

WISNER

**South—East Asian Ergonomics Society
Second Conference**

**PROGRAMMES
and
ABSTRACTS**

Denpasar—Bali, Indonesia
July, 27—29, 1988

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South-East Asian Ergonomics Society
Second Conference

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ABSTRACTS

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FOREWARD

"SELAMAT WISATA SASAR"
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to share their experiences on the applica-
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of the conference: The Role of Ergonomics in Develop-
ment, which covers 4 topics as the followings: 10

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FOREWARD

"SELAMAT DATANG DI DENPASAR"

Welcome to Indonesia and a special welcome to the island of Paradise. It is indeed a pleasure for us to have the honor of hosting the Second Conference of SEAES. This meeting will provide an opportunity for members of SEAES and ergonomist from other countries to share information and experiences on the application of ergonomics. This can be done under the theme of the conference: The Role of Ergonomics in Development, which covers 4 topics as the followings:

1. Rural ergonomics.
2. Education and training for ergonomics.
3. Intercountries differences in ergonomics application.
4. Impacts of technology and the role of ergonomics.

About 100 participants will attend this conference in which fourty four papers from all over the world will be presented.

This small book provides all abstracts of the paper and the additional information about the programmes of the conference.

We hope all participants will have a productive and pleasant stay in Denpasar-Bali, Indonesia.

Thank you.

The Organizing Committee.

OPENING REMARKS

Distinguish guests, colleagues, friends, ladies and gentlemen.

On behalf of SEAES (South-East Asian Ergonomics Society), Indonesian Physiological Society (IPS- (AIPI) and Departement of Physiology, School of Medicine, University of Udayana, I wish to express my sincere gratitude to all of you, who have gathered together here in Denpasar to conduct a lively discussions. As the President of SEAES, my deepest appreciation and heartfelt thanks to each and every one of you for your attention and participation in this SEAES Second Conference, which will be held from 27 till 29 July 1988. Also at this time I wish to express warm gratitude first of all to the Governor of Bali, the Rector of University of Udayana as well as IEA, and other organisations which have given very strong support in helping to arrange this conference.

The South-East Asian Ergonomics Society held its first meeting three years ago in 1985, also in this lovely island, in connection with the Internasional Symposium on Ergonomics in Developing Countries which was held at the same year in Jakarta. Similar in its character, this SEAES Second Conference is also attached to a more bigger accasion, the Internasional Ergonomics Association Congress which will be held in Sydney, August 1-5, 1988. We have to do such a policy for the sake of every body as far as financial matter is concerned, beside our own limitation as well as obstacles and constraints faced in organizing such an Occasion. Therefore we are very happy that with such a limitation we still have the opportunity to organize two meetings until recently. It meant that SEAES still has "something" in every body heart, especially those who are able to attend this meeting. I can only say again our appreciation and thanks to all of you.

Passing through all those abstacles and constraints, we should be able to make this opportunity as beneficial as possible, by giving all our efforts to make the conference a succesful one.

And although in physical form our contact will end after this Second Conference is closed, it does not meant that our effort in developing more understanding and co-operation to all of us will also end, but it must be followed and continuesly conducted through other type of activities since our main final organisation objectives are the welfare of the people as a whole. Our expertise is not only to be performed with arrogant in a close AC meeting room, but yet to be used more actively outside the building and for the people who is really needs help. Hopefully, such an ideal thinking will be the guidance of our three days discussions.

Finally, wishing better understanding and co-operation among us in the near future. Thank you so much.

President

SEAES

A. Manuaba.

The South - East Asian Ergonomics Society

CONSTITUTION

NAME

1. The name of the Society shall be "The South-East Asian Ergonomics Society".

OBJECT AND POWERS

2. The object of the Society shall be to promote learning and to advance education in countries in South-East Asia concerning the relationship between man and his occupation, equipment and environment, particularly the application of anatomical, physiological and psychological knowledge in conjunction with the engineering knowledge to the problems arising from this relationship.

3. In order to attain this object, the Society shall have the following powers:

(1) To promote and organise study and publication relating to the object.

(2) To arrange for educational courses, lectures and examinations.

(3) To accept and raise money for the purpose of the Society and to use it for the furtherance of the object of the society.

(4) To make suitable arrangements for carrying on the work of society and for meetings of the Society.

(5) To collaborate with institutions having an object similar to that of the Society.

(6) To promote the formation of organisations for the purpose of any of the powers of the Society and to assist the organisations as may be thought fit

MEMBERSHIP AND AFFILIATION

4. The Society shall consist of Members and Affiliated Organisations.

5. Persons applying for Membership shall hold a qualification in ergonomics or a cognate subject or shall have an active interest in furthering the object of the Society as the Council shall decide

6. Every application for Membership of the Society shall give the full name and address of the applicant, any degrees and diplomas, membership of other learned or professional societies or associations, occupation and position held and a list of publications of the applicant.

7. Members of the Society shall have the right to attend all Scientific Meetings and General Meetings of the Society, to vote on all matters requiring decisions at General Meetings, and to nominate Members for election to the offices specified in Clause 17 and 18.

8. Every applicant for Membership of the Society shall be recommended by at least two Members who shall also confirm the evidence submitted in support of the application to the satisfaction of the Council.

9. Firms, companies and associations which have an interest in ergonomics may become affiliated Organisations of the Society.

10. Affiliated Organisations may send two representatives to all scientific meetings of the Society at fees applicable to Members, and they will receive two copies all circulars and programmes as sent to Members.

11. Every application by a firm, company or association for affiliation to the Society as an Affiliated Organisation shall give its full name, address and the nature of its business or interest. Applications will be considered by the Council which may accept or reject such applications.

12. The acceptance by the Council of an application for affiliation of a firm, company or association does not entitle it to describe itself as a Member of the Society nor to use the Society's name in any way so as to suggest that the Society approves of any product of or action by the firm, company or association.

13. Every person elected as a Member and every firm, company or association accepted as an Affiliated Organisation shall not enjoy the privileges of Membership or Affiliation until the relevant annual membership or affiliation fee for the current year shall have been received by the Society.

14. Membership or Affiliation shall be terminated if resignation shall be signified in writing, if a Member shall die or an Affiliated Organisation shall be dissolved, if membership or affiliation fees are unpaid for such period as the Council shall determine, or if a resolution by the General Meeting of the Society resolved that the Membership shall terminate or the Affiliation becomes unfitted in the opinion of the Council.

MEMBERSHIP AND AFFILIATION FEES

15. The annual membership fee shall be ten United States dollars or such other rate as shall from time to time be determined by the voting members in the General Meeting.

16. The annual affiliation fee for an Affiliated Organisation shall be fifty United States dollars or such other rate as shall from time to time be determined by the voting members in the General Meeting.

COUNCIL

17. The Officers of the Society shall consist of :

- (a) President
- (b) Two Vice-Presidents

(c) Honorary Secretary-Treasurer

18. The business of the Society shall be carried on by a Council consisting of a President and two Vice-Presidents, Honorary Secretary-Treasurer and five Members of Council.

19. The Officers and Members of Council shall be elected every three years by Members of the Society at the General Meeting. Not more than three members of the Council including Officers shall be from same country.

20. The Auditors who shall be two individuals shall be appointed every three years at the General Meeting. They shall not be members of Council.

21. No President and no Honorary Secretary-Treasurer shall continue to hold office for more than six years consecutively.

22. The funds of the Society shall be under the control of the Council who shall have the power to invest the same and to expend such funds for the promotion of the object of the Society as it thinks fit.

23. The Council may form Committees consisting of such Members of the Society as it thinks fit and may delegate any of its powers to such Committees and any such Committee shall conform to regulations imposed on it by the Council.

24. The duties of the Honorary Secretary-Treasurer shall be to arrange the business of the Society in accordance with the directions of the President or the Council, to notify Members of the time and place of meeting, to take minutes of these meetings and to prepare a tri-annual report on the activities of the Society for submission to General Meeting.

25. The Honorary Secretary-treasurer shall have charge of the funds of Society, receive sums due to it, pay such bills as are directed by the Council, make up the accounts of the Society to 31 December in each year or to such other date as may from

time to time be determined by the Council and present at the General Meeting an income and expenditure account duly certified by the auditors.

26. The other officers shall generally assist the President and the Honorary Secretary-Treasurer and in particular shall in accordance with the instructions of the Council arrange scientific meetings of the Society, promote knowledge of Society activities and foster the general growth of the subject outside the Society.

MEETINGS

27. The ordinary meetings of the Society shall be Scientific Meetings and tri-annual General Meetings. An extraordinary General Meeting shall be called by the Honorary Secretary-treasurer at the instruction of the Council.

28. A notice of the General Meeting of the Society together with the proposed agenda shall be circulated to the members at least twelve weeks before the date of the meeting.

29. The Chairmen at any General Meeting of the Society shall be a member of the council.

30. At and General Meeting of the Society a quorum shall be twenty Members present in person or by proxy.

31. Any member unable to attend the General Meeting of the Society may vote by proxy in the election of the members of council and in the charge of the Constitution, the signed voting paper to be received by the Honorary Secretary-Treasurer before the Meeting. The decision at General Meetings shall rest with the majority and in case of an equality of votes the chairman of the Meeting shall have a casting vote in addition to his ordinary vote.

32. The Constitution of the Society shall not be changed unless three-quarters of those voting at the General Meeting of the Society are in favour of such change. Notice of the proposed change shall be tendered to the Honorary Secretary-Treasurer at least sixteen

weeks before such General Meeting, and shall be advised to all members in the notice calling the General Meeting.

Adviser : The Governor of Bali
Rector, Universitas Udayana
Vice President : W.O. Phoon
Secretary-Treasurer : Chaiyuth Chaiyuth (Thailand)
Chairman : A. Manuaba (Indonesia)
Members : Chaiyuth Chaiyuth (Thailand)
Sutarna (Indonesia)
Sonia Ting-Aguine (Philippines)
Gug K. S. (Singapore)
Guat Lin Tan (Malaysia)
B. Gunawan (Indonesia)
Rabindra Nath Sen (India)

Organizing Committee:

Chairman : Department of Biology
Secretary : N. S. (Faculty of Medicine)
D. P. Sucana
Treasurer : Universitas Udayana
Section :
1. Scientific : K. Karna
Tjening Kerana
2. Information : K. Tirtayasa
N. Anteng Aryana
3. Accommodation : Suyasning H. I.
K. Widana
4. Protocol : Abdullah Nahrawi
Alex Pangkahila

**OFFICERS AND COUNCIL MEMBERS OF SEAES
1985 - 1988**

President : A.Manuaba

Vice President : W.O.Phoon

Secretary-Treasurer: Chaiyutth Chavalitnitikul.

Council Members : C.N.Ong

M.Sebastian

Suma'mur P.K

Sutarman

Sonia Tiong-Aquino

Address : Department of Physiology

Faculty of Medicine

University of Udayana

Denpasar-Bali, Indonesia

**ORGANIZING COMMITTEE, SECOND CONFERENCE OF
SOUTH-EAST ASIAN ERGONOMICS SOCIETY**

Denpasar-Bali, Indonesia: 27-29 July, 1988

**A. Adviser : The Governor of Bali
Rector, University of Udayana**

B. Steering Committee:

Chairman : A.Manuaba (Indonesia).

Members : Chaiyuth Chavalitnitikul (Thailand).

Sutarman (Indonesia).

Sonia Tiong-Aquino (Philippines).

Ong Choon Nam (Singapore).

Guat Lin Evelyn Tan (Malaysia).

B.Gunawan (Indonesia).

Kazutaka Kogi (Japan).

Rabindra Nath Sen (India).

C. Organizing Committee:

Chairman : G.N.Nala

Secretary : N.Adiputra

D.P.Sucana

Treasurer: D.M.Kusmayuni

Section :

1. Scientific : K.Karna

Tjening Kerana

2. Information : K.Tirtayasa

N.Anteng Aryana

3. Accommodation: Suyasning H.I.

K.Widana

4. Protocol : Abdullah Nahrawi

Alex Pangkahila

INDONESIAN PHYSIOLOGICAL SOCIETY (IPS)
IKATAN AHLI ILMU FAAL INDONESIA (IAIFI)

IPS (IAIFI) was founded in Yogyakarta, center of Java, on December 24, 1964. To day its members, about 180 physiologist, are coming from various educational institutions, research centres, and private sectors as well. Besides enhancing the quality of its members through various scientific meetings which had being done annually, IPS is also trying to conduct public services in the field of sport, work, environmental physiology, ergonomics, nutrition and occupational health, in co-operation with other relevant institutions. Education was also became IPS's attention, especially for the undergraduate students where physiology had being taught. Of course postgraduate education had also being encouraged to IPS members.

Congress for president election was done every three years, and the coming one will be on December 1989 at Ujung Pandang. This event will have special status, since it will be the first that such a congress being done outside Java and Bali, and also because this will be our 25th anniversary. Therefore, it will be organized as such, so that as many as possible physiologists will attend the meeting, and foreign physiologist will be also welcome. Of course, other meetings are worth while also to be recalled due to its memorable values, as for examples the Workshop on Man and Traffic in Jakarta, 1970, the Joint-Workshop IPS and Armforces, 1973, Man and His Environment Symposium in Yogyakarta, 1974, Physiology and Sport Performance in Solo, 1981 and Jakarta, 1983, etc. Of course the most memorable and unforgettable one was in Bali, 1972, which was considered as the most successful one.

IPS published quarterly bulletin as communication media and Indonesian Physiological Journal which was issued six monthly. As a federated member of IUPS, IPS try to give its contribution optimally, within its

limitation, for example by contributing papers in some of IUPS congress.

Eric Min-Yang Wang and Houshang Shahnavaz
Center for Research and Development in
(CEDC) Dept. A, Bandung, West Java, Indonesia
Insulin, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

DEPARTMENT OF PHYSIOLOGY
FACULTY OF MEDICINE, UNIVERSITY OF UDAYANA
DENPASAR, BALI, INDONESIA

This department was founded in 1962, at the same time the Faculty of Medicine was founded. At that time to educate 30 medical and 30 veterinary/animal husbandary students, it had only 2 full timer staffs, A. Manuaba as the Head and W. Gejir as the Messenger. To day through various difficulties, this department is having 14 academic staffs, 1 "administrator", 1 "technician", and 2 messengers. They occupied 82 m² work spaces and using old equipments purchased in 1962 which are really inadequate. With all those limitation the TRI DHARMA : education, research and public services have to be carried out. Education in form of lectures and laboratory works had being conducted to the students of medicine, dentistry, technology, physical education, letters/anthropology and secretary. Real setting had being used mostly for laboratory works, likes factories, agricultural/rural activities, etc. Research on sport, work and environmental physiology, ergonomics, nutrition and occupational health had being executed mostly. Co-operative works in doing research with other relevant institutions are highly stressed, particularly in solving financial constraints. While public services had being pursuit hand in hand with other government and private bodies as well, through direct face to face communication as well as through electronical means like televisions and radio or printing means like local news papers. And finally it is important to note that this department of physiology is the only one in Indonesia which got a "Honorable Letter" from the Consortium of Medical Science, for its activities in doing researches relevant to development.

USER-FOCUSED METHOD OF EDUCATION AND TRAINING FOR
ERGONOMICS IN DEVELOPING COUNTRIES

Eric Min-Yang Wang and Houshang Shahnava
Center for Ergonomics of Developing Countries
(CEDC), Dept. of Human Work Sciences, Lulea university
Sweden.

Relevant education and training is one of the key factors that determines the success of the technology transfer. In corporation of human factors into the technology and consideration of the user characteristics in a given environment is a key element for optimum operation. Because of unawareness regarding the importance of ergonomics in the transfer of technology both among technology transferor and technology recipient, acquisition of modern technology have caused many adverse effects in developing countries (DCs). In this paper, ergonomics education and training problems were investigated. The "User-focused (UFO)" method and procedures for ergonomics education and training were discussed in order to promote its applications. It is concluded that training should (1) be directly related to the ergonomics problems of the country (2) emphasis should be given to simple and practical solutions for quick achievements; and (3) should utilize the available human resources and management strategy for short-term goals while continuous effort should be given to other required aspects for the long-term.

Experiences in the Design for Ergonomic Education and Training in Indonesia

Iftikar Z. Satalaksana,
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The existence of Ergonomics in Indonesia can be regarded as new. Although aspects of Ergonomics have been partly taught in different schools such like the Faculties of Medicine and the Faculties of Psychology, formal Ergonomics education as a separate knowledge only provided recently, at the Bandung Institute of Technology namely at the Department of Industrial Engineering and the Department of Design. However, research and practice of Ergonomics started years earlier.

This paper is intended to present the author's Indonesian experiences in performing curriculum design for Ergonomics and Ergonomic related courses as well as teaching at several Departments of Industrial Engineering at different Universities, the Department of Design in Bandung and at some Departments of Management at two Universities in Surabaya. Experiences in training design for Ergonomics for several industries will be also discussed in this paper.

It is quite interesting to note the differences in the perception of Ergonomics among different parties in matters and scope as well as in their needs. The multidiscipline nature of Ergonomics has brought challenge to promoting Ergonomics in Education and Training.

which got a "Honorable Letter" from the Consortium of Medical Science, for its activities in doing researches relevant to development.

EXPERIENCE OF WORKER EDUCATION ABOUT VDT WORK

Yoshiomi Temmyo; Kazuhiro Sakai
The Institute for Science of Labour
2-8-14 Sugao, Miyamae-ku, Kawasaki, Kanagawa
Japan

We found that some labour union leaders facing VDT work problems would rather think of a health examination for operators than think of improvement of the working conditions and environment. We developed an educational material about VDT work. The aim of the material is to have the operator understand the nature of the risk to which he/she is exposed in the job.

TRAINING IN PRACTICAL ERGONOMICS IMPROVEMENTS

Kazutaka KOGI,
Occupational Safety and Health Branch,
International Labour Office,
CH-1211 GENEVA 22
Switzerland

Training plays a key role in achieving concrete improvements at the workplace from ergonomics and related points of view. Recent experiences through the ILO's International Programme for the Improvement of Working Conditions and Environment (PIACT) in developing countries show that training is effective when it focuses on (i) a multi-disciplinary approach which takes into account the different aspects of workplace conditions, and (ii) participatory enabling methods, which make use of practical advice about carrying out immediate solutions. It is interesting that this enabling training can lead to real improvements when it is aimed at voluntary action built on local practice. Particular attention is drawn to the learning-by-doing process using good local examples, checklists and action manuals on production-related solutions. Simple, low-cost improvements have a large potential with respect to materials handling, workstation design, work organisation and physical environment. Training programmes should be developed which provide direct support for self-help action for these immediate improvements.

Ergonomics in Korea

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This paper introduces the ergonomics status quo in Korea. Current research areas of various universities, research institutes, and industries are presented followed by a brief historic review. The activity of the Human Engineering Society of Korea is also introduced.

Participatory Approaches for the Improvement of Occupational Safety in the Federal Republik of Germany

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In the last few years an increasing number of employees from the shop floor levels of production and administration in West Germany are being involved in problem definition and problem solving processes. Recently, and to a limited extent, ergonomic questions are also being dealt with.

The presentation will examine the theme utilizing

- a) the results of a major questionnaire involving approx. 250 West German companies designed, in part, to identify to what extent ergonomic subjects play a role in the work of Quality Circles,
- b) a detailed case study drawn from the chemical industry and dealing with an increase in the efficiency of Safety Delegates through the use of a team concept.

The summary will evaluate the effectiveness of the participatory approach in examining ergonomic subjects.

IMPACT OF NEW TECHNOLOGY AND THE ROLE OF ERGONOMICS

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No abstract.

will be discussed.

IMPACTS IN OPERATING KEY-PUNCHES AND COMPUTERS IN DENPASAR

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In relation to development of several supermarkets and department stores in Denpasar, key-punches machines were started being used and operated. Similar cases also happen in Banks and Universities with their computers with aim to increase their tasks and services. But, in fact, the use of these modern equipments were not followed by appropriate step related to fit the man-task system. This can be seen through the unnatural body posture showed by the operator due to unfit operator-seat system, lack of adequate lighting and contrast inappropriate micro-climate which might course to unexpected consequences. Of course such a condition will lower the productivity of workers at the end.

Data collected showed that such a situation is really exist, for examples 64.71 % are having eye strain, 76.47 % are having neck and shoulder pain, 76.47 % are having back pain, and 58.82 % are having legs complaint. In regard to lighting inadequate 30-40 lux were still found in several work places both at the bank and university as well. A little bit too cold working environment was also found at the bank. And last but not least about 30.0% of work tables need improvement. In addition 66.6% of key-punches operator are having headache which need special attention.

Based on those data, various improvement steps must be taken into consideration with aim to minimize or omit the negative impacts which might emerged due to the condition. It will be more economical if it can be done at the designing or purchasing stage.

THE USE OF METHODS OF PARTICIPATION IN THE SMOOTHER IMPLEMENTATION OF NEW TECHNOLOGY IN DEVELOPING COUNTRIES.

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The potential benefits that accompany new technology in terms of organisational efficiency, flexibility and increased communication have already been realised in many areas of industry, commerce and the service sector. Resulting changes in the organisation and implementation of work imply improvements to the physical, psychological and social conditions for employees. However, ergonomics research on the impact of new technology indicates that the changes incurred often entail unforeseen detriments to the quality of working work or may simply disguise or relocate existing problems.

Ergonomics are alert to these implications and to the need to involve workers in the implementation of change. Methods of participation in charge are being developed which can be applied to a variety of work design situations. Methods include using worker "design groups" to address workstation design, interview and questionnaire methods for eliciting job design information and semiautonomous working groups to aid implementation.

The delayed introduction of new technology to developing countries provides an opportunity to seize upon methods and enable minimal disruption and maximum returns on investment. The methods of participation available and their role in facilitating the introduction of new technology to developing countries will be discussed.

IMPACTS IN OPERATING SYSTEMS AND COMPUTERS IN THE USE OF MECHANICAL EQUIPMENT IN THE SMOOTHER IMPLEMENTATION
ERGONOMIC ASPECT OF
PERTAMINA LPG FILLING PLANT

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This study was conducted by doing observation of the physical work environment and its activities as a preliminary ergonomics study.

Mostly the work activities during LPG filling process are manual works such as lifting, slanting, pushing and rolling the LPG bottles, in order to perform their duties safely and efficiently.

Medical datas show up only relative small number of musculoskeletal problems and sickness absence.

AN ERGONOMIC STUDY OF WORKERS FOR
Ergonomics in Agricultural and Rural Development

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In most industrially developing countries economic growth is underpinned by the performance of the agricultural sector. Agricultural and forestry activities - encompassing crop production, harvesting and post-harvest processes have received relatively little ergonomics attention compared with other production and processing industries, where the benefits of ergonomics are now being recognised.

A study of farming systems is proposed which would reveal potential ergonomics improvements within existing socio-economic constraints and in response to local needs. Problems of crop establishment at an optimum level of mechanisation (human, animal or machine powered) are particularly amenable to ergonomics analyses and thence to engineering or work organisation based solutions. The application of the principles of ergonomics ensures that human abilities and behavioural characteristics are properly accounted for and that improvements are sustainable. Ergonomics has an important national role to play in encouraging rural development through increased agricultural productivity especially at the small farm level. Associated benefits and incentives include reduced drudgery and greater prosperity not only for the men and women engaged directly in food production but also in those in allied activities.

RURAL ERGONOMICS IN BALI

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Bali had being developed through three main principle sectors, namely: agricultural in broad sense, tourism and small scale cottage industries. Since Bali is a small density island, most of the activities practically occurred in the rural areas and cover a lot of people due to their labour intensive character. In such a situation, and coincide also with the main development objective "to develop man as a whole", ergonomics approach in doing the task become a must. By so doing the most important component of development goals, like healthy, safety, comfortable and efficient working conditions and environments, can be achieved.

Based on those thinkings, since 1969, when the First Five Years Development Plan was started, some ergonomics activities, also in rural areas, had being carried out. Due to various limitation, most steps had being done by using easy low cost available means and developing various examples which cover the three sectors of development. Those examples had being used until recently as means to motivate and negotiate other similar ergonomics activities.

In fact, with such activities, in Bali until recently we had already several examples in various sectors, which are keep increasing in numbers, of how ergonomics can be carried out by the people themselves. Those ergonomics examples, which are really important as tool of development in traditional communities, in fact, become rolling ice balls for other similar industries. Until recently, we already had ergonomics examples for hotels, black-silver-gold smiths, etc.

The only problem we have to face now is how to keep the ball always rolling by itself.

AN ERGONOMIC STUDY ON SICKLE DESIGNS FOR REAPING TASK IN INDIAN AGRICULTURE

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Indian agriculture, due to socio-economic reasons, uses mostly manual methods and conventional low-cost implement, e.g. sickles made by the village artisans for reaping, instead of using capital intensive machineries.

The present ergonomics study aimed at evaluating the traditional designs of sickles, used in the North-Eastern and Western regions of India, with regards to increasing efficiency, occupational health, safety and productivity.

Two new ergonomics design prototypes were developed and fabricated based on the anthropometry of the workers and studies with the existing designs. The effectiveness of the new designs were revealed by the field studies on experienced agricultural workers.

The new design of the sickle has the following features (I) An efficient lower-bend of the iron blade from the handle, the blade has a serrated concave cutting edge and a protrusion near the blunt tip opposite to the serrations. (II) Special protective hand guard. (III) More comfortable and non-slip grip handle.

Benefits observed with the newly designed sickle are: (I) Improvement in the working postures and productivity. (II) Reaping closer to the ground for more out put. (III) Protection against hand injuries. (IV) Comparable weight and cost with the existing designs. (V) Prevention of chances of slippage from the grip. (VI) Multi-purpose use for reaping herbs, shrubs and root crops and digging out of soil for seed sowing and transplantation.

ERGONOMICS HEIGHT OF ARBORS FOR GROWING GRAPES Nurah Nala

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Most of table grapes are trained on arbors, because grape roots require continuous supply of moisture, but in contrary their fruits favor in dry humidity. The higher the arbors the more their productions.

To find out the most ergonomics height of arbors with optimum production of fruits, a preliminary study was carried out in Bondalem village, Bali Indonesia, on two difference types of high arbors. The first arbor is 2,25 m and the second is 1,80 m in high, where the other factors which involved in their production are at the same condition.

Six healthy grape farmers pruning the vine at the first and second arbors alternately. During pruning at the first arbor they used a 0,45 m high bench support, so they could reached the arbors by standing on it and removed this support any time their hand could not reached the other area of arbors.

The heart rate during pruning were measured by ten pulse method and also their pruned area were noted.

The results of this study indicated that the second arbor more ergonomics ($P < 0.05$) than the first arbor, but there are no significant differences in their productions.

The only problem we have to face now is how to keep the ball always rolling by itself.

Application of Ergonomic Principles to the Man-machine Interface Design for a Medical Ultrasound Scanner

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This paper deals with the redesign process of multifunctional ultrasound scanner man-machine interface -- keyboard and screen format following the ergonomic principles.

The keys were rearranged and grouped based on functional analysis and well known principles such as arrangement by sequence of usage, functional sequence, frequency of usage, and importance. Color coding and compatibility of keys were also considered to reduce the operational errors. To increase physician's acceptability, key names were changed into more friendly words.

By increasing the character display buffer from 40x20 to 80x25, the width/height ratio of fonts were approached to near optimum (3:5), and the legibility was enhanced.

The determination of optimum parameters for cursor positioning devices such as joystick, trackball, and joy-key is left for further research.

The overall inter-observer reliability of the OWAS-method was tested to be 0,93. The lowest one (0,74) was obtained for combined work postures of the back.

The OWAS-method is a practical instrument in the development of existing worksites and work methods by decreasing harmful postural stress, and in the development of new worksites, methods or machines. The OWAS-method has been applied for the research purposes both in scientific and practical occupational safety and ergonomic studies.

OCCUPATIONAL HEALTH CONDITIONS AT OPEN PIT WORK POSTS
AND ITS IMPROVEMENTS

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An investigation on occupational health conditions made in two deep metal open pits revealed that high dust concentration and high temperature at work posts are the main factors harmful to operators. Improvement measures and its effects are presented in the paper.

Six healthy grape farmers pruning the vine at any time their hand could not reach the other area of arbor.

The heart rate during pruning were measured by the pulse method and also their pruned area were noted.

The results of this study indicated that the second arbor more ergonomic ($P < 0.05$) than the first arbor, but there are no significant differences in their productions.

OWAS, PRACTICAL METHOD FOR THE EVALUATION OF STRESS
INDUCED BY WORK POSTURES

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The OWAS-method was developed to observe and evaluate musculoskeletal stress induced by work postures at worksites.

The most frequent work postures for the back, arms, and legs as well as the weight of loads or the use of force are observed with the OWAS-method.

The postures and posture combinations were grouped into four action categories according to their musculoskeletal stress and health hazards estimated by experts. The action category indicates the urgency of corrections needed at work.

The data about work postures are collected with split-second visual observations. The postures are identified and classified at the very moment when the observer glances at the worker. The equal interval observation system is recommended to use in the OWAS-studies. Each observation is recorded with a number code manually, or using a data memory unit or a portable computer.

The overall inter-observer reliability of the OWAS-method was tested to be 0,93. The lowest one (0,74) was obtained for combined work postures of the back.

The OWAS-method is a practical instrument in the development of existing worksites and work methods by decreasing harmful postural stress, and in the development of new worksites, methods or machines. The OWAS-method has been applied for the research purposes both in scientific and practical occupational safety and ergonomic studies.

THE WORK LOAD OF MODERN BARIS DANCE

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In order to find out the workload of modern baris dance a study was conducted on ten male, healthy Balinese dancers. The physical characteristics of subjects were: age ranged from 21-17 year; mean of height 164.5 cm and mean of weight 54.8 kg. The study was carried out at Dance Academy Denpasar, at room temperature =ranged from 25.5-26.0 °C for wet temperature and 28.0-28.5 °C for dry temperature. Dancing heart rate was measured telemetrically. To evaluate the workload Christensen criteria was applied. The results were as follows:

1. A modern baris dance spending of 8.0 min. of time;
2. Since the first min. of dancing the heart rate was increased gradually until the maximum working beat was achieved within 6 min. of dancing; the maximum dancing heart rate was 149 beat/min.
3. Performing a modern baris dance produced a work pulse' mean of 53 beat/min. with the range of 38-78 beat/min.
4. Five min. post dancing, mean of heart rate was 91 beat/min. which almost similar with the resting beat

Conclusion can be drawn, that performing a modern baris dance induces a high work load to the body; therefore, it is recommended that modern baris dance can be used as one of the physical training for the physical fitness programme.

The OWS-method is a practical instrument in the development of existing workites and work methods by decreasing harmful postural stress, and in the development of new workites, methods or machines. The OWS-method has been applied for the research purposes both in scientific and practical occupational safety and ergonomic studies.

COMPUTER AS AID TO ANALYZE ERGONOMIC AND SAFETY FEATURES OF MAINTENANCE: DESCRIPTION OF TWO GRAPHIC APPLICATIONS.

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No abstract.

matter is how to maintain a policy which involves or integrating ergonomic within every work processes in the coming years.

Work Place Pollution, Health and Well-being of Workers

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The present study was designed to investigate the effects of work place pollution on the health and well-being of industrial workers. A sample of 60 workers taken from a polluted tannery industry in Dhaka, Bangladesh, was employed for this study. The measuring instruments used were the Job Satisfaction Scale, the Inventory for Subjective Health, the Feeling & Symptoms of Fatigue Scales, and the Life Descriptive Scale. The results show that the feeling & symptoms of fatigue, job dissatisfaction, and health problems of the workers increase with their job experience. Majority of the workers consider the work place unhealthy, and suffer from illness and take frequent sick leave. Besides work place pollution, unhygienic home environment, malnutrition, smoking, old age and over-time work have been found to affect the workers' health & well-being. The study indicate that to protect the workers' health & well-being measures should be taken to control work place pollution, improve working and living conditions, increase health care facilities and job satisfaction.

SOME POSSIBLE ERGONOMICS PROBLEMS FACED BY NURSES AT THE GENERAL HOSPITAL IN DENPASAR

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The General Hospital in Denpasar, with its 600 beds, has two functions, namely as the highest post of health care referral system in Bali as well as the educational hospital of the University of Udayana. Due to these functions it actually must be also act as a good example of how work can be done effectively and efficiently, especially by the most important man power in a hospital, the nurses. With such an assumption, a study from ergonomical point of view was carried out, by measuring anthropometric data both the equipments operated and the nurses as well, besides collecting personal feelings through questionnaires. This was based on the thinking that the ineffective and inefficient works among other are due to mismatch or unfit of nurse-equipments system, with all their impacts.

But in fact, with the exception of shiftwork system, most of the works done in that hospital were already ergonomically organized or designed, with the evidence of fit nurse-equipments system as can be seen from anthropometrical data as well as from the questionnaires. It seems that within these last years some improvements have already been done, particularly in purchasing new equipments as well as in designing new buildings, by considering some ergonomics principles in it.

Although further studies have to be executed in the near future, the existing situation for the time being can be accepted and tolerated. But more important matter is, how to maintain a policy which involving or integrating ergonomic within every work processes in the coming years.

BIOMECHANICS - MODELS AND MEASUREMENTS IN ERGONOMICS

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No abstract.

Work place pollution, health, and safety are becoming increasingly important in the modern industrial society. The general aim of the present study is to investigate the effects of work place pollution on the human body. The study is carried out in a factory where the workers are exposed to noise, vibration, and air pollution. The results of the study show that the workers suffer from various health problems, such as hearing loss, tinnitus, and respiratory diseases. The study also shows that the workers experience a high level of stress and fatigue. The results of the study are used to develop measures to reduce the effects of work place pollution on the human body. The measures include the use of noise-reducing equipment, the use of vibration-reducing equipment, and the use of air-purifying equipment. The study also shows that the workers should be given more information about the effects of work place pollution and the measures to reduce these effects. The study is a valuable contribution to the field of ergonomics and will help to improve the health and safety of workers in the modern industrial society.

EYE STRAIN OF GARMENT WORKERS IN DENPASAR, BALI

RAMBANGAN

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No abstract.

The aim of this study is to investigate the eye strain of garment workers in Denpasar, Bali. The study is carried out in a garment factory where the workers are exposed to high levels of light and noise. The results of the study show that the workers suffer from various eye strain symptoms, such as eye fatigue, eye pain, and blurred vision. The study also shows that the workers experience a high level of stress and fatigue. The results of the study are used to develop measures to reduce the effects of eye strain on the workers. The measures include the use of eye-protective equipment, the use of noise-reducing equipment, and the use of air-purifying equipment. The study also shows that the workers should be given more information about the effects of eye strain and the measures to reduce these effects. The study is a valuable contribution to the field of ergonomics and will help to improve the health and safety of garment workers in Denpasar, Bali.

EYE STRAIN OF GARMENT WORKERS IN DENPASAR, BALI
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and Suyasning H. I.

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In effort to increase the production, garment workers have been working from 07.00-04.30 PM and from 06.00 PM to 09.00 PM daily, with a lunch break from 12.00-01.00 PM. And this long working hours, among other in sewing works, have been done under 100-200 lux light intensity, which is really inadequate. With such a condition of work, it is assumed that some impacts might emerged, especially in regard to visual system. To convince it, a study was carried out.

Two hundreds and seven workers, 15-30 years old, which consist of 159 sewing and 48 non sewing task were studied as samples. They were classified into 4 working periods, namely: 0-1, 1-2, 2-3 and more than 3 years. Visual acuity of workers were tested by Snellen optotype, and symptoms correlated to eye strain were collected. The results showed that workers working more than 3 years are suffering more of visual acuity in compare to workers less than 3 years. The smallest impact was found among non sewing task workers. And eye strain cases also gave similar trend more frequent recorded among workers with sewing task than the none one. In relation to light intensity it was found that workers working under 100 lux was suffering more in visual acuity than those under 200 lux.

With all those evidence, improvement of working condition and work organization is a must.

PEN SHAPES AND SIZES

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Table 1 shows the 8 pen shapes built and tested; all used a fine point ball point as the writing instruments. The body of pens 1 and 2 were brass, 3, 4, 5 and 6 were aluminium and 7 and 8 were plastic.

Each of the 8 pens was evaluated by 23 subjects (University students). They evaluated each pen with 5 question using a 7 point scale: 1=strongly disagree, 2=disagree, 3=moderately disagree, 4=neither agree nor disagree, 5=moderately agree, 6=agree, 7=strongly agree.

When pen size is controlled at 9.5 mm, there is a preference for 5.6 g pens over the 22.8 g pens.

Whitin the 22.8 g pens, for shape there is no difference between round and hexagonal at the larger sizes but round is preferred over the hexagonal at the 6.3 mm size. In the small size, the edges of the hexagonal pen cut into their fingers.

Within the 22.8 g pens, males preferred the 9.5 mm diameter. Females disliked the 6.3 mm diameter. However hand breadth was not related to any preferences.

TABLE 1 Identification numbers for the 8 pens.

Shape	Weight, g	Diameter, mm		
		6.3	9.5	12.7
Round	22.8	1	3	5
Hexagonal	22.8	2	4	6
Round	5.6		7	
Hexagonal	5.6		8	

INVENTORY OF CLINICAL FATIGUE: DIAGNOSTIC MEASUREMENT;
THE CAUSE (AND) PREVALENCE OF CLINICAL FATIGUE IN THE TOURISM SECTOR OF
EDUCATION AND TRAINING FOR THE APPRECIATION AND
APPLICATION OF ERGONOMICS IN INDUSTRY

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No abstract.

The investigation was carried out in the Tourism Sectors.

The aim of this study is to make the tools as the assistance of medical doctors in detecting the clinical fatigue in every labour unit. And so henceforth as seeking this symptom for; to managed or to minimized the clinical fatigue whether among workers in Yogyakarta or in Indonesia.

DIAGNOSE AND OCCUPATIONAL DISTRIBUTION
OF LOW BACK PAIN AMONG THE COMMUNITY OF
SOUTH SUMATRA OIL REFINERY

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Pertamina Jakarta

Radiographic features of the subjects suffering from low back pain among the employees of the South Sumatra Oil Refinery were retrospectively studied. The objective of the study is to identify the high risk group and recommend appropriate ergonomic approach as the fundamental treatment. The radiographic study based on the Radiologist's diagnose could be classified as: 1. The abnormal groups, namely: bone structure abnormality, stone, infection and anatomic anomaly of the urinary system. 2. Other abnormal group associated with occupational activities such as trauma on the L-S region were not found in the study. 3. The normal group that radiographically not detectable are including blood supply disturbances could be largely attributable from postural dysfunction. To see the distribution of the normal group among Departments, this group were therefore occupationally classified. Non occupational activities done by one worker are considered the same as that of other workers. The high risk groups were identified following statistical computation employed on the data.

Towards National Ergonomic Standard

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Ergonomics is the science which deal with human being. As a human population differs in some measures from other population, it is natural to ask whether Ergonomic Standards used in a Society fit another Society. Anthropometrical measures is one of them which has proved the existence of inter-country Ergonomic differences.

Since there are many aspects which determine human performance such like climate, culture and work ethos beside anthropometrical measures, the use of internationally known standards should only be performed with care.

This paper is intended to present some of the differences, namely in speed of motion as shown by two research by the Bandung Institute of Technology at its Laboratory of Work Analysis and Ergonomics as well as from industrial experiences.

For an industrializing country such as Indonesia work standards are very important. Productivity which has become a national and international issue, could only be measured and increased if a national valid standard exist.

Standards in the design of products are also the concern of this paper. It will be shown how an internationally established standard design of a world widely used product provide lower productivity as compared to the productivity obtained from the same product designed specifically for Indonesians.

Nationwide Anthropometric Survey in Korea -- the past, the present, and the future

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This paper presents the 1986 national anthropometric survey in Korea. Eighty body dimensions were measured from 21648 Korean male and female aged from 0 to 50 years. Subjects were selected randomly through out the country. Martin-type anthropometers were used basically, but specially designed vehicles and supportive devices were adopted to facilitate the survey. The results were compared with previous surveys and with other ethnic groups' data.

ANTHROPOMETRIC DATA OF INDONESIAN WITH
VARIOUS OCCUPATIONS.

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In carrying out the development,Indonesia still has to import science and technology,which are not seldom beside advantages gained until recently,create various impacts or disadvantages in form of occupational diseases,accidents,ineffective and inefficient work processes which course to unproductive work and additional costs.Efforts in minimizing or omitting these negative impacts had being done,among other through transfer and choice of appropriate technology,which covers six basic aspects namely economics,technics, health/ergonomics,socio-cultural,environmental and energical conservation and preservation.These aspects must be viewed and applied holistically and wisely with aim to minimize or to omit negative impacts.But in practice,such an approach is unreachable due to various reasons,among others due to lack of knowledge and technical know-how,lack of anthropometric data of the consumers,and lack of "umbrella" legislation and regulation to be pursuit.

Facing all those constraints and obstacles, efforts of having Indonesian anthropometric data had already being done for years,and through this study anthropometric data of various occupations namely drivers,passengers,government officials,industrial workers and farmers are informed.The purpose is to be used in designing agricultural and industrial machines and equipments,office meubles and motorcars.

By so doing,a more fit man-task system in conducting development will be attained,which certainly course to better,healthier and comfort working conditions and environments at the end.And this will certainly enhance the productivity.

WORKPLACE DESIGN, NEW TECHNOLOGY AND ERGONOMIC IMPLICATIONS

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No abstract.

PREDICTIVE MODELS FOR OXYGEN CONSUMPTION AND PHYSICAL WORK CAPACITY

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An experiment was designed and conducted to accomplish the following objectives:

- 1) Development and testing a mathematical model for the prediction of the physical work capacity (PWC or aerobic capacity) in l/min of oxygen.
- 2) Development and testing a mathematical model for the prediction of the oxygen consumption or VO_2 (l/min).

A submaximal exercise protocol employing a bicycle ergometer at 4 different workloads was applied to estimate the aerobic capacity of an individual. The PWC predictive model used age, the highest workload and the corresponding heart rate as independent variables. Ventilation volume and age were employed as the independent variables to predict VO_2 .

One hundred male subjects, 20-49 years of age, participated in the experiment. All of them were agricultural workers in Northeast Thailand.

The results of the experiment were analyzed using the analysis of variance procedure from SPSS/PC Packages. The predictive models were developed using a stepwise multiple linear regression technique. The models were validated using twenty additional subjects. It was concluded that the models can reasonably predict PWC values with the sum of square of the errors (SSE) of less than 1.6 and predict VO_2 with the SSE of less than 1.9.

RELATION BETWEEN THE VDT OPERATING TIME
AND WORKER'S ESTIMATION OF WORK LOAD

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Okayama University Medical School
2-5-1 Shikata-cho Okayama, 700 Japan

In Japan, rapid introduction of the computer system into office and manufacturing work is causing various kinds of health problems, such as visual function disorder, problems in the neck-shoulder-arm region, and mental stress. In order to find out preventive measures of such occupational hazards, analysing working conditions, specially operating time of the workers, is considered to be essential. To grasp a situation of VDT operating time, the condition of usage of 86 VDTs in an electronics company was recorded for one month. From the data, the distributions of operating time a day and continuous operating time were calculated, and the result was compared to the result of workers' self estimation of their work load. There were several different types of VDT work; data entry, word processing, searching of data, computer aided drawing and so on. Operating time was varied according to the types of VDT work, and such difference is also found in the result of subjective questionnaire study on work load.

JOB INVOLVEMENT AS RELATED TO JOB ANXIETY AND
SOME DEMOGRAPHIC FACTORS

Azizur Rahman and Nasreen Wadud Sagar
Dept. of Psychology, University of Dhaka.

The present study was designed to find out whether the job involvement of the employees will be influenced by their anxieties concerning various constituents of the job life. The association between job involvement and demographic characteristics of the subjects was also intended to be explored. The sample comprised 294 blue collar workers. The Method of data collection was that of field study through questionnaire. The research instruments employed, included the Job Anxiety Scale (JAS) developed by Srivastava (1977) and the Job Involvement Graphic (JIG) scale developed by Kanungo (1982). The original English scales were translated into Bengali and the translated questionnaire was pretested on a sample of 25 blue collar workers who were excluded from the final sample. The results show that the job involvement of the subjects differed significantly according to their degree of job anxiety and that the subjects with lower degree of job anxiety had higher job involvement than those with higher degree of anxiety.

Ergonomic Workstations for Production

Sewing Tasks

C M Haslegrave

University of Nottingham

Department of Production Engineering and

Production Management

University Park, Nottingham NG7 2RD, UK

ABSTRACT

The layout of sewing workstations has a significant effect on both the productivity and health of the machinists. Upper limb strain injuries are recognised as a widespread problem in production sewing, but are not the only significant problem. Postural strain and fatigue also contribute to reduced efficiency among machinists.

Several production sewing tasks have been studied and some of the more important factors in the machine layout have been identified as influencing the visual and postural demands of the tasks. Consideration has to be given to the interrelationships in the layout of the machine controls, seating and delivery of material, as well as to the detailed elements of the task itself. Improvements to the design of existing workstations are recommended.

THE EFFECT OF LOW-HIGH OF HOUSE FLOORS ON
PERFORMANCE OF BROILER CHICKS

Sayang Yupardhi

Dept. of Physiology, Faculty of Animal Husbandry,
Univ. of Udayana, Denpasar-Bali, Indonesia.

A completely randomized design (CRD) experiment was carried out for six weeks to study the effect of low-high of house floors on performance of broiler chicks and farmer self.

A 900 chicks were used in this experiment. The initial live weight of the chicks was 46 g in average. They were subjected with 3 treatments: ground floors with rice hull (T1), 0.7 m height of floors with rice hull (T2) and 1.0 m height of bamboo slotted floors from the ground (T3). Each treatment consisted of 300 chicks.

The chicks was fed ad lib. and water was available all time.

The chicks on T3 grew significantly faster ($P < 0.05$) and its mortality and respiratory disease was significantly lower ($P < 0.05$) than the others. This is an indication that the circulation of the air on the T3 was better than the others.

From the human point of view, apparently farmer work (cleaning, watering, feeding) on the T3 was easier than the others; and his body posture could be maintained in right position. Thus, good posture helps farmers to keep well.

NECK AND SHOULDER COMPLAINTS AMONG
GARMENT WORKERS IN DENPASAR.

A. Manuaba; Suyasning H.I.; and Anteng Aryana.
Dept. of Physiology, School of Medicine,
Univ. of Udayana, Denpasar-Bali, Indonesia.

These last years garment industries became one of the most important industries in developing both foreign currencies earnings and employment opportunity as well. Thousands of female workers had been working in this industry, and since skill is needed, both the employees and the employers as well are strongly hope that they could keep on working as long as possible as far as financial matters are concerned. To attain such a condition, the work must be done in a healthy, safety, comfortable and efficient way, and this can only be reached if a fit man-task system can be organized and developed.

But, such a condition was assumed too difficult to be achieved, since workers are obliged to work with existing machines already available at the market. The unfit condition is evident by observing unnatural body position showed by the workers in doing their task. One of the impacts of such posture are neck and shoulder complaints usually raised by the workers. In fact, through questionnaires, such complaints are really happen.

About 50.0% are having neck and 58.3% shoulder complaints which can be related to the mismatch of man-task system. Such complaints certainly will influence their performances.

Since garment industries will have positive prospect in the future, improvement of man-task system become a must. Corrective ergonomics with unexpensive means must be done to the existing factories, while system ergonomics at designing stage, will be highly beneficial to attain better working conditions and environments in garment industry.

ERGONOMIC RECOMMENDATIONS FOR THE LOAD CARRIAGE

B. Kapitaniak; H. Monod; F. Huart.
Laboratoire de Physiologie du Travail CNRS
91 bd de l'Hopital, 75634 PARIS Cedex 13.

No abstract.

