2.1 Engineering Design

Use a set of ideas or specifications to produce (or assist in producing) a set of drawings and material specifications that represent a product. The product can be one component or a set of assembled components such as a consumer product, a die, a jig or a fixture. An inexpensive CAD system can be used to produce the desired drawings.

7.2.2 Prototype Manufacturing

From a set of design drawings and specifications, manufacture a product using a combination of numerically controlled (NC) machine tools and conventional machine tools to produce the physical products represented by these drawings and specifications.

7.2.3 Testing

Arrange for the prototype to be functionally tested and/or user tested in actual application. Any problems or deficiencies detected by these tests would require the repetition of the design (7.2.1) and/or prototype manufacturing (7.2.2) and further testing (7.2.3) steps until the prototype product is considered acceptable.

7.2.4 Final Design

Once an acceptable prototype is produced drawings and specifications are finalized, again using a CAD system.

7.2.5 Manufacturing Package

Based on a selected manufacturer's machine tool configuration a complete manufacturing package should be developed. This package will consist of a set of operation sheets specifying the sequence of operations, conventional machine tools, cutting tools, jigs, fixtures, gages and auxiliary processes to produce the product in quantity. The package will also include a quality control plan and the necessary inspection check points.

7.2.6 Training

Training Nepalese managers, professionals, technicians and operators in the technologies used by the Centre. This would include such courses as:

- A review and awareness seminar for managers
- NC part programming for professionals
- CAD principles for professionals
- Manufacturing Engineering for professionals
- NC machine operation for operators
- CAD/CAM hardware maintenance for technicians
- Group Technology for professionals
- Pareto Analysis for professionals - this involves grouping problems causes or parts populations in a ranked order from most severe or frequent to least severe or frequent.

7.2.7 Demonstrations

Demonstrating the Centre's hardware and software by assisting the Centre's clients in "hands-on" exercises so that they become familiar with the their capabilities and are able to use and operate them.

7.2.8 Spare Parts

During "non-training" periods use the Centre's resources to produce expensive or "hard-to-obtain" spare parts in limited (as opposed to production) quantities.

7.2.9 Consulting

Providing the following services:

- overseeing the initial production of products once a manufacturing package has been developed
- assisting users when troubles arise in using a Centre developed manufacturing package
- performing "Pareto" studies to determine those spare parts that are common to several manufacturers and developing a manufacturing package for their production

- utilizing group technology to assist manufacturers in determining the most cost efficient product mix, plant layout, plant expansion, etc.
- performing plant surveys and economic analyses to determine the applicability and justification of CAD/CAM technology

7.2.10 Information Dissemination

Maintaining a library of journals and textbooks (related to the Centre's technology) and making them available to clients.

7.2.11 Outreach Activities

Preparing, publishing and disseminating presentations, brochures, and case studies to make the user community aware of the Centre's capabilities and services and how to access them.

7.3 The Centre should establish definite and formal links with the Nepal Bureau of Standards and Metrology to make use of their capabilities in performing tests (7.2.3) and developing quality control plans (7.2.5).

7.4 The Centre should coordinate with the UNDP executed National Planning Project to determine priority areas and industries requiring the Centre's services.

7.5 In keeping with the country's policy to increase industrial privatization the Centre should be industry driven and user oriented. In other words the user community should articulate the needs and problems and the Centre should fulfil and solve them (not the other way around). One of the mechanisms to achieve this is to establish a board directors for the Centre with significant industry and user participation and representation.

7.6 The centre's facilities should be make available on a 3 shift basis. When they are otherwise unoccupied they should be made available on a rental basis to trained and qualified users.

8. PROJECT CONSIDERATIONS

8.1 Perhaps all the Centre functions can not be digested all at once. Therefore the project design should consider utilizing phases (including "follow on" phases) to

permit the center to become fully established through a progression of manageable stages.

- 8.2 During the project execution it would be desirable to have a full time Chief Technical Adviser (CTA) in Nepal throughout the project's life. He should be a fully qualified manufacturing engineer.
- 8.3 Depending on the economics of project execution it might be desirable to have a single consulting firm execute the project on a sub-contract and "turn-key" basis.
- 8.4 Special care should be given to the maintainability of any sophisticated hardware and software procured for the project.
- 8.5 Long term (9-12 months) fellowships should be considered for thorough training of the Centre's professionals and technicians. This is also desirable from the point of view of the firms (user's, suppliers, developers) who will provide the training. This training should be practical "hands-on" training as apposed to the academic variety.
- 8.6 Users should be charged something to use the Centre's services. In the beginning this should be nominal or below nominal. But by the project's end these fees should permit the Centre to operate on a self sustaining basis.
- 8.7 Since Nepal is an LDC and extremely short of funds it may be necessary to provide funding for supplying the Centre's physical facilities (building materials, power supplies, construction materials, etc).
- 8.8 The government must give assurances that it will be able to operate and maintain the Centre after the project terminates.
- 8.9 Rather than construct a new building and separate facilities to house the Centre, it would seem logical to incorporate the center within an existing facility.

9. FINAL CONSIDERATIONS

- 9.1 Although this preparatory assistance project (XP/NEP/89/113) specifies the fielding of two consultants, the 11-02 post appears redundant in view of

The fact that the individual filling the 11-01 post is a qualified CAD/CAM consultant and has considered the CAD/CAM aspects of the center during the current mission. He can also handle the CAD/CAM aspects in producing the PFF. Therefore it is recommended, provided the government and UNDP concur, that the 11-02 post be eliminated and the equivalent funds be used in the training components.

- 9.2 The second phase of this mission is scheduled to begin in Nepal on 2 February 1990. During this phase a project PFF will be produced and its implementation discussed with His Majesty's government of Nepal.
- 9.3 In view of the importance of conclusion 6.2 and the recommendation in 7.2.9 concerning spare parts, it is considered that a thorough analysis should be made of the national spare parts requirements from the point of view of which parts are most common and which represent the highest volume. Such an analysis should be made as early in the project as possible since it can serve as a basis for establishing priorities for spare parts manufacturing packages to be developed by the center.

ANNEX A

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

NEPAL - XP/NEP/88/113/11-01

JOB DESCRIPTION

Post Title: Consultant in Mechanical Engineering (Team Leader)

Duration: 2 months

Date required: 1989

Duty station: Kathmandu, with travel within the country

Purpose of project: To conduct a technical analysis on the feasibility, technological level and institutional aspects on the establishment of an "Engineering Prototype Development and Training Centre" - ranging from machine design to simple product development to facilitate H.M. Government of Nepal to take a decision.

Duties: The consultant will be attached to the Project Director, Ministry of Industry. He will undertake the following tasks: (a) get acquainted with the present status of mechanical engineering industry through visit to the selected industries, industrial estates and rural workshops and analyse the industry requirements in terms of engineering design, parts and product development and technical training; (b) get acquainted and estimate the national engineering requirements and technological level, with due consideration to the industrial investment and promotional activities and probable targets that may be achieved in the next 10 years; (c) assess the present technical status of educational and industrial training institutions and project the engineering/technological level of training needed in the intermediate term; (d) formulate a technical strategy on attainable engineering capabilities in terms of design product/components, target groups and training programme and the necessary equipment, institutional facilities, organizational structure, human power requirements, work plan and finances; draft the following reports/documents: (i) a in-depth technical analysis on the establishment of an "engineering prototype development and training centre" in parts/components/machine design and product development, (ii) a draft UNDP Project Formulation Framework (PFF) and discuss with the Government authorities; (f) recommend to the Government immediate plants to be undertaken.

Qualifications: Degree in mechanical engineering. Around 15 years of experience in engineering production, machine tools and equipment utilization and human power development. Sufficient knowledge on engineering design, prototype development and industrial liaison. Experience in engineering institutional development is an asset.