1. User-focused method of education and training in developing countries.
Eric Min-Yang Wang; Housang Shahnava.

2. Experiences in the design for ergonomics education and training in Indonesia.
Iftikar Z. Sutalaksana.

3. Experience of worker education about VDT work.
Yoshiomi Termyo; Kazuhiro Sakai.

4. Training in practice ergonomics improvements.
Kazutaka Kogi.

Session 2. 14:00-15:00. Raja Room.

Chairman : Kitti Intaranont.
Co-chairman: Wahyu Karhiwikarta.

5. Ergonomics in Korea.
Lee Nahm Sik.

6. Participatory approach for the improvement of occupational safety in the Federal Republic of Germany.
Habil Klaus J. Zink.

ERGONOMICS ASPECTS OF BALINESE TRADITIONAL HOUSING.

Putra, I G.M.
Faculty of Architectural Engineering,
Univ. of Udayana, Denpasar-Bali, Indonesia.

No abstract.

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SCIENTIFIC PROGRAMME

Wednesday, July 27, 1988.

Session 1. 11:00-12:30. Raja Room.

Chairman : A. Wisner.
Co-chairman: Hanny Najoran.

1. User-focused method of education and training in developing countries.
Eric Min-Yang Wang; Housang Shahnavaz.
2. Experiences in the design for ergonomics education and training in Indonesia.
Iftikar Z. Sitalaksana.
3. Experience of worker education about VDT work.
Yoshiomi Temyo; Kazuhiro Sakai.
4. Training in practice ergonomics improvements.
Kazutaka Kogi.

Journal of Human Ergology

Session 2. 14:00-15:00. Raja Room.

Chairman : Kitti Intaranont.
Co-chairman: Wahyu Karhiwikarta.

5. Ergonomics in Korea.
Lee Nahm Sik.
6. Participatory approach for the improvement of occupational safety in the Federal Republic of Germany.
Habil Klaus J. Zink.

*DLK
GENOVA
SEG HYG*

21. Some ergonomics problems faced by nurses at the task in a hospital.
R.N. Sen; Dipikar Choudhary.
22. Biomechanics model and measurements in ergonomics.
Odenrick Per; Eklund Jorgen; Ostengren Roland.

SYDNEY

Session 3. 15:30-17:00. Raja Room.

Chairman : David O'Neill.

Co-chairman: Iftikar Z. Satalaksana.

7. Impact of new technology and the role of ergonomics
C.N.Ong ; A.Wisner.
8. Impacts in operating key-punches and computers
in Denpasar.
A.Manuaba; K.Widana; and W.Delun.
9. The use methods of participation in the smoother
implementation of new technology in developing
countries.
Beverley J.Norris. (NOTTINGHAM)
10. Ergonomics aspect of Pertamina LPG filling plant.
Ismojo Jati; Harjono.

Thursday, July 28, 1988.

Session 4 A. 09:00-10:30. Raja Room.

Chairman : K.Kogi.

Co-chairman: Darwis S.Gani.

11. Ergonomics in agricultural and rural development.
David O'Neill.
12. Rural ergonomics in Bali.
A.Manuaba.
13. An ergonomics study on sickle design for reaping
task in Indian agriculture.
R.N.Sen; Debkumar Chakrabarti.
14. Ergonomics height of arbors for growing grapes.
G.N.Nala.

Session 4 B. 09:00-10:30. Legong Room.

Chairman : Stephan Konz.

Co-chairman: Harris Siregar.

15. Application of ergonomics principles to the man-
machine interface design for a medical ultra
sound scanner.
Lee Nahm Sik; Lee Min W.; Lee Seung W.
16. Occupational health conditions at open pit work
posts and its improvements.
Cai Junyung; Lu Guorong.
17. Owas, practical method for evaluation of stress
induced by work postures.
Timmo Suurnakki; Veikko Louhevaara; Osmo Kahru;
Ilkka Kourinka; Pekka Kansi; Aaro Peuraniemi.
18. Work load of modern baris dance.
N.Adiputra; K.Widana; A.Manuaba. ←

Session 5 A. 11:00-12:30. Raja Room.

Chairman : Lee Nahm Sik.

Co-chairman: Sritomo Wignjosebroto.

19. Computer as aid to analyse ergonomics and safety
features of maintenance: description of two
graphic applications.
Seppo Vayrynen.
20. Workplace pollution, health and wellbeing of workers
A.Khaleque; Nasreen Wadud; Mehtab Khanam.
21. Some ergonomics problems faced by nurses at the
General Hospital in Denpasar.
A.Manuaba; D.M.Kusmayuni; Abdullah N.
22. Biomechanics model and measurements in ergonomics.
Odenrick Per; Eklund Jorgen; Ortengren Roland.

Session 5 B. 11:00-12:30. Legong Room.

- Chairman : Rabindra Nath Sen.
Co-chairman: Haryono.
23. Rancangan.
H. Darwis S. Gani.
24. Eye strain of garment's workers in Denpasar.
K. Tirtayasa; D.P. Sucana; Suyasning H.I.;
D.M. Kusmayuni; and Anteng Aryana.
25. Pen shapes and sizes.
Stephan Konz; Ingko Oetomo.
26. Ergonomics applied to Indonesian made household productions.
Hanny Najooan; Widiarto.

Session 6 A. 14:00-15:00. Raja Room.

- Chairman : Jorgen Eklund.
Co-chairman: A.R. Trisno Sudiro.
27. Education and training for the appreciation and application of ergonomics in industry.
Sonia Tiong-Aquino.
28. Application of Today Health Index (THI) for health management in two factories.
Koya kishida; Murako Saito; Tetsuya Hasegawa;
A. Shigenobu Aoki; Shosuke Suzuki.

Session 6 B. 14:00-15:00. Legong Room.

- Chairman : Habil Klaus J. Zink.
Co-chairman: Rachmadi D.S.
29. Inventory of clinical fatigue: diagnostic measurement the cause and prevalence rate in the Yogyakarta Province.
L. Setyawati M.
30. Diagnose and occupational distribution of low back pain among the community of South Sumatra oil Refinery.
Syafei; H. Soeryadi.

Session 7 A. 15:30-17:00. Raja Room.

- Chairman : A. Khaleque.
Co-chairman: Sudiman.
31. Towards national ergonomics standard.
Iftikar Z. Sotalaksana.
32. Nationwide anthropometric survey in Korea, the past-, the present and the future.
Chul J. Kim; Sue C. Park; Hyun Chang; Jin O. Kim.
33. Anthropometric data of Indonesian with various occupations.
A. Manuaba; D.P. Sucana; and N. Adiputra.
34. Workplace design, new technology and ergonomics implications.
Eklund Jorgen.

Session 7 B. 15:30-17:00. Legong Room.

Chairman : Sonia Tiong-Aguino.
Co-chairman: Sugeng Rakhmadiono.

35. Predictive model for Oxygen consumption and physical work capacity.
Kitti Intaranont; P.khokhajaikiat.
36. Relation between VDT operating time and worker's estimation of work load.
Toru Itani; T.Otani; S.Koda; H.Aoyama.
37. Job involvement as related to job anxiety and some demographic factors.
Azizur Rahman; Nasreen Wadud.
38. Ergonomics problems of campus "bemo" transportation.
A.Manuaba; Tjening Kerana; K.Karna.

Friday , July 29, 1988.

Session 8. 09:00-10:30. Raja Room.

Chairman : I.Kourinka.
Co-chairman: H.Soeryadi.

39. Transfer of technology needs redesign.
A.Wisner; Arona A.W.; Ali Kerbal; Mouldi Sagar.
40. Ergonomics workstations for production sewing tasks.
C.M.Haslegrave.
41. The effect of low-high house floors on performance of broiler chicks.
Yupardhi, W.S.
42. Neck and shoulder complaints of garment's workers in Denpasar.
A.Manuaba; Suyasning H.I.; and N.Adiputra.

Session 9. 11:00-12:00. Raja Room.

Chairman : S.Richardson.
Co-chairman: L.Setyawati M.

43. Ergonomics recommendations for the load carriage.
B.Kapitaniak; H.Monod; F.Huart.
44. Ergonomics aspects of Balinese traditional housing.
Putra, I G.M.

General Assembly

Thank you for your co-operation.

GUIDANCE FOR CHAIRMAN

1. Please started your session on time by short introduction of speakers before presentation.
2. Time allocated for each speaker is 10-20 minutes which includes already for discussions. Chairman should be strictly managed the time by using lamp indicators (green, yellow and red). Green meant go on, yellow meant 2 minutes left, and red meant to stop one presentation.
3. It is up to the Chairman to flexibly manage the speakers within each session, since the final goal is how to make use of the allocated time efficiently and effectively.
Just a hint: discussions might be more effective and efficient to be carried out after all speakers finished with their presentations, which took more or less 10-15 minutes each.

GUIDANCE FOR SPEAKERS

1. Speakers that would like to use 35 mm slide or overhead projector, in their presentation, please submit the slides or transparencies 30 minutes in advance to the OC at the Secretariat Desk.
2. Please put or arrange them in sequential order.
3. Please collect them again, directly after your session end.
4. If by chance, you had collected other colleagues slides or transparencies, please be kind to return them back to the Secretariat.

Thank you for your co-operation.

Azizur Rahman; Nasreen Wadud.

GUIDANCE FOR CHAIRMAN

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42. Neck and shoulder complaints of garment's workers in Denpasar.

A. Manuaba; Suyasning, H. I.; and N. Adiputra.

LADIES PROGRAMME

4. A short notes might be worthwhile to be presented at the end of each session to the participants as summary/highlight of the discussions.
5. Co-chairman, beside taking the Chairman task in his absence, has to assist the Chairman in moderating the session by making notes of highlight topics during the discussion and act as a time keeper. Please submit the notes to the Secretariat after the session.

Thank you for your co-operation.

10.00 - 10.30 PM - 10.00
Room 00.01 Ball Beach Hotel
Wednesday, July 27, 1988
A short tour through the lobby at 10.20
12.30 PM - 12.30 PM
In the lobby at 10.20
AM).
Bring your \$/RM/ Yen for
shopping
Meal: served and cooked
Thursday, July 28, 1988
Hotel and Restaurant
09.00 - 10.00 PM
* Balinese Offering
* Dressing
* Cooking
be performed
of students
please gather in the
Lobby at 08.30 AM).
06.30 - 10.00 PM
Reception at Nusa Dua
and please gather in the
Lobby at 02.30 PM
Cashier, Ball Chair
Friday, July 29, 1988
02.00 - 02.00 PM
Ergonomics Village Study
four, please gather at
10.25 PM in the lobby)

LADIES PROGRAMME

This programme is specially organized for registered ladies /spouse; female participants are also welcome.

Tuesday-July 26, 1988

06.00 - 07.00 PM Informal gathering at Rama Stage Bali Beach Hotel.

Wednesday-July 27, 1988

10.00 - 10.30 PM Opening Ceremony at Agung Room Bali Beach Hotel

11.00 - 12.30 PM A Short Tour to Denpasar market (please gather in the Lobby at 10.50 AM).

Bring your \$/DM/Yen for shopping

Thursday-July 28, 1988

09.00 - 12.30 PM Demonstrations

- * Balinese Offering
- * Dressing
- * Cooking

(please gather in the Lobby at 08.30 AM).

06.30 - 10.00 PM Reception at Nusa Dua (please gather in the Lobby at 05.30 PM)
Casual Dress

Friday-July 29, 1988

02.00 - 05.00 PM Ergonomics Village Study Tour (please gather at 01.55 PM in the lobby)

RECEPTION

at

The Hotel and Training Institute Nusa Dua

28 July 1988

06.00 - 10.00 PM

Will be preceded by a short tour through Kuta and Nusa Dua areas (departure 05.30 PM from the Lobby)

Meals will be cooked and served by the students of Hotel and Tourism Training Institute

Entertainments will be performed by the students of Tourism Program Studies University of Udayana

and

Bina Vokalia Bali Choir under leadership of Mrs. A. Manuaba

A VISIT TO PEJATEN
A Roof Tile Village Industry

This programme is organised for registered ladies
July 29, 1988
02.00 - 05.00 PM
The participants are also welcome.

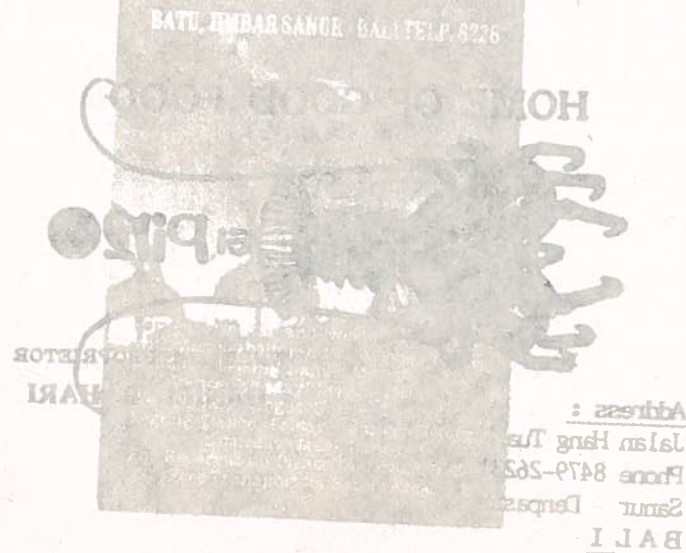
If in SEAES First Conference Study Tour, Batu Sangyang, a metal blacksmith village was chosen as the object, this time Pejaten a roof tile village was chosen as our tour target.

It is about 21 km distance from Denpasar, covering 150 hectares with 3.347 inhabitants in 624 households. The village is divided into eight community institutions (banjar) each of which has its own head (kelian). The head of the village (bendesa) is assisted in village management by an office administrator of his own choosing and also by a village social committee - Lembaga Sosial Desa (LSD) before 1980, or a village reliance council - Lembaga Ketahanan Masyarakat Desa (LKMD) following Presidential Decision No.28 promulgated on 31 March 1980. The LSD or LKMD is composed of people's representatives with the special task of planning, coordinating, and inspecting village development projects. Since the bendesa is also the chairman of the LSD or the LKMD, village management proceeds smoothly.

Although Pejaten is surrounded by the Dati River on the south and east and the Panan River on the north and west, most of its area is dry land (68.0 ha - 45.3%) on which residents farm and from which they take the raw materials for the "soil industry". House yards comprise 52.2 ha (34.8%); public utilities 5.8 ha (3.8%) and areas owned by outsiders 22.5 ha (15.0%). Pejaten inhabitants also own 148.2 ha of wet rice fields outside the village proper, meaning that an average rice field holding is only 4.4 acres per person, too small to make a living. Therefore development

efforts based on the traditional agricultural pattern are doomed to failure and the current focuses of development are on soil handicraft industry, encouragement of transmigration, active participation in family planning programmes, creating new employment opportunities and intensifying the use existing agricultural land.

And in these efforts, particularly in regard to soil handicraft industry, ergonomics principles had been applied to the production process, thus increasing productivity and improving working conditions and environments for those involved, especially women and children. In doing this, relying the efforts being done by the people themselves are always taken as a principle means in choosing the technology. The endeavour done from outside is just to make them understand and conscious of what ergonomics is and the benefit gain by using it.



SEE BALI

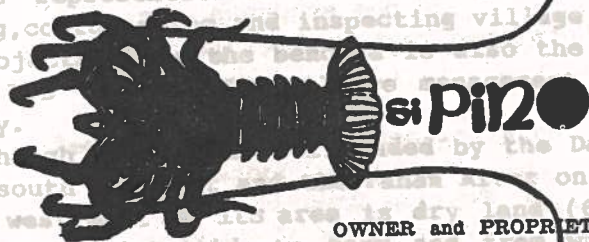
see "SI PINO"

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of Hotel Bali Beach.

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Sanur - Denpasar

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Dance, Tuesday - Legong Dance,
Wednesday - Joged Dance, Thursday -
Legong Dance, Friday - Janger Dance,
Saturday - Mask Dance
For Reservation Please Dial 8226, 8731
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SEE BALI

see "SI PINO"

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a smoking vulcano you can see

while you there

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Sanur - Denpasar

BALI

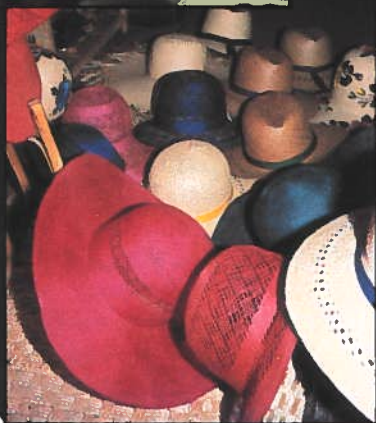
**South—East Asian Ergonomics Society
Second Conference**

WISNER

PROCEEDINGS

Denpasar—Bali, Indonesia
July, 27—29, 1988.

UP INSTITUTE FOR SMALL-SCALE INDUSTRIES



**A center for small enterprise training, research
and development in ASIA**

THE UP - ISSI COMMITMENT

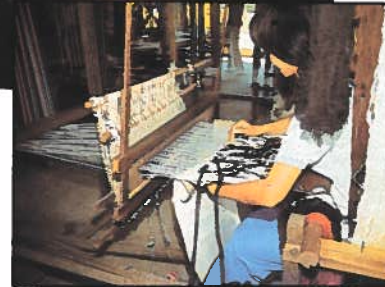
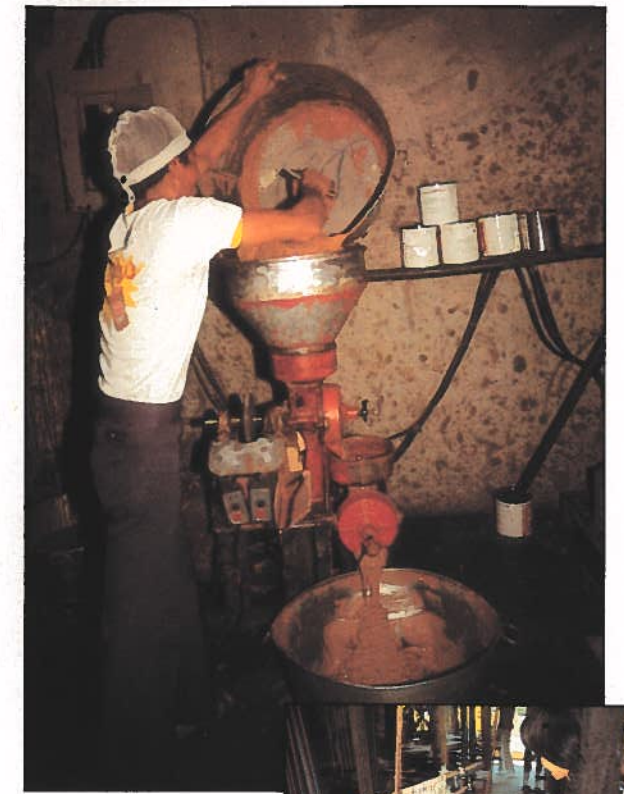
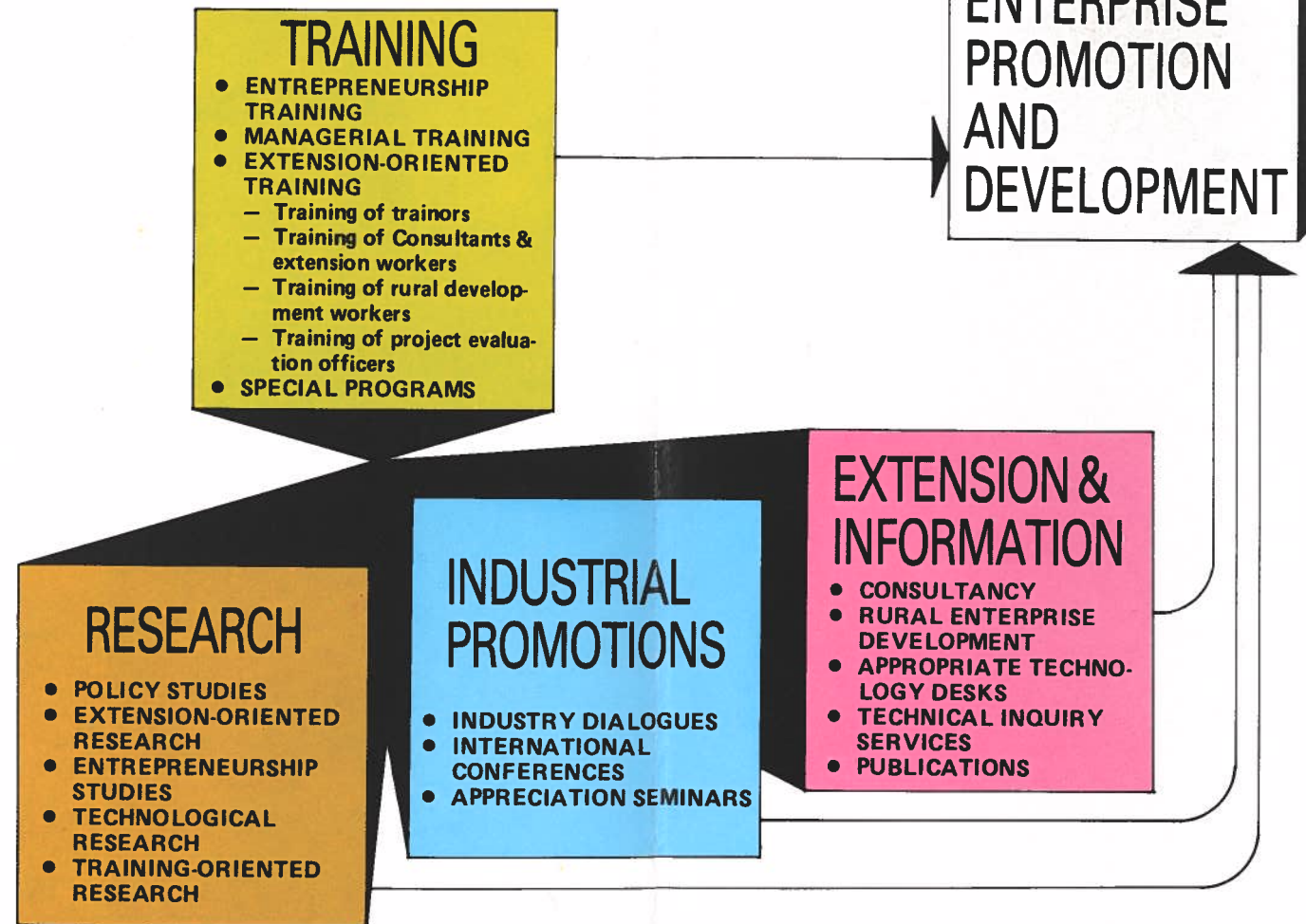
The Institute for Small-Scale Industries is a research and training organization established in the Philippines through a bilateral agreement between the governments of the Republic of the Philippines and the Netherlands. Its principal objective is to assist and promote the development of small enterprises in the Philippines.

The Institute's first task at the time of its inception was to influence national policy on the small enterprise sector. At the time when small enterprises were largely a neglected and obscure group, it was the only institution in the Philippines catering to the multi-faceted needs of widely dispersed small enterprises. It pioneered in entrepreneurship training programs which develop and harness latent entrepreneurial spirits.

Originally set up as the national training institute for Philippine small industries, the Institute for Small-Scale Industries gradually built up its capabilities and expanded its activities to include research, extension and information and industrial promotion programs.

In 1969, the Institute was established by law as a semi-autonomous unit of the University of the Philippines. Over the years, the ISSI has packaged and conducted training programs for similar agencies in Asian and other Third World countries, earning a name as a "center for small enterprise training, research and development" in the region.

STRATEGIES



The Institute's activities are geared towards entrepreneurship, managerial and extension-oriented training; policy and extension-oriented research, entrepreneurship studies and technological research; consultancy, rural enterprise development, small enterprise information dissemination and appropriate technology desks; and conduct of industry dialogues, conferences and appreciation seminars.

While the Institute is no longer alone in small enterprise assistance, it is credited to be a pioneering force behind the flourishing small enterprise movement in the Philippines and continues to be a center of excellence and innovation in the field of small enterprise training, promotion and development.

FUNDING

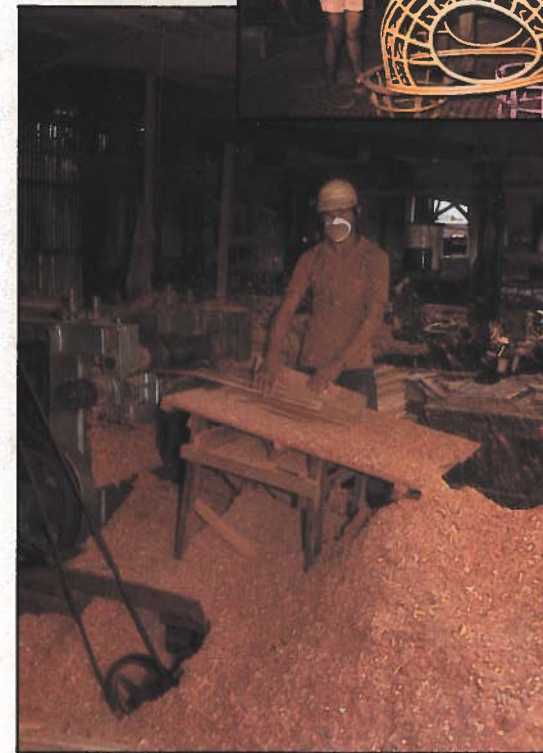
The Institute's operating programs are partly supported by the Philippine government and partly from earnings it generates from training, research and development projects. Through the years, the Institute has become increasingly self-reliant in its operations.



UP INSTITUTE FOR SMALL-SCALE INDUSTRIES
University of the Philippines
UP Campus, Diliman, Quezon City, Philippines

LINKAGES

The ISSI draws support from other private and public institutions, both local and international, which are also in the field of small enterprise development. Hence, its linkages have two-fold objectives: to draw support of and to share its experiences and knowledge in small enterprise development programs. Prominent among its linkages are the Small Enterprises Research and Development Foundation (SERDEF); Ministry of Trade and Industry and other government ministries and agencies in the Philippines; the Research Institute for Management Science in Delft, the Netherlands; Technonet Asia in Singapore; development assistance agencies of other countries; private foundations; and international organizations such as agencies of the United Nations.



UP INSTITUTE FOR SMALL-SCALE INDUSTRIES



A center for small enterprise training, research
and development in ASIA



THE
UNIVERSITY
OF
THE
PHILIPPINES
INSTITUTE
FOR
SMALL-SCALE
INDUSTRIES

IN COOPERATION WITH THE

SMALL
ENTERPRISES
RESEARCH &
DEVELOPMENT
FOUNDATION

ANNOUNCES ITS

**TRAINING
PROGRAMS
FOR 1988**

**ENTREPRENEURSHIP AND MANAGEMENT
DEVELOPMENT PROGRAMS
for Local Participants**

Young Entrepreneur's Program

February 5, 6, 7, 13, 20, 27; March 5 & 12
(3 consecutive days and 5 Saturdays)
8:30 A.M. — 4:00 P.M.
₱1,200

Stimulates personal competencies among prospective entrepreneurs and enables them to formulate basic business plans.

Industrial Automation and Instrumentation Course (IAIC)

Monday to Friday
5:30 — 8:30 p.m.
₱1,500 per module

Trains technical people on how to upgrade productivity of manufacturing firms through the design, operation and maintenance of industrial control systems. Consists of three independent modules, each of which covers a control system.

Module 1: Pneumatics and Electro-Pneumatics Control
February 15-March 4
July 18-August 5

Teaches participants how to use compressed air and electrical systems as sources of power for pneumatics and electro-pneumatics working control elements. Also covers the concepts, designs, maintenance and practice of pneumatics and electro-pneumatics technology.

Module 2: Digital Control System & Programmable Logic Controller (PLC)
April 11-29
September 12-30

Deals with the basic concepts of design, trouble shooting and practice of digital electronics control systems as applied in industry.

Module 3: Instrumentation and Automatic Control System
May 30-June 29
November 14-December 2

Provides knowledge on the measurement, monitoring and controlling of parameters like flow, level, pressure and temperature as required by industrial processes; calibration and maintenance of process related instruments; and basic design of process control systems.

Managers Course (MC)

March 7-June 10
September 1-December 2
Monday to Friday
6:00 — 8:00 P.M.
₱3,500

Enhances managerial competence of participants by exposing them to the broad spectrum of management functions, tools and techniques.

Don Vicente Madrigal Appreciation Course on Entrepreneurship (DVM-ACE)

March 18 & 19, August 26 & 27
Friday & Saturday
8:30 A.M. — 4:00 P.M.
₱350

Provides an appreciation of the requirements for entrepreneurial success and the basic guidelines in organizing and managing a small-scale enterprise.

IAIC Comprehensive Course

March 19-April 23
August 30-September 24
(6 Saturdays)
9:00 A.M. — 4:00 P.M.
₱1,500

Upgrades the skills of engineers and technicians on the fundamentals of instrumentation and process controls; and the principles, design and installation of practical instrumentation. Also provides actual hands-on calibration and repair on various instrumentation equipment.

Productivity and Quality Improvement Course For Small Enterprises

March 21-25
Monday to Friday
8:30 A.M. — 4:00 P.M.
₱1,500

Provides the participants with tools and techniques that would enable them to increase producti-

vity and at the same time improve quality in a small enterprise.

Marketing Strategies for Rural Enterprises (MSRE)

May 3-June 24
Monday to Friday
8:30 A.M. — 4:00 P.M.
₱3,500

Upgrades the capabilities of participants in formulating strategies for enhancing the marketability of products of various rural enterprises.

Productivity Through Effective Supervision (PES)

April 6-21; August 2-17
Monday to Friday
6:00 — 8:00 P.M.
₱1,300

Develops supervisory and interpersonal skills of supervisors or those about to assume supervisory functions.

Entrepreneurial Motivation Training (EMT)

April 11-29
Monday to Friday
8:30 A.M. — 4:00 P.M.
₱6,000

Enables the participants to design and implement Entrepreneurial Motivation Training Programs using appropriate training techniques.

Entrepreneurship Development Workshop for NGOs

Monday to Friday
8:30 A.M. — 4:00 P.M.

Provides participants with tools and techniques to meet the various needs of NGOs in identifying and assisting the management of income-generating projects. It consists of four modules, each of which covers a specific area.

Module 1: Appreciation of Entrepreneurial Competencies
April 25, 26 & 27
₱900

Increases the participants' level of awareness regarding entrepreneurial qualities and their importance to income-generating projects.

Module II: How To Prepare a Business Plan
May 2-6
₱1,200

Provides the participants with the basic guidelines for the preparation, analyses and implementation of a business plan.

Module III: Project Monitoring, Supervision and Control
May 9-13
₱1,200

Provides the participants with the tools and techniques that would enable them to implement projects successfully.

Module IV: Trainers Course in Enterprise Development
May 16-27
₱1,500

Provides participants with the skills necessary in organizing, implementing and evaluating a training program.

Financial Management for Small Business

May 7-June 4
(5 Saturdays)
8:30 A.M. — 4:00 P.M.
₱1,300

Enables the participants to identify the principles of financial planning and apply the basic tools in financial management and decision-making in solving problems of the financial aspect in small business.

Entrepreneurial Career Development Program (ECDP)

May 13, 14, 15, 21, 28; June 4, 11, & 18
September 9, 10, 11, 17, 24; October 1, 8 & 15
(3 consecutive days and 5 Saturdays)
8:30 A.M. — 4:00 P.M.
₱1,300

Stimulates personal entrepreneurial competencies and enables participants to formulate basic business plans.

Computer Literacy Program for SME Managers

May 24-June 14
Monday to Friday
6:00 — 8:00 P.M.
₱1,800

Enables the participants to gain knowledge on micro-computer operations as well as its applications in their functions as manager.

Regional Industrial Development Course (RIDE)

June 14-November 18
Monday to Friday
8:30 A.M. — 4:00 P.M.
₱9,500

Provides the participants with the necessary skills and techniques in designing, programming, and monitoring the industrial promotion component of a development program.

Marketing Plan Preparation Course (MPPC)

July 9-August 13
(6 Saturdays)
8:30 A.M. — 4:00 P.M.
₱1,900

Upgrades the ability of small enterprise owners and managers to improve their competitive position in the market and enables them to identify and analyze the various market factors affecting the firm.

Project Study Preparation Course (PSPC)

July 11-September 9
Monday to Friday
8:30 A.M. — 4:00 P.M.
₱3,500

Enables the participants to learn the techniques in identifying venture opportunities and in preparing a project feasibility study.

Industrial Extension Training Course (INDEXTRAC)

August 2-October 11
Monday to Friday
8:30 A.M. — 4:00 P.M.
₱3,000

Upgrades the competence of the participants in rendering extension and consultancy service to entrepreneurs in their respective countries.

Trainers Course in Entrepreneurship Development (TRACED)

September 6-November 18
Monday to Friday
8:30 A.M. — 4:00 P.M.
₱8,000

Provides the participants with the skills necessary in training entrepreneurs.

Information Officers Training Course (INFOTRAC)

September 13-November 11
Monday to Friday
8:30 A.M. — 4:00 P.M.
₱3,300

Increases entrepreneurial productivity through proper utilization of industrial information.

Project Evaluation, Analysis and Monitoring (PREAM) Course for SME Projects

September 14-October 28
Monday to Friday
8:30 A.M. — 4:00 P.M.
₱2,800

Aims to upgrade skills in evaluating, analyzing and monitoring small and medium enterprise projects.

Advanced Training on Industrial Control and Instrumentation for SMEs

September 27-November 11
Monday to Friday
8:30 A.M. — 4:00 P.M.
₱2,500

Trains technical people in the applications and practice of automation and instrumentation particularly in the fields of pneumatics, electropneumatics, digital electronics control, programmable logic controller and process control.

Marketing Opportunities and Practices Seminar Series (MOPS)

Friday and Saturday
8:30 A.M. — 4:00 P.M.
₱950/seminar

Keeps participants abreast of the marketing opportunities and practices; identifies prospects available to entrepreneurs of the industries concerned.

Garments	Feb. 12-13
Food Processing	March 18-19
Handicraft	April 22-23
Footwear	May 20-21
Ceramic	June 24-25
Plastics	July 22-23
Woodworking	Aug. 26-27
Toys and Gifts	Sept. 23-24
Retail and Wholesale	Oct. 21-22
Metal-Based	Nov. 25-26
Agribusiness	Dec. 9-10

UP ISSI: A CENTER FOR ENTREPRENEURSHIP TRAINING AND DEVELOPMENT IN ASIA

The UP Institute for Small-Scale Industries (UPISSI) is a training, research and development organization established in 1966 for the purpose of assisting and promoting the development of small enterprises in the Philippines.

The greater part of training resources has been placed on the development of potential and existing entrepreneurs, managers, supervisors, trainers, extension officers, consultants, regional development officers, project and loan officers and other such catalysts who will be able to hasten the development process.

Pushing beyond national boundaries, the UPISSI has offered its expertise and facilities to other countries in the Third World similarly engaged in increasing their small enterprise base. Thus, it has newly emerged as a center for "entrepreneurship training and development" in the region.

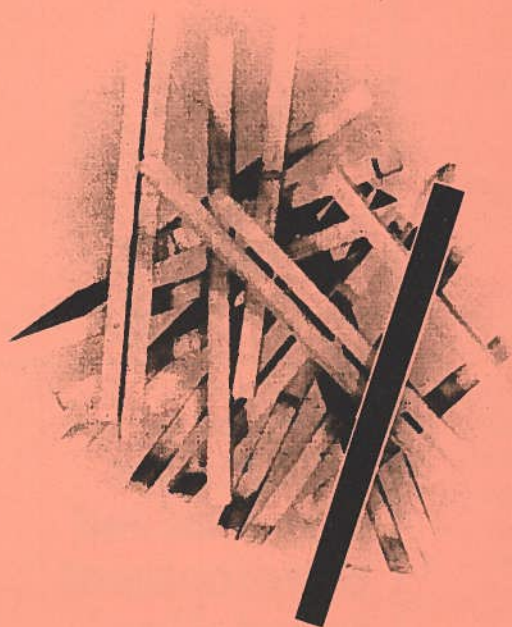
The UP-ISSI's linkages with private and public institutions here and abroad have two-fold objectives: to draw support of and to share its experiences and knowledge in small enterprise development programs. Prominent among its linkages is the Small Enterprises Research and Development Foundation (SERDEF).

RESERVATIONS

Reservations will be made for those who submit their application forms and pay the tuition fees one week before the opening of the program.

For particulars, write or all:
**Entrepreneurship & Management
Development Department (EMDD)
UP Institute for Small-Scale Industries
E. Virata Hall, E. Jacinto Street,
UP Campus, Diliman, Quezon City
PHILIPPINES
Tel. Nos. 997076 to 79
Cable Address: INSMASCIND**

**Small Enterprises
Research and Development
Foundation**

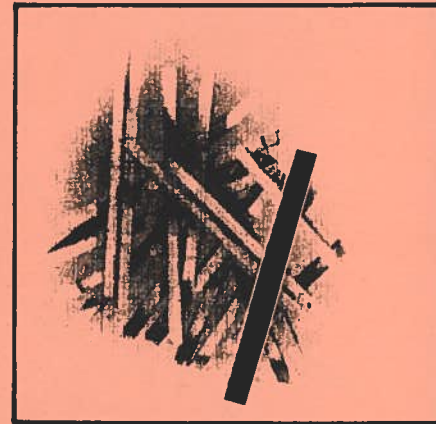


SERDEF

**WHAT IS
SERDEF?**

The Small Enterprises Research and Development Foundation of the Philippines, Inc. (SERDEF) is a private, non-profit, non-stock foundation duly registered with the Securities and Exchange Commission.

It is principally an institution of the private sector that will fund research and other projects for the promotion and development of small enterprises.



**small
enterprises
research and
development
foundation**

**WHY SMALL
ENTERPRISES?**

The national economic development strategy of the Philippines cites small and medium industry development as one of the major components of industrialization. Recognition of this economic sector has been based on its potential contributions to the three basic national economic goals: (1) *employment* (expanding opportunities for labor absorption); (2) *equity* (broader participation of the greater masses);

SGV & Co.
Auditors (Donor)

and (3) *growth* (raising real income levels of workers). At the same time, it has been recognized that small enterprises have special problems requiring innovative solutions and special government attention.

As a result, massive government resources have been mobilized to assist and encourage small enterprises. A number of agencies offer integrated assistance to small entrepreneurs, including research, marketing, technology transfer and training of entrepreneurs, managers and technicians. Liberalized countryside financing schemes are administered by various lending channels to meet the credit needs of small enterprises.

**SERDEF
IN SMALL
ENTERPRISE
DEVELOPMENT**

Because of the sheer size of the small industry sector and the consequent magnitude and complexity of its problems, the resources which thus have been poured into development efforts have been inadequate. Thus, urgent needs for basic research, especially in the area of technology, have had to be shelved, along with pioneering projects for the development of the countryside entrepreneur, and other similar projects.

SERDEF is the response of the private sector to the urgent need for development funds. The foundation was conceived to provide the mechanism whereby the more affluent members of the community could contribute directly to the government's efforts at stimulating the growth of the country's small scale

SERDEF'S OBJECTIVES

industries, in order to improve the quality of life of Filipinos.

SERDEF shall raise and channel funds for the following types of projects:

● **Technology Research and Development** — Research and development programs in the pursuit of technological advancement of small and medium enterprises development.

● **Entrepreneurship Development** — Identification and development of entrepreneurial potentials especially in the countryside, as well as extension of direct assistance (grants and cash donations, property or services) to existing entrepreneurs.

● **Education and Training** — Establishment of scholarships and professional chairs in various fields and disciplines of small enterprise management and development. Training courses, workshops, seminars, educational campaigns, conferences, conventions, forums and symposia on matters of vital importance.

● **Regional Development** — Assisting projects geared towards the development of the rural areas by conducting training programs for regional industrial extension officers, giving technical and financial support for countryside entrepreneurs, and setting up industrial estates and production centers in strategic rural areas.

● **Information Services** — Gathering and compilation of data and

publication and dissemination of information, research findings, studies, workshop and conference proceedings of SERDEF's activities. The production of such materials will enlarge the experience and talents of SERDEF clients. These materials will be incorporated in its training programs and made available to practitioners of small enterprises development.

● **Inter-Institutional Linkages and Collaboration** — Establishing cooperative ties with local, foreign and international organizations involved in small and medium enterprises development. It will maintain collaboration with such institutions active in the field.

BOARD OF TRUSTEES

The founding members of SERDEF who also comprise its Board of Trustees represent a broad spectrum of Filipino leadership in education, industry, finance, law, government, and socio-civic affairs.



HEAD OFFICE

The Small Enterprises Research and Development Foundation of the Philippines, Inc. is quartered at the ISSI Bldg. (Virata Hall), University of the Philippines, Diliman, Quezon City 3004. Tel. Nos. 997-076 and 981-034. Cable Address: INSMASCIND.

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SERDEF

**REVIEW OF ACTIVITIES
1987**



LETTER FROM THE CHAIRMAN AND THE PRESIDENT

1987 was considered by many experts around the world as the year when the NGOs (also known as PVOs) came to their own. Most NGOs, SERDEF included, achieved great strides towards self-reliance and the ability to stand on their own. For the year, the Small Enterprises and Research Development Foundation (SERDEF) can chalk up among its greatest achievements the fact that it has, through several mechanisms helped NGOs who, in turn, helped the micro- and small-scale entrepreneurs help themselves.

Today, the third generation NGOs, as they are called, aim at sustainable systems development which, through self-reliance, will keep them going on a self-propelled basis, assuring their viability in the longer term. SERDEF, throughout 1987, implemented assistance schemes for NGOs through the Capiz Rural Enterprise and Entrepreneurship Development Project, the Micro-Enterprises Development Project, the Project Hanapbuhay, the Economic Productivity Program of the Christian Children's Fund Affiliates in Northern Luzon, and the Bishop-Businessmen's Conference.

Grant funds amounting to more than ₱4.8 M from the USAID alone, ₱93,440 from the Australian Government, and other sources are being supervised by SERDEF through SERDEF and UP ISSI staff, to finance livelihood projects which NGOs and PVOs in selected rural areas have started to avail of as early as January.

The Development of Entrepreneurs for Cottage, Small and Medium-Scale Industries, a part of which has been subcontracted to SERDEF by the UNIDO, started in August of 1987 and is expected to promote the establishment of labor-intensive enterprises also for rural women and youth in the entertainment promotion area through pilot NGOs and their staff.

Besides using their funds for purely social and community improvement projects, NGOs are making these funds available to their members who wish to set up simple income generating projects. With their background and their values set on commitment and dedication, NGOs are proving to be successful in acting as conduits for loan assistance projects which assure the beneficiaries not only of material income but also of the psychological satisfaction of being in control of their lives and their destinies. The reputation of NGOs of being efficient and credible when dealing with donors and beneficiaries gives them an edge over other institutions that wish to have similar programs supported.

Besides assisting NGOs, SERDEF equally pursued with vigor its entrepreneurship and management training programs. The presently complex environment which potential entrepreneurs in whatever scale of business will face must be harnessed effectively. The challenge was still to find creative solutions to do this. SERDEF answered that challenge through the various training programs it implemented and/or co-sponsored throughout the year.

It also continued to assist the academic and collegiate education sector involved in business management education throughout the country through faculty training, materials development, and curriculum development towards entrepreneurship and small business management through the EDCEL Project.

Not forgetting the need for a solid research base for its activities, SERDEF implemented several research projects like the Role of Technology Transfer in the Local Content Program of the Philippines; ASEAN Small and Medium Business Improvement Study: Production Management; Study of Off-Farm Economic Activities in Philippine Rural Areas; Country Studies on the Growth, Developmental Role and Adaptability of Small-Scale Forest-Based Processing Enterprises in the Philippines, Thailand, Malaysia and Indonesia; and a textbook project on Entrepreneurship and Small Enterprise Management.

Other publications that came out during the year were: A Casebook on Management of Successful Small Businesses in the Philippines; the Introduction to Entrepreneurship; A Briefer for the Bishops-Businessmen's Conference for Human Development; and, the Potentially Viable Small Enterprises in the Philippines.

Finally, through its quarterly SERDEF UPDATE first published in June 1987, the Foundation was able to draw greater personal support from the individual members through the medium of the written word. Thus, members are becoming stronger catalysts in the chain reaction called development.

Aware of the expansion of the Foundation (1976 Founding Funds — ₱210,000; 1986 Total Funds — ₱3,433,680; and 1987 Total Funds — ₱5,637,336), your Board of Directors is proud to say that never before in the history of the Foundation has there been an upsurge of activities and an upswing of networking as it is experiencing now. The men and women who began the Foundation, some of whom (five, to be exact) continue to serve as members of the Board of Trustees, did not imagine the distance which their first efforts would reach. As the song goes, "if they should see us now!" Our thanks go not only to those men and women but also to the staff members of the UP ISSI who untiringly work to bring SERDEF's dreams to fruition.

1987, with all its uncertainties and challenges, was as exciting as it was uncompromising in exacting commitment and hard work from all of us. Together, we rode the high seas and found that we could make it. 1988 will therefore not be altogether a plunge into the unknown. We are now more aware of our weaknesses, our strengths, our opportunities, our threats. As a maturing Foundation, we are becoming more confident as we forge ahead.

Let us not let go of our grip of reality as well as our motivation to achieve better and greater heights. Our sights are clear: promotion, assistance, development of the small enterprise sector and those very close to it. We are ready for the new year ahead!

FRANCISCO R. FLORO
Chairman

LOURDES L. SANVICTORES
President

SUMMARY OF ACCOMPLISHMENTS

Its close relationship with the UP Institute for Small-Scale Industries enabled the SERDEF to find support for the numerous activities which it undertook in 1987.

INTEGRATED ASSISTANCE AND EXTENSION PROJECTS

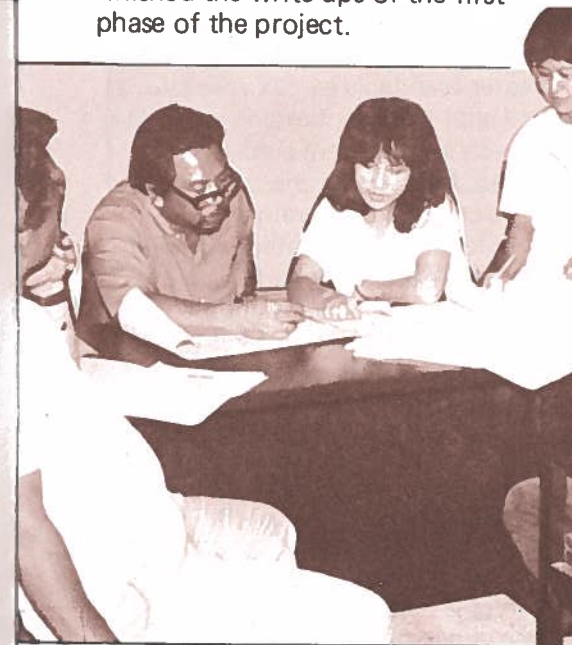
The informal sector, generally served by private voluntary organizations (PVOs), non-governmental organizations (NGOs) and non-profit, non-stock foundations, found in SERDEF a dynamic and responsive shelter for technical consultancy and extension assistance; financial support and credit; and entrepreneurial, technical and management training. As a result, SERDEF was co-implementor of the following integrated assistance projects for the micro-, cottage and small enterprise sectors:

* **USAID MICRO-ENTERPRISE DEVELOPMENT PROJECT** (August 1986-July 1989). Now on its second year, the USAID has increased the grant fund from ₱3.4 M to ₱4.8 M to accommodate the expanded work of IN-HAND, a subgrantee of SERDEF. The project conducted appreciation courses on entrepreneurship, provided financial assistance to its PVO-conduits, and published four issues of the KABUHAYAN NEWS, which served as showcase of the various activities undertaken by the project. As of November 1987, MEDP has accredited eight PVOs to serve as conduits and has given financial assistance totalling ₱203,000 to beneficiaries of PVOs engaged in agribusiness activities.



* **PROJECT HANAPBUHAY** (June 1987-June 1988). A one-year project which offers an integrated package of assistance to underprivileged but deserving Filipino youth, its main objective is to train and assist the beneficiaries towards self-sufficiency and greater well-being. It is a collaborative undertaking between the International Organization for Business and Economics Students (AIESEC) Philippines and SERDEF and with support from the PACAP of the Australian Government. Thus far, 26 youth participants from depressed areas finished the first entrepreneurship development training program while the lending component is due to start in the first quarter of 1988.

* **CONSULTANCY FOR THE ECONOMIC PRODUCTIVITY PROGRAM OF THE CHRISTIAN CHILDREN'S FUND, INC.** (August 1987-July 1988). This project consists of a consultancy package for the Project Affiliates (PAs) of the Northern Luzon Cluster of the CCF. Project implementation consists of three phases. The first will include a socio-economic survey and identification of potentially viable small enterprises at the municipal level; diagnosis of existing income-generating projects of the PAs; and the development of five investment profiles. Business management training for the PA staff will then be conducted as phase two while the implementation of the investment profiles will comprise the third phase. In December 1987, the project team finished the write-ups of the first phase of the project.



* **CAPIZ RURAL ENTERPRISE AND ENTREPRENEURSHIP DEVELOPMENT (CREED) PROJECT** (June 1987-May 1988). This one-year project is an integrated approach to the development of rural enterprises and entrepreneurship in the province of Capiz through the provision of training, research, extension and industrial information services. It is sponsored by the Philippines-Australian Community Affairs Program (PACAP) of the Australian Government. The training component of the CREED Project is jointly managed and implemented by SERDEF, UP ISSI and the Capiz Development Foundation (CDFI). A total of ₱64,128.4 has been released as loans while ₱93,440.61 more will be released to finance livelihood projects of CREED beneficiaries. The approved projects were on food processing and food service, bamboo/rattan furniture manufacturing, handicrafts, retailing, piggery, and services like beauty parlors. Other outputs for the period were the finalization of the investment profiles on piggery and poultry raising and the finalization and publication of the lending manual and supporting documents.

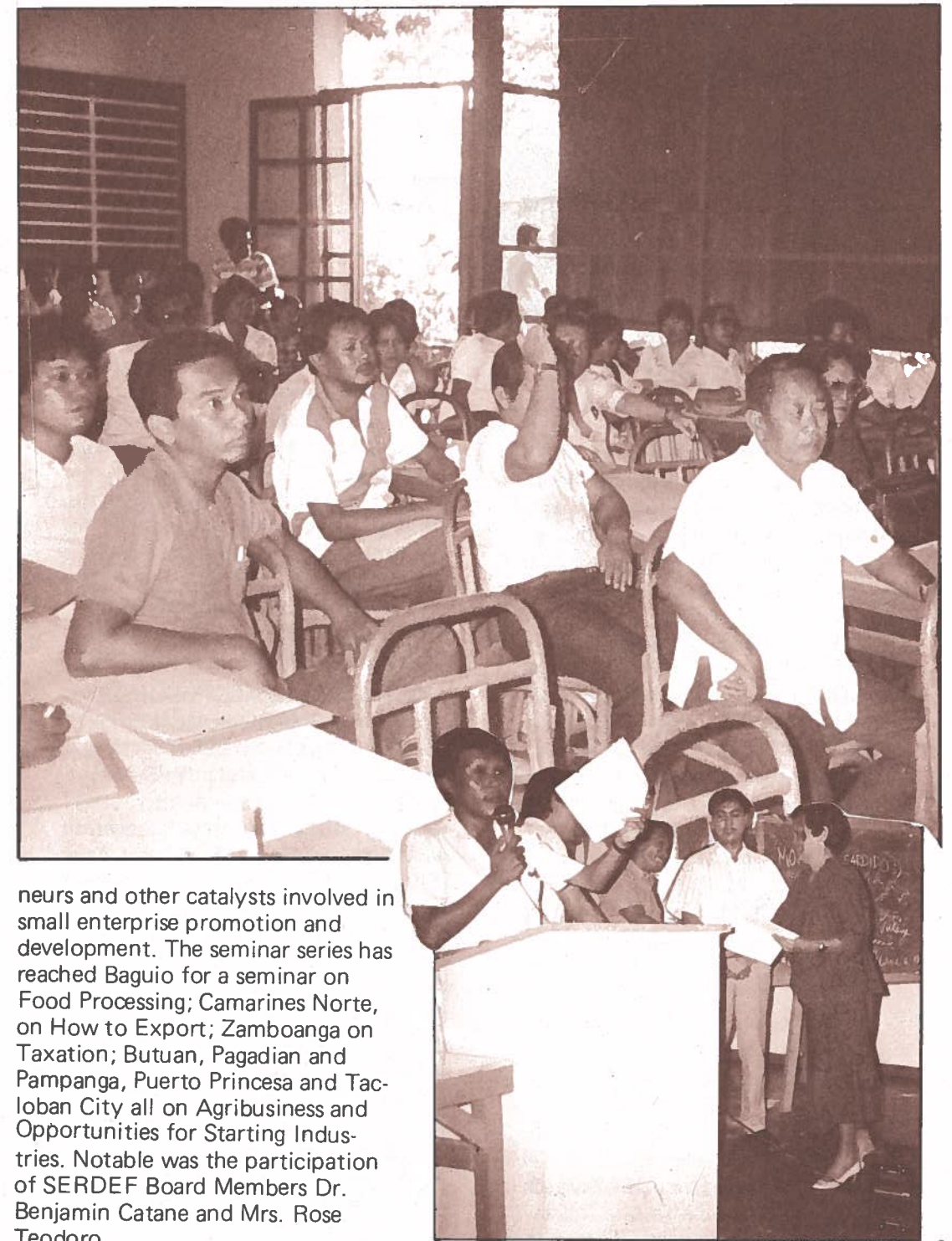
* **DEVELOPMENT OF ENTREPRENEURS FOR COTTAGE, SMALL- AND MEDIUM-SCALE INDUSTRIES** (August 1987 to December, 1989). This is a two-and-half year project which aims to promote livelihood activities through the establishment of cottage, small- and medium-scale, labor-intensive enterprises in rural and urban areas. The project is endorsed by the National Economic Development Authority (NEDA) and will give special attention to entrepreneurship development for women in rural areas and to youths in the entertainment industry as well as entrepreneurs in technology-based coco industries. The four cooperating agencies are the UP ISSI, the National Manpower and Youth Council (NMYC), the Technology and Livelihood Resource Center (TLRC), and the National Council of Women (NCW). SERDEF was awarded the subcontract for the development of a directory of institutions offering entrepreneurship development programs for the CSMI sector throughout the country. The other phases of the program include training of trainers, preparation of model schemes, and the validation and evaluation of selection methods. These phases are expected to be accomplished between 1988 and 1989.

* **BISHOPS-BUSINESSMEN'S CONFERENCE FOR HUMAN DEVELOPMENT.** Support for this laudable project was given in the form of partial funding for the conduct of a workshop on Livelihood, Micro-, Cottage, Small-and Medium-Scale Industries co-chaired by the Executive Director of SERDEF and

Bishop Antonio Fortich on July 7, 1987 during the BBC's 11th General Meeting. Technical assistance to the BBC Committee on Livelihood was extended by the Foundation throughout the year.

* **ENTREPRENEURSHIP DEVELOPMENT FOR THE COLLEGIATE EDUCATION LEVEL (EDCEL) PROJECT.** Conceived and launched in 1984, this continuing project reached out to five regions in 1987, seeking to develop an attitude of acceptance towards entrepreneurship among the commerce and business students in the regions. In 1987, four faculty development programs were held on Achievement Motivation Training of Trainers. These were in the National Capital Region (NCR), Region VI (Bacolod), Region V (Legaspi) and Region VIII (Tacloban). An Advanced Training of Trainers was held for Region VI in Iloilo. For materials development two case writing workshops were held for faculty members: one for Region VII in Iloilo and one for the Greater Manila Area. Six case studies were approved for funding while five research studies were similarly funded. Meanwhile, the monitoring of the curriculum development of five pilot schools situated in Cavite, Lucena, Cebu, Iloilo and Cotabato began this year. The Philippine Association of Collegiate Schools of Business (PACSB) and the SERDEF, together with UP ISSI staff are implementing the EDCEL Project.

REGIONAL SEMINAR SERIES. Although using training as a methodology, this outreach program brings the SERDEF members personally to the regions to share their knowledge and expertise with entrepre-



neurs and other catalysts involved in small enterprise promotion and development. The seminar series has reached Baguio for a seminar on Food Processing; Camarines Norte, on How to Export; Zamboanga on Taxation; Butuan, Pagadian and Pampanga, Puerto Princesa and Tacloban City all on Agribusiness and Opportunities for Starting Industries. Notable was the participation of SERDEF Board Members Dr. Benjamin Catane and Mrs. Rose Teodoro.

RESEARCH, INFORMATION AND PUBLICATIONS



The Foundation conducted major policy-oriented researches, performed micro investive studies and published information material for the use of the sector which it serves.

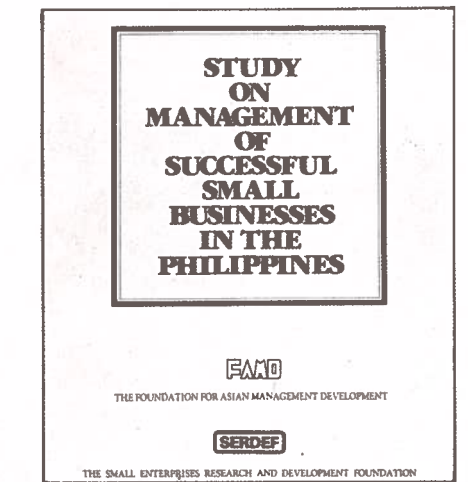
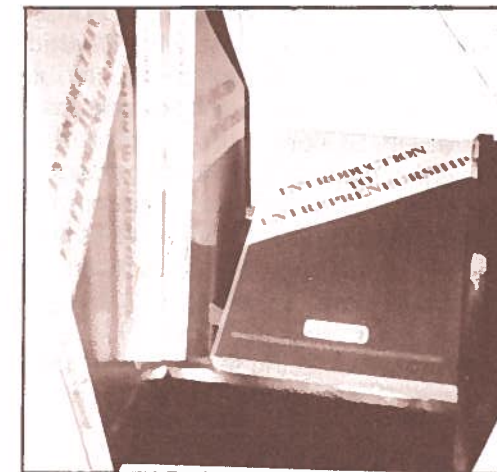
- * THE ROLE OF TECHNOLOGY TRANSFER IN THE LOCAL CONTENT PROGRAM OF THE PHILIPPINES (June 1986-March 1987). The Executive Director of the Foundation presented the research report at the Institute of Developing Economies in Japan in March. The study focused on the electrical appliance industry in the Philippines and determined the extent of the transfer of manufacturing technology from a foreign country to a large domestic firm, and from a large domestic firm to its small-firm subcontractors.
- * THE STRUCTURE AND ROLE OF SMALL AND MEDIUM INDUSTRIES IN ASIAN COUNTRIES: THE CASE OF THE PHILIPPINES (June 1987-March 1988). The study has the following objectives: to show changes in the

industrial structure of the country and highlight the present circumstances affecting small and medium businesses; to explore the potential of small and medium firms in terms of income creation, employment generation, and capital formation; and to suggest the desirable direction of Japan's economic cooperation in promoting the activities of small and medium enterprises in the country. The study covers four industries: wooden furniture, leather and footwear, garments, and machinery parts. The project team finished data gathering/fieldwork for the four industries, and completed tabulations and write-ups this year. The research results will be presented at the Institute of Developing Economies in Japan in March, 1988.

- * ASEAN SMALL AND MEDIUM BUSINESS IMPROVEMENT: THE PROBLEMS OF PRODUCTION MANAGEMENT (July 1986-April 1987). This was a comparative research study done in collaboration with the Institute of Southeast Asian Studies in Singapore which included three other countries besides the Philippines. The study sought to compare production efficiency of selected industries in Greater Manila vis-a-vis those located in the provinces. The research output was presented at a conference in Thailand by UPISSI's Assistant Director for Industrial Extension.
- * SURVEY OF RURAL OFF-FARM ECONOMIC ACTIVITIES (November 1986-May 1987). This survey shows the potential of non-farm acti-

vities for employment in rural areas and small-scale economic opportunities which can be undertaken in the regions besides farming and agriculture. The study was commissioned by the National Economic Development Authority (NEDA) and submitted in May.

- * COUNTRY STUDIES ON THE GROWTH, DEVELOPMENTAL ROLE AND ADAPTABILITY OF SMALL-SCALE FOREST-BASED PROCESSING ENTERPRISES IN THE PHILIPPINES, THAILAND, MALAYSIA AND INDONESIA (April 1987-July 1987). The study used secondary data which were analyzed in the light of the contributions, problems and prospects faced by the forest-based small-scale enterprise sector in the four countries mentioned. The Food and Agriculture Organization of the United Nations commissioned the research study.



- * PUBLICATION OF THE STUDY ON MANAGEMENT OF SUCCESSFUL SMALL BUSINESSES IN THE PHILIPPINES (1987). The study documents and analyzes the practices and beliefs of four successful Filipino entrepreneurs in the fields of garments, handicrafts, stuffed toys, and handbags. The casebook was supported by the Foundation of Asian Management Development (FAMD) in Tokyo, in collaboration with SERDEF. The book also contains an integrating paper and a summary of the workshop proceedings held in 1986 to pre-test the cases.
- * PUBLICATION OF THE TEXTBOOK ON INTRODUCTION TO ENTREPRENEURSHIP (1987). The textbook is primarily aimed at providing high school and college students with a basic knowledge on theories and concepts of entrepreneurship and has four cases of successful entrepreneurs for study. The Philippine Association of Collegiate Schools of Business (PACSB) collaborated with SERDEF and the UPISSI in publishing the textbook. Potential and existing entrepreneurs are also presently finding the book helpful.

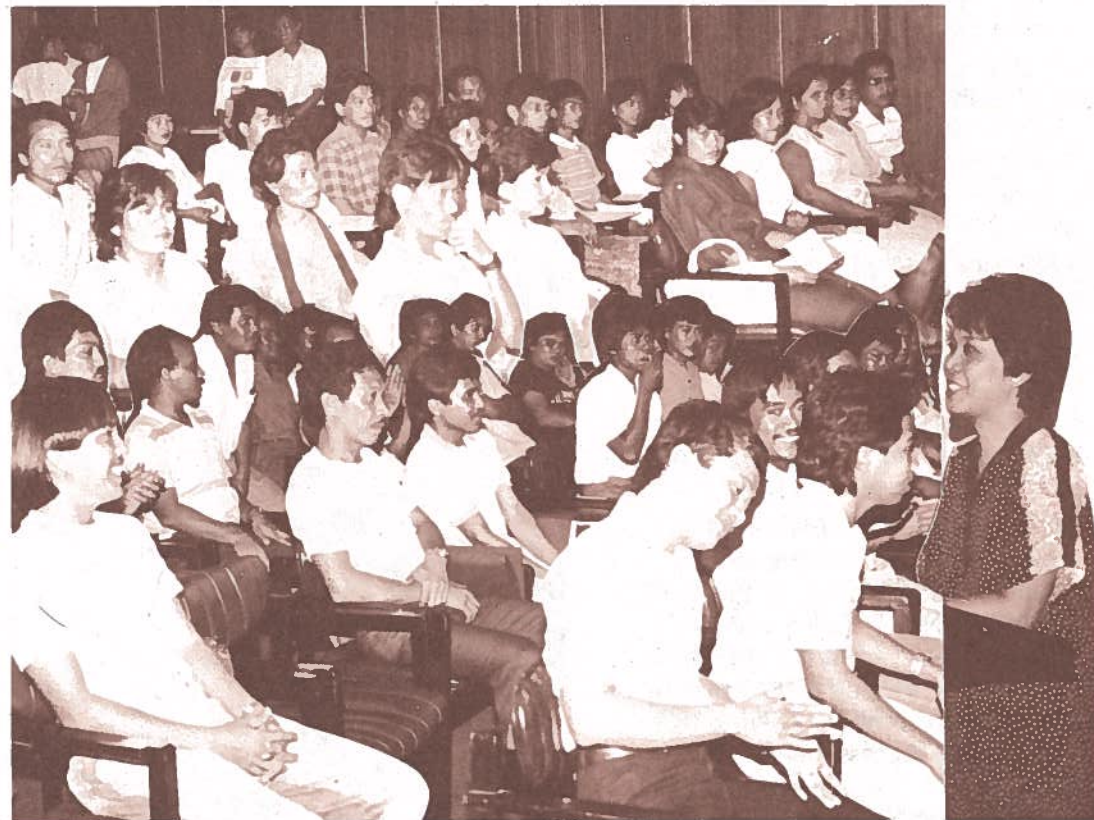


- * PUBLICATION OF THE STUDY ON POTENTIALLY VIABLE SMALL ENTERPRISES IN THE PHILIPPINES (1987). This is a 12-series study on the country's regions, focusing on 60 out of the 72 provinces of the Philippines. The book suggests the types of small enterprises that may be profitably set up in any particular province included in the review. The viability of the enterprises are analyzed based on existing natural resources, extent of infrastructure, and availability of support facilities in the province.
- * PUBLICATION OF KABUHAYANEWS. The *Kabuhayanews* is a quarterly publication of the SERDEF-USAID Micro-Enterprise Development Project (MEDP) which serves as a showcase for the various activities being undertaken by the MEDP. Starting with the third issue, which came out in August, the publication had a Business Opportunities Section which will serve as an exchange forum on products and/or services offered or needed by the micro-, cottage, and small enterprises being served by the project. Each member of the Foundation receives a copy of the publication.

- * ENTREPRENEURSHIP AND SMALL ENTERPRISE MANAGEMENT: TEXTBOOK PROJECT (August 1987-August 1988). This one-year project involves the writing and eventual publication of a text and case book on entrepreneurship and small enterprise management. The book will provide an integrated learning material on small enterprise management for college students who may opt to start a career on entrepreneurship after graduation. The project is on its literature research stage.
- * SMALL BUSINESS ENTREPRENEWS (SBE). There were three issues of the SBE published in 1987. Volume 4, No. 1, January-March, featured small business prospects for 1987 and articles on productivity and competitiveness as well as tips for business success. Featured are excerpts from the speech of Hon. Jose Concepcion, Secretary of Trade and Industry delivered at the closing of the First Asia-Pacific Conference on Small Enterprises and Entrepreneurship Development on February 27, 1987. Intensive care for small and medium enterprises was the theme of the April-June issue (Vol. 4, No. 2) of the SBE. Meanwhile, the third issue, July-September (Vol. 4, No. 3), analyzed the present economy so as to come up with answers to questions on the prospects facing businessmen in the near future. A featured article was the speech of Dr. Bernardo Villegas delivered during the closing ceremonies of the Managers' Course for Small and Medium Enterprises on August 3, 1987 entitled: The Economy: Poised for A Strong Recovery.



TRAINING PROGRAMS



The mainstay of the Foundation is still the varied and stimulating training programs which it opens to the public, especially the CSMI sector throughout the country. A total of 58 training programs were successfully conducted for 1,390 participants. Those trained included potential and existing entrepreneurs and small business managers, trainers and development workers, volunteers from NGOs and PVOs, technicians in industrial automation, and faculty members of business schools. The trainees for the year 1987 came from Asian and African countries whose developing economies are somewhat parallel with that of the Philippines. A list of the training programs launched and implemented by the Foundation is found in Table 1.

* TRAINING OF POTENTIAL AND EXISTING ENTREPRENEURS. A total of 527 potential and existing micro-, cottage, small and medium-scale entrepreneurs were trained during the whole year. Underprivileged sectors of society like women and out-of-school youth were reached by these training programs. It is also significant to note that majority of the trainees hailed from the regions. This means that the Foundation has been true to its mission of bringing training and development to the countryside where this is needed most. The UP ISSI staff were the close partners of the SERDEF members in the conduct of these training programs.

* TRAINING OF VOLUNTEER WORKERS, TRAINERS, FACULTY MEMBERS, CATALYSTS AND GOVERNMENT DEVELOPMENT OFFICERS IN MICRO-, COTTAGE, SMALL AND MEDIUM INDUSTRY TRAINING AND PROMOTION.

This group comprises the catalytic agents who proved to be multipliers in the spreading of the gospel of entrepreneurship throughout the country and includes faculty members of colleges and schools of business who were trained to re-orient their students towards choosing vocations in entrepreneurship. There were 427 participants in this category, 52 of whom were foreigners from developing countries like Bangladesh, Indonesia, Nepal, Thailand, Kenya and Zimbabwe.

* TRAINING OF TECHNICAL OFFICERS IN SPECIFIC INDUSTRY ASPECTS. Technical staff involved in such specific industry areas as industrial relations management, effective supervisory practices, industrial automation and instrumentation, and materials management and inventory control were also trained by the Foundation during the past year. A total of 431 participants were trained in this category. Follow-ups especially on the industrial automation and instrumentation courses showed that technicians are able to extensively use what they have learned.



INTERNATIONAL CONFERENCES



The Foundation co-sponsored symposia/conferences with internationally based agencies and PVOs during 1987. These gatherings brought together numerous entrepreneurs and development workers involved in the small and medium-scale industry sectors. The exchanges of ideas and general interest in improving the sector made the activities both fruitful and meaningful to the speakers, presentors and participants.

- * 1st ASIA-PACIFIC SYMPOSIUM ON SMALL ENTERPRISE AND ENTREPRENEURSHIP DEVELOPMENT (February 26-28, 1987). This activity provided a forum for all interested publics of small enterprise development — entrepreneurs, policy-makers, development plan-

ners, extension officers, financiers, and researchers — to freely exchange ideas, innovative approaches and experiences in small enterprise promotion. Critical issues that affect the survival and growth of an enterprise in the sector were identified and analyzed, and strategies formulated to increase its competitiveness in the local and foreign markets. Discussions also centered around how government and private entrepreneurship development programs could be made more responsive to the needs of the entrepreneur. A total of 182 local and foreign participants attended the symposium. The Singapore-based TECHNONET ASIA, the USAID, and the ASEAN Committee on Industry, Minerals and Energy were co-sponsors while UPISSI/SERDEF were local implementors and hosts.

- * CONFERENCE ON COCO-BASED AGRIBUSINESS OPPORTUNITIES FOR SMALL-SCALE INDUSTRIES (November 26, 1987). The Friedrich Ebert Stiftung Philippine Office through its PVO-beneficiary, the Small Economic Enterprises Development Foundation, Inc. collaborated with UPISSI/SERDEF for the implementation of this one-day conference. The forum explored new opportunities in small coco-based agribusiness projects for the benefit of potential and existing entrepreneurs, development workers, small business consultants, teachers and researchers. The conference program covered the state of the coconut processing industry, its problems and marketing of products. A group of 108 participants attended the conference.

PROJECTS WITH THE DEPARTMENT OF AGRICULTURE AND FOOD

The technical staff of the Department of Agriculture and Food (DAF) and the SERDEF prepared a total of nine volumes of reports on technical topics, a Post-Harvest Grain Handling and Storage Study, a Study of Past Project Development Efforts in Rainfed Agriculture and a Production and Marketing Study for Coffee, Pineapple and Sweet Potato in Region V.

- * TECHNICAL PAPERS (DAF-SERDEF). There were six volumes produced by the technical staff of the DAF and the SERDEF in 1987. Volume 1 concentrates on international affairs, livestock, poultry and feedgrains; Volume 2 contains three technical papers on vegetables, rootcrops and agricultural marketing; Volume 3 features papers on nutrition, farming systems, agribusiness and international affairs; Volume 4 has technical papers on agricultural finance, credit livestock, poultry, feedgrains and selected agribusiness statistics; Volume 5 publishes technical papers on commercial crops and fibers, pre-feasibility studies for asparagus production and castor bean processing, as well as farming systems, cooperatives and rural institutions which aid in the development of agriculture in the countryside; and Volume 6 contains technical papers covering agribusiness prospects in rice and corn production, vegetables, fisheries and irrigation.

- * STUDY OF PAST PROJECT DEVELOPMENT EFFORTS-RAINFED AGRICULTURE (February 1987). This Volume aimed to review and analyze past development efforts in rainfed agriculture towards a better understanding of the sector in order to uplift upland dwellers economically as well as promote a better balanced ecosystem in rainfed agricultural areas.
- * POST-HARVEST GRAIN HANDLING AND STORAGE STUDY (July 1987). The primary consideration of the study was the identification of postharvest development activities to facilitate the promotion of more equitable distribution of income and determine the appropriate strategy to utilize technology and expertise in the post-harvest field.
- * PRODUCTION AND MARKETING STUDY FOR COFFEE, PINEAPPLE AND SWEET POTATO IN REGION V (April 1987). This study promotes the idea that production and marketing linkages in agricultural development are very important. Farmers need assured markets and stable prices to sustain their livelihood. This study, therefore, compares and analyzes recommended versus actual production practices for the coffee, cacao and sweet potato farming sectors in Region V in order to recommend solutions to existing problems especially as far as marketing, distribution systems and production processes are concerned.

OUTLOOK FOR 1988

SERDEF began its second decade of existence in 1987. Organizing a Foundation is quite easy. But keeping it growing and making it stronger as the years go on is difficult and taxing. SERDEF was able to see its projects and networks grow as it went through its first decade. It has, therefore, answered the second challenge successfully.

In 1988, SERDEF, through UP ISSI will go one step forward towards helping the present small-scale business sector to modernize and consolidate its position. Recovery and increased growth in the nation's economy make it ripe for the small entrepreneurs to be more mature in its dealings, more and better organized and managed so that their enterprises can prepare to deal with the world as it enters the last decade of the 20th century. Modernization, not only in outlook and attitude but also in practice and use of technology will be advocated in 1988.

The "ASEAN flavor" which began in 1986 will continue to be intensified as the Foundation goes into projects linking it with the other nations in Southeast Asia. The outlook will be that of constant reaching out beyond Philippine shores so as to be enriched not only with the cultures and contributions of the other nations but also to share with them whatever the Foundation has already learned through its years of experience. Complementation and sharing of cases, materials, ideas, and thoughts, especially through meetings, workshops and conferences will be encouraged.



Also, more movement to the regions will be experienced by the Foundation in 1988. Its members have pledged their availability to be on hand and travel to the regions, hand-in-hand with UPISSI staff who are themselves gearing for regional travels. The Regional Seminar Series will be intensified so that its presence will be felt by entrepreneurs in the countryside. Other regional training programs are being conceptualized to bring the expertise of SERDEF members directly to the entrepreneurs.

The next year, 1988, will be a time when expectations will continue to be fulfilled. It will see more NGOs and PVOs coming to SERDEF to be accredited as conduits for loan assistance packages for the underprivileged sectors of society. It will receive more grants and donations from agencies who see that SERDEF is fulfilling its mission as a Foundation for the advancement of the small-scale entrepreneur.

There will be more chances in 1988 for the Foundation to prove that its vision in 1976 has set it on the right direction. The new year will therefore continue the projects began earlier, especially those which have a longer term like the Micro Enterprise Development Project, the Development of Cottage, Small and Medium Enterprises Project and the Entrepreneurship for the Collegiate Education Level Project. As the year begins, the Foundation will feel an upsurge of activity and fulfillment.

TABLE 1
LIST OF TRAINING PROGRAMS CONDUCTED BY SERDEF IN 1987

PROGRAM TITLE	DURATION	CO-SPONSOR(S)	NO. OF TRAINEES	
			Local	Foreign
Materials Management and Inventory Control	Nov 10, 1986 to Jan 16, 1987	International Labour Organization	0	1
Project Hanapbuhay *Entrepreneurial Motivation Training	Jan 8-10	AISEC	26	0
Training of Trainers Manila (NCR)	Jan 19 - 21	PACSB/EDCEL	30	0
Training of Trainers Bacolod (Reg. VI)	Jan 22 - 25	PACSB/EDCEL	25	0
Case Writing Workshop	Jan 29 - 31	PACSB/EDCEL	22	0
1st Project Evaluation Appraisal and Monitoring Course (PREAM)	Feb 5 - April 1	ADB/Krishi Bank	0	4
Regional Seminar Series Baguio (Reg II)	Feb 11	SLU EISSI	25	0
Bankers' Training Course for Nepalese	Feb 25 - Mar 27	GTZ Nepal	0	17
Supervisory Effectiveness Program	Feb 25 - Mar 15	N. de la Merced & Sons Co., Inc.	20	0
Industrial Automation and Instrumentation Control (Pneumatics & Electro-Pneumatics)	Mar 2 - 20		12	0
Training of Trainers Legazpi City (Reg V)	Mar 3 - 5	PACSB/EDCEL	18	0
Regional Seminar Series Daet (Region V)	Mar 29	DTI/People's Economic Council	22	0
Small Enterprise Planning and Development Course	Apr 2 - 14	MADECOR	0	7
Entrepreneurship Development Program for Trainers	Apr 2 - May 2	NMYC	27	0
Entrepreneurship Development Workshop Seminar * Personal Entrepreneurial Competency Development	Apr 3 - 5		8	0

* Business Planning	Apr 6 - 14		12	0
* Project Monitoring Supervision and Control	Apr 20 - 24		25	0
* Trainers' Training	Apr 27 - May 8		8	0
2nd Project Evaluation Appraisal and Monitoring Course (PREAM)	Apr 20 - Jun 20	ADB/Krishi Bank	0	8
Capiz Rural Enterprise and Entrepreneurship Development (CREED)				
* Young Entrepreneurs' Workshop	Aug 10-Sep 5	Capiz Development Foundation, Inc.	25	0
* Livelihood Development Program for Women	Aug 17 - Sept 13	Capiz Development Foundation, Inc.	31	0
31st Managers' Course	Apr 28 - Jul 31		29	0
Regional Seminar Series Zamboanga (Reg IX)	Apr 28		47	0
Curriculum Development Course on Entrepreneurship Development Program	May 7 - Jul 3	Asian Exponent	0	1
Entrepreneurial Career Development Program	May 15 - Jun 20		10	0
Productivity through Effective Supervision	May 19 - Jun 3		15	0
Industrial Extension Training Course	Jun 1 - Jul 17	ILO Bangkok	0	5
Productivity through Effective Supervision	Jun 1 - 9	Plastic Group of Companies	115	0
Project Hanapbuhay Entrepreneurship Development Program	Nov 13 - Dec. 18	PACAP	25	0
IAIC Instrumentation and Process Control Course	Jun 22 - Jul 10		42	0
Project Study Preparation Course	Jul 8 - Sep 4		5	1
Marketing Plan Preparation Course	Jul 10 - Aug 15		18	0
Regional Seminar Series Butuan City (Reg X)	Jul 17	DTI and People's Economic Council	23	0
Regional Seminar Series Pagadian City (Reg. IX)	Jul 21	DTI and People's Economic Council	52	0
Regional Seminar Series Pampanga (Reg III)	Jul 22	DTI and People's Economic Council	25	0
Project Evaluation Course	Jul 20 - Aug 4	ILO Bangkok	0	5
Small Business Consultancy	Jul 15 - Sep 18	DTI	27	0

Technical Report Writing Workshop	Aug 10 - Sep 1	Livestock Development Council	26	0
32nd Managers' Course	Aug 3 - Nov. 15		30	0
IAIC - Pneumatic and Electro-Pneumatic Control Course	Aug 17 - Sep 4		30	0
Industrial Extension Training Course	Aug 31 - Oct. 23	TECHNONET ASIA/ UNIDO	0	1
Rural Marketing and Extension Training	Sep 1 - Oct 20	USAID	0	3
Gaming Simulation for Educators & Trainers	Sep 9 - 17		15	0
Small Business Consultancy Course - Batch 2	Sep 15 - Nov. 22	Dept. of Trade and Industry	27	0
Small Business Consultancy Course - Batch 3	Sept 29 - Dec 1	Dept. of Trade and Industry	27	0
Small Business Consultancy Course - Batch 4	Oct 13 - Nov 27	Dept. of Trade and Industry	27	0
Study Tour Program for Industrialists from Sri Lanka	Sep 21 - Oct 2	TECHNONET ASIA	0	13
Comprehensive Course on Instrumentation and Process Control	Sep 26 - Oct 31		57	0
IAIC - Digital Control	Oct 5 - 24		27	0
Regional Seminar Series Cotabato (Reg XII)	Oct 3		83	0
Seminar on Industrial Relations Management	Nov 24 - 27	UPISSI Alumni	48	0
IAIC: Instrumentation and Process Control Course	Nov 23 - Dec 11		43	0
Regional Seminar Series Puerto Princesa (Reg IV)	Nov 28		20	0
Regional Seminar Series Tacloban City (Reg VIII)	Dec 3		23	0
Training of Trainers Baguio (Reg II)	Oct 22 - 24	SLU EISSI	36	0
Training of Trainers Tacloban City (Reg VIII)	Nov 27 - 30	PACSB/EDCEL	25	0
Advanced Training of Trainers Iloilo (Reg VI)	Dec. 14 - 15	PACSB/EDCEL	22	0

NOTES TO FINANCIAL STATEMENTS

1. ORGANIZATION AND OBJECTIVES

The Foundation is a nonstock, nonprofit corporation organized primarily to establish and provide a private institutional medium that will initiate, sponsor, promote, assist or conduct researches, programs and projects geared towards the promotion and development of small and medium enterprises. No part of the net income of the Foundation inures to the benefit of any officer, member or private individual.

The Foundation has been granted by the Bureau of Internal Revenue an exemption from the payment of income tax as a corporation organized for purely scientific purposes as contemplated by Section 26 (as amended) of the National Internal Revenue Code.

2. USAID GRANT

Under the U.S. Agency for International Development (USAID) Grant Agreement, the Foundation is not allowed to mingle funds from this Grant with other funds owned or controlled by it. Furthermore, all such funds received from the USAID must be deposited in a separate noninterest bearing bank account where all disbursements for goods and services under the USAID budget line shall be made.

3. TEMPORARY CASH INVESTMENTS

This account consisted of the following:

	1987	1986
Treasury bills	P3,412,877	P2,027,678
Time deposits - US Dollar	2,476,170	873,978
Time deposits - Peso	-	1,004,220
	<u>P5,889,047</u>	<u>P3,905,876</u>

Accrued interest income of ₱62,498 and ₱47,359 as at December 31, 1987 and 1986, respectively, are included in Accounts Receivable.

4. TRANSPORTATION AND OFFICE EQUIPMENT

Transportation and office equipment are carried at cost less accumulated depreciation. Depreciation is computed on the straight-line method over the estimated useful lives of the assets.

5. RESEARCH AND OTHER SPECIAL FUNDS

This account consisted of the following:

	1987	1986
Research Fund	₱428,864	₱377,778
Research Fellowship Fund	218,735	190,020
International Fellows Fund	127,611	110,860
Publications Fund	134,048	116,451
M. Gimenez Fund	57,275	-
MEDP Fund	4,564	-
	<u>₱971,097</u>	<u>₱795,109</u>

6. FUND ALLOCATIONS

Fund allocations represent appropriations of the funds of the Foundation for various endeavors consistent with its objectives. All such allocations are approved by the Board of Trustees.

**STATEMENTS OF OPERATIONS AND FUND BALANCES
FOR THE YEARS ENDED DECEMBER 31, 1987 AND 1986**

	1987	1986
REVENUES		
Seminars and workshops	₱3,298,579	₱ 758,902
Research and projects	624,178	962,271
Donations and grants	1,752,089	1,061,710
Interest income	127,039	234,725
Miscellaneous	159,663	203,167
	<u>5,961,548</u>	<u>3,220,755</u>
EXPENDITURES		
Projects:		
Honoraria	2,144,617	1,041,760
Supplies	387,033	181,400
Transportation and travel	370,570	370,570
Refreshments	181,505	85,704
Printing	173,620	181,505
Interviewers' fees	103,866	173,620
Advertisements	46,329	103,866
Communications	16,209	46,329
Miscellaneous	97,208	16,209
	<u>3,520,957</u>	<u>1,584,933</u>
Research grants	-	-
General and administrative:	-	-
Donations	206,785	206,785
Depreciation	70,800	70,800
Salaries and bonuses	64,448	59,896
Repairs and maintenance	58,789	26,719
Stationery and office supplies	33,195	20,922
Representation and entertainment	32,720	58,789
Professional fees	18,810	33,195
Insurance	17,168	32,720
Transportation and travel	9,981	18,810
Membership fees	7,800	17,168
Taxes and licenses	8,831	7,896
Miscellaneous	530,040	9,981
	<u>4,050,997</u>	<u>1,331,331</u>
EXCESS OF REVENUES OVER EXPENDITURES	1,910,551	1,636,822
FUND BALANCES AT BEGINNING OF YEAR	858,339	1,009,311
FUND ALLOCATIONS (Note 6)	(66,000)	16,000
FUND BALANCES AT END OF YEAR	<u>₱2,702,890</u>	<u>₱1,075,933</u>

See accompanying Notes to Financial Statements.

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The Board of Trustees
 Small Enterprises Research and Development
 Foundation of the Philippines, Inc. (SERDEF)

We have examined the balance sheets of Small Enterprises Research and Development Foundation of the Philippines, Inc. (SERDEF) (a nonstock, nonprofit corporation) as at December 31, 1987 and 1986, and the related statements of operations and fund balances and sources and applications of funds for the years then ended. Our examinations were made in accordance with generally accepted auditing standards and, accordingly, included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the financial statements referred to above present fairly the financial position of Small Enterprises Research and Development Foundation of the Philippines, Inc. (SERDEF) as at December 31, 1987 and 1986, and the results of its operations and the sources and applications of funds for the years then ended, in conformity with generally accepted accounting principles applied on a consistent basis.

Sybil K. Velasco & Co.

January 26, 1988

**STATEMENTS OF SOURCES AND APPLICATIONS OF FUNDS
 FOR THE YEARS ENDED DECEMBER 31, 1987 AND 1986**

	<u>1987</u>	<u>1986</u>
SOURCES OF FUNDS		
Revenues	P6,399,595	P3,220,755
Increase in:		
Funds in trust	1,132,648	300,811
Deferred project fees	932,933	863,750
Decrease in prepaid expenses	-	<u>1,684</u>
	<u>P8,465,176</u>	<u>P4,387,000</u>
APPLICATIONS OF FUNDS		
Expenditures (net of depreciation)	P4,125,140	P2,083,435
Increase in:		
Cash	1,229,563	878,156
Accounts receivable	667,777	47,260
Net additions to temporary cash investments	1,983,171	1,773,153
Purchase of transportation and office equipment	111,351	139,509
Decrease (increase) in accounts payable and accrued expenses	<u>348,174</u>	<u>(534,513)</u>
	<u>P8,465,176</u>	<u>P4,387,000</u>

See accompanying Notes to Financial Statements.

**BALANCE SHEETS
DECEMBER 31, 1987 AND 1986**

	1987	1986
<u>A S S E T S</u>		
CASH		
On hand and in banks - peso	₱1,169,468	₱ 279,609
Savings deposit - US dollars	175,092	294,798
USAID grant (Note 2)	931,167	471,757
TEMPORARY CASH INVESTMENTS (Note 3)	5,889,047	3,905,876
ACCOUNTS RECEIVABLE	986,927	319,150
TRANSPORTATION AND OFFICE EQUIPMENT - Net of Accumulated Depreciation of ₱456,159 in 1987 and ₱385,359 in 1986 (Note 4)	245,619	205,068
	<u>₱9,397,320</u>	<u>₱5,476,258</u>
<u>LIABILITIES AND FUND BALANCES</u>		
ACCOUNTS PAYABLE AND ACCRUED EXPENSES	₱ 327,933	₱ 676,107
FUNDS IN TRUST	1,635,368	502,720
DEFERRED PROJECT FEES	1,796,683	863,750
FUND BALANCES		
General Fund	2,702,890	858,339
Incentive Fund	1,075,933	1,009,311
Research and Other Special Funds (Note 5)	971,097	795,109
Endowment Fund	714,749	620,922
JGS Entrepreneurship Development Fund	172,667	150,000
	<u>5,637,336</u>	<u>3,433,681</u>
	<u>₱9,397,320</u>	<u>₱5,476,258</u>

See accompanying Notes to Financial Statements.



SMALL ENTERPRISES RESEARCH & DEVELOPMENT FOUNDATION

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MIRRORS

A Summary of Accomplishments in 1987
UP Institute for Small-Scale Industries



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By yearend 1987, there was enough hard evidence to show that things are looking up at last for this country and people. GNP, the yardstick of total economic activity — posted a 5.05 per cent growth. This performance is more than one per cent short of the targetted 6.5 per cent but is nevertheless still significant and reassuring compared to the less than one per cent growth recorded in 1986.

To a large extent, the favorable shift in the wind has been spurred by a surge in industrial performance. The industrial sector recorded a 7.9 per cent gain — quite impressive considering that industry declined by 2.7 per cent last year. Among the biggest gainers are consumer firms which experienced growth rates of from 20 to 60 per cent. President Corazon Aquino has also rightfully attributed much of this increase to the vigor and vitality of the small and medium business sector.

1987 was a year which saw the Countryside Economic Development Program (CEDP) continue pump-priming the rural economy by more than P10 billion and politicians putting in more

funds in election spending. The government moved swiftly and impressively in terms of dismantling monopolies, removing price controls, laying import liberalization fully in place and starting to implement the agrarian reform program even as Congress still debates on the issue. Another salutary move by government was earmarking P4 billion in massive low-cost housing.

Investments began to come in, although not in the magnitude hoped for, as business begin to see the abatement of labor unrest in some sectors, the closer government-private sector interface in policy and program-setting and the promulgation of an Omnibus Investment Code which, for the first time, explicitly considers the promotion of small and medium business as an important if not priority concern.

Of special significance to small businessmen was the creation of a Council on Micro, Cottage, Small and Medium Industries expected to give impetus to the "small is beautiful" movement. The "Tulong sa Tao" program and the work being done by the regional Peoples Economic Councils underscored

the complementarity between the government and private-sector efforts in rural enterprise development. At the same time, the Industrial Guarantee and Loan Fund continued to provide liberalized credit to small-enterprise borrowers.

Overall, it may be said that the year ended with the country's entrepreneurs facing the biggest and most exciting challenges ever. Poised for a strong recovery, the nation looks to the country's business people — their creativity, risk-taking and energy — for the creation of a vigorous and progressive society.

Small-scale entrepreneurs, in particular, are reminded that recovery will not come from some master stroke but that it takes human effort to achieve recovery. In other words, it is they — the entrepreneurs — who can make things happen.

Today, more than ever, small entrepreneurs should be able to compete on the basis of efficiency. They should be on the lookout for new and appropriate technologies that will offer opportunities to upgrade productivity. They should watch out for opportunities for joint

ventures that would expand their technological and financial dimensions and scan the horizons for new markets and ways of recycling waste products and making use of indigenous materials.

The UP ISSI continues to stand alongside the small entrepreneur as it has done in the past 22 years. The UP ISSI shall go on promoting new small business creation and helping existing small enterprises survive and grow and realize their vast potentials to contribute to nation building. The UP ISSI shall likewise remain to be at the forefront of developing and training small-enterprise development workers — trainers, consultants, extension workers, information officers — who would be in a position to help the small business community help itself. More importantly, the UP ISSI shall continue to make significant researches which the national policymakers have used in the recent years as their information base.

— Melito S. Salazar, Jr.



BRIEF HISTORY AND GOALS

In the early sixties, the UNESCO Research Centre in Calcutta, India conducted a survey on small enterprises in the Philippines. The study probed deep into the difficulties encountered by small businessmen which, by their sheer number, formed the backbone of the country's economy. The survey proved to be an eye-opener, bringing to light the potential contributions of small entrepreneurs which could only be realized if they could be helped to overcome their size-related problems. This led to the forging of a bilateral agreement in March 1966

between the governments of the Philippines and the Netherlands to establish a small-enterprise training research and extension organization as a special project of the University of the Philippines.

In 1969, Congress passed RA 6041 making the Institute a permanent unit of the University.

As a pioneer institution, the Institute tackled the uphill task of trying to influence national policy to favor the small enterprise sector and focus public attention to the promise in small-scale entrepreneurship. By the early seventies,

these efforts seemed to have gained ground as small industries made it, for the first time to the National Development Plan (FY 1972-76) as an important strategy for economic growth.

Thereafter, the "small is beautiful" campaign begun by the Institute grew into a pervasive national movement, with a number of government agencies being mobilized to promote and assist small enterprises. Most notably, the then Department of Industry organized a Bureau of Small and Medium Industries (BSMI) which in turn fielded small business assistance officers in all of the country's twelve regions. By the mid-seventies, private industry had joined the small industry bandwagon. Industry and trade chambers, private voluntary organizations and civic associations came forward to take initiatives in the areas of enterprise financing, training, subcontracting and transfer of technology.

Inevitably, new small industry assistance programs proliferated. This was true both in the government and the private sectors. As more and more skilled development manpower was required to implement and manage these programs, more compelling demands were made on the training capabilities of the UP ISSI. Soon, the Institute placed its greater efforts on the training of individuals who would in

turn help small business people — trainers, extension officers, regional development workers, information officers, credit officers, etc. Training these so-called "agents of change" was expected to generate a multiplier effect to accelerate small enterprise development.

The economic crisis of the mid-eighties caused a number of big companies to fold up and lay off scores of employees, including executives. The crisis situation called attention to the built-in superiority of small businesses to operate in less than predictable situations.

In response to the crisis, the UP ISSI introduced innovations in its entrepreneurship development programs by designing special packages for displaced executives, engineers and technical personnel of big companies so that these well-trained and experienced individuals could invest their talents and resources in putting up and running their own "show." The Institute spearheaded with the Philippine Association of Colleges and Schools of Business (PACSB) the integration of entrepreneurship and small business management in the business curriculum. Other new markets reached were returning contract workers and their dependents, "balikbayans," micro-entrepreneurs in the rural community and the youth, among others. The Insti-

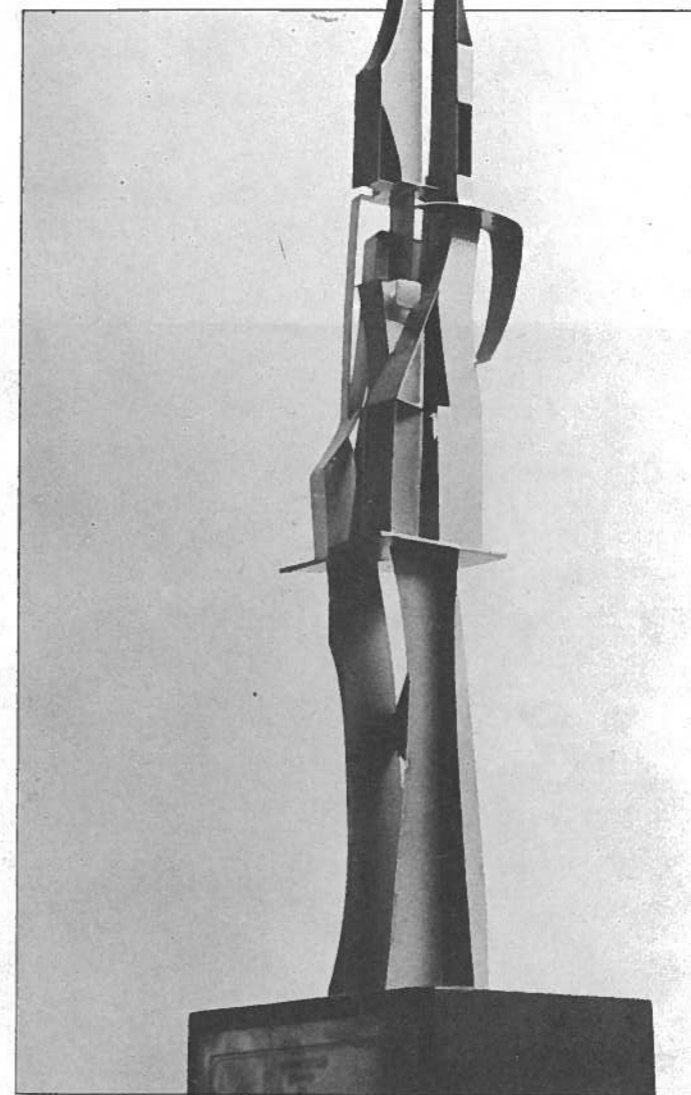
tute also accelerated its research activities to increase the knowledge base of the sector particularly for the purpose of formulating government response to entrepreneurial needs.