Language: English

Background

Information:

- (i) Nepal's development efforts are currently attuned to the Government's endeavour for national self-reliance. Private sector will be playing an important role. However, an insitutional mechanism for linking private and public industrial sector, to upgrade the skills, and to develop a framework for promotion of ancillarization and subcontracting linkages between large and small manufacturing enterprises is of utmost importance.
- (ii) Within the framework of the Seventh Plan (1985-90) and the national development strategy and planning, the higher utilization of production capacities and to achieve self-reliance in terms of engineering and technical services to public and private sector, with special reference to small and medium scale industry, has been awarded top priority.
- (iii) In this context, many of the foreign companies operating in Nepal require spare parts and components for their production machinery at quick notice. (Note: example of existing foreign companies: Orissa Industry Ltd., Jenson & Nicholson, British American Tobacco, Indian Tobacco Company, Comcraft Asia, Union Carbide & Co., Tungssram, Mitsui State Co., French Centre for International Research, National Export Corporation of China, Thai Preserve Factory Co. Ltd., Kissan Products Ltd.)
- (iv) Many of the Nepalese companies who wish to expand the production or enter new fields require product engineering assistance as well as spare parts for their existing machinery (Note: examples are Northern enterprises - engineering and textile, Climax trading - electronic assembly, Koshi Metal Crafts - containers and crown caps, Sundar Furniture Industries - steel furniture, Neapl power engineering - swith boards, East-West Concern - roofing, etc.).
- (v) Some of the Nepalese investors who wish to enter into non-engineering industrial projects will also require spare parts for their production machinery (example: John Kazi tuladhar Pvt., Mechi Stones and Minerals Amalgamated Industries, Indushankar Chinni Udyog, Nepal Polyethene and Plastic Ltd.).
- (vi) There are many new investment projects (in dairy industry, pharmaceutical, agro, packaging, chemical, textile, engineering and energy equipment sector) which will require spare parts, components for the production machinery.
- (vii) The village level rural artisans require hand tools and equipment (such as vice, hammer, chisel, tongs, etc.) and basic products.
- (viii) The small and medium metal working industries in the private sector, industries in Industrial Estates require simple production machinery and equipment (such as manually operated metal shear, sheet metal guillotine, punch press, arbour press, press brake forge, etc.) and industrial hand tools (such as tongs, hammer, pliers, foot rule, hand forge tools, chisel, mallet, etc.) and also simple products.

(ix) Some of the metal working factories such as Birganj Agricultural Implements Factory and other workshops in industrial estates require simple/intermediate products (such as improved agricultural machinery, low powered equipment, pumps, motors, small engines, etc.).

(x) The range of products vary from simple tools to precision parts. Although the educational institutions, such as polytechnics impart academic training, there is a need to bridge the gap between institutions and industry. The technology varies from basic design to advanced aspects. In this context it should be noted that certain industries (e.g.: textile) has introduced CAD techniques. It is necessary to be aware of the well proved advanced techniques in parts/components/machine design and product development.

(xi) Therefore, engineering training plays an important role. The training aspects will have to be related to the technology of product line, present requirements, future trends and the level of national technical infrastructure now and in the immediate future.

(xii) The H.M. Government of Nepal wishes to develop the local technical and engineering capabilities through the establishment of a engineering prototype development and training centre. This will call for investment in infrastructure, human power and physical facilities. Therefore, the H.M. Government of Nepal wishes to secure UNIDO's assistance on a priority basis to assist them in taking an appropriate decision at an early date.

(xiii) The UNIDO team of consultants for this 2 months task consists of:
- 11-01 Mechanical Engineer (Team Leader)
- 11-02 Computer Technology Engineer
The 2 consultants will act as a team and will prepare the necessary reports.

PERSONNEL CONTACTED DURING THE MISSION

UNITED NATIONS

Mr. J. Berke, Resident Representative, UNDP
Mr. J. Toyberg-Frandzen, Assistant Resident Representative, UNDP
Mr. L. Zhou, Junior Professional Officer, UNIDO
Mr. L. Poos, Chief Technical Adviser, UNIDO (Nepal Bureau of Standards and Metrology)
Mr. M. Satyapal, Chief Technical Adviser, UNIDO (Industrial Planning Division)
Mr. S.S. Mahdi, FAO Representative in Nepal

MINISTRY OF INDUSTRY

Mr. I.S. Thapa, Joint Secretary and Project Director
Mr. B.N. Chalise, Joint Secretary
Mr. D.R. Bhattarai, Director General, Nepal Bureau of Standards and Metrology
Mr. R.B. Bhattarai, Director General, Department of Industry
Mr. M.B. Shrestha, Member Secretary, Textile Board
Mr. B.K. Shrestha, Mechanical Engineer, Planning Division
Mr. A.B. Shrestha, Mechanical Engineer, Department of Cottage Industries
Mr. M.L. Shrestha, Textile Expert, Textile Board

OTHER GOVERNMENT

Mr. D.M. Singh, Member National Planning Commission
Mr. P.P. Dahal, Joint Secretary, FACD/Ministry of Finance
Mr. R.S. Rana, Vice Chancellor, Royal Academy of Science and Technology (RONAST)
Mr. N.B. Singh, Member Secretary, Royal Academy of Science and Technology (RONAST)
Mr. T.M. Singh, Chief Appropriate Technology, Agricultural Development Bank (ADB)
Mr. A.N.S. Thapa, Managing Director, Nepal Industrial Development Corporation (NIDC)
Mr. R.N. Dhungel, Chairman and General Manager, Economic Service Centre

RESEARCH AND TRAINING

Mr. S.R. Tiwari, Dean, Institute of Engineering, Tribhuvan University
Mr. S.B. Shakya, Campus Chief, Tribhuvan University
Mr. P.M. Shrestha, Staff Member, Research Center for Applied Science and Technology (RECAST)

Mr. D. Manandhar, Consultant, Mechanical Training Center, Swiss Assistance for Development and Cooperation.
Professor S.P. Dhoubhadel, Dean of Engineering Institute, Tribhuvan University
Mr. R. Guthier, Project Director, Small Business Promotion Project (GTZ)

PRIVATE INDUSTRY

Mr. M.L. Pradhan, President Federation of Nepalese Chambers of Commerce and Industry (FNCCI)
Mr. S. Devkota, General Manager, Balaju Yantra Shala Limited, (General Metalworking Machining)
Mr. P.P. Pradhan, Executing Director, Limited (Metal fabrication)
Mr. N.L. Joshi, Manager, Shree Textile Limited (Weaving)
Mr. G. Mittal, General Manager, National Structure and Engineering Limited (Fabrication and Foundry)
Mr. N. Shrestha, General Manager, NECOENCO Industries Limited (Steel Furniture and Construction Products)
Ms. Y.S. Sherpa, Managing Director, Shiecto Nepal Limited (Metal Fabrication)
Mr. J.B. Shrestha, Managing Director, Nepal Transformers Limited. (Power Transformers)
Mr. M. Sharma, Admin Officer, Annapurna Textile Mill Limited. (Winding, Weaving, Warping, Printing)
Mr. S.C. Agrawal, Managing Director, Ashok Steel Industries Limited (Pipe and Corrugated Sheet Fabrication)
Mr. A. Agrawal, Workshop Manager, Ashok Steel Industries Limited (Pipe and Corrugated Sheet Fabrication)
Mr. U.S. Thapa, Managing Director, Himalayaya Enterprises (Fuel Injection Pump Overhaul)