Today, it is clear that the UP ISSI has built up its capability not only as a national but also as a regional training institute for small industry development in Asia and the Pacific. Its mission includes a strong thrust for modernizing the small-scale industries which it seeks to help become more productive and responsive to the challenges set by the times.

These two thrusts, regionalization, and small industry modernization, will carry it forward as it aims to be a significant partner in the total development of the Philippines.

Goals

The U.P. Institute for Small-Scale Industries is committed to contribute to small enterprise promotion and development through the principal strategies of *training, research, extension and information*. This report presents what it has accomplished in 1987 in pursuit of these goals.



REVIEW OF ACCOMPLISHMENTS



SUMMARY

In line with the entrepreneurial spirit which it tries to promote, the Institute for Small-Scale Industries moved in 1987 to introduce new and innovative programs, pilot experimental projects, explore new markets and mobilize to the full its resources and facilities.

Training was easily the most dominant activity during the year. Training efforts paid attention as much to the needs of en-

trepreneurs and would-be entrepreneurs as to the requirements of small enterprise development workers — the so-called "agents of change" expected to hasten development. Notably, the Institute served a good cross-section of the small enterprise sector. Private voluntary organizations out-of-school youth, the rural sector, government organizations local governments, the academe, student organizations, industry chambers and groups, rural women, de-

pressed communities, international development organizations, church-affiliated groups — all these came in either as training program collaborators or program beneficiaries. As a consequence, the Institute was able to train an unprecedented number of people in a record number of entrepreneurship and entrepreneurship development programs.

In industrial extension, the principal activity was the Micro Enterprise Development Program which

extended a package of financing, training, technology and management consultancy services to rural micro businessmen through accredited private voluntary organizations. A pilot project supported by the US Agency for International Development (USAID) and the Small Enterprises Research and Development Foundation (SERDEF), the MEDP seeks not only to assist the micro-enterprise sector but also to upgrade the capability of the collaborating PVOs



to assist their small enterprise beneficiaries. Another major extension project is the Economic Productivity Program implemented for the Christian Children's Fund seeking to promote income-generating projects in selected marginal areas in Northern Luzon. At the same time, the extension staff continued to service walk-in clients in a variety of problem areas, notably sources of financing and project feasibility study preparation.

Research activities

probed into the technology transfer process from a large to a small firm in the electrical appliance industry and the prospects and problems of small-scale forest-based processing enterprises. The latter is a multi-country study in the ASEAN region.

Industrial information took the form of technical inquiry and publication services. Published during the year was a quarterly small business magazine, a quarterly newsletter for micro en-

trepreneurs, a textbook on entrepreneurship and a guidebook on potentially viable small enterprises in the country.

The Institute also played host to an international gathering of small business people early in the year and an assembly of coco-based entrepreneurs and development workers by year end.

Finally, the year was marked by initiatives to align the Institute's programs more closely with the University's academic

objectives. A graduate program in entrepreneurship development was designed during the year and submitted to the UP Central Administration. Approval of this program is expected to lay the groundwork for the Institute's entry into the mainstream of the University's academic community. Meanwhile, the Institute vigorously pursued a staff development program to prepare its staff not only for more extension work but also for formal teaching functions.

ENTREPRENEURSHIP AND MANAGEMENT DEVELOPMENT

Training in 1987 blazed trails, so to speak. There was a deliberate effort to design new programs for specific market segments, some of which have heretofore been unserved.

Private voluntary organizations (PVOs) is one example of a market served for the first time. A four-module entrepreneurship development workshop, covering all aspects of EDP, sought to upgrade the capabilities of PVO staff to assist the development of income-generating projects. This program pursues the objective of training small enterprise development "catalysts" and is considered innovative because it is directed this time not to government development workers but to those from non-governmental organizations (NGOs).

The women's sector is another market segment targeted during the year. A livelihood development program for rural women was held in Capiz in recognition of the potential contribution of rural women to development.

The year was also marked by vigorous efforts to reach out to the regions. A regional seminar series supported by the SERDEF hied to various areas in the countryside — Baguio, Butuan, Pampanga, Pagadian, Cotabato, Daet, Puerto Princesa, and Tacloban City — to promote small-scale entrepreneurship. Training was designed according to the priority needs of the specific rural business community, as identified by local governments, universities or PVOs operating in the area and cooperating with the Institute in

the conduct of the program. For instance, entrepreneurs in Baguio wanted a program on the food processing industry; the business community in Pagadian asked for a seminar on taxation; while small businessmen from Daet expressed a need for knowhow on how to export. The Institute sought to deliver these requirements as specified.

Another new thrust was the municipal enterprise management program. As its name implies, this program encouraged local governments or municipalities to engage in profitmaking projects like slaughterhouses and public markets. The program delivers the message that entrepreneurship is not only for individuals but also for government and government organizations.

Two projects — Project Hanapbuhay and CREED (Capiz Rural Enterprise and Entrepreneurship Development) project — provided not only training services but a more integrated package of assistance, including credit and extension, to beneficiaries. Project Hanapbuhay benefitted urban out-of-school youth in cooperation with AIESEC Philippines, a nationwide organization of business students. On the other hand, CREED addressed the needs of the rural small enterprise sector.

CREED is considered experimental in the sense that it piloted a new scheme — adapted from a western model — for selecting participants to entrepreneurship development programs. If found effective, the selection scheme shall be replicated in other entrepreneurship development programs (EDPs) of the Institute and shall be made available to other organizations engaged in EDP.

Training programs in 1987 reached a record 1735 trainees — up by 83.7 per cent from last year's performance — in 60 training courses, workshops, seminars or appreciation / orientation programs (in 1986, only 39 programs were held). In terms of regional representation, the National Capital Region accounted for 54.0 per cent while the rest of the participants came from other regions of the country, with Region VI having the next biggest group (10.5 per cent) followed by Region IX (6.7 per cent).

Foreign trainees accounted for 199 or 5.1 per cent of the total participants. The biggest foreign group was from Nepal (27.7 per cent of foreign participants), followed by groups from Bangladesh (19.3 per cent) and Indonesia (18.5 per cent).

The total figures include participation in two symposia held during



the year. The first was the First Asia-Pacific Symposium on Small Enterprise and Entrepreneurship Development (ASPAC SEED) held in February 25-28 at Hotel Intercontinental Manila jointly organized with Technonet Asia with support from the USAID and the ASEAN Committee on Industry, Minerals and Energy (COIME). The symposium tackled the theme "Making Small Enterprises more Competitive through More Innovative Entrepreneur-

ship Development Programs."

The second symposium was the Conference on Coco-Based Agribusiness Opportunities organized jointly with the Small Economic Enterprises Development (SEED), Inc. with support from the Friedrich Ebert Stiftung Philippine Office. The gathering was held on November 26 at the Hotel Intercontinental Manila. The conference focused on the status, problems and prospects of the coconut-

based industry and new opportunities in terms of financing, marketing, livelihood opportunities and development of new products, processes and technologies.

The training programs are catalogued in some detail on Table 1. (The list does not include training conducted for beneficiaries of the Micro-Enterprise Development Project which is presented separately on Table 5). Figs. 1 to 5 present a profile of participants.



On its third year in 1987, the Entrepreneurship Development for Collegiate Education Level (EDCEL) project implemented by the Institute, the Philippine Association of Colleges and Schools of Business (PACSB) and the SER-DEF went full steam ahead with its curriculum-testing, teacher's-training and resource-materials development activities.

Pilot-testing of the new entrepreneurship-enriched curriculum in five schools of business which began in 1986 was continued in 1987. A team from the PACSB and the UP ISSI started monitoring the pilot runs.

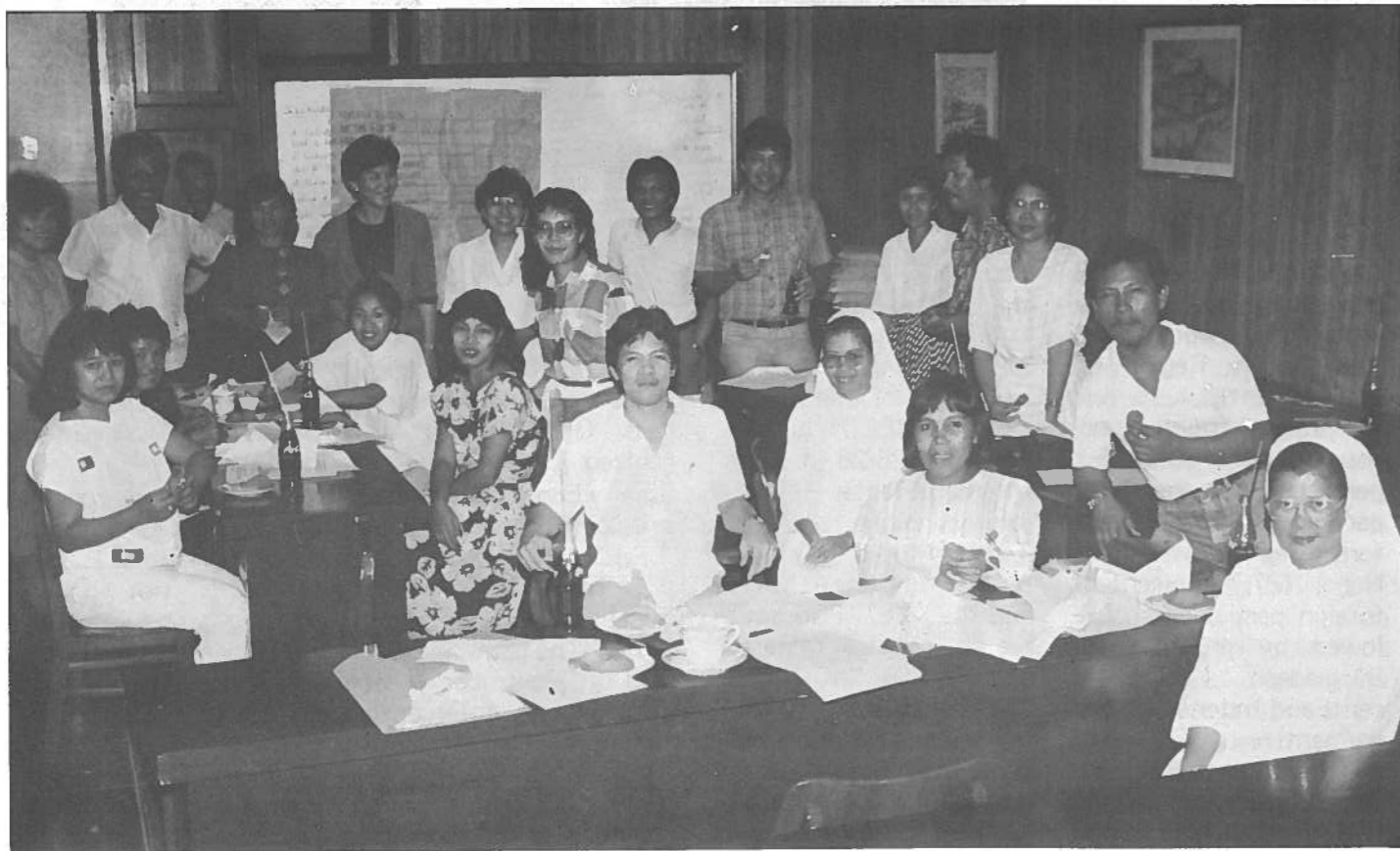
Four faculty development programs were held on Achievement Motivation Training of Trainers in 1987. One was held in Metro Manila while the rest were held in the regions: Regions VI (Ba-

colod), V (Legaspi) and VIII (Tacloban). An advanced training of trainers was held in Region VI (Iloilo).

What was probably the biggest activity for the project during the year was the case-writing component, for which research fellowships were made available by the Foundation for Asian Management Development (FAMD) and SER-DEF. During the year, two case-writing work-

ENTREPRENEURSHIP DEVELOPMENT FOR COLLEGIATE EDUCATION LEVEL

shops were held: one in Metro Manila and the other in Iloilo. Research fellowship grants were awarded to five faculty members of PACSB-member schools while six other research proposals were being considered by the EDCEL project committee. Meanwhile, the Institute encouraged its own staff to supplement the case-writing efforts. By year end, a total of five new cases were completed (See Table 2).



*PROPOSAL TO OFFER GRADUATE PROGRAM IN ENTREPRENEURSHIP DEVELOPMENT

One of the most significant moves made last year — one which will have far-reaching effects on the Institute's future was the design of a Master in Entrepreneurial Development (MED) program which would in effect elevate the Institute's status from an extension to a degree-granting unit.

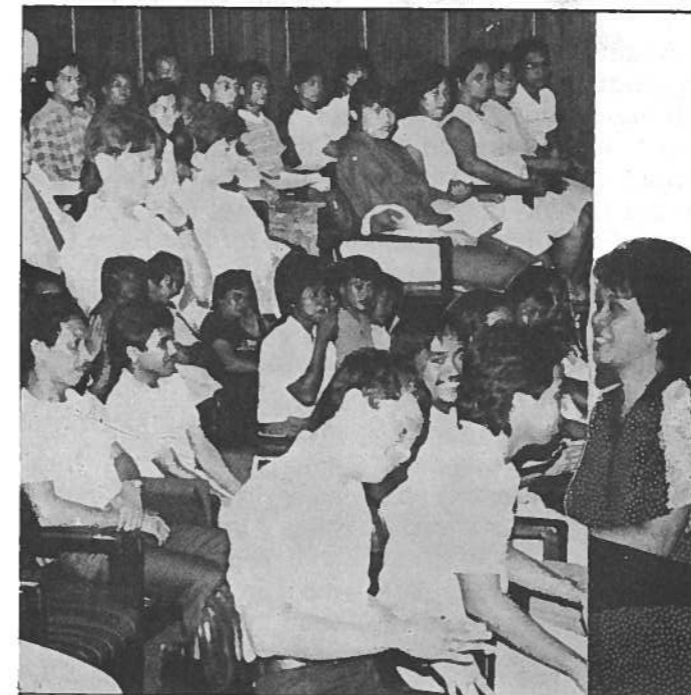
The rationale for MED derives from the premise that entrepreneurship is a separate and distinct discipline from management. However, MED recognizes that entrepreneurs must learn how to manage their business enterprise properly. Therefore, the program has taken into account the training requirements for both disciplines.

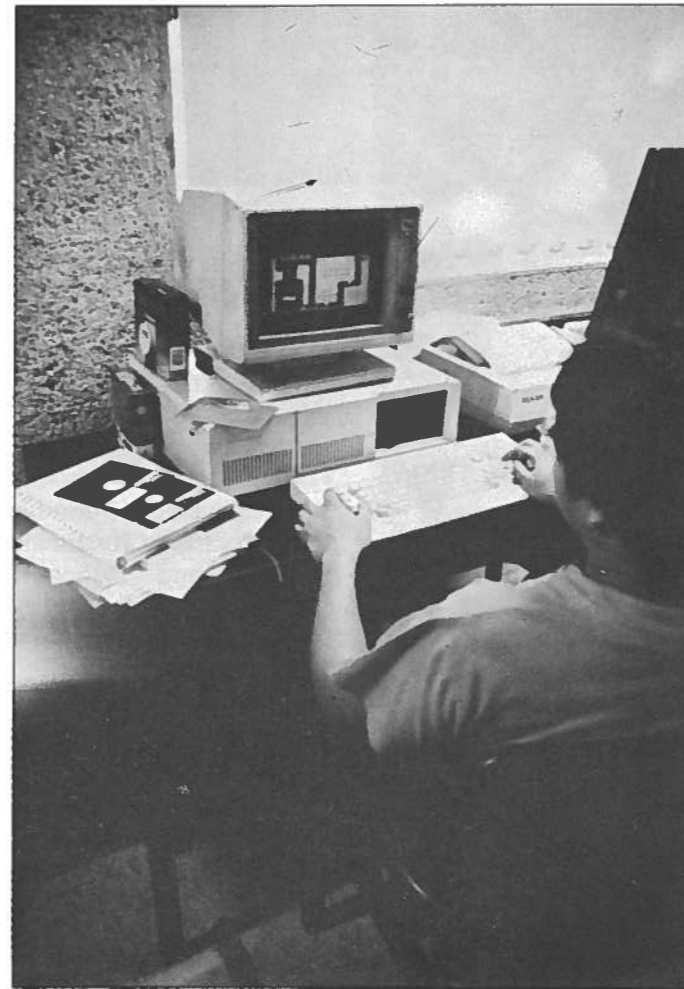
The MED is proposed to be an eight-month, one-academic year program, requiring full-time graduate work and com-

prising 36 units.

That the Institute is prepared to take on this academic responsibility is affirmed by the presence of a staff distinguished for its specialized training in the discipline and whose capability has been developed by years not only of classroom teaching but also of studying and actually helping entrepreneurs in the field. In addition, the Institute has developed and implemented — and is continually updating — small business management and entrepreneurship development curricula for its various markets.

By year end, a formal proposal has been prepared asking for authority from the UP Central Administration for the Institute to offer the MED. As the proposal still awaits approval; the Institute is pursuing vigorous staff development programs specially in terms of graduate degree courses in preparation for the academic work ahead.





RESEARCH

The research function supports the Institute's objective of small enterprise promotion and development through the conduct of policy studies, extension-oriented research, entrepreneurship studies, technological research and training-oriented research. Research also provides essential inputs to training programs in the form of training needs analysis, training impact evaluation as well as training

materials like cases, exercises, handouts, etc.

For 1987, four major research studies were completed in the first half of the year. The first, entitled "The Role of Technology Transfer in the Electrical Appliance Industry in the Philippines," was done with support from the Institute of Developing Economies (IDE) of Tokyo, Japan. The aim of the study was to determine the extent of the transfer of manufacturing technology from a large domestic firm to its small-firm subcontractors.

Another international organization, the Food and Agriculture Organization (FAO) sponsored a project called "A Study on the Growth of Small-Scale Forest-Based Processing Enterprises in Four Developing Countries in the ASEAN Region." This study identified the key factors contributing to the growth or decline of forest-based small-scale processing enterprises in five countries, including the Philippines, based on data on production, investment, employment as well as policies and regulations affecting

the industry.

A third study completed was a survey on "Small-Scale Operations in the Rural Areas of the Philippines and their Potential for Non-Farm Employment Generation." Covering eight regions in the country, the project assessed the status and performance of the micro, cottage and small enterprises in the rural areas in order to determine their significance and degree of involvement in the overall non-farm activities of the national economy. The project is a collaboration

"Changes in the Industrial Structure and the Role of Small and Medium Industries in the Philippines. Covering 200 firms, the study focused on four industry sectors, namely: garments as a foreign exchange earner; wooden furniture as a resource-based industry; machinery-parts manufacturing as support to large industry; and leather and footwear as a job-absorption industry. The study is also sponsored by the IDE.

The year 1987 also witnessed the start of another IDE-assisted project. This project tackles a comprehensive study on four industry sectors among small and medium firms in the Philippines. By yearend, the study was nearing completion.

The study is actually the last of a four-phase, four-year project with the Japanese organization started in 1984.

A research team likewise participated in the evaluation of the Girl Scouts of the Philippines' Scouts Entrepreneurial Endeavours for Development (SEED) program. Initial evaluation showed that the program was successful not so much as a venue for developing livelihood and entrepreneurial skills as in providing opportunities for young women to practice and internalize desirable work attitudes and values.

Table 3 lists down the research projects undertaken during the year and gives some basic information about each.

between the Institute and the National Economic and Development Authority (NEDA).

Finally, the "ASEAN Small and Medium Business Improvement Problems of Production Management" probed into efficiency and productivity factors affecting the operations of selected industries in Greater Manila vis-a-vis firms located in the provinces. The study was made in cooperation with the Institute of Southeast Asian Studies (ISEAS) of Singapore and the USAID.

By yearend, there was an ongoing study on





INDUSTRIAL EXTENSION

The greater industrial extension effort was placed on rural micro enterprise assistance — through the Micro Enterprise Development Project (MEDP) — and on assisting depressed communities in Northern Luzon through the Economic Productivity Program.

The MEDP is an integrated micro-enterprise assistance project implemented in cooperation with SERDEF, Inc. and the USAID. As an experimental project, it initially assists beneficiaries engaged in the priority industries of agribusiness and food processing in

Regions III and IV.

As its name implies, MEDP is a program for the "micros," the smallest of the small business people. The program integrates credit assistance with skills training, management and entrepreneurship development and the extension of appropriate and cost-effective technologies.

Now on its second year, the program received from USAID an increased grant fund from P3.4 million to P4.8 million to accommodate the expanded work of IN-HAND, a subgrantee of SERDEF.

By the end of the

year, the MEDP has lent a total of P256,905 to ten clients through three PVO-intermediaries: the Laguna Red Cross; the Rotary Club of Morong Foundation; and the Angeles University Foundation's Institute for Small Business and Cooperatives. Other PVOs which the MEDP worked with were: SIKAP, Inc. of Tala, Rizal; Lingap Pangkabataan, Inc. and Solidarity Foundation of Rosario, Cavite.

Nevertheless, the loan figures do not look impressive and do not begin to tell the story of all the other services and assistance performed to help the small enterprise emerge and stay viable. For example, in Morong, Rizal, four technical training programs were conducted for the target beneficiaries of the Rotary Club Foundation on the following livelihood projects: nata de coco production, cattle fattening, cucumber production and orchid raising.

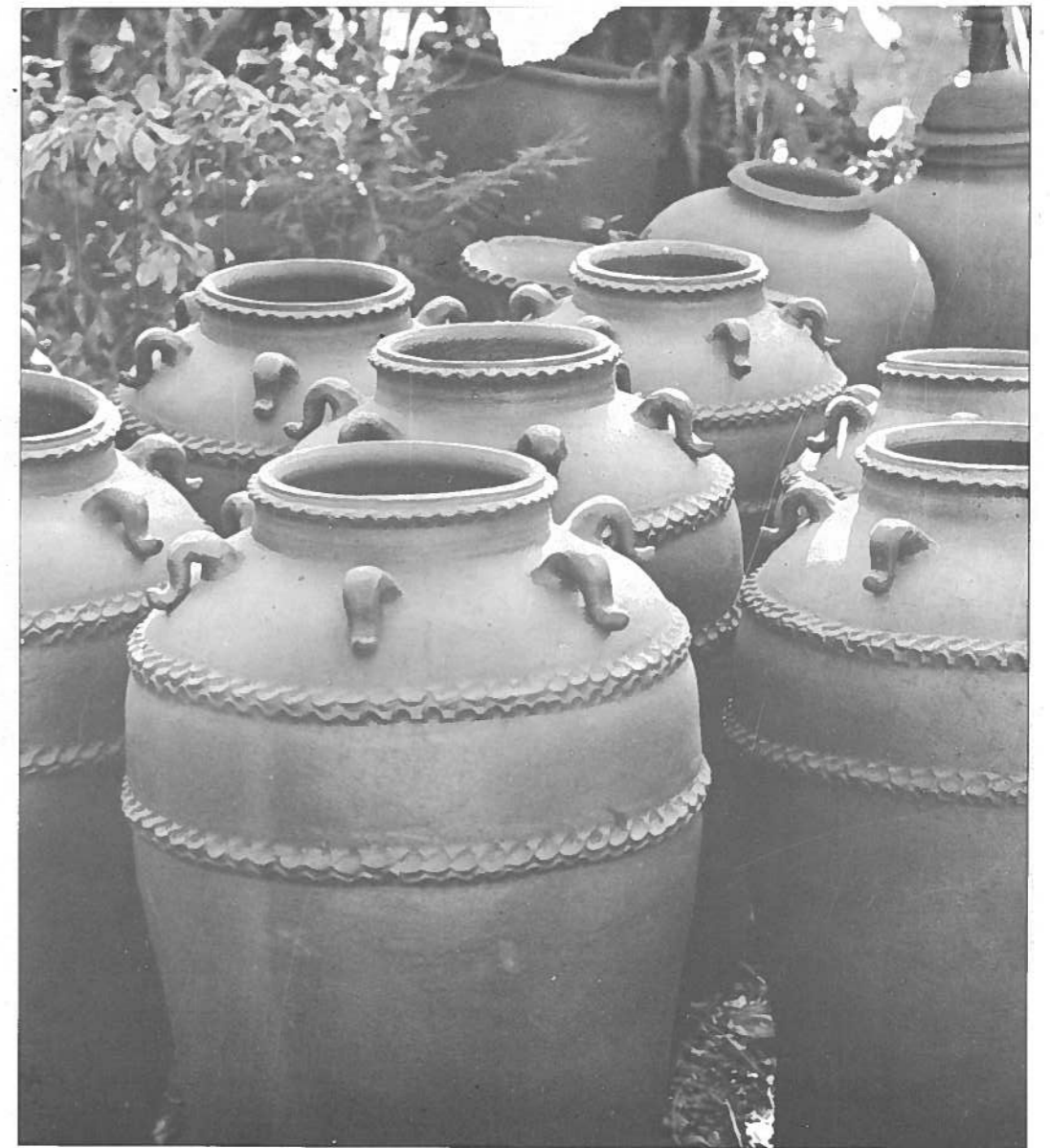
The MEDP assistance is extended not directly to the small business community but rather through private voluntary organizations operating in the communities — people who understand better the needs of beneficiaries and who enjoy

their trust and confidence. In order to upgrade the capabilities of these PVOs in assisting micro entrepreneurs, the Institute also conducted training for their staff in such areas as project monitoring and evaluation. (Table 5 catalogs the training programs conducted by the MEDP during the year.)

In a sense, therefore, the MEDP seeks not only to promote micro entrepreneurship but also to strengthen institutional capabilities in micro enterprise development.

On the other hand, the Economic Productivity Program implemented for the Christian Children's Fund, Inc. aims to promote income-generating projects and economic productivity programs for economically-depressed communities in selected areas in Northern Luzon.

Specifically, the Institute undertook last year socio-economic surveys of all the beneficiary-communities; business diagnosis of existing income-generating projects; and investment profiles of five potentially viable small business projects. For the following years, the Institute will assist beneficiaries in setting up and running the



various income-generating projects identified, monitoring the projects and rendering technical and managerial advice, whenever necessary. A one-week entrepreneurship development program shall also be held for project beneficiaries.

The Institute undertakes these activities in collaboration with CCF's project affiliates like the Sampaguita Family Help-

er Project in Urdaneta, Pangasinan; Faith Social Services Center in Rosario, La Union; Fahan Integrated Rehabilitation Services in San Fernando, La Union, and Our Lady of Lourdes Family Helper Project (OLLFHR) in Itogon, Benguet.

Apart from these two major extension projects, the Institute continued to render extension services to entrepreneurs on a

walk-in basis. During the year, a total of 56 such clients were served, most of whom come from Metro Manila. The bulk of assistance given had to do with the following subject areas: source of financing; business planning; identification of business opportunities; sources of assistance; preparation of project feasibility study; and various types of technical problems.



INDUSTRIAL INFORMATION

During the year under review, the Institute's industrial information staff continued to serve its two category of publics: external and internal.

The external users are the small business community on the one hand and on the other the community of trainers, educators, consultants and other individuals and organizations who make it a business to help small businessmen. The in-

ternal users are the Institute's own staff and participants in its various training programs.

Industrial information activities were pursued with an eye to the needs of these publics.

Published during the year were quarterly issues of *Small Business Entrepreneurs*, a quarterly magazine for small businessmen, with support from Technonet Asia and SERDEF. The issues tackled such themes as "making small enterprises more competitive," "business recovery (this time is it for real?)" and "intensive care for small

and medium enterprises."

Another quarterly, the *Kabuhayan, News* was published. *Kabuhayan* focused on the activities of the Micro Enterprise Development Project and sought to provide technical information for its beneficiaries engaged in food processing and agribusiness.

A new periodical, the *SERDEF Update* is a quarterly newsletter on the programs, projects and beneficiaries of the Small Enterprise Research and Development Foundation (SERDEF) with which the Institute is closely affiliated.

Two books were launched during the year. The first was the *Introduction to Entrepreneurship*, a publication addressed to the entrepreneurship-oriented youth. Intended to be a textbook in college-level entrepreneurship subjects, *Introduction* is a primer on the behavioral characteristics and business skills required for successful entrepreneurship. The book was published under the EDCEL project of the Institute, the PACSB and SERDEF.

The other book launched was the *Potentially Viable Small Enterprises*

which catalogues small business projects — identified according to resource endowments and market potentials — which may profitably be set up in each of the country's provinces. This was seen as the Institute's contribution to small enterprise promotion in the rural areas.

Other materials published during the year were: *Mirrors* (annual report) 1986; *Cornicle* (ISSI house organ); *Glazes and Decorations*, a guide for ceramic practitioners; and briefers on ISSI researchers which were disseminated to members of the new Philippine Congress as well as other government and private organizations.

Most Institute publications were sold at nominal rates to walk-in clients, through training programs and, more aggressively, through booths set up at book fairs, industry conventions and other industry gatherings. During the year, the Institute sold a total of P109,015 worth of publications.

Technical inquiry services continued to reach out to small entrepreneurs needing solutions to technical, marketing and other problems. A total of 120 inquiries were answered, mostly by mail. Inquiries come not only locally but also from abroad. The most frequent subject of inquiry were: appropriate technology, banana processing, earthworm raising and fish processing.

As in previous years, the Institute's Resource Materials and Documentation Center served both internal and external users — this year totaling 1,990. New acquisitions in its collection

are 1441 books, monographs and periodicals. A bimonthly *Annotated List of RMD New Acquisitions* was distributed to the staff and other organizations linked with the Institute in informa-

tion-sharing arrangements. Likewise, an *Annotated Bibliography of ISSI Researches* was prepared as an input to the bibliography project of the UP Management Education Council.





EXTERNAL LINKAGES

External linkages are forged with a view to promoting collaborative undertakings; fostering sharing of information, staff and other resources; sourcing of funds for priority projects; and cultivating markets for the Institute's various programs. Thus, the Institute has, through the years, developed a network of local, foreign and international organizations with which it links in many of its projects and activities.

The strongest ties were maintained with the Small Enterprises Research and Development Foundation (SERDEF), a private foundation of prominent members of the business, government and education sectors which the Institute has been affiliated with since 1976.

From among the government sector, the ISSI actively worked in 1987 with the Department of Trade and Industry, Department of Foreign

Affairs, Department of Local Governments, National Economic and Development Authority, Department of Science and Technology, National Manpower and Youth Council, Industrial Guarantee and Loan Fund and the Department of Agriculture. Among non-government organizations, the most prominent linkages are with the Philippine Association of Colleges and Schools of Business, the Philippine Chamber of Commerce and Industry (of which the Institute Director was co-chairman of the Committee for Cottage, Small and Medium Enterprises); the Financial Executives (FINEX) Foundation; the Philippine Council of Management (in which the Associate Director was a board member); the Personnel Management Association of the Philippines (PMAP); and the Girl Scouts of the Philippines (which gave a plaque of recognition to

the Institute for assisting in the evaluation of its Scouts Entrepreneurial Endeavours for Development or SEED project and a special individual award to EDCEL Project Manager Paz H. Diaz for conceptualizing the infrastructure of the project). The families of Don Vicente Madrigal and Jose Sanvictores, both pioneer entrepreneurs of the country, are also among the Institute's strong supporters.

Among international organizations, the chief partners of the Institute remained to be Technonet Asia, the Institute of Developing Economies (IDE) of Japan, the Institute of Southeast Asian Studies (ISEAS) of Singapore, the United States Agency for International Development (USAID), the International Labour Organization and the Foundation for Asian Management Development (FAMD) of Japan.



By year end, the United Nations Development Programme (UNDP) and the United Nations Industrial Development Organization (UNIDO) came forward as collaborators in a major project expected to run for the next 2-1/2 years. Other foreign and international linkages are with the Asia Pacific Center for Technology Transfer (APCTT) of Bangalore, India, Friedrich Ebert Stiftung Philippine Office and the Food and Agriculture Organization (FAO).

Needless to say, the

government of the Netherlands, which was responsible for the foundation and nurturing of the Institute during its fledgling years, continued to provide support to various international training programs. Likewise, the Australian government, through its embassy in Manila, came in as source of fund for the Project Hanapuhay and CREED programs' extension and credit component. Another emerging alliance is with the Konrad Adenauer Foundation.



The development of its staff is always a priority concern of the Institute. This is premised on the philosophy that the quality of its service can only be good as the quality of the staff performing the service. Moreover, as the Institute made a bid in 1987 to begin to offer formal degree programs in entrepreneurship and entrepreneurship development, staff development became a more urgent concern. It was realized that the Institute had to upgrade the academic credentials of its staff to develop from within an adequate faculty.

It is in this context that the Institute set up an Educational Support Program to encourage staff to undertake or pursue formal graduate degree programs. In 1987, three staffmembers availed themselves of study privileges under this scheme. More staff, however, are taking graduate studies on their own.

opportunities to finish undergraduate studies and vocational and technical training including computer training.

At the same time, the Institute continued to send staff to special training programs locally and abroad. (See Table 6).

In order to promote staff development as well as to strengthen institutional linkages, several of the staff attended conferences/workshops or undertook special assignments abroad (see Table 7).

HUMAN RESOURCE DEVELOPMENT
To promote staff development, staff charts out his own career development plan. The Institute's human resource development office prioritizes these plans and supports them accordingly. Where a commonality of staff development needs is identified, in-house programs are provided whenever possible.

Among administrative staff, a similar development plan was made available. During the year, several administrative staff were provided op-



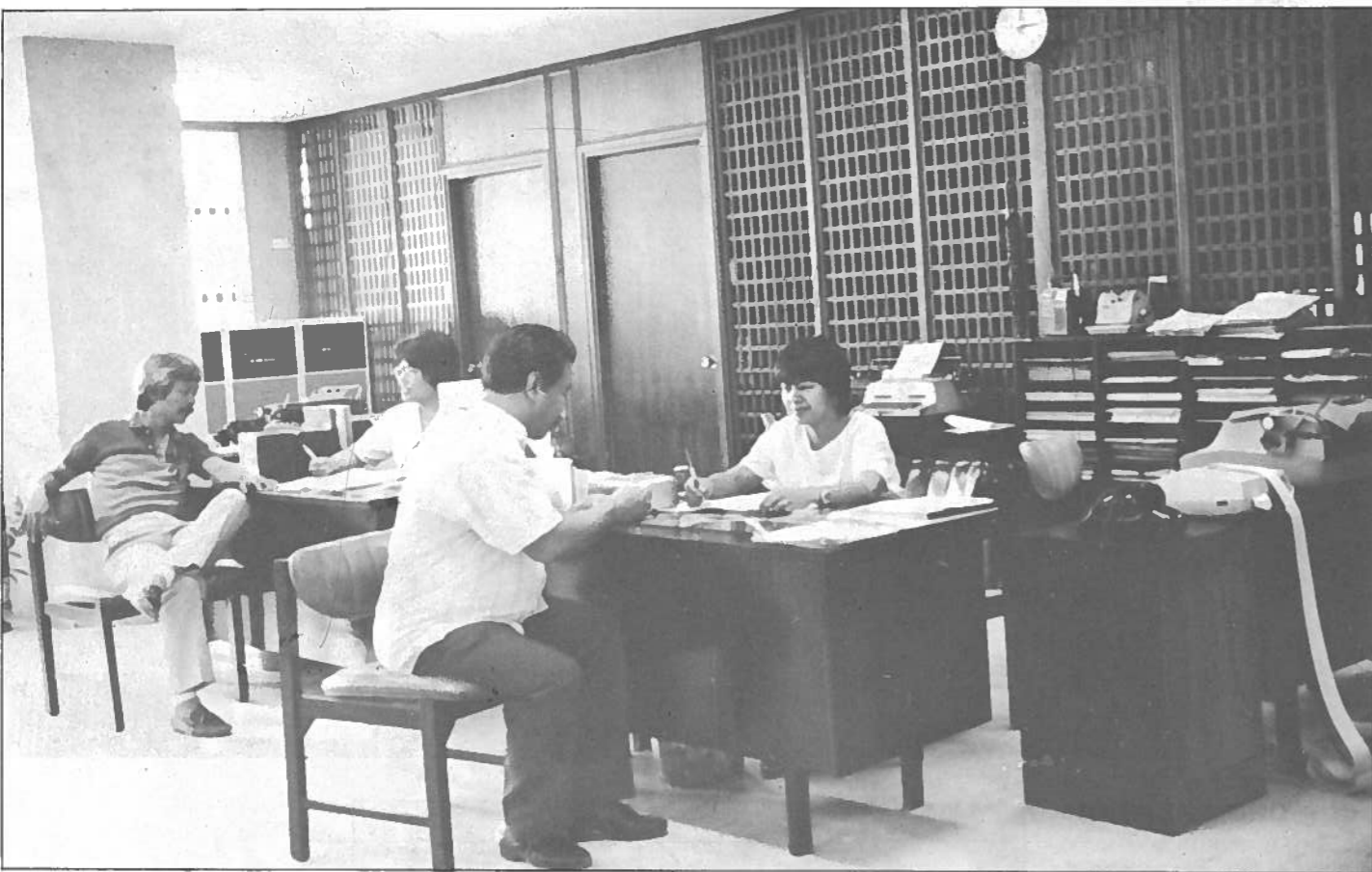
ORGANIZATION

The Institute in 1987 was manned by a regular staff complement of 12 technical, 25 academic and 32 administrative staff for a total of 69. On the other hand, there were 10 staff employed by SERDEF on a contractual basis, most of whom are detailed to the Institute.

The same "culture" of job expansion begun in the past three years was sustained. Job expansion was also an imperative of a leaner organization on the one hand and the rising demands on the Institute's capabilities, on the other hand. The management style encouraged discipline, productivity and professionalism in the organization.



Overall efficiency was upgraded with the improvement of facilities, such as the provision of two new classrooms on the ground floor and the installation of a power generator. Also accomplished during the year was the construction of a spacious car park and the landscaping of the Institute grounds.



FINANCE

The financial picture of the Institute may be seen from the figure at right.

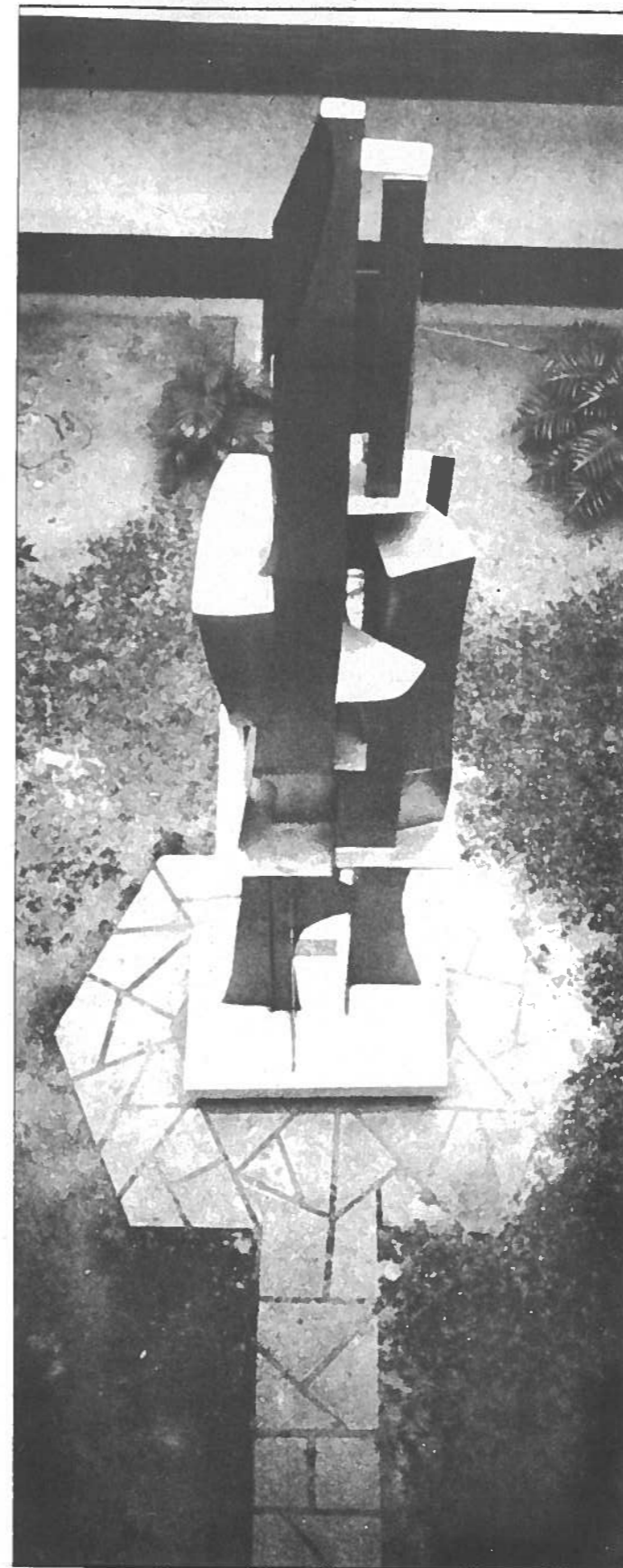
More than in previous years, the Institute tapped external sources of funds to supplement allocations received from the National Budget. In addition to traditional donors, new ones came in, expanding considerably the Institute's market and financial base. Support from local government departments likewise expanded, notably from the Department of Trade and Industry.

The Institute-affiliated foundation, the SERDEF, is credited for much of

the external financial support the Institute has enjoyed for the past many years. This has enabled the Institute to implement priority projects which otherwise it could not afford to undertake.

At the same time, the Institute built up an endowment fund from project savings in previous years which was placed in trust with the UP Foundation for the setting up of Staff Development, Publications, Research and Building Maintenance Funds as well as a professorial chair in entrepreneurship.

	Allotment	Expenditures	Balance
I. Personnel Services	P3,699,700	P2,763,230	P936,470
II. Maintenance & Other Operating Expenses	150,000	150,000	
	P3,849,700	P2,913,230	P936,470



1988: A FORWARD LOOK

Much as 1987 has been an unprecedentedly busy and challenging year for the Institute, the next year promises to be more exciting and stimulating and to exact more from the staff's capabilities and resources. Indeed, 1987 ended with the entry of new and bigger projects that promise to overshadow previous records of achievement.

A major project expected to demand much in terms of staff commitment is a UNIDO-UNDP supported multi-agency project called "Development of Entrepreneurs for Cottage, Small and Medium-Scale Industries" started in late 1987. The development objective of the project is to promote employment through the establishment of cottage, small and medium-scale labor-intensive enterprises in rural and urban areas. The Institute will work with various national institutions and private voluntary organizations in designing and implementing pilot entrepreneurship development programs which shall be replicated in various areas of the country. The pro-

ject will give special attention to entrepreneurship development among women in rural areas and out-of-school youth.

Another priority goal is the pursuit of the initiatives started in 1987 to transform the Institute into a degree-granting unit of the University. In 1987, the Institute expects to make headway towards this goal.

Extension activities under the Micro-Enterprise Development Project and the Economic Productivity Program are expected to accelerate in 1988 as more beneficiaries avail of financing and more potentially viable projects identified.

Training shall continually explore new and bigger markets and offer innovative programs.

As the nation surges toward greater economic growth in 1988 and beyond, the Institute looks forward to contributing more dynamically and innovatively to small business creation and the improvement of existing small enterprises.

This is the mission of the Institute.