GOVERNMENT INDUSTRY

Mr. L. N. Thakur, Deputy General Manager, Birganj Sugar Mill
Mr. Y.P. Shau, Acting General Manager, Birganj Sugar Mill
Mr. M.P. Panyar, General Manager, Agricultural Tools Factory Limited
Mr. R.B. Karki, Chief, Pilot Demonstration Foundry (Grey Iron)
Mr. S.B. Thapa, Chairman, Cottage Handicrafts Emporium

ANNEXURE C

SUMMARY OF COMMENTS MADE BY GOVERNMENT OFFICIALS

In general, all government officials were supportive of the project to establish an Engineering Prototype Development and Training Centre in Nepal. But each of them made certain comments and indicated certain particular concerns as noted below:

Mr. B. Khatri, Secretary Ministry of Industry

Mr. Khatri wanted to be assured that the caliber of individuals currently being produced by technical institutes in Nepal were capable of absorbing the training to be given both by the project itself and the resultant Centre. He also expressed interest in solving Nepal's spare parts problems and requested that the private sector participate in and support the Centre to some degree from its inception. In addition he stressed the Government's policy of privatizing industry.

Mr. D.M. Singh, Member, National Planning Commission

Mr. Singh placed heavy emphasis on the Centre making a major contribution to solving the National spare parts problem. He wanted to be sure that the spare parts problems to which the Centre devoted its energy were, indeed, those that would impact the national problem significantly. Also he requested that the project be closely coordinated with the current National Planning project being executed by UNIDO.

Mr. R.S. Rana, Vice Chancellor, Royal Academy of Science and Technology

Mr. Rana outlined in some detail (with the aid of a video tape) the functions and resources of RONAST. He promised the full cooperation of RONAST with the project and Centre. He indicated that there was a strong likelihood that RONAST would utilize the Centre to produce prototypes for some of the projects on which they were working.

Mr. B.N. Chalise, Joint Secretary, Ministry of Industry

Mr. Chalise advanced the idea that the Centre should play a key role in solving the national spare parts and machine utilization problems. Further he hoped that the Centre would assist in designing some simple machine tools (i.e. small wood lathe and sensitive drill press) that could be indigenously produced and used by Cottage Industries.

Mr. P.P. Dahal, Joint Secretary, Ministry of Finance

Mr. Dahal made the point that although the Government would be assisting the project to some degree, at the project's completion, the Centre should be financially self sufficient. He also stressed the fact that private industry must feel that the Centre is theirs and that they must support it from the beginning.

Mr. R.B. Bhattarai, Director General, Department of Industry

Mr. Bhattarai was particularly concerned that the Centre take steps during the project phase to involve the user community. He explained the anticipated changes in the import duty structure to encourage private industry. Also he encouraged sending Centre personnel abroad for training (fellowships). Finally he emphasized that the Centre be self supporting because any hint of subsidies tended to have an adverse effect on user support.

Mr. D.R. Bhattarai, Director General, Nepal Bureau of Standards and Metrology

Mr. Bhattarai enthusiastically supported the concept of such a Centre. He looked forward to close cooperation between the Centre and his organization - particularly in the areas of functionally testing prototypes and designing quality control plans for manufacturing packages.

Mr. S.R. Tivari, Dean, Institute of Engineering, Tribhuvan University

Mr. Tivari pledged full cooperation with the establishment of the Centre. He indicated that he might be able to make land and other facilities available. Also, he expressed the desire to have some of his staff trained at the Centre - particularly in CAD technology and highlighted the importance of improving National Productivity.

Mr. R.N. Dhungel, Chairman and General Manager, Economic Service Centre

Mr Dhungel indicated that he supports the idea of training users by demonstrating the manufacture of actual user parts at the Centre using improved production methods. He feels that entrepreneurs, properly encouraged and motivated, will make good use of the Centre's resources. Further, he felt that high technology methods should be used by the Centre to produce conventional (not high technology) manufacturing packages for industry users. Also he promised the resources of his organization would be used in assisting in determining the priority with which the Centre should work on problems related to spare parts and marketable products.