Table 1
ENTREPRENEURSHIP AND MANAGEMENT DEVELOPMENT PROGRAMS
1987

PROGRAMS	SCHEDULES	CLIENT	NO. OF PARTICIPANTS	
			LOCAL	FOREIGN
1. Materials Management and Inventory Control Course for Mr. Mussa	November 10, 1986- January 16, 1987	ILO/SERDEF	0	1
2. Project Hanapuhay I - Entrepreneurial Motivation Training - Business Planning - Trainor's Training	January 6-10 January 12-Feb. 7 June 1-3	AIIESEC/SERDEF AIIESEC AIIESEC	26 12	0
3. EDCEL Training of Trainers in Manila	January 19-21	SERDEF/PACSB	25	0
4. EDCEL Training of Trainers in Negros Occidental	January 22-25	AIIESEC/SERDEF/PACSB	33	0
5. EDCEL Case Writing Workshop in Iloilo	January 29-31	SERDEF/PACSB	21	0
6. 1st Project Evaluation Appraisal and Monitoring Course (PREAM)	February 5 - April 1	ADB/KRISHI BANK/ SERDEF	0	5
7. Regional Seminar Series (RSS) Baguio on Food Processing	February 11	SERDEF	25	0
8. Bankers' Training Course for GTZ Nepal	February 25-March 27	GTZ Nepal/SERDEF	0	17
9. Supervisory Effectiveness Program for N. de la Merced Sons Co., Inc.	February 25-March 15	N. dela Merced & Sons/ SERDEF	20	0
10. 1st Asia-Pacific Symposium on Small Enterprise & Entrepreneurship Development	February 25-28	Technonet Asia	102	36
11. IAIC Module I: Pneumatics Electro-Pneumatics Control Course	March 2-20	SERDEF	12	0
12. 2nd DVM Appreciation Course on Entrepreneurship	March 20-22	Madrigal-Vasquez Family	12	0
13. Regional Seminar Series (RSS) on How To Export	March 29	DTI/SERDEF	20	0
14. Small Industry Development Course for Indonesians	April 2-14	Mandala Dev. Corp./SERDEF	0	7
15. EDP for NMYC Trainers & Staff	April 2-May 2	NMYC/SERDEF	27	0
16. Entrepreneurship Development Workshop-Seminar (EDWS) Module 1: Personal Entrepreneurial Competency Devt.	April 3-5	SERDEF	8	0
17. EDWS Module 2: Business Planning	April 6-14	SERDEF	11	0
18. EDWS Module 3: Project Monitoring Supervision & Control	April 20-24	SERDEF	24	0

19. 2nd PREAM	April 20-June 20	ADB/KRISHI BANK/SERDEF	0	8
20. EDWS Module 4: Trainers Training	April 27-May 8	SERDEF	8	0
21. Capiz Rural Enterprise and Entrepreneurship Development (CREED) Program - Young Entrepreneurs Workshop - Livelihood Development Program for Rural Women	May 1- April 30 August 10- September 5 August 17- September 13	Capiz Dev. Found./SERDEF	25 31	0 0
22. 31st Manager's Course	April 28-July 31	SERDEF	28	0
23. RSS Zamboanga on Taxation	April 28	SERDEF	44	0
24. Curriculum Development Course for Vocational Trainers on Entrepreneurship Development	May 7-July 3	Asian Exponent/ SERDEF	0	1
25. Entrepreneurial Career Development Program	May 15-June 20	SERDEF	10	0
26. Productivity Through Effective Supervision	May 19-June 3	SERDEF	15	0
27. INDEXTRAC for Bangladesh	June 1-July 17	ILO Bangkok/SERDEF	0	5
28. Project Evaluation and Supervision Course	June 1-June 9	Plastic Group of Cos./ Depth of Trade & Industry	115	0
29. Small Business Consultancy Course (SBCC) for DTI Batch No. 1	July 15-Sept. 18	DTI	27	0
30. Project Hanapuhay II 33.1 EDP for Batch No. 1 33.2 EDP for Batch No. 2	November 9-14 December 14-19	SERDEF	20 22	0 0
31. IAIC Module 3	June 22-July 10	SERDEF	42	0
32. Project Study Preparation Course	July 8-September 4	SERDEF	5	1
33. Marketing Plan Preparation Course	July 10-August 15	SERDEF	10	0
34. 17th Management Consultancy Course	July 14-December 17	Netherlands Gov't	1	7
35. RSS Butuan on Agribusiness RSS Pagadian on Agribusiness RSS Pampanga on Agribusiness	July 17 July 21 July 22	SERDEF SERDEF SERDEF	23 52 25	0 0 0
36. Project Evaluation Course for Bangladeshis	July 20-August 4	ILO Bangkok/ SERDEF	0	5
37. 3rd DVM-ACE	July 31-August 1	Madrigal-Vasquez Family	33	0
38. Technical Report Writing Workshop	August 10-September 1	Livestock Dev. Council/ SERDEF	25	0
39. 32nd Managers Course	August 3-November 13	SERDEF	18	0
40. IAIC Module I	August 17-September 4	SERDEF	30	0
41. INDEXTRAC for B. Aluko	Aug. 31-October 23	Technonet/UNIDO/ SERDEF	0	1
42. Rural Marketing Seminar	September 1-October 20	USAID	0	3

43. 9th Trainers' Course on Entrepreneurship Dev't.	September 4- November 26	Netherlands Gov't	3	9
44. Gaming Simulation for Educators and Trainers (GAMSET)	September 9-17	SERDEF	15	0
45. SBCC Batch No. 2	September 15 November 22	Dept. of Trade & Industry/SERDEF	27	0
46. Comprehensive Course on Instrumentation and Process Control	September 26 October 31	SERDEF	58	0
47. SBCC Batch No. 3	September 29 December 1	Dept. of Trade & Industry/SERDEF	27	0
48. IAIC: Module 2	October 5-23	SERDEF	27	0
49. SBCC Batch No. 4	October 13 December 15	Dept. of Trade & Industry	27	0
50. Small Industry Consultancy Course	October 19 November 27	UNIDO-Ministry of Foreign Affairs	8	13
51. RSS Cotabato	October 3	SERDEF	73	0
52. Seminar on Industrial Relations Management	November 24-27	UPISSI Alumni Assn. Pampanga Chapter/ SERDEF	48	0
53. IAIC Module 3	November 23 December 11	SERDEF	34	0
54. RSS Puerto Princesa	November 28	SERDEF	19	0
55. RSS Tacloban City	December 3	SERDEF	23	0
56. Municipal Enterprise Management	November 24- December 5	Dept. of Local Govts.	41	0
57. EDCEL Entrepreneurship & Business Faculty Dev. Seminar, Baguio City	October 22-24	PACSB/SERDEF	36	0
58. Conference on Coco-Based Agribusiness Opportunities	November 26	SEED, INC/Friedrich Ebert Stiftung/SERDEF	108	0
59. EDCEL Training of Trainers, Tacloban	November 27-30	PACSB/SERDEF	25	0
60. EDCEL Advance Training of Trainers, Iloilo	December 14-15	PACSB/SERDEF	22	0
		GRAND TOTAL	1616	119

Fig. 1
ENTREPRENEURSHIP AND MANAGEMENT DEVELOPMENT PROGRAMS
PARTICIPANTS' PROFILE
By Regions

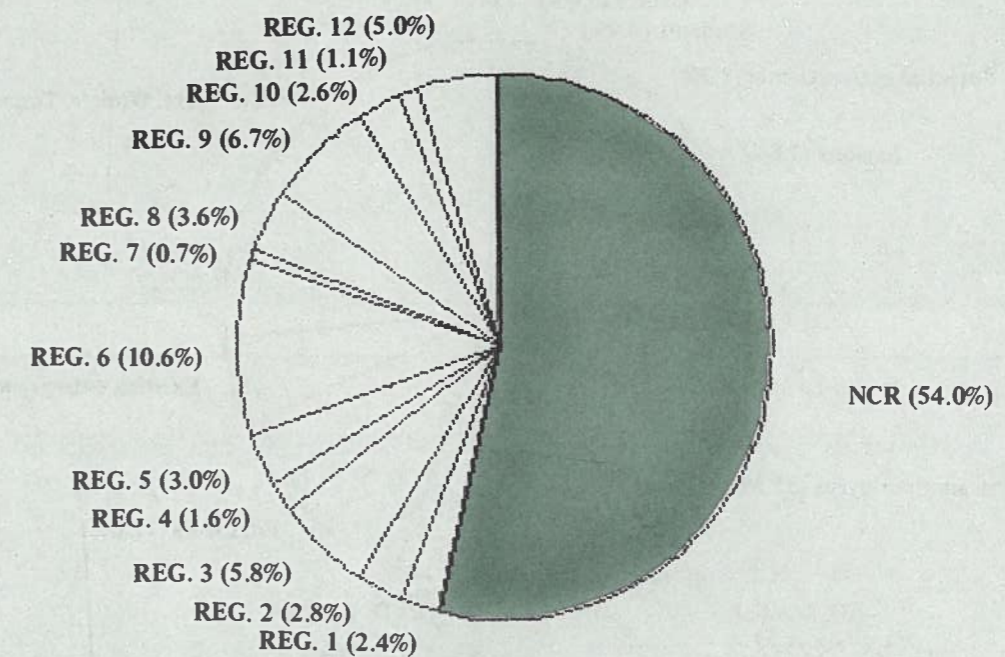


Fig. 2
 ENTREPRENEURSHIP AND MANAGEMENT DEVELOPMENT PROGRAMS
 PARTICIPANTS' PROFILE
 By Occupation

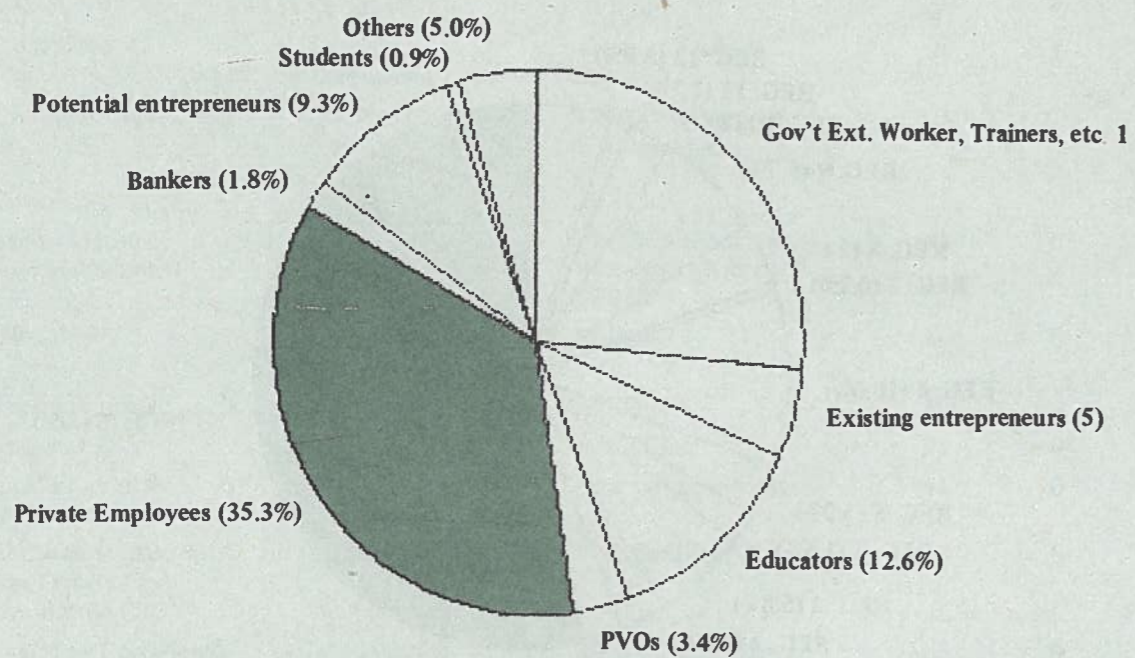


Fig. 3
 ENTREPRENEURSHIP AND MANAGEMENT DEVELOPMENT PROGRAMS
 PARTICIPANTS' PROFILE
 By Nationality

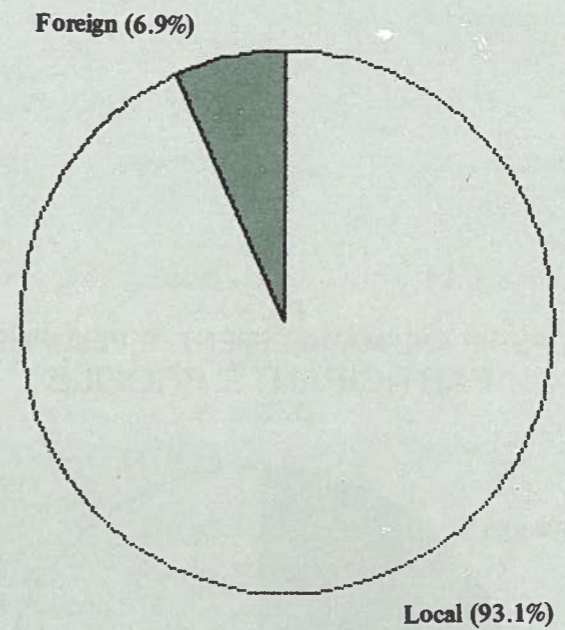


Fig. 4
 ENTREPRENEURSHIP AND MANAGEMENT DEVELOPMENT PROGRAMS
 PARTICIPANTS' PROFILE
 By Country

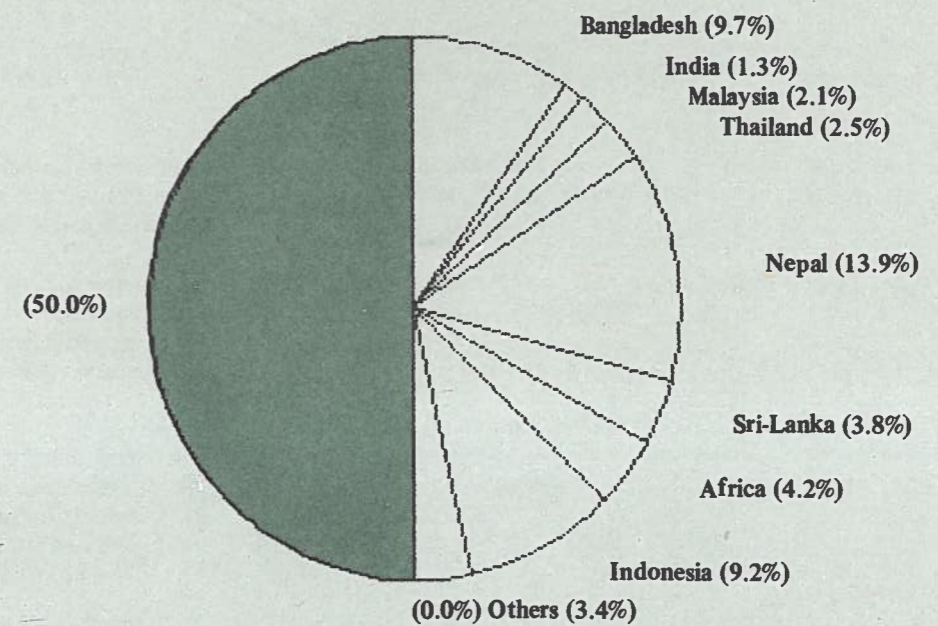


Fig. 5
**ENTREPRENEURSHIP AND MANAGEMENT DEVELOPMENT PROGRAMS
 PARTICIPANTS' PROFILE**
 By Sex

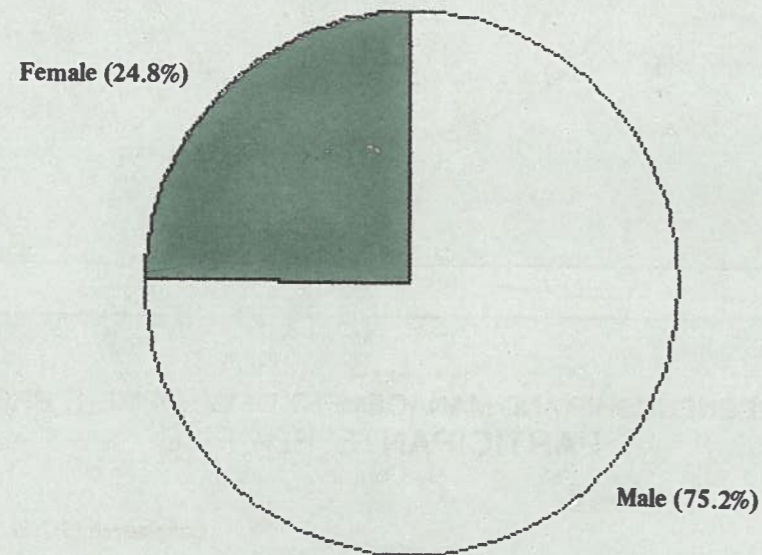


Table 2
RESEARCH/CASE STUDIES COMPLETED IN 1987
(EDCEL PROJECT)

Title/Topic	Writer	School	Sponsor
1. "The Practicum Program for Business Students of the College of Business Administration of Enverga University: An Evaluation"	Pablito Budoy	Manuel S. Enverga University Foundation	FAMD
2. "Soft-Cheese Making in Cavite"	Revelino Garcia	San Sebastian College Recoletos, Cavite City	FAMD
3. "Homecraft Industries Inc." Three Cases in: general management and organization; production management; and financial management	Arlene E. Liberal	UP ISSI	SERDEF
4. "Good Food Corner," A Case on Organization, Management and Finance	Paz H. Diaz	UP ISSI	SERDEF
5. "Rural Enterprise Development in Palawan," A case in Rural Manpower and Strategies for Rural Enterprise Development	Arturo O. Mangabat	UP ISSI	SERDEF

Table 3
RESEARCH STUDIES COMPLETED
1987

Project Title	Sponsor	Inclusive Date
1. "The Role of Technology Transfer in the Electrical in the Philippines"	Institute of Developing Economies in Japan (IDE)/SERDEF	June 1986 February 1987
2. "ASEAN Small and Medium Business Improvement Problems of Production Management"	Institute of Southeast Asian Studies (ISEAS)/SERDEF	September 1986 March 1987
3. A Study on the Growth of Small-Scale Forest-Based Processing Enterprises in Four Developing Countries in the ASEAN region	Food and Agricultural Organization (FAO)/SERDEF	April 1987
4. "A Survey of Small-Scale Operation in the Rural Areas of the Philippines and their Potential for Non-Farm Employment"	National Economic and Development Authority (NEDA)/SERDEF	November 1986 March 1988
5. GSP SEED Program Evaluation	Girl Scouts of the Philippines (GSP)	September 1986 June 1988

Table 4
LIST OF BORROWERS AS OF DECEMBER 31, 1987
MICRO ENTERPRISE DEVELOPMENT PROJECT (MEDP)

Name	Project	Amount	PVO
1. Daniel Almera	Poultry	P 10,289.00	Laguna Red Cross
2. Evelyn Bernardino	Poultry	36,154.00	- do -
3. Sikap Pasamba	Cucumber production	30,299.00	Rotary Club Foundation of Morong
4. Noemi Lorenzo	Orchid growing	22,600.00	- do -
5. Roselene San Juan	Orchid growing	22,600.00	- do -
6. Jose Sevilla, Jr.	Cucumber production	35,963.00	- do -
7. Mercedes Espiritu	Orchid growing	22,600.00	- do -
8. Thelma Panganiban	Orchid growing	22,600.00	- do -
9. Pablo Balunsat	Integrated poultry and piggery	33,800.00	Angeles University Foundation
10. Romeo Tolentino	Duck raising	20,000.00	- do -
TOTAL		P256,905.00	

Table 5
TRAINING PROGRAMS
MEDP

Title	Date	PVO	No. of Participants
1. Appreciation Course for Entrepreneurs-Business Plan Preparation (ACE-BP)	January 19-27	Laguna Red Cross (LRC)	12
ACE-BP	February 10-20	Rotary Club Found. of Morong, Rizal (RCF)	25
2. Project Monitoring, Evaluation and Control	June 19	Marikudo Agro. Forestry, Solidarity Found., Inc. (SFI) and RCF	4
3. ACE-BP	July 21-27	Angeles University Found. Inst. for Small Business and Cooperatives (AUF-ISBC)	20
4. Soap-Making Seminar*	June 27-29	Samahang Kapatiran (SIKAP)	4
5. Soap-Making Seminar*	September 25-27	LRC	3
6. ACE-BP	October 15-20	Lingap Pangkabataan, Inc. (LPI)	15
7. ACE-BP	November 5-12	LPI	20
8. ACE-BP	October 27-29	SFI	5

*In cooperation with the Dept. of Science and Technology.

Table 6
STAFF DEVELOPMENT PROGRAMS
1987

Loida J. Nario	Training Course in Measures for Smaller Industry Development, Osaka, Japan, January 8-March 31
Loida J. Nario Jaime S. Guanzon Crispina B. Almonte Celia R. Pascual Myrna V. Magbitang Theodosia T. Vinuya Corazon A. Cabungcal	Fourth Convention on Statistics, Philippines Statistical Association Inc. and NEDA, June 15-16
Gil Dennis Raposa	Workshop on Neuro-Linguistic Programming I & II, Ateneo de Manila Central Guidance Bureau, June 16-17 and June 29-30
Corazon A. Cabungcal	S3 Approach to Managerial Effectiveness, Phil. Council of Management, June 19-20
	Forum on the Omnibus Investment Code of 1987, Century Park-Sheraton, August 7
Arlene E. Liberal	Workshop on the Development of Micro Enterprises, Phil. Business for Social Progress, September 21-25
	National Convention, Phil. Society for Training and Development, September 17-18
Lolita F.B. Belandres	Course on Evaluation of Long-Term Projects, September 21 - October 2
Corazon A. Cabungcal	Computer Application in Social Research, Development Academy of the Phils., September 21-25
Sonia Tiong-Aquino	Philippine Management Congress, Philippine Council of Management, November 19-20
Ofelia C. Bravo	Conference on Coco-Based Agribusiness Opportunities in Small-Scale Industries, UP ISSI and Small Economic Enterprises Development, Inc., November 26
Myrna V. Magbitang	Open Forum on the VAT System, Philippine Chamber of Commerce and Industry, December 15

**Table 7
INTERNATIONAL MEETINGS/CONSULTANCIES/
SPECIAL ASSIGNMENTS
1987**

Melito S. Salazar, Jr. Corazon Cabungcal	Workshop on the Joint Research Project on the Role of Technology Transfer in the Local Content Program of the Phils., Tokyo, Japan, March 9-16 (presented Phil. paper)
Melito S. Salazar, Jr. Antonio A. Bravo	Workshop on ASEAN Small and Medium Business Improvement: Production Management; and Symposium on ASEAN Small and Medium Business Improvement, Bangkok, Thailand, April 12-15 (Presented Phil. study)
Myrna R. Co	Technonet Asia, Singapore, April 22 – May 2 (Assisted in the finalization/editing of ASPAC SEED report of proceedings)
Melito S. Salazar, Jr.	Executive Committee Meeting, Technonet Asia, Singapore, July 21-26 Ad Hoc Working Group Meeting on Small and Medium Business Improvement, Economic and Social Commission for Asia and the Pacific and ISEAS, Singapore, September 3-4 University of the Philippines delegation to the Peoples Republic of China. October 20 – November 4
Zeneida O. Ticsay	1987 Workshop on Technology Transfer among Developing Countries and Study Visit on Information Systems, Seoul, Korea, October 30 – November 13
Paz H. Diaz	Approtech Asia VI Council Meeting on Income-Generating Strategies for Asia NGOs, Bangkok, Thailand, November 18-20 (Served as facilitator and rapporteur)

**LIST OF STAFF
1987**

TECHNICAL STAFF

1. ACAIN, Virgilio H.
2. ALMONTE, Crispina B.
3. AQUINO, Sonia Tiong
4. BELANDRES, Lolita F. B.
5. BRAVO, Ofelia C.
6. CABUNGCAL, Corazon A.
7. CAPATI, Alberto P.
8. DIAZ, Paz H.
9. ITAO, Arnulfo F.
10. LIBERAL, Arlene E.
11. MACASPAC, Zeneida S.
12. TICSAY, Zeneida O.

ACADEMIC STAFF

1. ABAINZA, Victor C.
2. BALDORIA, Brenda R.
3. BRAVO, Antonio A.
4. BUNGAY, Janet L.
5. CANLAS, Lerma L.
6. CO, Myrna R.
7. CRISPINO, Aquiles C.
8. CUBILLAS, Leoncio T., Jr.
9. EMBISAN, Nelia A.
10. ESGUERRA, Mercedes A.
11. ESTEBAN, Clarita O.
12. GUANZON, Jaime S., Jr.
13. GULA, Alfredo P.
14. LOZANO, Leonardo C. P.
15. MAGBITANG, Myrna V.
16. MANGABAT, Arturo O.
17. MILLA, Angelita C.

18. MORALES, Cecilia T.
19. NARIO, Loida J.
20. ORDILLAS, Adele J.
21. PASCUAL, Celia T.
22. RAPOSA, Gil Dennis A.
23. RAYMUNDO, Angelita S.
24. DE VEGA, Alexander G.
25. VINUYA, Theodosia T.

ADMINISTRATIVE STAFF

1. ALEGRO, Demetria M.
2. ALMOSARA, Romeo E.
3. ANASTACIO, Romeo C.
4. ANGELES, Romeo F.
5. ANTONIO, Estelita M.
6. BRILLANTES, William
7. CANLAS, Bernabe S., Jr.
8. CANTIMBUHAN, Romulo M.
9. CARIÑO, Ambrosio M.
10. CARIÑO, Herminigildo F.
11. CINCO, Virginia A.
12. CIPRIANO, Epifania O.
13. CLERIGO, Blesilda A.
14. CRUZ, Adelaida B.
15. CRUZ, Manuel E.
16. DE LA TORRE, Leonisa G.
17. INGRESO, Edgardo F.
18. JAVATE, Adriano E.
19. LABRADOR, Milagros A.
20. LERIO, Rodolfo L.
21. MAGSALAY, Esther N.
22. MARCIANO, Emerlita O.
23. MARTIRES, Gil P.
24. MATEO, Eufrocina L.
25. PAYAWAL, Roberto T.
26. PEREZ, Lourdes P.
27. RANADA, Benilda M.
28. RECINTO, Primo M.
29. RIVERA, Victor L.
30. ROJO, Samuel G.
31. SIOCHI, Anita P.
32. SANTOS, Teresita V.

CONTRACTUAL (SERDEF-supported)

1. BUNDALIAN, Florentino
2. DAKANAY, Redentor
3. ELIZAN, Elizabeth
4. GADINGAN, Catalina
5. ITAO, Gamaliel
6. JAVATE, Loida
7. PARADERO, Pepito
8. RECIO, Gloria
9. SOLARTE, Luisa
10. TEODORO, Salvador



INSTITUTE FOR SMALL SCALE INDUSTRIES
UNIVERSITY OF THE PHILIPPINES
DILIMAN, QUEZON CITY

Prepared by the Industrial Information Department

ANTHROPOMETRIC DATA OF INDONESIAN WITH VARIOUS OCCUPATIONS

A. Manuaba, D.P. Sutjana, N. Adiputra

Department of physiology, School of Medicine,
University of Udayana, Denpasar, Bali, Indonesia

Introduction

In carrying out development, Indonesia still has to import science and technology, which are not seldom, beside advantages gained until recently, creates various impacts or disadvantages in form of occupational diseases, accidents, ineffective and inefficient work processes which course to unproductive work and additional costs. Efforts in minimizing or omitting these negative impacts have been carried out through transfer and choice of appropriate technology, which covers six basic aspects or criteria, namely economic, technic, health / ergonomics, socio-cultural, environmental and energetic preservation and conservation. These aspects or criteria must be viewed and applied holistically and wisely with aim to minimize or to omit negative impacts. But in practice, such an approach is unreachable due to various reasons, among others due to lack of knowledge and technical know-how, lack of anthropometric data of the consumers, lack of coordination between related institutions and lack of umbrella legislation and regulation to be pursued. Facing all those obstacles and constraints, efforts had already being done to fill in the lackings, among others of having Indonesian anthropometric data. This study is one of those efforts, particularly in regard to the anthropometric data of drivers, passengers, industrial workers, government officials and farmers.

Method.

By using anthropometer Super anthropometric measurements were conducted in nine cities namely Meda, Padang, Palembang, Bandung, Semarang, Yogyakarta, Surabaya, Ujung Pandang and Denpasar. As samples were drivers of buses and trucks (all male), female and male passengers, government officials, industrial workers, and farmers. Items being measured were selected based on practical purposes.

Result and discussion.

Result are shown in table 1 and 2, which are grouped due to similar character. In fact, not all data were presented due to space limitation. And there is no significant differences exist between those various occupations. But anyhow, these data can be used in designing agricultural and industrial machines and equipments, office meubels and motor cars. By so doing, it is hoped that more "fit" man-task system in conducting development will be more possible to be attained, which course to better working conditions and environments.

Table 1 ; ANTHROPOMETRIC DATA OF INDONESIAN WITH VARIOUS OCCUPATION

MEASUREMENT	D R I V E R		P A S S E N G E R		G O V . O F F I C I A L	
	TRUCK	BUS	MALE	FEMALE	MALE	FEMALE
Number	460	491	459	448	450	400
Age((eyer)	31.92 ± 8.65	32.43 ± 7.94	25.08 ± 6.22	24.98 ± 8.78	30.66 ± 7.30	28.77 ± 7.39
Body weight(kg)	58.36 ± 9.49	55.92 ± 10.05	54.35 ± 6.68	47.10 ± 6.84	56.10 ± 8.09	47.57 ± 7.15
Stature (cm)	162.51 ± 5.59	161.86 ± 6.18	162.86 ± 6.43	152.31 ± 6.16	161.84 ± 6.24	152.31 ± 11.10
Shoulder breadth	48.34 ± 5.72	40.65 ± 4.75	40.36 ± 3.32	36.11 ± 6.38	40.27 ± 3.26	36.65 ± 2.51
Forward grip reach	70.31 ± 5.27	70.61 ± 5.84	69.26 ± 3.54	66.38 ± 4.61	70.61 ± 4.99	65.93 ± 5.67
Side arm reach	54.35 ± 4.73	54.29 ± 4.53	53.51 ± 4.08	53.51 ± 3.79	55.86 ± 7.33	52.27 ± 6.60
Sitting height	84.43 ± 3.89	90.12 ± 13.99	83.43 ± 6.88	78.71 ± 4.61	83.86 ± 4.84	79.10 ± 3.71
Eye level	73.35 ± 3.89	74.10 ± 5.03	74.35 ± 3.5	67.78 ± 4.60	73.57 ± 4.19	68.54 ± 3.49
Elbow rest ht	23.09 ± 3.41	22.74 ± 3.10	22.30 ± 2.72	21.56 ± 2.97	23.18 ± 3.35	21.88 ± 3.09
Vertical reach sitting	116.90 ± 5.29	115.75 ± 7.08	116.61 ± 5.98	108.87 ± 5.73	116.02 ± 5.78	107.04 ± 9.49
Hip breadth	31.64 ± 3.46	32.42 ± 13.02	31.38 ± 3.18	30.72 ± 3.81	32.23 ± 2.83	30.17 ± 4.49
Knee height	51.16 ± 4.07	50.44 ± 3.15	50.16 ± 3.66	47.40 ± 3.15	50.37 ± 3.04	47.74 ± 2.93
Popliteal height	42.23 ± 2.99	41.32 ± 2.84	41.60 ± 2.55	39.22 ± 2.72	41.48 ± 2.48	38.99 ± 2.86
Buttock poplit. length.	44.88 ± 3.45	43.82 ± 4.02	44.78 ± 3.35	43.31 ± 3.48	44.67 ± 3.54	43.89 ± 3.60
Buttock knee length.	54.36 ± 3.51	53.90 ± 3.72	54.92 ± 4.05	51.50 ± 3.73	54.20 ± 3.91	52.51 ± 3.51
Buttock finger length.	81.73 ± 10.78	86.99 ± 8.12	80.55 ± 4.35	82.72 ± 4.64	85.37 ± 11.01	81.85 ± 7.86
Buttock leg length.	95.62 ± 6.64	99.52 ± 8.52	94.14 ± 7.87	89.46 ± 7.47	95.46 ± 6.43	90.41 ± 7.81

Author's abstract in duplicated to Conference Secretariat, Department of Physiology, Faculty of Medicine, University of Udayana, Jalan P.B. Sudirman Denpasar - Bali, Indonesia.
 SENDLINE OF FULL PAPER, JUNE 1, 1988

SOUTH EAST ASIAN ERGONOMICS SOCIETY
 SECOND CONFERENCE, DENPASAR - BALI
 INDONESIA, 27 - 29 JULY 1988

Table 2 : ANTHROPOMETRIC DATA OF INDONESIAN WITH VARIOUS OCCUPATION

MEASUREMENT	INDUSTRIAL WORKER		FARMER	
	MALE	FEMALE	MALE	FEMALE
Number	419	420	417	450
Age (year)	29.02 ± 7.65	26.07 ± 8.37	33.37 ± 10.39	29.53 ± 9.57
Body weight(kg)	53.69 ± 7.45	46.42 ± 6.00	50.82 ± 6.72	45.96 ± 6.08
Stature (cm)	160.97 ± 7.95	151.07 ± 5.38	160.39 ± 6.02	149.62 ± 5.56
Eye level Std	150.14 ± 6.35	139.33 ± 5.43	148.93 ± 6.14	138.05 ± 5.55
Shoulder height	134.46 ± 6.36	126.55 ± 6.27	133.54 ± 5.96	124.72 ± 5.34
Elbow height	99.07 ± 4.98	92.96 ± 4.67	98.77 ± 5.22	91.46 ± 5.16
Grip height	69.75 ± 4.64	65.44 ± 3.72	69.21 ± 4.42	64.74 ± 4.53
Vertical reach height	193.18 ± 8.39	180.28 ± 7.95	191.14 ± 8.45	177.33 ± 5.23
Forward grip reach	68.81 ± 4.78	65.03 ± 5.01	71.39 ± 9.32	63.41 ± 5.23
Side arm reach	53.65 ± 4.17	51.26 ± 4.57	54.49 ± 5.27	49.29 ± 4.36
Sitting height	82.61 ± 4.75	77.63 ± 3.95	81.81 ± 4.84	77.16 ± 3.66
Eye level st.	71.92 ± 4.30	65.85 ± 3.98	70.62 ± 4.69	66.34 ± 3.91
Elbow rest height	22.22 ± 3.26	20.79 ± 2.80	21.15 ± 3.70	21.06 ± 3.61
Hip breadth	31.36 ± 2.81	30.16 ± 4.14	30.56 ± 2.97	30.23 ± 3.27
Knee height	50.17 ± 3.25	47.03 ± 2.83	49.80 ± 3.42	46.22 ± 3.57
Popliteal height	41.35 ± 3.15	38.81 ± 2.92	41.26 ± 2.95	38.67 ± 2.61

Armed abstract in duplicated to Conference Secretariat, Department of Physiology, Faculty of Medicine,
 University of Udayana, Jalan P.B. Sudirman Denpasar - Bali, Indonesia.
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User-focused Method of Education and Training for Ergonomics in Developing Countries

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(May, 1988)

Abstract

Relevant education and training is one of the key factors that determines the success of the technology transfer. In corporation of human factors into the technology and consideration of the user characteristics in a given environment is a key element for optimum operation. Because of unawareness regarding the importance of ergonomics in the transfer of technology both among technology transferor and technology recipient, acquisition of modern technology have caused many adverse effects in developing countries (DCs). In this paper, ergonomics education and training problems were investigated. The "User-focused (UFO)" method and procedures for ergonomics education and training were discussed in order to promote its applications. It is concluded that training should (1) be directly related to the ergonomics problems of the country; (2) emphasis should be given to simple and practical solutions for quick achievements; and (3) should utilize the available human resources and management strategy for short-term goals while continuous efforts should be given to other required aspects for the long-term.

Introduction

The optimum utilization of human resources is shown to be the most important factor for technology transfer in developing countries (DCs). Davis, Bartolucci, and Valenzuela (1983)¹ considered "peopleware" as the most critical component for a successful technology transfer program and have argued that no matter how sophisticated the technology may be, "without the involvement of well-qualified personnel, the system becomes useless". It is a fact that many experts and highly trained immigrants from various DCs have contributed significantly toward development of advanced technology in industrialized countries. It is well known that the cognitive ability of people is not race depended. This reveals an strong evidence that the people in DCs are capable of developing their indigenous technology and transferring appropriate technology to their own countries if they are provided with proper education and training.

Ergonomics and Technology Transfer

Technology transfer is not an independent work that can be done by itself, it must be supported by many other factors with which the success of technology transfer can be expected (Derakhshani, 1984² and Lasserre, 1982³). In recent decades, the experience of technology transfer has shown some adverse effects for DCs (Meshkati and Robertson, 1986)⁴. Negligence of local

features of work demands and operators capacities, such as body size differences, physical work capacity, cognitive complexity, population stereotype and environmental conditions of the recipient country, has caused many problems in safety, health, human well-being, and productivity in DCs as the consequences of inappropriate technology transfer. A misfit of technological setup and the human workforce result not only in high rate of accident, illness and dissatisfactions but also in low rate of system utilization, low quality product and frequent and costly repair of machinery and equipment (Wisner, 1980)⁵. According to the government record of industrial accidents of Taiwan, Ma and Wang (1983)⁶ investigated the causes of industrial accidents in 1981. The result showed that among 9638 accidents, 65% were related to improper hardware design, 51% were related to poor software design and some cases were condemned of both causes. The authors also estimated the loss of productivity, due to disability and death but not considering other losses such as damage of facilities, amounted to US\$510 million which was about 1% of the GNP of that year. However, figures up to 5% of GNP are even reported from some DCs (ILO, 1983)⁷. These accidents and losses could be easily prevented by the application of ergonomics to their work if the workers have had enough ergonomics and safety education and training. It is obviously worthwhile running a proper ergonomics education and training program, because its cost is far less than the losses of productivity; moreover, the positive effects of the program can improve the productivity and be profitable. A recent publication by Swedish Employers Federation (SFO, 1987)⁸ shows that investment in ergonomics at factory levels is technically least difficult and gives highest business economic profitability.

"User-focused" Method and Procedures

The ergonomics education and training was discussed in different levels by Baloyi (1987)⁹. Among them, making it a national policy which would be the most influential issue. However, it may be more practical and effective to begin with small-scale ergonomics education and training program in industries to convince the policy makers of its necessity by showing the actual benefits.

There is no absolute "best" method or procedures for education and training but an optimum one must depend on the specific conditions of the country and give emphasis to the development of cultural skills (Lasserre, 1982). This means that in planning an ergonomics education and training program one must keep the needs of the "user" (the learning group) in mind. In other words, the program must be planned in such a way as to fit the students' or trainees' needs and their future use. In doing so, one of the authors has conducted a successful training course in work study for managers from small-sized plants in Taiwan by "User-focused (UFO)" method. The experience gained from this exercise could be used to design and execute successful ergonomics training program at various levels. The method start with a simple survey on the facts among major branches of industries which may have potential needs of applying ergonomics in their work. From the result of

the survey, the organizers can have a better understanding on specific and practical ergonomic problems directly related to the industries. Based on this information, the followings can be determined accordingly.

1. The objective of the program. For whom the program is planned? Management, engineers, supervisors, or workers?
2. The qualifications of the participants and instructors. What basic knowledge and experience are required for the participants and the instructors in order to ensure the appropriateness of the program?
3. The types of the program. Short course, seminar, in-plant training, demonstration, group discussion, or participatory action learning?
4. The size of the class. According to the types of the program, the appropriate size of the class can be determined.
5. The teaching and practicing materials. What books, notes, handouts, video and audio materials, and cases are available? What are to be prepared?
6. Other relevant items, such as the place, the schedule, the cost, and the facilities, etc.

In addition to above considerations, emphases should always be placed on practical, applicable measures. Case studies should be included in the training program in which participants would find opportunities to use their theoretical knowledge gained during the course for solving practical ergonomic problems with simple solutions so that later in working life the participants are capable to carry such measures independently, manifest the benefits, and promote the applications in their plants. It is not easy to initiate a new program like ergonomics in any plant without the full cooperation and involvement of the employees. Therefore, as other participation management strategy -- such as Total Quality Control (Karyadi, 1987)¹⁰, Suggestion Improvement System, Self Management System, etc. -- are stressed, simple ergonomics skills can also be integrated with management strategy as a whole to maximize the utilization of the available human resources and accumulate the achievement of the short-term goals in short period of time. With minor changes and more general and theoretical knowledge, this method can also be applied to university education for best long-term result.

At the Center for Ergonomics of Developing Countries (CEDC), using UFO method, we have designed and executed many ergonomics training courses for various categories of people both in several DCs such as China, Sri Lanka, etc. and in Sweden. In fact, based on a recent agreement between the Swedish International Development Authority (SIDA) and the CEDC, the Swedish experts who shall work on SIDA's industrial aid programs in various DCs would participate in a "UFO" training program on ergonomics at CEDC. It is accepted that Swedish consultants with basic knowledge in ergonomics would do a better job in DCs. As a result, the transfer of Swedish technology to DCs would incorporate ergonomics and would be more appropriate for the recipient countries.

Conclusion

There are many factors involved in a successful ergonomics

application in technology transfer, relevant education and training is only one of them. Other factors including ergonomic data, standards, and researches are also important and should be worked out. The UFO method may provide a guide in planning effective ergonomics education and training program to fit the practical needs and it should (1) be directly related to the ergonomic problems of the countries; (2) emphases should be given to simple and practical solutions for quick achievements; and (3) should utilize the available human resources by integration of management strategy with ergonomics skills.

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SOUTH EAST ASIAN ERGONOMICS SOCIETY
SECOND CONFERENCE, DENPASAR - BALI
INDONESIA, 27 - 29 JULY 1988

EXPERIENCES IN THE DESIGN FOR ERGONOMIC EDUCATION
AND TRAINING IN INDONESIA

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I. INTRODUCTION

As the case in many developing countries, the existence of Ergonomics in Indonesia can be regarded as new. Although aspects of Ergonomics have been partly taught at different universities, formal education in Ergonomics as a separate knowledge only provided recently, a.o. at the Bandung Institute of Technology. Two departments which provide Ergonomics courses are Industrial Engineering and Design. This paper is intended to present the author's experiences in the design of Ergonomics and Ergonomics related courses in Indonesia for different disciplines at different Universities.

II. AT DEPARTMENTS OF INDUSTRIAL ENGINEERING

Industrial Engineering has been known for its early activities in the area which later known as Human Engineering or Ergonomics. Works of F.W. Taylor on the existence of optimal work load for workers around 1900 and the works of the Gilbreths on Motion Study are the examples. Even today, in The U.S. for instance, Industrial Engineers are still one of the biggest consumers of Ergonomics. In spite these backgrounds, Ergonomics in Industrial Engineering curriculum in Indonesia has not always been regarded appropriately. The main reason is on the highly stressed human aspects of Ergonomics. In a developing society like Indonesia, interest is more on high-tech areas especially those related to hardwares. If a high-tech hardwares are already on hand, it is considered adequate for everything. Another important reason is, as Ergonomics was in the past, the lack of mathematical sophistication. Regarded as a part of Human Sciences, Ergonomics does not attract the Engineers. It should also be mentioned here that the micro aspect of Ergonomics, e.g. the man-machine systems, is also a source of negligence. As a discipline, Industrial Engineering develops more and more to macro world inside and outside industry in general. Micro systems are seen as traditional and, being traditional means old days. Although not every aspects of the mentioned reasons has scientific bases, Ergonomics has not always been regarded appropriately due to those impressions.

The existence of a group of Faculty Staffs which consistently work on Ergonomics and perform research in this field with a number of significant results have made Ergonomics always in motion and always at better shapes. The curriculum of 1979 at ITB has increased two credit hours for the Work Study course to include mainly Ergonomics subjects. Also, another credit hour for practicum which include Ergonomics laboratory

practice for students. The curriculum of 1987 not only stresses more on the importance of Ergonomics, but also establishes Industrial Ergonomics as one of the seven specialisation in ITB's Industrial Engineering education. This development seems to have impacts to Industrial Engineering education at other Universities. Many of them come to our Ergonomics Group for a consultation to incorporate Ergonomics in their curricula according to their needs.

III. AT A DEPARTMENT OF DESIGN

The author teaches Ergonomics at the Department of Design at ITB for its Product Design and Interior Design students since 1986. Seems to be the opposite of what is found at IE Departments, design students find Ergonomics too mathematical namely, when it comes to statistical treatments for some Ergonomic aspects and when discussions are on Biomechanical calculations. The mathematical analysis of man-machine systems are felt as too heavy. The solution to the problem is to give them basic knowledge with simple mathematical analysis without losing its essence and develop ergonomic problems from the students world of design. This seems fit them pretty well.

IV. AT THE FACULTIES OF ECONOMICS

When the author was a member of a team to design curriculum for the Department of Production Management at the Faculty of Economics at the Institute for Cooperatives Management in Bandung, the author has to convince other members on the importance of a Work Design course for their students. Today, as a result, they feel not only compulsory to provide the course but also already has the intention to establish their own laboratory. Three years later, 1987, the author was asked to help design a course named Ergonomics for the Faculty of Economics of two Surabaya universities. This is mainly due to the increasing awareness of the importance of industrial efficiency and productivity for national development. However, following the author's suggestion, they seem to change the name to Work Design since it is more appropriate for them.

V. CONCLUSIONS

It is quite interesting to note the difference in the perception of Ergonomics among different disciplines in matters and scope, as well as in their needs. It is the multidiscipline nature and the wide area of Ergonomics' application bring Ergonomics to such acceptance and appreciation. It is the challenge of Ergonomists to promote Ergonomics until it is always appreciated appropriately.

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SOUTH EAST ASIAN ERGONOMICS SOCIETY
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Title of paper

EXPERIENCE OF WORKER EDUCATION ABOUT VDT WORK

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2-8-14 SUGAO, MIYAMAE-KU, KAWASAKI, KANAGAWA, JAPAN

A training manual titled "Some 10 checks for VTD work" was put together by us to provide information on the basic information for improving working conditions and environment at VDT workplaces. The manual is also designed as a kind of checklist comprising 10 items (Table 1).

In our training course using the manual, the participants basically go through the following steps:

1. Receive basic knowledge on VDT work from an instructor.
2. Read and discuss the manual.
3. Visit an actual VDT workplace checking the working conditions and environment according to 10 items of the manual.

Actually, however, the 3rd step is not always taken because of difficulty on preparation of the course.

Then we visited two offices with VDT workstations, whose operators had received the first and second steps of the course, to see if the manual was effective to them. One was a medical clinic and another a lawyers' office.

In the two cases, only part of the employees' work was done at VDT workstations. Moreover, the management and labour have concluded the following arrangements: 1) an opportunity to take 15-minute break after 45 minutes' VDT work is secured, and 2) VDT work is not to exceed 3 hours per day. On the other hand, there were lots of problems on the items of furniture (e.g. desks and chairs) and the visual and illumination conditions.

The introduction of VDT work was not accompanied by any redesign of the offices. It was hard to change sitting positions frequently, because the chairs were not designed to allow the operators freedom of movement while seated. They complained about the size of the working area, which was too small.

Table 1

SOME 10 CHECKS FOR VDT WORK

1. Put restrictions on a total amount of VDT work and a maximum working hours per day, including overtime.
2. Put restrictions on a spell of VDT work and allow operators to take spontaneous microbreaks as well as a rest period after each spell of the work.
3. Make use of adjustable furniture and VDT equipment.
4. Improve working environment such as lighting, noise, ventilation etc. in order to alleviate burdens on man at VDT workplaces.
5. Think out some devices to minimize use of VDT.
6. Decide guidelines for VDT work regulation between labour and management and put them to practical use.
7. Don't assign workers specializing in VDI work.
8. Improve continuously interface programs between operators and VDT equipment (software) so that the work in question can be done more easily.
9. Prepare education and training not only for VDT work safety and health but for how to use a VDT system. The education and training must be easy to understand.
10. Keep it in mind that the improvement of working conditions and environment is first and a physical examination for the operators is second.

Concerning lighting, there seemed to be a lot of problems in the two offices. The general lighting from ceiling was inadequate to the VDT work done (the ceiling fluorescent tubes were being reflected.); the characters on the screens were not legible; the anti-glare shields attached to the screens did not work well for protection against troublesome glare. Nevertheless, not much attention had been devoted to the visual and illumination conditions of VDT workstations. After receiving the course, they could not know how they should take any step to improve lighting.

TRAINING IN PRACTICAL ERGONOMICS IMPROVEMENTS

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Introduction

Real improvements in working conditions and the working environment require awareness, acceptance and ability on the part of both the management and workers. Obviously, reliance on laws, regulations and standards is not enough. To secure active contributions of managers, workers and other key people, it is essential to train these people.

This is true also for achieving concrete improvements at the workplace from ergonomics points of view.. While ergonomics needs to be applied as an integral part of the overall efforts of working conditions improvement, it is better and more effectively applied by involving all those who deal with workplace design and practice (Sen, 1984). Participation, through training, of all these people in applying ergonomics principles is particularly important.

In accordance with industrialisation, particularly in developing countries, application of ergonomics at the workplace will grow and perhaps accelerate in the near future. It is necessary to assess existing training methods in this field and organise effective training programmes so as to have positive impacts on sound technological development.

Need for enabling training

It is well known that ergonomics can be usefully applied to a range of industrial and traditional situations. Many concrete benefits are also reported from developing countries (Kogi and Sen, 1987). There are, however, still gaps in the application of ergonomics, particularly in developing countries and among small enterprises and underserved sectors. To help these enterprises and sectors apply appropriate solutions, advice, information and training are essential about any of the important aspects of working conditions, safety and health, depending on the needs of each workplace.

Recent experiences through the ILO's International Programme for the Improvement of Working Conditions and Environment (PIACT) in developing countries, show that training is effective when it focuses on:

- (i) a multi-disciplinary approach which takes into account the different aspects of workplace conditions; and
- (ii) participatory enabling methods which make use of practical advice about carrying out immediate solutions.

Thus, it is essential to incorporate ergonomics points of view in the training process (WHO, 1981). Ergonomics aims at fitting work equipment and methods to people's capacity, and thus makes it necessary to pay attention to various aspects of workplace conditions. A multi-disciplinary approach is inherent when we try to apply ergonomics. By looking at different aspects of work, we are encouraged to identify a series of potential improvements in working conditions and performance and to build up a better understanding of human work. This can lead to many improvements that can upgrade working conditions and enhance productivity.

It is equally important to guide people to actually implement ergonomics solutions in real settings. This is possible not only for engineers, safety and health personnel and other specialists but for all people concerned. In particular, managers and workers can be trained to identify potential improvements, develop practical solutions and implement them. In this way, training should enable people to carry out improvements by self-help (Louzine, 1982; Kogi and Sen, 1987)

Incorporating multi-disciplinary and ergonomic points of view, enabling training programmes should be organised at least on two levels: (i) the training of managers and workers; and (ii) the training of labour inspectors, safety and health personnel and others directly concerned with the design and improvement of working conditions and environment.

Building on local practice

It is interesting that this enabling training can relatively easily lead to real improvements when it is aimed at voluntary action built on local practice. This importance of local practice cannot be over-emphasised. The best way to enable people to carry out improvements at the workplace is to show good, locally available examples and, giving practical advice, guide them to conduct similar improvements.

Our experiences within the ILO's PIACT activities also confirm the effectiveness of using local examples. The learning-by-doing programme developed by the ILO proved effective in training managers and workers of small and medium-sized enterprises (Kogi, 1987; ILO, 1988). It has been successfully conducted in India, Indonesia, the Philippines, Thailand and Argentina. The aim was to give practical advice and

enable these enterprises to carry out improvements by self-help (ILO, 1988). The training programme consisted of a checklist exercise, workshop sessions to discuss good examples from the participant enterprises and group work to carry out improvements during the programme period. The principles of the training approach thus established are: (1) to build on local practice (starting from the real problems of the enterprise instead of priorities of outsiders); (2) to focus on achievements (good examples already available); (3) to link working conditions with other management goals (particularly productivity); (4) to encourage exchange of experience; (5) to promote worker involvement; and (6) to use learning-by-doing.

In using local examples in ergonomics-related training, the following two methods seem especially important:

- to use audio-visual aids for illustrating good, local examples (so as to have an overview of potential measures); and
- to provide solution-oriented guidance, such as by a checklist and action guides (so as to help identify priority solutions rather than merely spotting problems).

Slides and video-clips are especially useful in showing good, local examples. A corrective checklist consisting of simple, practical measures applicable in any small enterprise can guide the participants in finding their own solutions. Some more hints can be given by guide manuals that provide concrete guidance about how to implement solutions: In this respect, it is essential to go beyond teaching ergonomics principles. Examples and how-to-do knowledge are important.

Emphasis on low-cost improvements

Among locally available improvements, low-cost solutions are a very effective training tool. In fact, there are many low-cost improvements including a range of ergonomics solutions. They offer opportunities for each enterprise to take immediate action. Since they are mostly simple changes in work equipment or practical arrangements in work procedures, they can give lessons to others about how to induce similar, low-cost solutions.

Typical low-cost improvements include: better materials storage and handling; simple changes in work-station arrangements; better work organisation and scheduling; improved lighting; safer work procedures; screening of hazards; and inexpensive welfare facilities. Most of these improvements apply basic ergonomics principles in a visible way. For example, materials handling

improves at minimal cost by clearing and marking passage-ways, providing push-carts or using gravity-chute feeding. Simple work-station changes, such as jigs, fixtures, stable work surfaces, appropriate working height or placing tools and materials in easy reach, can have large benefits.

Examples of low-cost solutions can be effectively incorporated into various training programmes. Training materials documenting locally achieved low-cost improvements should be developed and used. They facilitate the learning process for finding practical solutions.

Scope for ergonomics training

Training can play a key role in applying ergonomics to places of work. Training programmes should be organised to enable people to carry out immediate improvements applying basic ergonomic principles. Participatory, enabling training can lead to many concrete improvements.

It is essential to use local examples with a focus on improvements already locally achieved with local materials and skills. Particular attention is drawn to the learning-by-doing process using audio-visual aids, checklists and action manuals. Especially important are simple, low-cost improvements which have a large potential with respect to materials handling, work-station design, work organisation and physical environment.

Appropriate and flexible training modules and materials must be developed for use in basic and vocational education and in on-the-job training of key people, managers and workers. By enabling these people to build on local practice and apply practical solutions by self-help action, opportunities can be created to utilise ergonomics widely.

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Ergonomics in Korea

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Historic Review

Ergonomic way of thinking is one of the very nature of human being. Even in the ancient Korean tools, we can easily find the effort of ergonomic design. Especially, Korean pragmatism which prevailed in the last period of Yi-dynasty (1700-1900) shows us house or castle building standards based on anthropometry.

But, the modern ergonomics was introduced in Korea after the Korean War as a part of western civilization. From early 70's, work measurement and human factor were started to be lectured as a major topics in the industrial engineering and industrial management department. The establishment of the Human Engineering Society of Korea marked a turning point of the ergonomic history of Korea. In 1988, Ergonomics Center has opened to gather the nation-wide human factors information.

The Human Engineering Society of Korea

The Society was formed in 1982 to serve human factors practioners and ergonomists working and studying in Korea. The Society has over 250 members, representing a broad spectrum of disciplines, including engineering, industrial design, psychology, physiology, medicine, sports and home economics (Table 1).

Regular scientific meetings which are held at spring and autumn provide an opportunity for the presentation and discussion of papers. The Journal of the Human Engineering

Table 1. The Human Engineering Society of Korea -- 1988

President	:	Dr. Kyung S. Park, Prof. of IE, KAIST
Members	:	250 persons
Sustaining members	:	22 companies and research institutes
Subcommittee	:	10 subcommittees including anthropometry/biomechanics, safety/industrial hygiene, human reliability, product design, and Sports science
Spectrum	:	Engineering
		Industrial design ++++++++
		Medicine +++++++
		Sports +++++
		Psychology +++
		Physiology +++
		Home economics +++

Society of Korea is published twice a year. It contains research papers, technical reports, short articles, notes, essays, and ergonomic news. The Society welcomes members and submission of papers from overseas countries.

Education and Research

Most of universities offer the human engineering or ergonomics classes in engineering or industrial design courses. KAIST, Seoul National University, Korea University, and POSTECH has intensive master and Ph.D. courses related to this field.

New Research Institute -- Ergonomics Center

In 1988, a new Ergonomics Center was established in the Korea Standards Research Institute which is similar to the National Bureau of Standards in U.S. The primary goals of this center are to build a human factors database which is used for various industrial standardization, and to develop new ergonomic methodologies and testing equipments.

New laboratories -- anthropometry/biomechanics lab, human performance lab, working environment research lab, and information center will be set up at Ergonomics Center.

Industries

Korean industries grows fast and they invest much to the R&D. Areas such as garment, fabric, furniture, sports shoes and motor industries are greatly interested in ergonomics/human factors. It will be hoped closed cooperation between industries, university, and research institutes.

Conclusive Remarks

As reviewed before, ergonomics area is growing fast in Korea. We hope to contribute to the ergonomics research field in the near future and welcome the international cooperations in research and development.

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**SOUTH EAST ASIAN ERGONOMICS SOCIETY
SECOND CONFERENCE, DENPASAR - BALI
INDONESIA, 27 - 29 JULY 1988**

Title of paper

Participatory Approaches for the Improvement of Occupational Safety in the Federal Republik of Germany

Author (s)
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Background

Problem analysis and solution is a natural task for the executive. For many companies, it is completely new to use knowledge and experience gained directly from workers on the production line for this purpose. Research into Japanese management concepts has led to the 'discovery' of the Quality (Control) Circles. Their intention is to involve as many workers from the shop floor level as possible. The theory behind the introduction of such problem solving groups is that problems are best identified and solved where they develop and by those who are most involved.

Empirical Research of Participatory Approaches

The research was organised in two stages. The first stage was designed to identify, in companies of more than 800 employees, how many used small group activities and why. The second stage involved the 247 companies who had indicated involvement with small group activities and was designed to analyze in detail experiences with the concept.

The results of the first stage show that the reasons for introducing small group activities also include the improvement of the work and the work place environment. However, ergonomic aspects play a subordinate role. Where ergonomic aspects were discussed the topics were distributed as follows:

- work environment		38,0 %
-- ventilation and climate	37,0 %	
-- light levels and type of lighting	21,7 %	
-- noise	21,7 %	
-- misc.	19,6 %	
- work place organisation		20,7 %
- work equipment organisation		15,7 %
-- lifting and restraining systems	26,3 %	
-- vacuum cleaning systems	21,1 %	
-- misc.	52,6 %	
- work safety		9,1 %
- organisation		5,0 %
- work process routine		3,3 %
- misc.		8,2 %

Practice shows that small group concepts that involve an open structure and give individual members a free choice of subject concentrate initially on ergonomic themes. Later the group moves on to more complex subjects for

which it is easier for the company to provide empirical evidence of economic success.

Case Study: "Occupational Safety"

Safety at work is mainly a management task. Although the responsibility for work safety lies with the company, German law requires the support of safety at work specialists and delegates. Safety delegates must be appointed in all companies with more than 20 employees. They are not specialists within the company structure but are in honorary positions and have no special authority in their working area. Practical experience shows that these delegates are often involved in a role conflict: On one hand, without authority, they perform a support function for the company on the other hand they are thereby effectively perceived to perform a control function over their superiors.

Experience gained by a major chemical company shows that a Quality Circle approach released an enormous amount of effort and initiative.

Evaluation

Participation - whether generally in organisation of work, or specifically in questions of ergonomics - is not yet wide spread in West Germany. This is partially due to the managerial perception that the participation of workers in the organization of their own work places involves increased costs. Problems created by the introduction of new technology, or forms of organization, can, by including the affected in the preparation, be solved and considerable money saved. Participation can reduce barriers to acceptance and thus increase effective utilization. Themes, such as improvements in occupational safety that currently with traditional procedures show poor results, can be handled very successfully.

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IMPACTS IN OPERATING KEY-PUNCHES AND COMPUTERS IN DENPASAR

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Introduction

In relation to development of several supermarkets and department stores in denpasar, key-punch/cash machines were started being used and operated. Similar cases also happen in Banks and Universities with their computers with aim to increase their tasks and services. But in fact, the use of these modern equipments were not followed by appropriate step related to fit the man-task system. This can be seen through unnatural body posture showed by the operator due to unfit operator-machine system, inadequate lighting and contrast, inappropriate micro-climate which might course to unexpected consequences. Of course theoritically such a condition will lower the productivity of workers at the end. To convince that such unfit man-task system existed, a study was carried out.

Method

Questionnaires were given to operators of key-punch/cash machines in one Supermarket, of computers in one Bank and one University, which used already those machines for some time. Measurements of temperature, humidity, and light intensity of rooms to be used and relevant anthropometry of particular body parts of the operators and the furnitures/machines faced or operated as well were carried out. Meanwhile direct obser-
vation was also done at the place during operation.

Result and discussion

Table 1- Complaints raised by operators

Sample	Headache	Eyes	Neck- Shoulder	Back- Waist	Thigh- Legs
A. N = 4	-	3	4	3	1
B. 6	4	4	5	6	4
C. 7	-	4	4	4	5
17	4	11	13	13	10
	23.53%	64.71%	76.47%	76.47	58.82%
A-University	B-Supermarket	C-Bank			

Table 1 showed eyes strain, neck-shoulder and back-waist pains as the most highest complaints raised by operators. It meant that impacts were really happen among the operators. And the reasons are not only be due to operating the machine itself, but also as the consequence of mixed influences of various factors existing, for examples inadequate lighting in some of the work places (30-40 lux), noisy environment (60-75 dB), too cold room temperature (17°C wet bulb) and unergonomic/unfit relationship between the operator and the machine (30.0% of work table needs improvment). And the type of work organization is also could be considered as additional causes, as for example the static work/sitting only of supermarket (B)-operators, in comparison to other operators which are very mobile.

Table 2- Light intensity, air temperature and humidity

Samle	Light Int.	Air Temperature	Humidity
A	30 - 200 lux	26.5 - 24.0°C	81 - 82 %
B	150 - 1500	24.0 - 22.0	77 - 84
C	30 - 200	21.0 - 17.0	67 - 85

Table 3- Anthropometric data of equipments

Sample	Table height	Seat height	Visual observation
A	73.2 cm	46 cm	bad work-posture
B	86.1	70.2	bad work-posture
C	77.2	47.7	bad work-posture

Headache which is only found among supermarket of operators, might be due to long monotonous working hours with numerics, short lunch break (15 - 30 minutes only), and noisy environment. Actually to face those work conditions they could sequentially exchange the work posture (sitting - standing) while working, but very often the opportunity is not being used. Thigh and legs complains could be caused by unfit chair-table system, as for examples no or inappropriate foot-rest, legs took over the chair function due to its inadequate size, absent of back rest, etc. Result of observation strengthening those opinions.

With all those results, various improvement steps must be taken into consideration with aim to minimize or omit the negative impacts which might emerged due to the condition. It will be more economical if it can be done at the designing or puchasing phase, in which appropriate man-task system must be strongly and integrally taken into consideration at that phase.

ERGONOMIC ASPECT
OF
PERTAMINA LPG FILLING PLANT

BY
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PERTAMINA JAKARTA

ABSTRACT

This study was conducted by doing observation of the physical work environment and its activities as a preliminary ergonomics study.

Mostly the work activities during LPG filling process are manual works such as lifting, slanting, pushing and rolling the LPG bottles, in order to perform their duties safely and efficiently.

Medical data show up only relative small number of musculoskeletal problems and sickness absence.

INTRODUCTION

LPG is one of various Oil & Gas Products made by PERTAMINA for domestic as well as for industrial fuel and supplied by using special bottles.

This usage of such particular bottles for the form practicability and safety.

For this purpose in the country, PERTAMINA possesses five LPG Filling Plant.

In this paper we would like to present a preliminary ergonomics study of LPG filling process in the largest PERTAMINA LPG filling plant, located in Northern sea side of Jakarta, at Jl. Jampia, Tanjung Priok.

The total member of workers are 91 persons.

Working hours are scheduled into two shifts :

from 07.30 - 14.00 and from 14.00 - 21.00, with 30 minutes official resting time at 11.30 - 12.00 a.m. and from 18.00 - 18.30 p.m. for 6 days weekly.

PERTAMINA provided personal devices to the workers such as :

- Safety Shoes
- Leather and Cotton Gloves
- Clothing

The capacity of the plant are :

- 20,000 - 25,000 small bottles / day and
- 1,000 - 1,500 large bottles / day

It means 100 - 125 trucks carrying small bottles, and 10 - 15 trucks carrying large bottles per day.

LPG FILLING PROCESS

Work Methode

Empty LPG bottles are carried out by trucks from LPG Agents in the city to LPG Filling Plant.

There are two types of LPG bottles :

- Small bottle (for home fuel), 15 kgs empty weight
- Large bottle (for industrial fuel), 39 kgs empty weight

The floor of LPG plant was adjusted at the same level with the height of the truck floor for ergonomic consideration.

The large bottles are moved to the LPG filling plant by slanting, pushing and rolling, whilst small bottles are moved by lifting from trucks to LPG filling plant, and by using chain conveyor bottles are moved to LPG filling machine.

Filling process from LPG filling machine to LPG bottles are done by connecting the bottle to the machine with a tube connector.

It takes two minutes to fill up a large bottle, making 84 kgs / bottle.

By conveyor and semi automatic system the filling process of small bottles, the workers put on the connecting rod at one side and at the other side put off.

After filling process, the bottles are weighted.

From the filling machine the bottles are transferred to trucks by the same procedure as earlier.

Physically the work load of these labours can be classified as moderate (300 K cal / hour)

WORK ENVIRONMENT

Physical work environment such as temperature, noise, lighting were observed :

Temperature: 27 °C WBGT - 29 °C WBGT

Noise : 77 dBA - 84 dBA

Lighting : 50 fc - 300 fc

By the above figures it is concluded that physical work environment is in normal limit, by consideration of ergonomics.

MEDICAL DATA

Morbidity

PERTAMINA also provides out-patient clinic in Tanjung Priok located closely to the LPG filling plant.

Total number of out-patient visits were 7,046 in 1987.

Number of out-patient visits by musculoskeletal problems :

Low Back Pain	17	0,2%
Joint Pain	44	0,6%
Pain All Over	217	3,1%

Absenteeism

Sickness absence due to musculoskeletal problems in 1987 :

	Case	Days Lost
Joint Pain	1	2 days (2%)
Pain All Over	1	2 days (2%)
Total	2	4 days (4%)

Number of sickness absence in 1987 was 98 days.

DISCUSSION AND CONCLUSION

The physical work environment in this particular plant is in normal range by consideration of ergonomics aspects. LPG filling activities by workers, e.g. lifting, slanting, pushing, rolling the bottles from the trucks to the filling machine and vice versa, besides the adjustment of the height of the filling plant floor and the truck floor is considered to be the best for the workers as well as for the productivity.

The number of out patient visits by musculoskeletal problems in 1987 was 3,1 %, whilst the sickness absence was only 4%. WHO (1985) stated that 2% up to 5% at workers in industrial countries suffered from musculoskeletal problems, and the sickness absence was 15% of total sickness absence. Finally it could be concluded that by applying the ergonomics, the workers activities in LPG filling plant Tanjung Priok Jakarta can be done safely and efficiently.

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RURAL ERGONOMICS IN BALI

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Introduction

In carrying out development, Bali was being developed through three main economic sectors, based on Hindu's culture, namely agriculture in broad sense, tourism and small scale-cottage industries. Since Bali is a small density island, 5,600 km² in size with 2,6 million population, in practice most of those above activities occurred in the rural areas and covering a lot of people due to their labour intensive character. In doing so, science and technology which being used with all the advantages gained and disadvantages faced as the consequences, must meet the situation. In accordance with the main development objective: "to develop man as a whole", healthy, safety, comfortable and efficient work conditions and environments must be achieved. To support such a condition, ergonomic approach in executing development, particularly in transferring and choosing the technology become a must. Based on this thinking, since 1969, when the First Five Years Development Plan was launched, ergonomics was being conducted until recently, in those three sectors.

Method

Conscious that carrying out new ideas in traditional community needs some prerequisites, among others must be in form of easy low cost examples of how new ergonomics technology can be executed, this method was being used intensively in various sectors. In addition, the technology which being used must originally has the people's character, which means as a product of their own conscious and creative thinking. By so doing, it is hoped that like an ice ball it will keep rolling, and every time with some modifications and improvements, but still having ergonomics character. Of course, it must be presented first with programmes to build awareness, then understanding and finally consciousness of the problems and their solution through systematic and continue; non formal education like trainings and courses and formal one through schools and universities which should be executed intensively. Depend on participants educational background, some technical and orientation programmes were also included. As targets, beside the Tripartite, university's students were also actively involved. With their participation, especially the students during their KKN (Student Work Scheme), ergonomics application in the rural areas became more flourish. Since KKN will involved 1200 students a year, who will stay two months in the villages, it can be imagined what the results are. Of course, other methods were being conducted also, like an intensive used of TV and Radio as well as local newspapers. Nonetheless to say to involve ergonomics within several courses conducted by other institutions in and for the rural areas. And there were some times when all districts heads and other important key persons in the villages, were trained also in ergonomics. This has a very important meaning, since in a traditional community, the role of formal and informal leaders are highly relevant due to its paternalistic society system.

Result and discussion

Through all those activities, some improvements from ergonomical point of view have been carried out, especially in the villages. In regard to ventilation, cross ventilation through inexpensive ways were encouraged, while in term of lighting, improvements were being done just by using glass or plastic roof tile to substitute the ordinary ones.

To fit the work system, a support like cussion or other available means was being used. If needed foot rest or support was also provided to fit the job. For safety purposes, not seldom safety measures were made only with a piece of bamboo or wood available at the place. Work path was also improved by using ergonomics steps or route, especially for those working in the river to excavate sand for building materials. In rice mills, work organization like flow of work, safety measures, dust, noisy environment were improved according to available means at the place. Several villages where the peoples were working mostly on particular industry, were encouraged to become ergonomic villages by starting an ergonomic financially supported nucleus home industry as example. From this nucleus, the ergonomics concept will keep rolling to others in the villages just like an ice ball. Fit to this character no more financial support was needed. Through such a mechanism, similar activities were being done to various villages with particular economic activities. Therefore until recently we had already so called "ergonomics villages" for black smiths in gold-metal and silver, weaving, floor and roof tile beside for offices, hotels and factories. And through similar mechanism we are still busy recently with other two metal black smiths villages. But in doing these two activities, work practically being taken by themselves. Now the whole villages became examples, and we just brought the other villagers to that place and then see and discuss the problems with their host. In short the motivator job was being taken from us, and they can talk freely on their own languages. It is not only how ergonomics was being implemented became topic of discussion, but also other related matters like marketing, product form, material used, etc. So a bigger ice ball was start rolling. But of course beside some succesful efforts there are also some unsuccessful ones, like instead of rolling the ball just melts. It was due to low priority has been given by the people to this ergonomics endeavour, in compare to other programmes. Of course such experiences were very useful and fruitful. Finally it seems that hard works are still needed to attain better future in the rural areas.

Title of paper:

Author(s):
 Postal address:
 Presenter:

Results and Discussion

The mean height and weight of the grape farmers were 1.62 ± 0.01 m and 61.6 ± 1.5 kg with their mean aged were 23.3 ± 0.8 ys. Their heart rate during pruning were measured immediately after 30 minutes and one hour work using "ten pulse method". Their heart rate in rest (before pruning) and the wide areas have been pruned at the arbor also noted. The results are shown in Fig. 1 & 2. The increase of their heart rate during pruning after 30 minutes and one hour work at the first arbor is higher than at the second arbor. And this differences is statistically significant ($p < 0.05$). The mean area of the pruning to indicated their productivity every 30 minutes are wider at the second arbor compared with at the first arbor, and stastically significant with $p < 0.05$. While their production of grape fruits are no differences in statistically between the grapes growing on the first arbor and the second arbor. The temperature under the first arbor was 29.8°C and their humidity was 89.9%. At the second arbor the temperature was 29.6°C and their humidity was 89.8%.

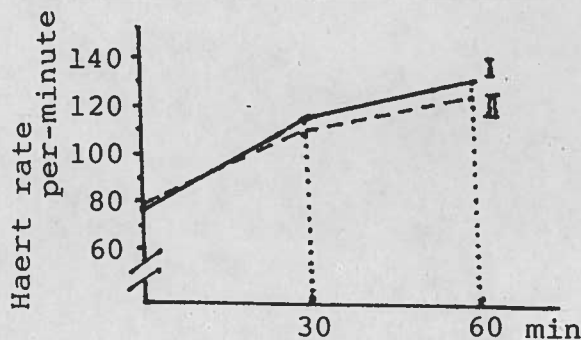


Fig.1. Heart rate of the farmers during pruning.

I = first arbor
 II = second arbor

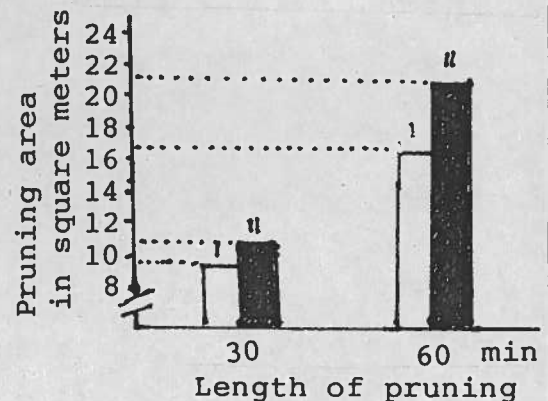


Fig.2. The wide of areas were pruned by the farmers

Conclusions

It is concluded that:

1. The 1.80 m high of arbor is more ergonomic than the 2.25 m
2. The production of the grape fruits on the two arbors are no significant in differences.

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Application of Ergonomic Principles to the Man-machine Interface Design for a Medical Ultrasound Scanner

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Introduction

Ultrasound scanners has become one of the most widely used tools for internal medicinal, obstetrical, and gynecological diagnosis because of its non-invasive and real-time-displaying characteristics.

Though the main function of the medical ultrasound scanner is simply displaying the cross-sectional images of internal organs, but various additional functions are required to enhance the image quality and to facilitate the medical recording and measurements. As a results, control panel is crowded with lots of keys, and it is not easy for physicians or radiologists to operate. As shown in Table 1, ease of operation is one of the most important factors which contribute to the purchasing decision [2]. Therefore, man-machine interface (MMI) design become a critical issue of medical ultrasound scanner industries.

This paper deals with the ergonomic reasoning during the

development of SONOACE-3000 ultrasound scanner. Various ergonomics principles were considered and adopted in the keyboard and screen format redesign.

Table 1. Factors which contribute to purchasing decisions

5 point scale

Screen resolution/image quality.....	4.53
After service/maintainability	4.40
Reliability/durability	4.23
Cost/performance.....	4.22
Ease of operation.....	4.10

Application of Ergonomic Principles

SONOACE-3000 is a linear type scanner which has a unique 8 points selective focusing, various image processing functions, and documentation & measurement functions.

Keyboard height was determined based on the 50%tile Korean male standing elbow height. Membrane keyboard was adopted to protect from electrolyte gel.

Keys were arranged and grouped by the ergonomic principles [1, 3] based on the functional analysis. It was possible to find out five functional groups after discussion between engineers and physicians (Table 2). Keys were assigned to each functional group and each group was allocated based on the frequency of use rule, i.e. most frequently used group was positioned at the most convenient location.

Table 2. Functional key groups

Groups	Functions
Alphanumeric group	Documentation/ marking
Operations group	Freeze/gain control
Display group	Display mode selection
Measurement group	Distance/area measurement
Image processing group	Image enhancement

Directional and conceptual compatibility were also considered in some control keys. To reduce the operational error, special function keys were color coded. Key names were changed to more familiar words like CR (Carriage Return) to New Line and Delete to Back.

Character buffer was increased to 80x25 which gives more information and legibility. Width-height ratio of character has become the ratio of 3:5 which is near optimum value [3].

Conclusion and Further Remarks

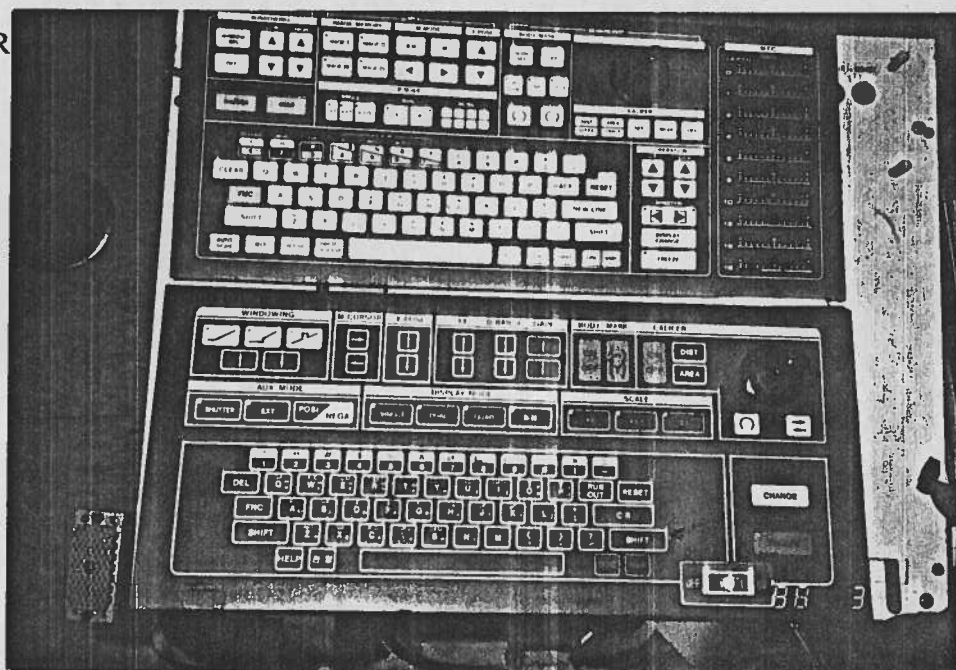
Ergonomic considerations give great help to the marketing of ultrasound scanners but this is only a

first step of MMI research. Following researches are going for further enhancement of MMI of medical ultrasound scanners:

- Determination of optimum parameters for positioning devices
- Comparison of fixed and menu-driven function keys
- Quantitative measurement of user performances

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OCCUPATIONAL HEALTH CONDITIONS AT OPEN PIT WORK POSTS AND ITS IMPROVEMENTS

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Since 1980, the authors and co-workers have made an investigation on occupational health conditions at the work posts and researched the improvement measures in both Baiyin & Daye deep metal open pits. The purpose is to coordinate the relation between operator and working ambient, to protect the health of operators and raise labour productivity.

THE CONDITIONS OF OCCUPATIONAL HEALTH

Through air pollution detection at the work posts from 1980 to 1984 in Baiyin open pit where ore is transported by trucks, it has been revealed that dust is the major air pollutant (Table 1).

TABLE 1 CONTENTS OF MAIN AIR POLLUTANTS IN BAIYIN MINE

ITEMS	DUST	CO	NO _x	SO ₂	CH ₂ O	BENZO(a)C ₁₀ H ₁₀
	(mg/m ³)	(mg/m ³)	(mg/m ³)	(mg/m ³)	(mg/m ³)	(μg/100m ³)
T L V	2.0	30.0	5.0	15.0	3.0	—
A C *	12.9	7.6	0.38	0.5	0.08	2.6
OVER-TLV(%)	47.4	7.0	1.4	0	0	—

★ Average Concentration

The dust at the main work posts has that features of high concentration, high SiO₂ content, and prevailing respirable dust, which cause occupational silicosis easily (Table 2).

TABLE 2 THE FEATURES OF DUST AT MAIN WORK POSTS IN BAIYIN OPEN PIT

PLACE	WORK POST	CONCENTRATION			DISSEMINATION (%)				SiO ₂
		MEAN	RANGE	> TLV	PARTICLE SIZE (μ m)				CONTENT
		mg/m ³		%	< 2	2-5	5-10	> 10	%
OUTDOOR	H. DRILL	19.4	0.6-103	83.3	61	21	10	8	38.5
IN CONTROL CABIN	TRUCK	11.0	2.2-39.6	100	76	19	4	1	38.5
	SHOVEL	8.77	1.3-36.0	89.3	65	18	12	5	38.25
	DRILL.M.	11.2	1.1-87.0	90.2	60	25	10	5	38.25

H. DRILL - Hammer Drill ; DRILL.M. - Drilling Machine

General investigation on silicosis in Baiyin and Daye shows that silicosis is considerably serious. In 1972, in Baiyin, at the high tide of production the silicosis diagnosis rate from among the reexamined key operators was 10.8% and the silicosis incidence rate was 1.8% of total of operators exposed to dust. From 1962 to 1981, the Baiyin mine has trained 1055 truck

drivers successively. Due to relatively poor work conditions, up to 1979, 679 drivers were transported to another post, their average length of service at driver post was only 5 years. Such frequent post change was favourable to reduce silicosis incidence rate, but it cut down the degree of skill in specialized technology. Besides the dust, the thermal condition in the work posts in high temperature season was very abominable. In Daye the extreme temperature in the control cabins was over 45°C, the about 40°C high temperature may last for 2-3 months. The operators usually felt asthmatic, weary, and were all of a sweat. In addition, at work posts in open pit such occupational hazard problems as noise, vibration etc. However these were not even more serious than dust pollution and high temperature. Therefore, the key problem had to be solved is how to control the dust pollution and improve the thermal condition in summer.

IMPROVEMENT MEASURES

To improve occupational health conditions of the control cabin of truck, power shovel and drilling machine, some measurements were taken at Baiyin and Daye open pit, such as enclosing the control cabin and mounting air conditioner with air cleaner, anion-exchanger and antivibration unit to the cabin. As a result, the dust concentration was reduced to 2 mg/m³ or less, and the thermal condition was improved, the extreme temperature in the control cabins can maintain at 23-30°C even in summer.

In addition, prewetting ore stack before to be shoveled, wetting the road surface by the watering car, and drilling with water or dust trap have been used. These measures reduced the intensity of the dust exhausting equipments (Table 3), which can make dust concentration to drop to about 2 mg/m³, reaching basically the standard of the occupational health.

TABLE 3 THE EFFICIENCY OF CONTROLLING DUST EXHAUSTING EQUIPMENTS

MEASURE	ADOPT MEASURES OR NOT	INTENSITY (mg/s)	EFFICIENCY (%)
WETTING	NOT	3105.9	52.4
	YES	1479.4	
PREWETTING	NOT	769.6	69.8
	YES	232.8	
DUST TRAP	NOT	38175.0	99.2
	YES	291.7	

DISCUSSION

Both Baiyin & Daye open pits are at deep excavating stage, therefore, the natural ventilation conditions are very poor. However, owing to the fact that measurements reducing dust concentration and lowering the temperature at the work posts were taken, the occupational conditions were improved obviously.

In the view of ergonomics, it is necessary to develop vibration, noise and other occupational hazard protection & research the correlations between occupational health conditions and factors such as anthropometry, industry psychology and labour productivity etc. in the future.

ACKNOWLEDGEMENT

The authors wish to express their appreciation to all of participants involved in the investigation for their valuable assistance and cooperation.

No. 17

**SOUTH EAST ASIAN ERGONOMICS SOCIETY
SECOND CONFERENCE, DENPASAR - BALI
INDONESIA, 27 - 29 JULY 1988**

Title of paper

OWAS, PRACTICAL METHOD FOR THE EVALUATION OF STRESS
INDUCED BY WORK POSTURES

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Presenter

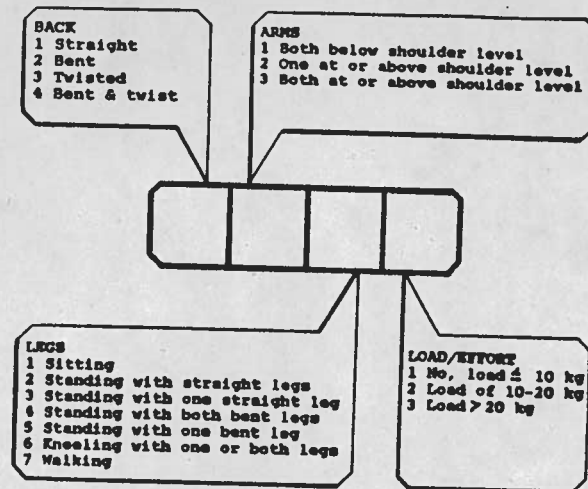
INTRODUCTION

The qualitative and quantitative determination of poor work postures creates a basis for adjusting work posture load towards the optimum as regards the worker's health and musculoskeletal functions. The OWAS-method was developed to observe and evaluate musculoskeletal stress induced by work postures at worksites.

DESCRIPTION OF THE OWAS-METHOD

The system of OWAS-work postures was developed according to the experience obtained for the steel industry (Karhu et al. 1977, Karhu et al. 1981, Heinsalmi 1986). The most frequent work postures for the back, arms, and legs as well as the weight of loads or the use of force are observed with the OWAS-method (Figure 1).

Figure 1. Coding of OWAS-working postures



Each of the classified alternatives have their own number code.

ACTION CATEGORIES OF THE OWAS-METHOD

The postures and posture combinations were grouped into four action categories according to their musculoskeletal stress and health hazards estimated by experts. The action category indicates the urgency of corrections needed at work.

OBSERVATION TECHNIQUES

The data about work postures are collected with split-second visual observations. The postures are identified and classified at the very moment when the observer glances at the worker.

Airmail abstract in duplicated to Conference Secretariat, Department of Physiology, Faculty of Medicine,
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DEADLINE OF FULL PAPER, JUNE 1, 1988

The equal interval observation system is recommended to use in the OWAS-studies. Each observation is recorded with a number code manually, or using a data memory unit or portable computer. The observation frequency may be either 30 s. or 60 s. The accuracy of the observation technique recommended is sufficient when the number of observations exceeds 80-100.

RELIABILITY OF THE OWAS-METHOD

The overall inter-observer reliability of the OWAS-method was tested to be on the average 0.93, the range being 0.74-0.99. The lowest one was obtained for work postures of the back, and it was especially difficult to distinguish between the straight-forward bent and twisted bent postures.

DISCUSSION

The OWAS-method is a practical instrument in the ergonomic development of existing worksites and work methods by decreasing harmful postural stress, e.g. in the development of new worksites, methods, and machines (Väyrynen 1984). The OWAS-method has been applied for the research purposes both in scientific and practical occupational safety and ergonomic studies.

The suitability of different field methods to observe musculoskeletal work load has been considered by Kilbom et al. 1986. According to this review the OWAS-method provides information on the amount of the most common work postures in relation to the total working time. The OWAS-method does not reveal the rhythm of occurrence of different work postures, nor of the duration of static muscle contraction demanded by a single work posture. It is also difficult to distinguish a dynamic muscle contraction from a static one with the split second observations, and this has been taken into account in the hazard estimate.

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THE WORKLOAD OF MODERN BARIS DANCE

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Balinese dancing is one of the Indonesian dancing. Comparing with other dancing, the distinctive characteristics of Balinese dancing are as follows:

1. Balinese dance is very expressive one, the means used to convey expression being mimicry and eye movements. 2. Most Balinese dancers are dynamic in nature, in harmony with the accompanying music of the Balinese gamelan, which is also full of force and power. 3. The position of legs is usually open and low, even the point of squatting. 4. The position of arms is usually open and lifted slightly that the shoulder seems to be lifted too.

Baris dance is the most strong characteristic of Balinese dances. It is usually choreographed by a male dancer. Originally Baris dance is regarded as a classical-sacred dance; but like Javanese dances have also undergone a process of modernization. As a result of it, Baris dance now is being secularise becoming a modern-solo baris dance.

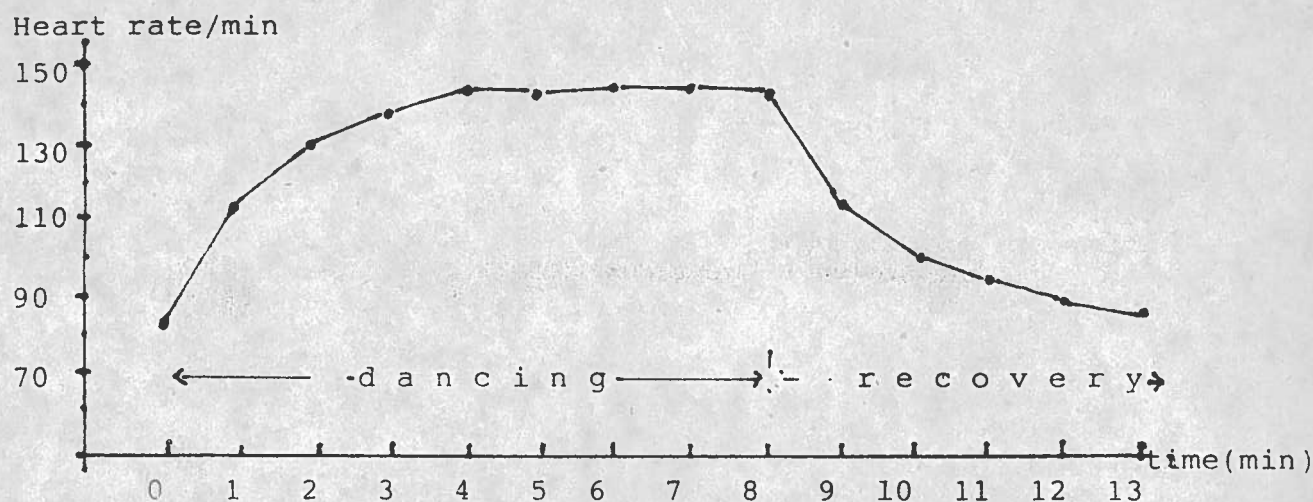
It is generally accepted by Balinese dance expertises, that by mastering on baris dance it is easier to study another Balinese dances. Based on that, baris dance is considered a basic-compulsary dance for male students at Dance Academy (ASTI) Denpasar. Inherent to modernization process, many dances are created. But unfortunately, very few study had been done and no adequate synthesis had been done related to Balinese dancing, as far as from health point of view. To enumerate some studies which were using Balinese dancer as subject are: study conducted by F. Bilal (1981), K. Tirtayasa (1983) and Adiputra (1988). Therefore, this study intended to explore the workload of modern baris dance. The goals is to identify the workload of activity of performing a modern baris dance.

Material and method.

Subject of this study was ten Balinese, male, healthy dancers. They participated the study voluntarily. Heart rate was recorded using ECG telemetrically (ECG Receiver Model S-5140 M; Automatic Start Recorder Model RTG-2101, Nihon Kogyo Co. Ltd), before -during dancing and until 5 minutes of recovery. The study was conducted at Dance Laboratory, ASTI Denpasar, at room dry temperature of 28-28.5 oC and wet temperature of 25.5-26.0 oC with the relative humidity of 77-81%. Christensen criteria was applied to evaluate the dancing workload.

Result and discussion.

It is found that a modern Baris dance takes 8.0 minutes. The mean of resting heart rate was 86 beat/min. and the maximum dancing heart rate was 149 beat/min. It was achieved within 6 minutes of dancing. Since the first minute of dancing the heart rate was increased gradually and steady state condition was achieved within 4 minutes. Then heart rate decreased steeply when the dancing activity stopped. After 5 minutes post dancing mean of heart rate was 91 beat/min which was almost similar to resting heart rate. Noticing the maximum dancing heart rate achieved, it is clearly shown that performing a modern Baris dance produced a pulse work of 63 beat/min.



Graph 1. Dancing and recovery heart rate of Baris dance performance.

By applying Christensen (1964) criteria, Baris dance activity is categorized into a high workload type of work. It is supported by the fact that the dancers were experienced by a lot of sweating and having a high frequency of respiration during dancing (about 40 /min). The results seem to confirm the hypothesis and substantiate the previous study conducted by Tirtayasa (1983), that increasing in physical working capacity after practicing Balinese dancing for one semester may be due to the hard activities when performing Balinese dances.

Based on a pulse work achieved, it is clearly shown that Baris dancing activity producing a significant training effect on the heart, respiratory system and musculoskeletal as well. As stated by Grandjean (1969), Astrand and Rodahl (1970) that a pulse work of 30-40 beat/min. is quite enough in producing the training effects on the body.

The recovery process was happened within 5 minutes; there was no significant difference between resting heart rate and heart rate at 5 minutes of recovery ($P > 0.05$). The fast onset of recovery may be due to a well trained condition of the dancers. All of the results found are presented in graph 1. And the physical characteristics of subjects were: mean of age 23.8 years; mean of weight and height were 54.8 kg and 164.5 cm, respectively.

Conclusion and Recommendation

Based on the data obtained and the above discussion the following conclusion can be drawn: activity of performing a modern Baris dance produces a high work load; and exercising the heart as well as the other systems of the body.

For further study it is recommended to measure the energy expended in performing the modern Baris dance; and to analyse the Baris dance's movements in term of static and dynamic movements.

Acknowledgements

The authors wish to render their deepest thanks to the Director of ASTI Denpasar and to the students who participated the study. Without their participations this study would have never carried out. Also many thanks are addressed to our colleagues in Dept. of Physiology, School of Medicine, Univ. of Udayana for the assistances and criticisms during the study.

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SOUTH EAST ASIAN ERGONOMICS SOCIETY
SECOND CONFERENCE, DENPASAR - BALI
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Title of paper

COMPUTER AS AID TO ANALYSE WORK POSTURES: BASIC PRINCIPLES AND ADVANTAGES OF TWO GRAPHIC OWAS APPLICATIONS

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INTRODUCTION

Computer-aided design (CAD) systems are widely used for modeling and design of environments and products. When ergonomic aspects are added to the systems the procedure can be characterized by concept "ergoCAD". In addition to the man-model facility, ergonomic CAD programs generally also contain various routines for analysing and visualizing the man-machine interface.

Both of the programs developed by us are especially dealing with work postures. Often the worker cannot freely adopt his or her work posture. The spaces in which tasks are performed cause numerous mechanical restrictions. So the postures are quite naturally one of the first and most suitable factors to be aimed to control better with ergoCAD systems.

DESCRIPTION OF DEVELOPED APPLICATIONS

The first program, named MINTAC, creates a three-dimensional (3-D) graphic man-model which can be modified and placed in a 3-D model of the working environment (Fig. 1). The man-machine interaction can be evaluated by several parameters, for instance: visual contact to the working object, the height and depth of a given object, need to climb, the distance between the models extended arm and the object to be reached, as well as strenuousness of work posture.

The first application was following a study dealing with ergonomic problems of forest machine maintenance (Väyrynen, 1984). In the application work postures are analysed and rated according to the Finnish method called OWAS (Karhu et al., 1977, 1981; Corlett et al., 1986).

The OWAS method is designed to suit especially "moving" manual tasks in which all parts of the body are needed. The program can determine the man-model's OWAS-classified work posture (the positions of the back, upper limbs and lower limbs) and OWAS action category, which ranks on ordinal scale the strenuousness of the posture combination. This program was applied to analysing maintenance tasks of a forest tractors. The program was developed for a special, large CAD computer (Computervision system).

The second one of applications, OWASCA, is intended to demonstrate and rank work postures used in any heavy mobile manual tasks. It is a cheap 2-D graphic program for personal microcomputers (IBM PC XT/AT compatibles, Apple Macintosh). OWASCA is easy to learn. It includes only

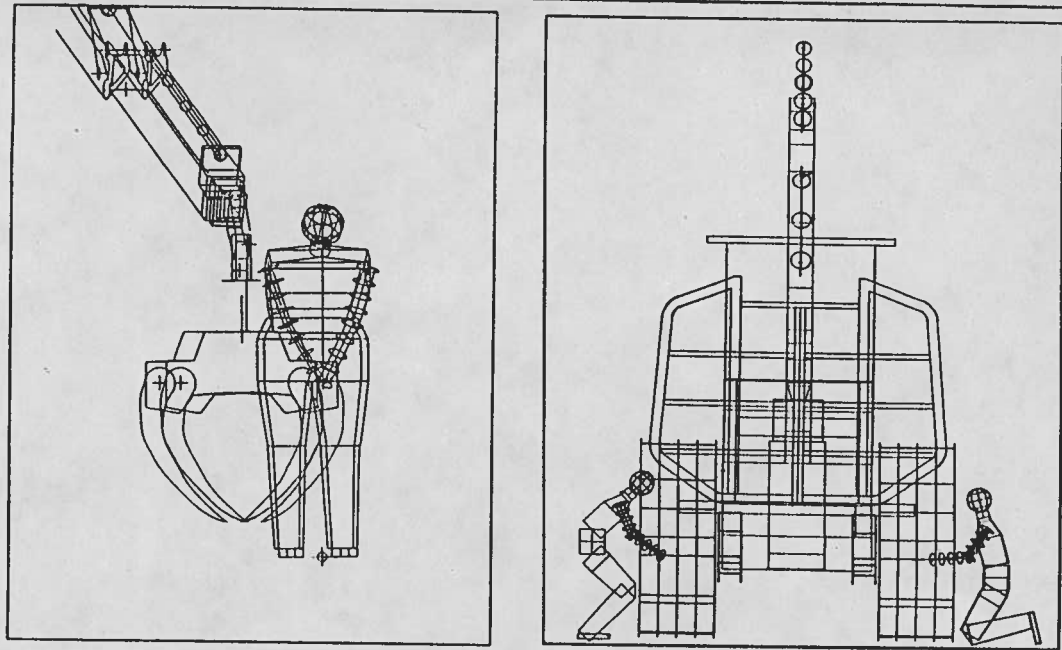


Figure 1. The Finnish anthropometric 3-D man-model (MINTAC) can be placed into working environment modeled by CAD system, and eg work postures can be evaluated.

man-model facilities according to the OWASsystem. Potential users, in addition to designers, are occupational safety and health personnel. The training of OWAS specialists is one of the main utilizing possibilities. The OWASCA software together with expected increase in microcomputer use by safety and health professionals makes possible to boost redesigning workspaces and working ways for decreasing postural load.

CONCLUSIONS

Design for better ergonomics can be simplified and speeded by computers, computers can explore and visualize on the screen large numbers of concepts and variations in a short time, ergoCAD provides at early design stage qualitative and quantitative answers to a host of questions to which a designer could previously have applied only his intuition and experience. Applying ergoCAD naturally has limitations of its own. The potential possibilities, including task animation, are in any case very promising.

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SOUTH EAST ASIAN ERGONOMICS SOCIETY
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Title of paper

Work Place Pollution, Health and Well-being of Workers

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INTRODUCTION

Industrial effluents emission is a major source of environmental pollution (WHO, 1977). Bangladesh is not an industrially developed country. Nevertheless, there is an increasing trend of industrialization, and the level of industrial pollution in some specific regions is quite high, which has created localized environmental problem (Quaderi, 1982).

AIM

The present study was designed to investigate the effects of work place pollution on the health and well-being of the industrial workers.

METHOD

Research setting and the subjects : The present study was conducted in a polluted tannery industry in Dhaka, Bangladesh. A sample of 60 workers were randomly selected for this study from a total of 150 workers employed in the tannery industry, and all of them are male. Their mean age and seniority were 35 and 8 years respectively. The educational qualification of the subjects varied from illiterate to secondary school level.

Measuring instruments: 1) The Job Satisfaction Scale (Warr et al., 1979); 2) The Inventory for Subjective Health (Dirken, 1967); 3) The Questionnaire for Subjective Symptoms of Fatigue (Kogi et al., 1970); and 4) The Life Descriptive Scale.

RESULTS

It is evident from the results that the majority of the workers suffer from illness and take frequent sick leave. The workers with longer work experience suffer from more perceived, health problems and job dissatisfaction than

the workers with shorter work experience. Thus the results support the view that prolonged industrial exposure to toxicity, even at low dose, causes more harm to the individual than relatively short time exposure. The data show that 25% of the workers had pre-service record of ill health but 75% of them have acquired illness after joining the present job. Over 95% of the workers have considered their work place unhygienic and expressed dissatisfaction with the work environment. The workers who are living within the polluted area have registered more health complaints than those who are living outside of the polluted industrial area. The results also indicate that there is inter-individual variability among the workers in their ability to cope with and sustain the health risk factors involved in the job. Some workers are less predisposed, while others more vulnerable to illness than others. Besides work place pollution, other factors which have been found to affect the workers health are unhygienic home environment, smoking, old age, and over-time work. The workers have perceived poor working and living condition, exposure to chemical and physical noxious agents, transport problems, malnutrition, lack of health care facilities, work related fatigue, job stress and job dissatisfaction as some of the health risk factors.

CONCLUSION

The study indicates that given the nature of raw-materials used in the tannery, it may not be possible to eliminate completely the sources of work place pollution. However, to safeguard the workers' health and well-being measures should be taken to control work place pollution, improve working and living conditions, increase health care facilities and job satisfaction.

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BIOMECHANICS - MODELS AND MEASUREMENTS IN ERGONOMICS

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Rules and principles from mechanics are used in biomechanics to understand movements and mechanical characteristics of biological systems and living creatures. It can be discussed whether biomechanics is a basic science, but it is clear that it is a very old science. This is illustrated by the role biomechanics had in the important medical discoveries made during the 15th and 16th centuries and biomechanical thinking is still very important in medical research. Biomechanics is also an important tool in ergonomics to analyse physical load on the body in different work situations. The purpose of this paper is to review some recent developments in this area.

Models are often used in biomechanics to describe reality. The mathematical equations that describes the model are more interesting than the physical characteristics of the model. Since the development of a model with necessity leads to simplifications, a model most always be validated against real experiments. Disagreements between the model and experiments leads to improvement of the model. This also means that it is possible by means of a model to integrate results from several different experiments.

In biomechanical experiments it is often impossible to measure all variables at the same time, it is reasonably to assume that these variables can be correctly calculated from the model if the model is validated by other variables. The equations in the model often describe static undefined problems, i.e. there are more unknown variables than equations. A common example is distribution of forces between co-operative muscles around a joint.

Diseases and discomfort in the musculo skeletal system in humans can be caused by high load, repeated movements and prolonged static load. Knowledge about the causation of musculo skeletal diseases in work is poor, but mechanical factors seems to be of great importance. The relation between physical load and disease can be analysed by means of biomechanical and epidemiological investigations. For example according to NIOSH there is an increased risk of back pain in work situations where the calculated compression force on lumbar back is 2500 - 4500 N and a high risk when the force exceeds 4500 N. See Chaffin and Andersson (1984).

Spinal loading is probably the strongest predictor for back pain. A model for loading on the spine and several muscles at lumbar level has been presented (Schultz et al 1982). The model has been used to calculate muscle forces and compression forces in many different loading situations. It has been validated by measurements of lumbar discs pressure and myoelectric signals from acting muscles.

It is well known that the lumbar discs have visco-elastic characteristics. This means that disc compression increases when the load increases momentarily and that discs shrink with time under extended compressive load. When the disc is unloaded it expands again. Due to these characteristics of the discs human height decreases during a working day. The shrinkage is caused by both the gravity force and the physical work load. A method has been developed that measure the body with a accuracy of 0.6 mm and it is possible to see differences between work situations if the spinal loading differs more than 100 N (Eklund 1986).

In standing position it is necessary to keep the mechanical equilibrium by coordinated activation of postural muscles. There is always a small body sway. External disturbances are compensated by movements between body segments to keep the body centre of gravity within the area of support. The postural muscles are controlled by the central nervous system, which coordinate sensory input from the eyes, vestibular system and proprioceptive system. A dynamic model for upright stance has been developed (Odenrick 1985). Knowledge about how body movements are controlled and coordinated by the central nervous system is important when work places are designed.

Even relatively simple two dimensional whole body models includes extensive equation systems than needs many mathematical operation to solve. Computer programs for biomechanical calculations are now available on personal computers (Chaffin and Andersson 1984). The personal computers have made it possible to simulate load profiles in different work situations. Data about working postures are put in the computer from measurements on pictures made by ordinary film or video cameras.

Computer Aided Design (CAD) is a common tool today in industry. CAD and biomechanical modelling can also be used in ergonomic applications, for instance in planning work postures in assembly work. Today it is possible to show three dimensional structures on a grafical computer screen. SAMMIE is an example of a computer program where an three dimensional operator can be moved around interactively. Around the operator other structures such as tables, chairs, and machines, etc can be placed (Case and Porter 1980).

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SOUTH EAST ASIAN ERGONOMICS SOCIETY
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Title of paper

RAMBANGAN

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Introduction

Rambangan sawing is a method of sawing carried out by a two-man crew. The operation was studied twice : first sampling of performed activities and second continuous timing of the operation. The objective of the study was to determine the productivity of rambangan sawing and the factors affecting it.

Materials and methods

The study was conducted at the Faculty of Forestry, IPB Bogor. Data were collected in the yard of the Laboratory of Timber Harvesting Analysis where sawing of a log of Jabon (Anthocephalus cadamba) was taking place. The following equipment was used to measure dependent and independent variables : stopwatches, caliper, measuring tape, marking equipment, and calculator.

The rambangan sawing operation was divided into the following work cycle elements : preparation, tool maintenance, sawing, and break. The continuous timing method and activity sampling were used. The following independent variables were measured : Dbh (in centimeter), length of log (in meter), and surface area sawn (in square meter). Computation of productivity was based on the measurement of diameters at both ends and the length of log before sawing. Sawn volume was measured to facilitate calculation of the recovery percentage (= conversion factor). In order to determine productivity of rambangan sawing, regression equation for estimating the productive work cycle elements was computed.

Results and discussion

Work cycle time distribution were determined as being as follows : preparation = 28 % , tool maintenance = 2 % , sawing = 59 % , and break for resting = 11 % . It meant that the sawing occupied 59 % of work cycle time (WCT). This indicates that if improvements are to be made , the emphasis should be placed on sawing. Elements of work of rambangan sawing as the results of activity sampling were skid and hoist to rambang = 2.4 % , wedge and support = 7.2 % , plumb and mark = 7.6 % , saw = 57.1 % , move supporting poles = 0.9 % , move and remove plank off cut = 1.2 % , tend saw = 8.0 % , plan and discuss = 2.1 % , fetch and carry tools = 0.6 % , carry and stack = 0.8 % , and break and wait = 12.1 % . From these results it can be seen that sawing occupied nearly the same percentage of WCT as was calculated from the results of the continuous timing.

The labour productivity was 0.036 cubic meters of sawn wood or planks per effective hour per man.

As for the recovery factor of a total of 36 planks or boards of 0.33266729 cubic meters from the log of 0.59815812 cubic meters, the recovery percentage was :

$$\frac{0.33266729 \times 100 \%}{0.59815812} = 56 \%$$

which meant that the recovery factor is quite favourable compared with that of the Faculty of Forestry training sawmill which is 40 % , and the stationary sawmill which is about 45 % .

The influence of area cut on sawing time was established by the regression equation :

$$Y = - 0.70 + 0.00287 X$$

$$R^2 = 0.99$$

where Y = sawing time per board, in minute

X = sawn surface area , in square meter

The high value of R^2 may be attributed to the sample size and the shape of the jaban log which was lean, rounded, and without knots. The results indicate that the sawing time per board is linearly related to the sawn surface area. This is reasonable, since the surface area of wood sawn determines the sawing time as it reflects the log size and shape.

Conclusion

It should be noted that the sample size is too small for generalization, it was only one species of wood, the wood was fresh from felling, and the workers are not so experienced. However, the results of the study suggest that rambangan sawing is profitable, especially if a small amount of wood has to be sawn.

The productivity of rambangan sawing is dependent on the size of the log as this determines the surface area to be sawn. Research into the sawing pattern may aid in productivity improvement.

The recovery factor is reasonable and may suggest that the method should be considered in small scale sawing of village or family timber for personal use.

The exercise shows that simple work study techniques will provide in a relatively short period of observation a surprising amount of information and insight, into an operation about which ergonomists or work scientists have little knowledge.

EYE STRAIN OF GARMENT WORKERS IN DENPASAR BALI

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Introduction

There are many small scale industries in Denpasar. Among them are garment industries which employ many workers.

In effort to increase the production, workers have to work almost all day long from 07.00 AM to 04.30 PM with a break for rest and lunch from 12.00 to 01.00 PM. They have to be back on work from 06.00 PM to 09.00 PM.

And this long working hours, especially in sewing task, have to be done between less than 100 and more than 200 lux light intensity. Working under lighting less than 100 lux is really inadequate. Beside in operating the machine the sewing task workers have to concentrate their attention to small objects which always moving in accordance to the rotation of the machine.

With above mentioned working situation it is assumed it will cause eye muscles fatigue (ciliary and accommodation muscles) which is followed by eye strain or asthenopia (1,2,3). Eye strain consist of many symptoms, which are: head felt heavy, headache, pain around the eye, lachrymatory, eye blurred, decrease of accommodation and in long time will accompanied by decrease in visual acuity. To convince it, a study was carried out.

Method

There were 207 selected garment workers, 15 - 30 years old, which consist of 159 sewing task workers and 48 non sewing task workers. These two groups were also classified according to their working period of 0 - 1 year, 1 - 2 years, 2 - 3 years and more than 3 years. In relation to their daily working light intensity in the work place, there were 128 sewing task workers working under 100 lux and 31 working in more than 200 lux respectively. The visus of the workers was examined with Snellen's test chart. Beside visus, the symptoms which correlated to eye strain were also recorded.

Result

The result showed in table 1 that the workers working more than 3 years are suffering more of decreasing visual acuity in compare to workers less than 3 years. The smallest impact was found among non sewing task workers (18.7 %).

About the eye strain, more eye strains were found in sewing task workers compared to non sewing task workers (table 2).

Table 1. Working period and decreasing visual acuity of sewing task workers.

Working period	0 - 1 year	1 - 2 years	2 - 3 years	3 years
% decreasing visual acuity	22.9	25.5	30.7	42.1

Table 2. Number of subjective symptoms of sewing and non sewing task workers during working period.

Symptom	sewing task worker	non sewing task worker
Head felt heavy	53	13
Headache	70	17
Pain around the eye	92	16
Lacrhyrmatory	107	19
Eye blurred	76	16

There were 33.5% decrease in visual acuity on workers with lighting under 100 lux compared to 12.9% on workers with lighting more than 200 lux.

From the above data we find more decreasing of visual acuity and eye strains on sewing task workers.

Suggestion

Since more garment industries will be opened in the near future, such constraints must be minimized or omitted. Therefore it was suggested to improve working condition and work organization in order to decrease the eye strain of sewing task workers in the garment industries in Denpasar Bali.

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Pen Shapes and Sizes

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Many different size and shape pens are available in the market. What are the characteristics of a good pen?

Kao (1974) had 10-year-old children use ball-point pens with diameters of 6, 9 and 12 mm. Boys wrote slower with the 6 mm pen but girls were not affected by diameter.

METHOD

Pens Eight pen shapes were built; all used a fine point ball point as the writing instrument. See Table 1.

TABLE 1 Identification numbers for the 8 pens.

<u>Shape</u>	<u>Weight, g</u>	<u>Diameter, mm</u>		
		<u>6.3</u>	<u>9.5</u>	<u>12.7</u>
Round	22.8	1	3	5
Hexagonal	22.8	2	4	6
Round	5.6		7	
Hexagonal	5.6		8	

The body of pens 1 and 2 were brass, 3, 4, 5 and 6 were aluminum and 7 and 8 were plastic.

Task Each of the subjects wrote a sentence, containing the 26 letters of the alphabet, four times with each pen in a random order. In addition each drew a star, a triangle and a square inside a 6 mm diameter circle.

Subjects The 23 university students (13 male; 10 female) received extra credit in a course for their participation in the experiment.

Procedure The subject's hand breadth was measured. Then they practiced the task for a few minutes with one of the pens. Then they wrote with each of the 8 pens in a random order. After each pen, they evaluated each pen with five questions:

1. The pen was comfortable to write with.
2. Control of my writing movement was good.
3. I was satisfied with this pen.
4. My fingers' muscles were not cramped (tired).
5. Overall, I liked this pen.

Each question was evaluated on a 7-point scale: 1=strongly disagree, 2=disagree, 3=moderately disagree, 4=neither agree nor disagree, 5=moderately agree, 6=agree, 7=strongly agree. The rating was normalized through the following formula:

$$\text{NSCORE} = (\text{SCORE} - 1) (100/6)$$

Thus a vote of 1 gives 0% and a vote of 7 gives 100%.

In addition, writing time was recorded with a stopwatch.

RESULTS

Writing time was found to be affected by practice so it was not used for evaluation. The pens were evaluated with a series of analyses of variance. Although there were minor differences in results with the five questions, only the fifth question results (overall preference) will be reported here.

Table 2 shows the score by pen.

TABLE 2 Normalized vote by pen. Votes in the same grouping are not statistically ($p < .05$) different.

<u>Pen</u>	<u>NSCORE</u>	<u>Grouping</u>
8	66	A
7	62	A B
3	50	B C
4	48	B C
1	38	C
6	37	C
5	36	C
2	20	D

When size is controlled at 9.5 mm, there is a preference for 5.6 g pens over the 22.8 g pens--that is, 8 vs. 4 and 7 vs. 3.

Within the 22.8 g pens, for shape there is no difference between round and hexagonal at the larger sizes but round is preferred over hexagonal (1 vs. 2) at the 6.3 mm size. The subjects indicated that, in the small size, the edges of the hexagonal pen cut into their fingers.

Within the 22.8 g pens, for size there seems to be a slight preference for the 9.5 mm diameter (3 + 4 average 49 vs. 5 + 6 averaging 36.5 vs. 1 + 2 averaging 29). However the effect is not strong and, as noted above, there seems to be a problem with hexagonal shapes in small diameters.

Within the 22.8 g pens, males preferred the 9.5 mm diameter (vote of 49 for 6.3, 69 for 9.5 and 49 for 12.5). Females had no preference between the two larger pens but disliked the small pen (vote of 24 for 6.3, 44 for 9.5 and 42 for 12.5).

Hand breadth was not related to any preferences. Upon reflection, if a hand dimension is to be measured it probably should be first finger diameter as the pen is held by the fingers, not the palm.

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As new technologies are being applied and used throughout Indonesia, its impact positive and negative is felt by people using these household products.

It concerned one aspect of the plastics and metal industries, as producers of these household products, as seen from the ergonomic point of view. This presentation tries to analyse the hazards encountered by people, in this case mostly women, using certain household products which have certain qualities as potential sources of injury to users.

Human aspects are often neglected by producers due to ignorance.

These products eventually can cause physical damage to users.

Well designed products usually must meet a range of desirable requirements such as :

1. The Form or Shape of a product must give an indication of its use or its function.
2. A product must meet the requirements of fitness for the intended purpose and faultless functioning.
3. It must accords with the physical requirements of the users ergonomically.
4. A well designed product. will be a stimulation of sense and intellect.
5. It must meet relevant safety regulations and performance standards in avoidance of potential sources of injury during operation.

These are commonly known products which are used every day by thousands of people and are designed neglecting these requirements, such as :

- plastic eating utensils, like spoons, forks, plates, cups and saucers
- cooking utensils, like frying pans, ladders, grater, water kettles, etc
- cleaning utensils, like pails, buckets, washing boards, etc

Every Industrial System consist of some or all of the following components, each of which interacts with the others and with technical, economic and

other considerations or constraints.

Good ergonomic design should be regarded as an essential part of good design, not as something separate.

Ergonomic implications should be considered at all stages of the design process, especially the early stages.

It is not sufficient only to consider ergonomics in the final detail stage when all major design decisions have been made.

Ergonomic requirements should be as specific as possible or they may not be adequately considered.

As in many cases most design decisions involve compromises.

If an optimal ergonomics solution is not possible, the consequences should be carefully considered, especially if limits are exceeded.

Human factors should be applied intelligently and with caution. As a general factor of human behaviour there is a certain attitude of persons in early and middle years of adulthood.

Persons in early years of adulthood are adjusting to new life patterns and playing new roles such as spouse, parent, and breadwinner, that make them more cautious, more oriented toward efficiency and cost effectiveness. People who are using these above mentioned three categories of household products, mostly belong to these group of users.

Operational factors that must be considered like: body size, variational with sex, posture when using these utensils, other antropometric data, therefore these utensil must be designed according to efficient handling, balanced muscular work to avoid static muscular efforts.

So producers of household products should apply ergonomic techniques and procedures that are essential in determining the specifications in terms of efficiency, reliability, safety and comptability.

.....*****.....

EDUCATION AND TRAINING FOR THE APPRECIATION AND
APPLICATION OF ERGONOMICS IN INDUSTRY
by

SONIA TIONG-AQUINO (Philippines)*

Introduction

The science of ERGONOMICS has yet to be imbued in the minds of many businessmen, academicians and government planners and policy makers. Though ERGONOMICS has been known in the existence for some time, its dissemination and incalcation still needs to be boosted in order to appreciate the direct and indirect benefits that can be derived in making work life enjoyable.

State of Education and Training on Ergonomics

In the Philippines, as well as in most Third World countries, education and training can very well act as the catalytic boosters in propelling the widespread dissemination of this transdisciplinary practise.

However, the existing undergraduate course curricula as well as the various training programs offered in the Philippines today barely tackle the issues on Ergonomics. It is unfortunate that the principles of Ergonomics are only offered in the graduate level under the topics of occupational health and safety and in industrial engineering. It is imperative that those in the academe evaluate their curricula to integrate human factors engineering in order to imbibe among the students at an early stage a discipline which will enhance working conditions.

There are initiatives among large scale industrial establishments to have their personnel trained to look into the improvement of facilities. These firms are engaged in monotonous and repetitive operations which makes it more urgent to make physical resources conform to the physical and psychosocial needs of their employees particularly the labor force.

Professional organizations and employer groups offer programs which deal with the need for industrial health and safety for the occupations which are obviously exposed to hazards. Likewise, the medical and the allied medical practitioners conduct seminars and/or incorporate in their continuing education program topics in human factors engineering.

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Training Entrepreneurs and Change Agents

The University of the Philippines Institute for Small Scale Industries (UP-ISSI), is the lone institution in the country that has incorporated into its training programs a session on ergonomics. Being heavily involved in small enterprise training, research and development in the Asia-Pacific region and some African nations, the UP-ISSI has continuously echoed the importance of improving working conditions, the need to provide safety and preventive measures against accidents/hazards and the simple improvement techniques to its local and foreign participants.

Aside from the lecture/discussion, case study and action learning training methodologies used, program participants are asked to conduct an in-plant survey wherein existing firms are analysed and evaluated. Apart from analyzing the financial condition of the manufacturing entity which reflects the managerial competence of the operating staff, the production process and marketing practices are dealt with in more detail. This "hands-on" experience is a well-appreciated learning tool and a proven effective means of gauging the application of classroom principles.

Improvements in working conditions and production efficiency usually evolve as a result of critical analysis of manpower-machine complementation with an understanding/ knowledge of the influence of the working environment. Areas for improvement are then identified and measures to enhance productivity and efficiency are later presented for adoption.

The further dissemination of ergonomic principles is ensured as the core of UP-ISSI training participants include managers, supervisors, consultants, extension officers and small business entrepreneurs who in one way or the other have the influence to incalcate changes in business operations and other work establishments.

The School of Allied Medical Profession (SAMP), also of the University of the Philippines, include Ergonomics as one of the topics in their health and safety courses. The subject is treated from the point of view of prevention and the curative aspect and very little on the cause of the risks and hazards faced by the workers.

Presently however, the subject on human factors engineering is fast getting into the curriculum of these courses. Participants have a better appreciation of the effects and danger of the many risks and hazards in industries especially in establishments where there is little managerial concern for the physical and environmental conditions of the workplace. This is more evident in manufacturing firms where there is no in-house medical practitioner or retainer.

Participants to the courses of UP SAMP are doctors of

medicine, nurses, health workers, medical aides and personnel officers of industrial firms. Through them the preventive and curative aspects of those affected will be attended to.

The Department of Industrial Engineering, College of Engineering in the University of the Philippines has a one-unit credit for the subject on ergonomics. This one unit credit is incorporated in a three unit subject which is offered on a semestral basis. Ergonomics is treated under the broad subject of work study. Therefore students graduating from industrial engineering are knowledgeable of how to identify problems and how to design processes and physical facilities. The applicability and the effect to productivity and efficiency of the firm is merely an academic exercise which may be lost in the milieu of information acquired during student days.

Conclusion

The Philippine experience reveals that the change can be brought about by education and training. These are useful mechanisms to effect behavioural and attitudinal changes in people. If properly handled, it can redirect the perspective and action of the target audience by enabling individuals to adopt suitable means and apply knowledge and use skills relevant to the conditions of work. The experience also shows that the ability to motivate and convince the entrepreneur/managers/investors to participate in the effort to making work life better is a critical factor.

Making work life good (better) is a function of how well decision-makers and chief operating officers of an enterprise look at their human resources. It is their understanding of the fact that a healthy nation at work begets a more committed workforce. There must be a collective effort among the academe, professional organizations, trade associations and relevant government agencies to develop training and education as the interventions to which the change can be effected.

The South - East Asian Ergonomics Society as it meets in Bali to discuss its major theme on "The Role of Ergonomics in Development, should delve deeper into how it can activate all ergonomic societies in effectively meeting the challenge of disseminating and inculcating the principles of ergonomics initially among its member countries. Corollary to this recommendation is to enjoin institutions in developed countries to share their skill and knowledge in the application of ergonomics in industry. Under the aegis of the SEAES, aid programs should be tapped to provide the necessary financial support so that a more concrete plan of popularizing and applying ergonomics can be realized.

APPLICATION OF TODAI HEALTH INDEX (THI) FOR HEALTH MANEGEMENT IN TWO FACTORIES

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1. INTRODUCTION

Health has two aspects: objective and subjective. Both aspects are important for a person and, also, for health personnels. The subjective health status will be informed by interview and / or by paper questionnaire. The latter will be used more effectively for the health care of a mass.

THI is something like Cornell Medical Index, which is one of self administered questionnaire developed by Dr. K. BRODMAN et al. in 1945. THI was developed by S. SUZUKI et al. as a new health questionnaire in 1974. THI has 130 questions, 12 scales, and 3 discriminant function values (DF value). THI has three choices of response, yes, no, and the intermediate one. The THI developed was applied to 6 thousand workers of a trade firm in Tokyo to examine the validity of THI. THI is used as an effective tool for workers' health survey and cares in Japan.

2. METHOD

THI was applied as a screening device for health management of workers belonging to two small-medium sized factories. A total of 495 workers composed of 452 male workers of a glass bottle manufacturing factory and 43 male workers of a soft-drink bottling factory were the subjects of the present study.

Twelve scales of THI are as follows: 1. SUSY many subjective symptoms, 2. RESP complaint on respiratory organs, 3. EYSK complaint on eye and skin, 4. MOUT complaint on mouth and anus, 5. DIGE complaint on digestive organ, 6. IMPU impulsiveness, 7. LISC lie scale, 8. MENT mental instability, 9. DEPR depression, 10. AGGR aggressiveness, 11. NERV nervousness, 12. LIFE irregularity of daily life.

3. RESULT & DISUSSION

It was confirmed that the twelve scale scores of THI obtained at small-medium sized factories differed from those scales of reference group investigated at a large-sized trade firm. It is on the basis of AGGR, LISC and also MENT which characterized workers, locality, job (clerical or field work), and size of company (large or small sized) that the difference could be evaluated.

Urban life characterized by a life style of staying up late at night and waking up late in the morning has been reflected on LIFE. LIFE induced by transformation of working schedule, such as two or three shift of work and overtime, was also reflected on this scale.

Two scales of THI test, i.e., SUSY & DIGE seemed to be the representative scale indicating a close relation between work load and health level. The discriminant score for diagnosis of psychosomatic disease is considered to be one of the most useful assessments of the individual's health condition.

As mentioned above, THI is recommended as a convenient assessment method for health management of workers and for screening individuals or groups requiring health management from the total respondents belonging to small-medium sized enterprises where health administrators or professionals for health services are not available.

4. Reference

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THI scores (M, SD) by working area of two factories (Representative four scales, AGGR, MENT, LIFE and LISC, are indicated.).

Scale	AGGR	MENT	LIFE	LISC	Mean age
<i>Bottle manufacturing factory</i>					
Managers	15.16 2.40	21.66 4.52	16.44 2.83	20.77 3.55	45.4
Planning Div.					
Inf. control	14.69 2.25	*25.92 4.51	18.76 4.76	*16.61 3.79	29.1
Ind. Mechanic	***14.22 2.69	*25.66 5.38	20.11 4.28	17.83 2.50	29.9
Sales Div.	15.00 2.72	24.33 4.35	17.53 3.50	18.73 2.76	34.9
Finance Div.	15.80 1.81	22.40 6.36	18.00 4.89	18.30 2.54	31.1
Labor Management	14.55 2.83	**26.44 5.51	20.00 3.36	*17.83 2.50	39.9
Production Control Div.					
Furnace control	***14.46 2.48	**25.00 5.18	*20.56 4.00	18.46 2.64	37.5
Inspection	***14.54 2.01	***24.31 4.85	***20.54 3.63	*18.48 2.62	35.2
Production Div.					
Production	***14.29 2.16	***25.49 4.93	***21.05 3.74	**17.40 2.68	33.9
Control	***14.40 2.18	***25.02 4.73	18.77 3.25	**17.67 2.72	33.6
Maintenance	***14.00 2.02	**25.88 4.39	18.50 3.71	18.00 3.04	32.9
Technical	***13.84 2.77	***25.55 4.88	*20.50 4.05	18.10 3.23	30.9
Research and environmental	***13.53 2.57	24.30 5.86	18.84 2.99	19.38 2.81	33.2
<i>Soft drink bottling factory</i>					
Managers	***13.92 2.75	21.46 6.06	19.15 4.27	19.15 2.91	41.8
General affairs	***13.83 1.72	**28.00 3.34	21.33 3.67	19.16 2.92	35.8
Quality Control	***14.00 1.00	27.00 5.00	22.00 4.58	*16.33 0.57	33.0
Bottling line	14.71 3.86	**25.71 2.43	21.28 4.07	19.42 2.29	40.4
Canning line	***13.78 2.32	*25.00 5.68	21.35 4.50	18.78 2.42	38.6

Mean values are indicated in the upperline, standard deviation in the lower. *** indicates significant level of $p < 0.001$, ** significant level of $p < 0.01$, * $p < 0.05$ in comparison with reference group.

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No. 29.

INVENTORY OF WORK FATIGUE : DIAGNOSTIC
MEASUREMENT : THE CAUSE AND IT,S
CORRELATION TO PSYCHOSOCIAL STRESS

By : L. Setyawati M

SOUTH - EAST ASIAN
ERGONOMICS SOCIETY

SECCND CONFERENCE
27-29 July 1988
Denpasar, Bali Indonesia.

Introduction

The study which is announced in this opportunity is a brief temporary report (as brief communication) of our next investigation about fatigue.

The most generally accepted definition of health is that recommended by the World Health Organization : "Health consists of a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity "It is important to note that health may be thought of as more than just the absence of disease or illness. Indeed, health may be thought of in the context of increasing levels of healthfulness, or "wellness" to use a term currently enjoying popularity (Dunn, 1961; Ardell, 1977).

Occupational health promotion may also be thought of as striving to improve personal health from the individuals (and union's) perspective, while striving to improve the human resource from the organization's perspective. A report issued by the National Chamber Foundation (1978) agrees with this conclusion :

"A workplace may be a setting particularly well-situated to effective and widespread health promotion programs. Through the programs, business can help employees and their families achieve and maintain better health the programs have the potential to benefit not only the individual participants, but also the sponsoring company..."

Fatigue which were studied is work fatigue, as general fatigue.

Fatigue is the decline in performance that occurs in any prolonged or repeated task.

Epidemiological studies in primary care in the United States found that fatigue was the seventh most common presenting symptom, and 25 % of these fatigue symptoms were newconcerus. 40 - 50 % may have a psychological cause (Kennedy, 1987).

The causes of fatigue are monotony of work; intensity and duration of mental and physical work; work environment : climate, light and noise; mental causes, responsibility, workes and conflict; disease, pain and nutrition (ILO, 1983).

Heerjan (1982) informed that as a house doctor of an industry he often find the clinical fatigue as an exposing sign without any serious organic symptoms and Kogi (1971) declared that social and ekological survey are needed to be done among workers and let to know what does the cause of work fatigue.

Fatigue is tendenciously increase the accident in the workplace; disturb the workers and will give disadvantage to the employer and decrease productivities (Gilmer, 1966 and Suma'mur, 1984).

In Indonesia statistically the proportion between number of workers in the work place and medical doctor in every institution/ industry are not sufficient. So are Urgently needed to create a diagnostic tool to detect any occupational health problem in the institution such as work fatigue.

As a fact Indonesia has many differences than others such as culture, climate and psychosocial live which might be influenced the work fatigue.

In this study we thing importantly to prepare a diagnostic tool for work fatigue among workers in Indonesia to maintain the productivity and to manage them.

The goal of this paper are to set an Indonesian fatigue. Scale up; to know surely the cause of fatigue and to determine whether the classes based upon the static features of psychosocial stress are correlated with those based upon the work fatigue.

Methods.

The subject is setted from a depart ment of ahotel in Yogyakarta and were examined with Reaction Time, one parameter for fatigue; than also be observed by Indonesian Fatigue Scale which be prepared for this reason and Psychosocial Stress Inventory. The fatigue workers were determined their causes (as mentioned in ILO, 1983).

Before the above manipulation subject to be enquired

1. By "Lie Score" test to devide whether the employeers lied or not;
2. By General Health Goldberg Inventory (GHQ) to check whether the worker were health or not.

The Indonesian Fatigue Scale were setted with many items :

- a. Symptoms of fatigue according to the statement of Gil -

mer (1966) and Grandjean (1969).

- b. Worksite influences of the Indonesian workers.
- c. The effect of Psychosocioeconomical factor to the employees.

This scale is characterized by its Questionair form: will could be done by non medical trained personeel: valid and reliable as the diagnostic measurement to detect work fatigue.

Results and discussion.

The temporary result of this study i.e. were about its causes: the correlation between psychosocial stress and its fatigue and the degree of their fatigue (To be examined with "Reaction time").

Sixtyone workers were randomly assigned to receive study examination. All of that subject were examined with Lie Score test; Goldberg test, "Reaction Time", Psychosocial stress test and with the Indonesian Fatigue Scale. Lie-Score test.

Study using this test gave result that ninety percent of the worker were not lie (Table I).

General Health Goldberg Inventory

In Table II shown that eighty five percent of the "not lie" worker having the general health. "Reaction Time" test.

In Table III shown that mild fatigue were happen to 50 percent of the employees; twenty five percent were moderat rate one and fifty percent were severe fatigue. 10 % were

found as non fatigue worker.

Psychosocial stress test.

Table IV shown about sixty five percent of the workers having the psychosocial stress; from that amount mostly got the moderate and severe psychosocial stress. And his back ground of stress were coming from the work environment and outside of worksite environment (Table V).

Table VI shown the correlation between psychosocial stress and the degree of fatigue.

As mentioned by Kogi (1971) and Kennedy (1987) this study proved the evidence of psychosocial stress among the fatigue workers. Sixty five percent of the fatigue caused by the psychosocial stress.

According to the first purpose of this study it's need ed urgently to prepare a diagnostic measurement for fatigue which include the psychosocial factor of employees.

Final of this paper, we hope the futher suggestion to support our goal of the next study.

Summary and conclusions.

1. Sixty one workers of a hotel in Yogyakarta were randomly assigned to receive this study. Ten percent were found as non fatigue employees; fifty percent were mild fatigue; twenty five percent were moderate and fifty percent were severe fatigue.
2. Psychosocial stress as the cause of fatigue were experienced by sixty five percent of fatigue one.
3. The futher study are needed to prepare the diagnostic measurement for fatigue with it's Indonesian speciality.

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DIAGNOSE AND OCCUPATIONAL DISTRIBUTION OF LOW BACK PAIN
AMONG THE COMMUNITY OF SOUTH SUMATRA OIL REFINERY.

Sjafei *, Soeryadi **

A B S T R A C T .

Radiographic features of the subjects suffering from low back pain among the employees of the South Sumatra Oil Refinery were retrospectively studied.

The objective of the study is to identify the high risk group and recommend appropriate ergonomic approach as the fundamental treatment.

The radiographic study based on the Radiologist's diagnosis could be classified as :

1. The "abnormal group" representing the majority of the pathological conditions not associated with occupational factors, namely :
 - a. Bone structure abnormalities, such as : Rheumatoid arthritis, Osteoarthritis, Lumbosacral imbalance etc.
 - b. Stone, infection and anatomic anomaly of the urinary system. (1,2).

The above abnormal group that radiologically well identified, were considered not due to occupational factors, therefore excluded from the study. (1,2,4,8).

2. Other abnormal group associated with occupational activities such as occupational trauma on the Lumbosacral region were not found in the study.
3. The "normal group" that radiographically not detectable are including blood supply disturbances could be largely attributable from postural dysfunction (3).

To see the distribution of the "normal group" among Departments, this group were therefore occupationally classified.

Non occupational activities done by one worker are considered the same as that of other workers. The high risk groups were identified following statistical computation employed on the data.

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Chief Medical Officer* ; Occupational Health Officer**

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I. I N T R O D U C T I O N .

Unergonomic work condition such as static work, maintaining any set of muscles in a rigid, unsupported position for a long period of time, wrongly lifting and carrying due to arduous occupational activities will result in muscular strain.

The stress on the lumbosacral muscles will diminish blood supply causing pain on the back. (3).

The abovementioned pathological conditions that mostly caused by occupational factors are not detectable by radiography. (2,4)

Occupational trauma on the lumbosacral region may result in structure damages that visible in the radiography, but actually not found in the study.

Lifting, carrying and sedentary works are very commonly experienced by workers in daily operation of an oil refinery such as that in the South Sumatra Oil Refinery.

In ordinary practice Radiography is one of other means to confirm the diagnose of low back pain. A complete history, neurological, general examination and even the medical treatment not resulting in any better are usually done long before the radiographic study.

The well defined diagnose and data of the radiography make us possible to appropriately exclude a considerable number of pathological condition that not associate with occupational factors.

In the study, the term "occupational factors" means any activity done directly associates with company bussiness, while other activities done at home are categorized as non occupational factor. The non occupational factors experienced by one worker were considered the same as other worker's.

As far as ergonomic concern, the study will try to identify the type of work of workers having high risk to occupational low back pain. Ergonomic approach then would therefore be implemented as the fundamental treatment for the high risk group instead of just medical treatment.

II. OBJECTIVE OF THE STUDY.

The objectives of the study are :

1. To identify the high risk group.
2. To define the type of work of the high risk group.
3. To give appropriate recommendation.

III. MATERIAL & METHOD .

1. Studied population.

The subjects of the study were originated from Radiographic feature of the workers suffering from low back pain in The South Sumatra Oil Refinery.

The Radiography done since 1983 untill 19 87 were collected and retrospectively studied.

2. Plain x-ray and intravenous pyelograph.

Plain x-ray of the back and pyelography were used to exclude any pathological conditions not associated with occupational factors.

3. Degenerative musculoskeletal diseases.

To exclude the degenerative diseases from the study, those who were older than 50 years old were not included. (5).

4. Classification of the Radiographic feature.

The reading of the Radiographs were done by Radiologist and classified as :

A. "Abnormal group". This group consists of :

1. Bone structure abnormality, including : Rheumatoid arthritis, Osteoarthritis, Lumbosacral imbalance etc.
2. Urinary system abnormality, including : Stone, Infection and anatomic anomaly.

The "Abnormal group" that radiologically well defined were considered not associated with occupational factors.

b. "Normal group". This group consists of :

Pathological condition associated with blood supply disturbances of the back muscles that radiologically not detectable.

5. The use of computer facilities.

Other informations concerning the workers identifications were obtained from Personal Department backed up by Computer facilities.

6. Occupational classification.

The existing Departments were applied as the job classification of the workers and used as nominal scale in the Descriptive statistic. The Departments are :

The Departments are :

- | | |
|-----------------------|------------------------------------|
| a. Security Dpt. | g. Health Dpt. |
| b. Electrical Dpt. | h. Logistic Dpt. |
| c. Engineering Dpt. | i. Financial Dpt. |
| d. Maintenance Dpt. | j. Marine & Telecommunication Dpt. |
| e. Refinery Dpt. | k. Personal Dpt. |
| f. Fire & Safety Dpt. | l. Public Relation Dpt. |

7. The distribution of the "normal" group among Departments.

The "normal" group that their complaint were largely believed due to occupational origin and the Radiological changes were ill defined, were occupationally classified.

8. Descriptive and Inferential Statistics.

- The data were presented in the form of polygon and tabulation.
- Nominal scale.

The existing Departments in the Refinery were used as the nominal scale in the Descriptive Statistics.

- "Time/year" were used as other variable.

The year of the collection of the Radiography is considered as another variable in the study. The photos were collected since 1983 untill 19 87.

- Comparability of the data among Departments.

The data among Departments need^{to} be statistically comparable. In this regard, incidence rates were employed on the data instead of the observed number and used as X_n .

- Statistical computation.

To analyze the differences of incidence rate of low back pain among Departments, statistical computations were done, namely:

- "t" test of significant were used,
 - to ascertain whether the difference between Incidence Rate in 1985 and 1986, 1987 were statistically significant or just purely by chance.
 - to ascertain whether the difference between Incidence Rate of the Personal, Finance and Public Relation Department and other Departments were statistically significant or just purely by chance. The "raw" data of the "three Departments" were relatively higher than other Departments.

C. to ascertain whether the difference between the Incidence Rate of Staff employees and that of Non Staff group were statistically significant or just purely by chance.

2. Relative Risk.

The Relative Risk were computed to quantify the association between job group and risk of suffering from low back pain.

9. The differences of the distribution of the "normal" group among Departments were discussed and concluded.
10. Based on the statistical findings and the conclusions, suggestions were then recommended.

V. R E S U L T .

A. Overall view of the result of Radiological reading.

The figure includes employees and their relatives, occupational and non occupational low back pain.

Figure I.

RADIOGRAPHIC DIAGNOSE	1985	1986	1987	Total
1. Normal	234	84	264	582
2. Stone in the u.system	87	34	70	191
3. Osteophyte / Spur	25	12	31	68
4. Infection of the U.Sys	19	2	4	25
5. Kinky ureter	10	1	10	21
6. Bone structure abn.	23	10	21	54
7. Calcification	7	1	3	11
8. Congestion of the U.S.	9	16	11	36
9. Anatomic anomaly	5	5	14	24
10. Fracture of the Spine	0	0	0	0
11. Herniated Nucleus P.	0	0	1	1
T O T A L	419	165	429	1013

The number of the Radiographic reading is an information of the magnitude of the problem.

The pathological conditions represented by "the normal group" could be associated by temporary blood supply diminishing due to postural dysfunction.

Sedentary or isometric work were widely blamed as one of the etiology of the occupational low back pain.

B. Number of Radiographic reading by year.

Figure 2 includes employees and their relatives, occupational and non occupational low back pain.

Figure 2.

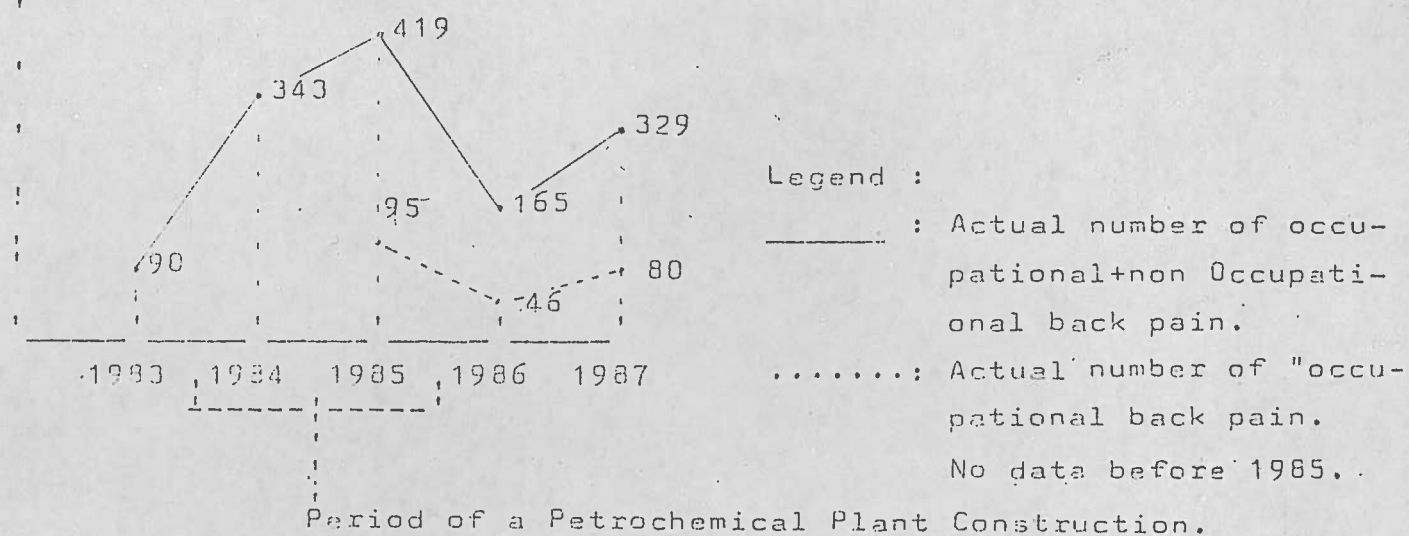


Figure 2 demonstrates the coincidence between the peak of the Polygon with the period of Petrochemical Plant Construction involving most Departments in the Refinery. Statistical computation indicated no significant difference between the incidence of Low back pain in 1985 and that in the next two years, i.e. 1986 and 1987. ($p > 0,05$).

C. Figure 3.

Number of Employee by Department, Job group and Year.

Legend : Stf. = Staff
 : N.Stf= Non Staff.

	1984	1985	1986	1987				
D E P A R T M E N T	Stff	N.Stf	Stf	N.Stf	Stf	N.Stf		
1. Security	6	272	12	256	11	253	12	251
2. Electric. Power	40	369	74	529	79	543	82	541
3. Engineering	136	224	150	235	147	177	156	218
4. Maintenance	109	973	94	750	92	811	88	774
5. Refinery	98	697	111	626	103	663	99	662
6. Fire and Safety	11	35	18	64	18	58	19	66
7. Health	69	302	66	289	72	276	74	245
8. Logistic	49	377	48	334	40	254	43	244
9. Finance	42	89	36	88	41	94	42	85
10. Personal	72	292	72	249	68	269	70	258
11. Marine & Telecom.	62	490	69	443	61	446	64	419
12. Public Relation	22	36	15	19	11	17	10	17
T O T A L	710	3884	765	3890	737	3861	747	3789

D. Figure 4.

Incidence rate of "occupational" low back pain, regardless to job group of the employee.

DEPARTMENT	1985	1986	1987	Remark
1. Security	7,56	3,78	7,52	
2. Electrical power	8,29	1,60	7,95	
3. Engineering	10,39	9,43	21,39	
4. Maintenance	25,82	6,64	19,72	
5. Refinery	14,93	7,85	17,08	
6. Fire & Safety	24,39	26,31	11,76	
7. Health	36,62	11,49	12,54	
8. Logistic	10,47	3,40	13,94	
9. Finance*	27,77	37,03	23,62	High
10. Personal*	43,61	26,70	36,58	"
11. Public Relation*	88,24	35,71	37,03	"
12. Marine & Telecommunication	21,48	13,81	20,70	

Figure 4 demonstrates :

- The actual incidence rate of the most Department in 1985 were higher than that in 1986 and 1987, although the difference was not significant. ($p > 0,05$). This situation also shown in the Figure 2 as the coincidence between the peak of the Polygon-graph with the period of Petrochemical Plant Construction.
- The actual incidence rate of the "normal group" of the finance, Personal Affair and Public Relation Department were continuously higher than that of other Departments in 1985, 1986 and 1987. The difference is suprisingly significant. ($p < 0,05$). This is a subject to a lot of discussion since the employees in that Departments are generally believed as sedentary work.

E. Figure 5.
Incidence rate of the "occupational back pain" by job group.

DEPARTMENT	1985		1986		1987	
	Staff	Non Staff	Staff	Non Staff	Staff	Non Staff
1. Security	0	7,81	0	0	0	7,57
2. Electrical P.	0	9,45	0	1,84	12,19	7,31
3. Engineering	40,54	1,89	14,18	5,65	19,23	22,93
4. Maintenance	85,11	18,47	10,87	6,16	22,72	19,38
5. Refinery	27,02	12,78	19,41	6,03	50,50	12,08
6. Fire & Safety	55,55	15,62	105,26	0	52,10	0
7. Health	30,30	36,46	27,77	7,24	0	16,33
8. Logistic	0	11,97	0	5,94	0	16,39
9. Finance *	27,77	34,09	24,39	42,55	0	35,29
10. Personal *	83,33	32,78	73,52	14,87	28,57	38,76
11. Public Relat.	0	157,89	90,90	0	0	58,82
12. Marine & Telec.	14,49	22,57	32,78	11,21	0	23,86

The application of significant test on the data in Figure 5 will result in the strength of association between job group and risk of suffering from occupational low back pain. The results of the computation are shown in page 10, but the detail computations are not demonstrated.

F. Figure 6.

Distribution of "Normal group" among Departments .

DEPARTMENT	1985			1986			1987		
	Staff	N. Staff	Total	Staff	N. Staff	Total	Staff	N. Staff	Total
1. Security	0	2	2	0	1	1	0	2	2
2. Electrical	0	5	5	0	1	1	1	4	5
3. Engineering	3	1	4	2	1	3	3	5	8
4. Maintenance	8	14	22	1	5	6	2	15	17
5. Refinery	3	8	11	2	4	6	5	8	13
6. Fire&Safety	1	1	2	0	2	2	1	0	1
7. Health	2	11	13	2	2	4	0	4	4
8. Logistic	0	4	4	0	1	1	0	4	4
9. Finance	1	3	4	1	4	5	0	3	3
10. Public Rel.	0	3	3	1	0	1	0	1	1
11. Marine&Tel.	1	10	11	2	5	7	0	10	10
12. Personal	6	8	14	5	9	14	2	10	12
TOTAL	25	70	95	16	30	46	14	56	80

Four-fold table to compute relative risk between job group and risk of suffering from occupational low back pain can be constructed by using Figure 3 and Figure 5.

G. Four fold tables : Figure 7.

Year	Group	Staff	N. Staff	Total	Relative Risk
1985	Non Staff	70	3820	3890	$\frac{70 \times 740}{320 \times 25} = 0,54$
	Staff	25	740	765	
1986	Non staff	30	3831	3861	$\frac{30 \times 721}{3831 \times 16} = 0,35$
	Staff	16	721	737	
1987	Non Staff	66	3723	3789	$\frac{66 \times 733}{14 \times 3723} = 0,92$
	Staff	14	733	747	

H. Figure 8.

Test of significant.

In The study Test Of Significant is needdd and used,

1. To ascertain whether the differences between Incidence Rate of all Departments (\bar{X}) in 1985 and that in 1986 and 1987 is statistically significant or just purely by chance.

The statistical Parameters are :

1985 : \bar{X}	=	26,62	1986 : \bar{X}	=	15,31
: n	=	12	: n	=	12
: Sd.	=	6,65	: Sd.	=	3,84
: $(X-\bar{X})^2$	=	5351,01	: $(X-\bar{X})^2$	=	1783,66
1987 : \bar{X}	=	26,62			
: n	=	12			
: Sd.	=	2,93			
: $Z(X-\bar{X})^2$	=	1040,32			

Note : $Z(X-\bar{X})^2$ is for the comparison of two different samples. Further detail of the computations were not shown here. The result is $p > 0,05$.

2. To ascertain whether the difference between Incidence Rate of the Finance, Personal Affair and Public Relation Departments and that of other Departments are statistically significant or just purely by chance.

Following the statistical procedures demonstrated in Figure 8 No.1, we obtained that $p < 0,05$.

So, the Incidence Rate of that Departments were significantly higher than that of other Departments.

3. To ascertain whether the difference between Incidence Rate of Staff group and that of Non Staff group is statistically significant or just purely by chance.

The result, were : In 1985 : $p > 0,05$; not significant
 In 1986 : $p < 0,05$; significant
 In 1987 : $p > 0,05$; not significant. (8,9,10).

That results were confirmed by Relative Risk shown in Figure 6, namely : In 1985 : RR.= 0,54 ; moderate association
 In 1986 : RR.= 0,35 ; strong association
 In 1987 : RR.= 0,92 ; weak association. (15).

VI. DISCUSSION.

1. Advantages and disadvantages of the use of radiography as the tool of diagnose in the study.

In the study radiographic features were used to identify the occupational back pain through the exclusion of the group of well defined radiologically changes.

This is somewhat arbitrary consideration, since the number of radiographically normal group could be confounded by those with non - occupational back pain such as early stage of Rheumatoid Arthritis, group of malingering etc.

The exclusion of those who were 50 years old and over from the study population was an attempt to minimize the number of non occupational low back pain as the cofounding group.

Occupational trauma resulting in damages with well defined Radiologically changes such as spinal fracture so far were not found in the study.

Subjects with malingering.

The existent of subjects with malingering in the normal group is possible. This is one of the limitation of Radiography as the diagnostic tool.

Herniated Nucleus Pulposus.

When Herniated Nucleus Pulposus occurred, it was mainly due to the weakening of the spinal structures, while occupational activities were just a trigger. In addition, Herniated Nucleus Pulposus very often occur during aging and therefore excluded from the study population. (6).

2. Job classification.

The job of the employees were roughly classified based on the existing Departments and job group. Although the job group consists of 16 grades but classified only into two group namely, Staff and Non Staff. Hence, a further field study is apparently needed to specify in a greater detail concerning the job classification on ergonomic basis especially in the high risk Departments.

3. The result of the study.

The result of the study can be summarized as the following :

- a. Although the actual Incidence Rate of Low back pain in 1985 was higher than that in 1986 and 1987 but the difference was not statistically significant. ($p > 0.05$).

The fact that the Petrochemical Plant Construction was mainly done by Contractors could be the cause of the situation.

3.b. The Public Relation, Finance and Personal Affair Departments had continuously appeared to be the high risk Departments since 1985 untill 1987. This situation is interesting since the type of work in that Departments is generally believed as sedentary work.

c. The association between job group and risk of suffering from low back pain.

As mentioned in page 11 under Figure 8 no.3 that job group has strong association with risk of suffering from low back pain in 1986. It was confirmed by $p < 0.05$ and $RR = 0.35$. But it was unlikely that in 1985 and 1987. (1985: $p > 0.05$, $RR = 0.54$, 1987 $p > 0.05$, $RR = 0.92$). This findings is in line with that in number 3.b suggesting that the higher the job group, the less physically active, the more likely suffer from low back pain Situation in 1986 need further observation since other study done elsewhere disclosed that occupations involving heavy labor have an incidence of low back pain similar to that in more sedentary work, but disability is more common in the former. This probably more related to (be confounded by) type of work required than the symptom (6). Arduous physical activity may result in low back pain when it is wrongly done, but even improve blood supply of the muscles if ergonomically and physiologically done. (11,12,13,14).

VII. CONCLUSION .

1. Radiographic studies were used to identify the occupational distribution of low back pain among workers in South Sumatra Oil finery. In this regard a considerable number of non occupational back pain can be excluded from the studied population.
2. Sedentary type or isometric work was the main cause of occupational low back pain. The disability of heavy labor is more related to the type of work than the symptom.
3. Public Relation, Finance and Personal Departments had appeared to be the high risk Department.
4. Further study is needed to identify in a greater detail concerning job classification on ergonomic basis especially in the high risk Departments.

VIII. RECOMMENDATION .

1. Make a further study to identify unergonomic practices especially in the high risk Departments.

2. Introduce "A Guide for manual lifting and carrying" especially for the group with physically active.
3. Define maximum permissible weight for manual lifting and carrying.
4. Physical fitness program should be officially implemented and effective especially for the high risk group. The level of physical fitness of the employees should be "average" or over.
5. Review and improve general work conditions including : work schedule, work load, room space, table-chair system etc. based on ergonomic point of view. This could reduce the group of malingering that may exist in the "normal group".
6. Look into the ratio between the sedentary and more physically active worker in the high risk Departments to quantify the association between the sedentary work and risk of suffering from low back pain in that Departments.

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SOUTH EAST ASIAN ERGONOMICS SOCIETY
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Title of paper

TOWARDS NATIONAL ERGONOMICS STANDARDS

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I. INTRODUCTION

Ergonomics is the science which deal with human being. It has long been realized that human characteristics differ from one population to another either physically, socially or culturally based. As a knowledge pioneered and developed at least, at its early stages, in the United States and some European Countries, Ergonomics is still western population centered although Ergonomic research in non western countries has started to develop in recent years. As far as standards on human performances are concerned, Ergonomics standards developed in (for) western population should only be applied with great care. Some Indonesian experiences has shown this to be true. This paper presents three Ergonomic subject matters which have been found to be some of the areas where population characteristics have to be considered when applying Ergonomics namely, anthropometry, speed of motion and product design. The findings are based on research results performed by the Bandung Institute of Technology, i.e. the Laboratory for Work Analysis and Ergonomics.

II. ANTHROPOMETRICAL DIMENSIONS

One of the most frequent accidents in construction works in Indonesia happens in the operation of heavy equipments. It is strongly felt that lack of anthropometrical fitness in the the operator-machine systems is the main source of reason. The Railway state company has long been concerned by the physical design of foreign made locomotives which is too large for average Indonesian operators. These situation is not without reasons. Measurements by the Laboratory of Work Analysis and Ergonomics in Bandung shows that the average height of Indonesian students are 166 cm. It can be reasonably predicted that due to social-economic conditions, locomotive operators have lower height figure. Compare the figure to average height of for example, American males which is 172 cm [1]. There are ofcourse other anthropometrical differences besides height between Indonesian population and other populations which should also be considered promptly.

III. SPEED OF MOTION

It is of quite importance to note that for a simulated manual assembly work, Indonesian subjects perform faster for work areas close to the body (< 20 cm), and slower for work areas far from the body (> 35 cm) [3] as compared to what would be shown by Western workers if calculated from three Predetermined Motion Time Systems (Work Factors, Methods Time Measurement and Basic Motion Time). Time measurements for Indonesian experiments were performed with standard time study

procedures. Another research result shows that Western workers are faster than Indonesian workers in 35 % of the motions classified in the Maynard Operation Sequence Technique. The research were performed laboratorily as well as practically at the Nusantara Aircraft Manufacturing Company in Bandung [2, 4]. However, it is quite interesting to note that for the motions which Indonesian workers perform faster (5 % of them), most are for tool use motions.

IV. TYPE WRITER KEYBOARD DESIGN

The internationally widely used QWERTY type writer keys layout design has been found to be less productive compared to a design specifically developed to be used for typing Indonesian words. The Indonesian design were developed through considering alphabets use in Indonesian words and Physiological ability of the fingers. For a 100.000 words of typing, the new design requires approximately thirty minutes faster compared to typing with the standard design type writer [5].

V. THE NEED TO DEVELOP NATIONAL ERGONOMIC STANDARDS

The three research results which represents Indonesian cases might be found as well in other countries. Many works have proved the existence of anthropometrical differences between populations. Besides strengthening these findings in anthropometry, this paper also shows differences in speed of motion. In an industrialising country like Indonesia it is of importance to consider these facts since many practical aspects relate to them directly. Among others are efficiency dan productivity which have become national issues. The design of products especially used for productive purposes included also in this category as shown through the type writer keyboard layout design here.

This indicatates the importance of developing national ergonomic standards at least for relevant subject matters. Since there are many other Ergonomic subject matters which are strongly population dependent, it is a challenge for Ergonomists anywhere in the world especially in non western countries to extend their research in this area. The more this has been explored the more Ergonomics has share in national developments and in its turn receives more acceptance.

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ANTHROPOMETRIC DATA OF INDONESIAN WITH VARIOUS OCCUPATIONS

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Introduction

In carrying out development, Indonesia still has to import science and technology, which are not seldom, beside advantages gained until recently, creates various impacts or disadvantages in form of occupational diseases, accidents, ineffective and inefficient work processes which course to unproductive work and additional costs. Efforts in minimizing or omitting these negative impacts have been carried out through transfer and choice of appropriate technology, which covers six basic aspects or criteria, namely economic, technic, health / ergonomics, socio-cultural, environmental and energetic preservation and conservation. These aspects or criteria must be viewed and applied holistically and wisely with aim to minimize or to omit negative impacts. But in practice, such an approach is unreachable due to various reasons, among others due to lack of knowledge and technical know-how, lack of anthropometric data of the consumers, lack of coordination between related institutions and lack of umbrella legislation and regulation to be pursued. Facing all those obstacles and constraints, efforts had already being done to fill in the lackings, among others of having Indonesian anthropometric data. This study is one of those efforts, particularly in regard to the anthropometric data of drivers, passengers, industrial workers, government officials and farmers.

Method.

By using anthropometer Super anthropometric measurements were conducted in nine cities namely Meda, Padang, Palembang, Bandung, Semarang, Yogyakarta, Surabaya, Ujung Pandang and Denpasar. As samples were drivers of buses and trucks (all male), female and male passengers, government officials, industrial workers, and farmers. Items being measured were selected based on practical purposes.

Result and discussion.

Result are shown in table 1 and 2, which are grouped due to similar character. In fact, not all data were presented due to space limitation. And there is no significant differences exist between those various occupations. But anyhow, these data can be used in designing agricultural and industrial machines and equipments, office meubels and motor cars. By so doing, it is hoped that more "fit" man-task system in conducting development will be more possible to be attained, which course to better working conditions and environments.

Table 1 ; ANTHROPOMETRIC DATA OF INDONESIAN WITH VARIOUS OCCUPATION

MEASUREMENT	D R I V E R		P A S S E N G E R		G O V . O F F I C I A L	
	TRUCK	BUS	MALE	FEMALE	MALE	FEMALE
Number	460	491	459	448	450	400
Age((eyer)	31.92 ± 8.65	32.43 ± 7.94	25.08 ± 6.22	24.98 ± 8.78	30.66 ± 7.30	28.77 ± 7.39
Body weight(kg)	58.36 ± 9.49	55.92 ± 10.05	54.35 ± 6.68	47.10 ± 6.84	56.10 ± 8.09	47.57 ± 7.15
Stature (cm)	162.51 ± 5.59	161.86 ± 6.18	162.86 ± 6.43	152.31 ± 6.16	161.84 ± 6.24	152.31 ± 11.10
Shoulder breadth	48.34 ± 5.72	40.65 ± 4.75	40.36 ± 3.32	36.11 ± 6.38	40.27 ± 3.26	36.65 ± 2.51
Forward gripreach	70.31 ± 5.27	70.61 ± 5.84	69.26 ± 3.54	66.38 ± 4.61	70.61 ± 4.99	65.93 ± 5.67
Side arm reach	54.35 ± 4.73	54.29 ± 4.53	53.51 ± 4.08	53.51 ± 3.79	55.86 ± 7.33	52.27 ± 6.60
Sitting height	84.43 ± 3.89	90.12 ± 13.99	83.43 ± 6.88	78.71 ± 4.61	83.86 ± 4.84	79.10 ± 3.71
Eye level	73.35 ± 3.89	74.10 ± 5.03	74.35 ± 35	67.78 ± 4.60	73.57 ± 4.19	68.54 ± 3.49
Elbow rest ht	23.09 ± 3.41	22.74 ± 3.10	22.30 ± 2.72	21.56 ± 2.97	23.18 ± 3.35	21.88 ± 3.09
Vertical reach sitting	116.90 ± 5.29	115.75 ± 7.08	116.61 ± 5.98	108.87 ± 5.73	116.02 ± 5.78	107.04 ± 9.49
Hip breadth	31.64 ± 3.46	32.42 ± 13.02	31.38 ± 3.18	30.72 ± 3.81	32.23 ± 2.83	30.17 ± 4.49
Knee height	51.16 ± 4.07	50.44 ± 3.15	50.16 ± 3.66	47.40 ± 3.15	50.37 ± 3.04	47.74 ± 2.93
Popliteal height	42.23 ± 2.99	41.32 ± 2.84	41.60 ± 2.55	39.22 ± 2.72	41.48 ± 2.48	38.99 ± 2.86
Buttock poplit. length.	44.88 ± 3.45	43.82 ± 4.02	44.78 ± 3.35	43.31 ± 3.48	44.67 ± 3.54	43.89 ± 3.60
Buttock knee length.	54.36 ± 3.51	53.90 ± 3.72	54.92 ± 4.05	51.50 ± 3.73	54.20 ± 3.91	52.51 ± 3.51
Buttock finger length.	81.73 ± 10.78	86.99 ± 8.12	80.55 ± 4.35	82.72 ± 4.64	85.37 ± 11.01	81.85 ± 7.86
Buttock leg length.	95.62 ± 6.64	99.52 ± 8.52	94.14 ± 7.87	89.46 ± 7.47	95.46 ± 6.43	90.41 ± 7.81

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SOUTH EAST ASIAN ERGONOMICS SOCIETY
SECOND CONFERENCE, DENPASAR - BALI
INDONESIA, 27 - 29 JULY 1988

Table 2 : ANTHROPOMETRIC DATA OF INDONESIAN WITH VARIOUS OCCUPATION

MEASUREMENT	INDUSTRIAL WORKER		FARMER	
	MALE	FEMALE	MALE	FEMALE
Number	419	420	417	450
Age (year)	29.02 ± 7.65	26.07 ± 8.37	33.37 ± 10.39	29.53 ± 9.57
Body weight(kg)	53.69 ± 7.45	46.42 ± 6.00	50.82 ± 6.72	45.96 ± 6.08
Stature (cm)	160.97 ± 7.95	151.07 ± 5.38	160.39 ± 6.02	149.62 ± 5.56
Eye level Std	150.14 ± 6.35	139.33 ± 5.43	148.93 ± 6.14	138.05 ± 5.55
Shoulder height	134.46 ± 6.36	126.55 ± 6.27	133.54 ± 5.96	124.72 ± 5.34
Elbow height	99.07 ± 4.98	92.96 ± 4.67	98.77 ± 5.22	91.46 ± 5.16
Grip height	69.75 ± 4.64	65.44 ± 3.72	69.21 ± 4.42	64.74 ± 4.53
Vertical reach height	193.18 ± 8.39	180.28 ± 7.95	191.14 ± 8.45	177.33 ± 5.23
Forward grip reach	68.81 ± 4.78	65.03 ± 5.01	71.39 ± 9.32	63.41 ± 5.23
Side arm reach	53.65 ± 4.17	51.26 ± 4.57	54.49 ± 5.27	49.29 ± 4.36
Sitting height	82.61 ± 4.75	77.63 ± 3.95	81.81 ± 4.84	77.16 ± 3.66
Eye level st.	71.92 ± 4.30	65.85 ± 3.98	70.62 ± 4.69	66.34 ± 3.91
Elbow rest height	22.22 ± 3.26	20.79 ± 2.80	21.15 ± 3.70	21.06 ± 3.61
Hip breadth	31.36 ± 2.81	30.16 ± 4.14	30.56 ± 2.97	30.23 ± 3.27
Knee height	50.17 ± 3.25	47.03 ± 2.83	49.80 ± 3.42	46.22 ± 3.57
Popliteal height	41.35 ± 3.15	38.81 ± 2.92	41.26 ± 2.95	38.67 ± 2.61

Title of paper
 Author (s)
 Postal address
 Presenter

Table 2 : ANTHROPOMETRIC DATA OF INDONESIAN WITH VARIOUS OCCUPATION

MEASUREMENT	INDUSTRIAL WORKER		FARMER	
	MALE	FEMALE	MALE	FEMALE
Number	419	420	417	450
Age (year)	29.02 ± 7.65	26.07 ± 8.37	33.37 ± 10.39	29.53 ± 9.57
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Stature (cm)	160.97 ± 7.95	151.07 ± 5.38	160.39 ± 6.02	149.62 ± 5.56
Eye level Std	150.14 ± 6.35	139.33 ± 5.43	148.93 ± 6.14	138.05 ± 5.55
Shoulder height	134.46 ± 6.36	126.55 ± 6.27	133.54 ± 5.96	124.72 ± 5.34
Elbow height	99.07 ± 4.98	92.96 ± 4.67	98.77 ± 5.22	91.46 ± 5.16
Grip height	69.75 ± 4.64	65.44 ± 3.72	69.21 ± 4.42	64.74 ± 4.53
Vertical reach height	193.18 ± 8.39	180.28 ± 7.95	191.14 ± 8.45	177.33 ± 5.23
Forward grip reach	68.81 ± 4.78	65.03 ± 5.01	71.39 ± 9.32	63.41 ± 5.23
Side arm reach	53.65 ± 4.17	51.26 ± 4.57	54.49 ± 5.27	49.29 ± 4.36
Sitting height	82.61 ± 4.75	77.63 ± 3.95	81.81 ± 4.84	77.16 ± 3.66
Eye level st.	71.92 ± 4.30	65.85 ± 3.98	70.62 ± 4.69	66.34 ± 3.91
Elbow rest height	22.22 ± 3.26	20.79 ± 2.80	21.15 ± 3.70	21.06 ± 3.61
Hip breadth	31.36 ± 2.81	30.16 ± 4.14	30.56 ± 2.97	30.23 ± 3.27
Knee height	50.17 ± 3.25	47.03 ± 2.83	49.80 ± 3.42	46.22 ± 3.57
Popliteal height	41.35 ± 3.15	38.81 ± 2.92	41.26 ± 2.95	38.67 ± 2.61

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WORKPLACE DESIGN, NEW TECHNOLOGY AND ERGONOMIC IMPLICATIONS

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The distribution and extent of musculoskeletal disorders in industry has undergone a change in Sweden during the last decades. Back disorders were earlier the most common affections. These were considered to be partly caused by work and workplace features. Examples of risk factors shown to be important are heavy lifting, bending, stooping, twisting, repetitive movements, forceful movements and vibration exposure (Andersson 1981).

Industry has during many years introduced counteractions in attempts to prevent work related back pain. The strategies have been to decrease lifting, unsuitable postures and vibrations. This has mainly resulted in lifting aids, sometimes automated production systems, improved workplace design such as adjustable working heights and decreased working distances. New designs of lifting aids have evolved, for example hand manoeuvred force amplifying devices and vacuum regulated lifting aids, allowing fast and easy handling of goods. The increased use of fork lift trucks and pallets has also decreased the need of manual lifting. Use of bigger containers instead of smaller boxes or sacks also eliminates manual handling which is replaced by mechanical aids instead. Jobs have transformed from physical handling to regulation of equipment, machines and vehicle driving. All these changes together are believed to be the reason for the decrease in work related back disorders which now can be seen in Sweden.

Today, however, there is a strong increase of work related neck and shoulder disorders. The risk factors for these disorders are less known, but are considered to be static work postures, repetitive tasks, rapid movements, raised arms and stress among others (Kvarnström 1983). There is less experience concerning prevention in industry, partly since these problems are relatively "new". In fact, many of the manual jobs described above, have transformed into seated work tasks in which neck and shoulder disorders have become common instead. Examples of occupational groups which have undergone this development can be found in forestry and industrial production. Lumberjacks had previously back pain. They have now partly been replaced by machines and forest machine drivers, who are affected by shoulder pain. The earlier heavy manual materials handling in industry has now largely been eliminated, and is now instead performed by the use of fork lift trucks. The drivers of these trucks are often affected by neck pain due to the excessive demands of neck movements.

The strategies in industry to prevent these disorders are now to create good seated postures which cause minimal postural work load, and to create variation between several work tasks and work postures. In other words, work organizational changes are now seen as very important means to improve the situation in relation to the introduction of new technology.

In the application of ergonomics, the analysis of the work is central for all preventive measures. It is not enough to identify bad postures and the presence of risk factors for musculoskeletal disorders. For effective prevention, also the causes of an unsatisfactory situation emanating from the work demands must be identified. One way to analyse these causes, which has been shown to be a useful tool (Eklund 1986), is presented below:

ANALYSIS OF WORK TASK

<u>Visual demands</u>	!	<u>Demands on physical manipulation</u>
light	!	precision
contrasts	!	forces
glare	!	directions
object sizes	!	handgrips
viewing directions	!	postures
temporal pattern	!	movements
	!	temporal pattern
	!	
<u>Mental demands</u>	!	<u>Properties of the workplace</u>
mental load	!	physical dimensions
vigilance	!	spatial restrictions
concentration	!	exposure (vibrations, climate)
stress	!	

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PREDICTIVE MODELS
FOR
OXYGEN CONSUMPTION AND PHYSICAL WORK CAPACITY

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During prolonged physical work, the individual's performance capacity depends largely upon his or her ability to take up, transport and deliver oxygen to the working muscles. Consequently, the physical work capacity (PWC) or aerobic capacity is probably the most appropriate measure of a worker's physical fitness (Astrand and Rodahl, 1977). Both maximal and submaximal exercise tests can be employed to determine the PWC values. Though the first protocol is more accurate but the latter can predict the PWC with sufficient reliability and accuracy (deVries, 1980; and Fox and Mathews, 1981). This submaximal test can also be applied to sedentary or older individuals without discomfort and potential hazards associated with maximal tests (Astrand and Rodahl, 1977; and deVries, 1980). Both of the methods, however, are rather time-consuming. Thailand, as a developing country, also face one problem, i.e., equipment employed in the experiment, oxygen and carbondioxide analyzer in particular, is very expensive. Therefore, the need for a simple and rapid method is obvious if one wants to test larger groups of people. Besides, models developed in the western countries may not be applicable due to different kinds of equipment, methods and ethnic groups of subjects.

The purpose of this study was to develop and test mathematical models using simple significant variables to predict oxygen consumption and the aerobic capacity. Such variables were so simple that no expensive equipment was required. These models will be very useful to the collection of ergonomic data in the field being conducted in Northeast Thailand.

SUBJECTS AND METHODS

One hundred male subjects, 20-49 years of age, participated in the experiment. All of them were agricultural workers in Northeast Thailand and were accustomed to hard working activity.

The test protocol required each subject to pedal the bicycle ergometer (Monark) at 4 different workloads for 5 minutes at each load at a speed of 50 rpm. All subjects started off with a low workload. After resting for 15-30 minutes, they continued at a higher workload. During the last minute of each load, the oxygen uptake was determined by the Douglas-bag method collecting expired air through a half-face mask (Hans-Rudolph). The gas analyses were made by a AVL 954 Blood Gas Analyzer. With all variables corrected to STPD condition, the oxygen consumption was computed using a generalized formula (Fox and Mathews, 1981, p.607). The corresponding heart rate was recorded by a cardiograph recorder (Minigraph MG-1A). The PWC was then

calculated by extrapolating the regression line of 4 values of oxygen uptake and corresponding heart rate to the predicted maximum heart rate (220-Age) and projecting for the PWC in l/min as described by Kamon and Ayoub (1976) and deVries (1980).

To check on the reliability of the experiment, 20 subjects were randomly chosen from the original group and retested. Results were then statistically compared using a t-test.

To validate the models, an additional experiment was conducted using extra 20 male agricultural workers from other villages. They were asked to do the same test of the previous protocol. All data were recorded and later computed.

RESULTS AND CONCLUSIONS

Attempts were made to develop the mathematical models, from data of 100 subjects, using the stepwise multiple linear regression technique (least square criterion) from SPSS/PC Package. There were 3 types of models developed:

1) to predict PWC from age (A), a workload (L) in watts and the corresponding heart rate (HR) in a form of Von DobeIn, et al. (1967), labelled Model 1,

$$PWC = \frac{0.492 (L) + (3.662 - 0.013A)}{0.927 (HR)} \quad \text{l/min of oxygen}$$

2) to predict PWC from age, oxygen uptake (VO) in l/min at STPD and the corresponding heart rate, labelled Model 2,

$$PWC = \frac{0.881 (VO) + (7.6 - 0.008A)}{1.389 (HR)} \quad \text{l/min of oxygen}$$

3) to predict oxygen consumption using age and ventilation volume (VE) at STPD as independent variables. After executing several computer programs, it was decided to use an exponential form for the model, labelled Model 3,

$$VO = 0.172 \frac{0.918^{VE}}{0.307^A} \quad \text{l/min of oxygen}$$

The model validation employed data from additional 20 subjects. Table 1 shows the comparison of PWC values estimating from Model 1 and Model 2 as opposed to the predicted ones of selected researches. A one-way ANOVA procedure was conducted to compare the mean of PWC predicted values which proved to be significantly different at 5% confidence level. Further Duncan's test showed that Von DobeIn's was statistically lower than the others'.

Table 2 illustrates the comparison of oxygen uptake values predicted by Model 3 and by Bernard, et al. (1979). Based on the one-way ANOVA procedure, no significant differences occurred.

In all cases the predicted models from this study produces less errors (SSE, sum of square of the estimates) and smaller deviations. Test-retest analysis using a standard t-test showed

no significant difference ($t=1.64$) between the mean PWC values. The results confirm the validity of the research methods and equipment employed. The models will be used for data collected from the field where less expensive equipment is employed.

TABLE 1

No.	Model Sources	Data Used	Mean	Std. Dev.	SSE	F Statistic
1	This Study	20	2.90	0.53	-	
2	Model 1	20	2.85	0.38	2.62	
3	Model 2	20	2.90	0.40	1.47	11.697
4	Tayyari (1985)	20	3.15	0.50	3.20	
5	Von DobeIn (1967)	20	2.27	0.27	10.77	

TABLE 2

No.	Model Sources	Data Used	Mean	Std. Dev.	SSE	F Statistic
1	This Study	80	1.44	0.31	-	
2	Model 3	80	1.42	0.22	1.93	1.78
3	Bernard (1979)	80	1.35	0.24	2.27	

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Title of paper

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RELATION BETWEEN THE VDT OPERATING TIME AND
WORKER'S ESTIMATION OF WORK LOAD

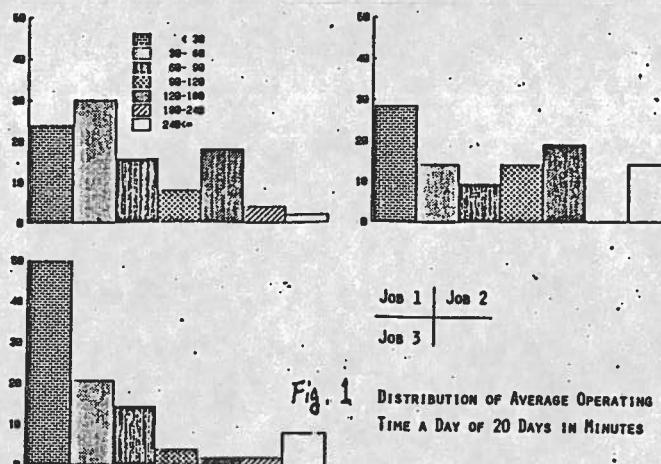
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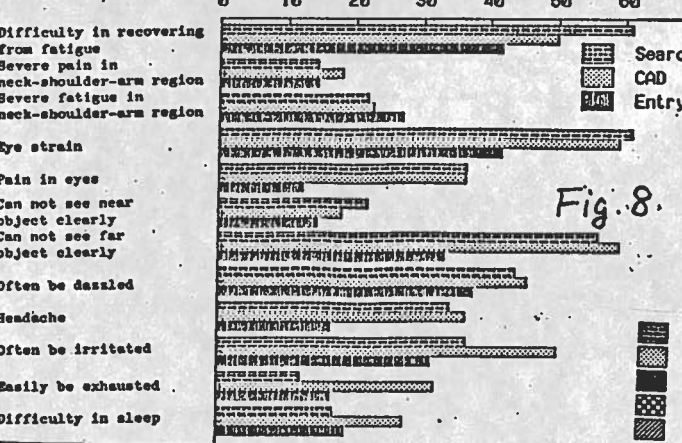
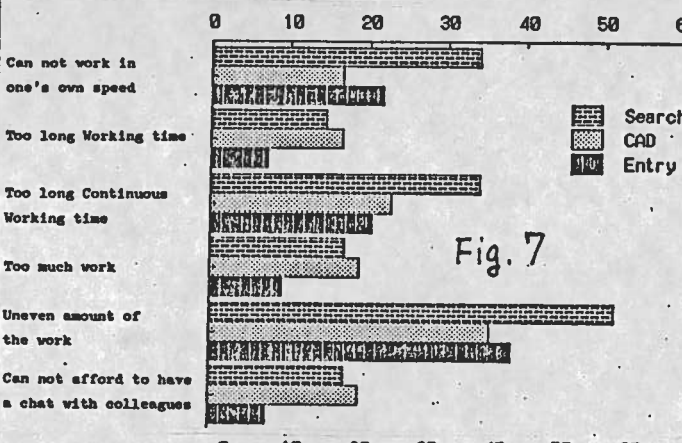
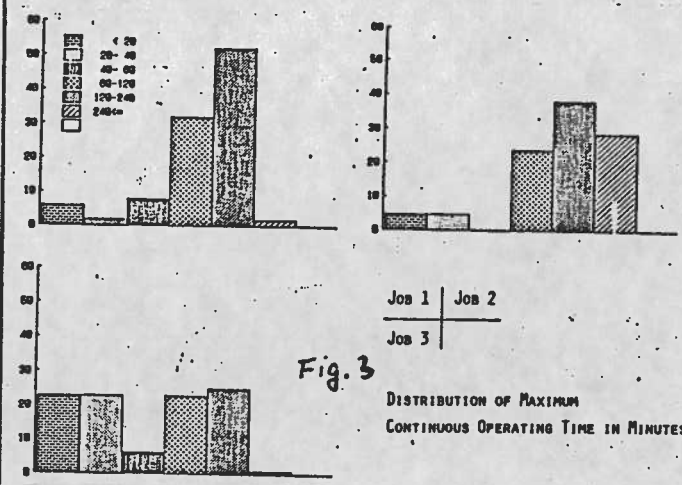
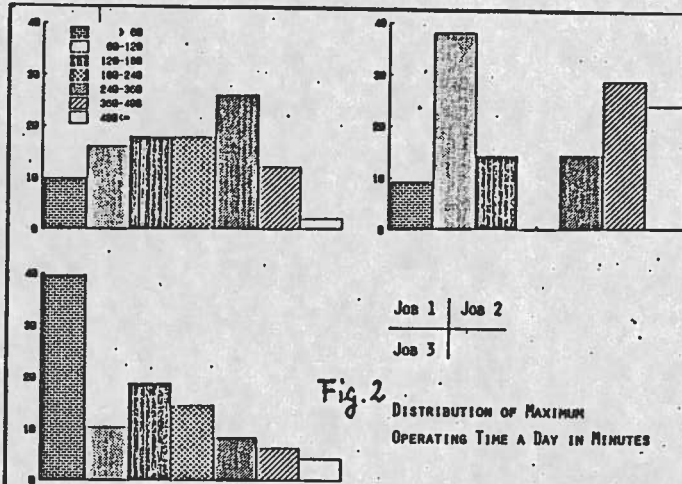
INTRODUCTION: In Japan, rapid computerization at office and manufacturing work has caused various kinds of health problems, such as psychosocial stress, symptoms of eye and vision, musculoskeletal strain, disorder of autonomic nerves and reproductive problems. In order to find out preventive measures of such occupational hazards, it is important to define the characteristic of VDT work load. Especially, operating time analysis is considered to be important, as VDT is used in different manners in various kinds of jobs. To grasp the characteristic of VDT work load, a study on VDT operating time by recording the usage of machines and a questionnaire study on work load and health condition of workers were carried out in an electronics company.

METHOD: Operating time of 86 VDTs was recorded for 20 working days, and the data of 19 VDTs at a purchasing and selling section (Job 1), 11 CAD units at a designing section (Job 2), and 12 VDTs at a production management section (Job 3) were analysed to compare with the results of a questionnaire study about work load and health condition of the workers at the sections. The main task of the workers is data searching at Job 1, CAD (Computer Aided Drawing) at Job 2, and data entry at Job3. The number of the workers who operated the VDT was 50, 21 and 48 in Job 1, 2 and 3, respectively. A questionnaire study was also carried out for the workers at those sections.

RESULT: Figures 1, 2 and 3 show the distributions of average operating time a day, maximum operating time a day and maximum continuous operating time of the workers in Job 1, 2 and 3. From these results following characteristics of the distribution of operating time are pointed out: 1) At Job 1, the variation of operating time a day among the operators is not big as that at Job 2 and 3. 2) Many of the workers in Job 2 are working for long time without rest. 3) At Job 3, half of them are working less than 30 minute a day in average, but a few workers are working long time.

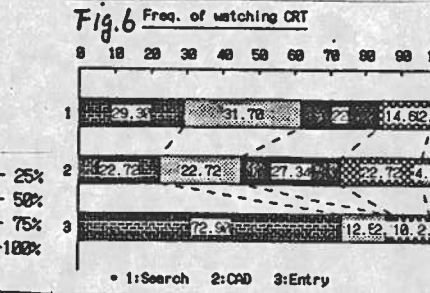
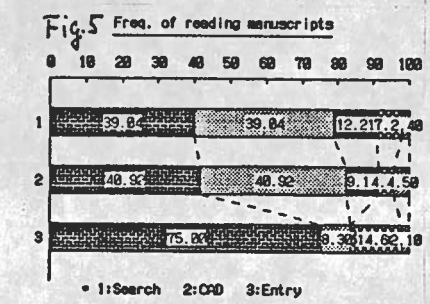
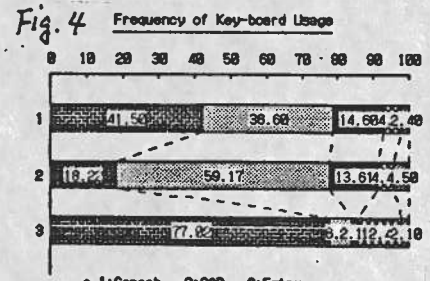


Workers' self estimations of the frequencies of using a key-board or "mouse", reading manuscripts and watching CRT are shown in figures 4, 5 and 6. Computer aided drawing units operators are using key-boards and watching CRT more frequently than the operators



in other jobs. Subjective complaints about work and health condition is shown in figures 7 and 8. The workers in Job 1 and 2 complain of eye and visual problems and general fatigue more frequently than the workers in Job 3. The rate of the complaints about mental stress is higher among the worker in Job 2 than others.

CONCLUSION: Work load and health condition of the workers of three groups using VDT in different manners was estimated by analysing the record of operating time, and the result of subjective questionnaire. The result showed that there exist some a little difference in the work load among three groups and the workers are complaining health problems relating to such difference in work load.



ERGONOMICS PROBLEMS OF CAMPUS "BEMO" TRANSPORTATION

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Introduction

Since 1986, University of Udayana started to use its new campus which is located at the Bukit area, about 30 km distance from the old one. It is about 30-40 minutes by car normally driven using public transport which is popular as "bemo". But in fact, in daily practice, less than 30 minutes driven were very often experienced by passengers who are mostly students. In addition, practically more than 10 passengers were accommodated in that small bemo, which was done by the driver for economic reason. In such a situation, it was assumed, that various unexpected things might happen, started from inconvenience trip up to accident, particularly with the bad traffic engineering found in several places. Of course one of the reasons is might due to unfit or un-match passenger and driver-seats systems, which are actually unnecessarily occurred if ergonomics principle was implemented during the designing phase of these small buses. And, certainly it can be done easily, since most of those buses are new ones, the body was designed and built in Bali. Since frequent trips will be carried out by the students, and trip comfortness and safety will influence their academic performances, for examples in following lectures, laboratory works, and examinations as well, ergonomic transportation means become a must, with the fact that more students will be using the new campus in the coming years in accordance with the Rector Policy, such transportation means are really needed. To attain that condition, an ergonomic study of current problems faced by passengers in a campus bemo was carried out as base data for improvements.

Method

Relevant anthropometric data of students and parts of "campus" bemo as well were collected. Questionnaires were also used to students, particularly in regard to their feelings and comments as passengers. Students proposal for improvements were noted as additional data.

Result and discussion

From questionnaires, it showed that 67.0% of the students said: "traveling in that bemo was really uncomfot". This is due to the squeezing condition (97.0%), no space for legs movement (100%), and the air within the bemo felt too hot (91%). In addition, about 97% said travelling in that bemo creates headache and unsafety feeling, which causes by too many passengers (73%), too fast driving velocity (73%) and rough driving (82%). And finally about 73% afraid travelling in that bemo due to unconvenience last experiences (91%). With all those comments, it is evident that it is really inconvenience travelling in that campus bemo, and that condition will certainly influence the performance of students in carrying out their tasks afterward.

Those comments were strongly supported by the fact that unfit passenger-seats system existed, among other in regard to seat width/length, space for legs and head for passengers.

Table 1, showed that seat length is shorter than 10 hip breadths, which course to inconvenience sitting. Although there is about 10 cm space for legs (122.0-11.4), practically it is still difficult to move the legs due to forced sitting posture as consequence of low seat height in compare to popliteal height. And average 2 cm difference between average sitting height + seat height and ceiling height make the movement is also impossible. In short, it is really inconvenience riding with that bemo.

As regard to driver-equipments relationship, foot reach average is 81.02 + 6.58 cm, while distances of brake, clutch and accelerator is 77.23 + 3.34 cm on average. It meant that theoretically equipments operated by foot are reachable. In relation to hand reach, 72.12 + 3.52 is the average, while all hand controls distances are 69.3 + 1.3 on the average. I meant also are still within reach. It is difficult to say, whether such an ergonomics condition encourage drivers to drive roughly and fastly.

With all those lackings, particularly in regard to passenger aspects, improvement is a must, particularly in facing the future development of the new campus.

Table 1. Anthropometric data of bemo and passengers (cm).

Item	Bemo	Passenger
Seat length "long"	192.40 ± 2.4 cm	
"Short"	125.13 ± 3.18 cm	
Hip breadth		32.56 ± 1.71 cm
6 students		195.36 ± 10.26 cm
4 students		130.24 ± 6.84 cm
Seat height	28.17 ± 2.60 cm	
Popliteal height		41.22 ± 1.56 cm
Space width	122.0 ± 4.24 cm	
Buttock knee of		55.72 ± 2.75 cm
Two students		111.44 ± 5.50 cm
Ceiling height	117.5 ± 2.32 cm	
Sitting height + seat height		115.02 ± 6.05 cm

TRANSFER OF TECHNOLOGY NEEDS REDESIGN

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KEYWORDS : Transfer of technology, Industrial Redesign.

INTRODUCTION

Too many factories imported in industrially developing countries are quickly dilapidated. Though some of them are able to yield a decent amount of production, the quality is generally low and the technical layout rapidly deteriorated. Three researches carried out in algerian paper mills (Kerbal 1988), tunisian and french paper mills (Sagar 1988) and senegalese chemical factories (Aw 1988) show how the mechanisms of dilapidation take place, what the workers succeed to do to fight the production decay and what can be done to reduce these costly phenomena.

METHODS

The general methodology has been described earlier (Wisner 1976). It is related to ergonomic work analysis (Sahbi 1984) recently transformed by Pinsky et Theureau (1987) who developed the concept of "course of action analysis". To understand the "course of action", it is necessary to study the whole behaviour (action, observation and communication) and to confront the worker with his/her recorded behaviour.

In the case of technology transfer, it is interesting to compare two situations, one in the seller's country and the other in the buyer's country. Sometimes the comparison takes place between two factories installed in two regions of the same country (Abraham 1986).

To avoid or - at least - reduce the undesirable effects of inconvenient transfer, a general method now used for systems design can be applied : the empirical anticipation of likely future activities. This anticipation is possible when the ergonomist is helped by a group of designers, experienced workers and shop managers during the design period (Daniellou 1988).

ORIGINS OF DILAPIDATION

Three domaines of mistakes or neglects can be considered : equipment, organization and training.

Too often, geographic differences are not considered during the preparation : for instance large quantity of pure water or stable supply of electric power with precise characteristics are assumed to be easily available everywhere in the world. In fact water and electricity are not supplied in the three types of plants studied at quantitative and qualitative lever implicitly considered in the design of the productive system. The disappointing characteristics of water bring about corrosion and abrasion and the unstability of the electrical

supply is related to unsatisfactory operation of automated systems. These important points are not the only ones which call for redesign of the equipment.

It looks cheap and efficient to transfer organization and training systems simultaneously with the equipment. In fact, organization is a bridge between equipment and environment (Wisner 1984). The contingency theory of organization (Robbins 1983) predicts that if environment is clearly different, organization has to change. This consideration is extremely important in the process industries studied by us. A high level of easy communication between all workers operating in this type of factory is recommended by all authors in industrialized countries. In fact, in the three types of plants studied, the communication devices were usually out of order, the competences of the workers were despised and the target of high quality was given up. An authoritarian type of organization had in fact taken place. But, many workers using their competence had reestablished some communication using verbal or non verbal languages and had more or less compensated the failing automatic devices. A more realistic approach of the real functioning of equipment, of the workers competence and of the difficulties they have to master can lead to an original and efficient organization.

Training is considered since the beginning of technology transfer as the main field of action to improve the running of systems. Though some authors continue to doubt the possibility of some ethnic groups to produce efficient industrial workers, this restriction does not seem to be real (Meckassoua 1986). But work analysis has to be used to describe both the initial and final stages of training. Too often the initial knowledge of workers acquired under very diverse circumstances (hunting, fishing, handicraft-making) is neglected or denied (Feuerstein 1980, Wisner 1988). The final effect of training is sometimes unrelated to the real difficulties the worker will have to solve in the plant. The tasks are defined in relation to theoretical operations that do not even take place in the seller's country and are of course very far from the actual problems of a dilapidated factory. In one of the factories considered by us, the very modern training center installed within the plant, ignores the real state of operation of the neighbouring shops.

The highest grade of unreality sometimes takes place during the "test run", scheduled as the contractual end of the seller's role for the factories sold "keys in hand". During the few days of the test run, pure and abundant water and stable electricity supply are requested, a numerous group of experienced engineers and operators are displaced from the seller's design, production and maintenance departments. The test run succeeds usually under these conditions. But it is not uncommon that either the whole plant or at least some part of it will never work again. The real conditions of exploitation quickly appear and the problem of the inadaptation of equipment, organization and training to the local

conditions that have not been studied before, have to be solved under the worst conditions. A prior empirical anticipation of likely future activities would have allowed a limited but efficient redesign of the transferred technology.

REDESIGN

In most industrially developing countries, original design of new plants is not yet possible due to the scarcity of competent engineers, though a country like Brazil has now got over this stage in many fields, for example the distilleries described by Abrahao (1986). But even inside this country, important adaptations have to take place in relation to local constraints. Special parts of the technical layout have to be modified in relation to the natural and industrial resources. Spare parts stocks have to be fitted to local conditions. Organization needs rethinking as the environment is different. Training should be adapted to meet the real situation of the sometimes impaired plant, the initial competences of the available manpower and the poor local technical support.

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ERGONOMIC WORKSTATIONS FOR PRODUCTION SEWING TASKS

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INTRODUCTION

Within the last few years, upper limb strain injuries have been recognised as a serious problem in the textile industry. Other industries which require highly repetitive, short cycle tasks and which experience similar problems are the electronics industry (assembly tasks) and food processing. For the industries concerned, the costs in sickness absence and high labour turnover are very serious indeed. It is however notoriously difficult to record statistics from the textile industry in order to judge the true scale of the problem.

The present study of sewing workstations was undertaken as a result of wrist pain and injuries reported by machinists. Observations of several production sewing tasks have been drawn together to produce preliminary recommendations for the design or redesign of sewing workstations, and to form the basis for a detailed study of the sewing task which will be aimed at identifying the changes which need to be made to reduce the levels of injury.

INVESTIGATION OF THE SEWING TASK

The sewing tasks were studied on the production line in some detail using video film. In addition to this, machinists were interviewed and a larger number were asked to complete questionnaires in order to obtain information about the work they were performing, their experience of fatigue and discomfort during the working day and the influence of the workplace layout on how they performed their task.

A great deal of information was obtained from the workers themselves, which helped to illuminate both the problems identified by the managers and the measurements taken from video. In one study, it was found that well over half of the machinists felt that they were not able to work at full efficiency throughout the working day due to the pain or discomfort they experienced in doing the task. Some experienced serious fatigue as early as mid-morning, while others reported such fatigue as occurring in the second half of the working week. This was closely related to the type of work on which they were engaged.

SEWING TASK

The responses to the questionnaires showed that machinists were able to identify very specific sites of discomfort which were related to the task. For instance, several grips are used in sewing both for holding material and for performing fine operations such as tying off or sealing threads. These can cause strain injuries to the fingers as well as the more commonly reported wrist injuries.

The study also showed that the upper limb strain injuries were not simply related to the primary (right-handed) task of feeding the material through the sewing machine. Machinists reported other problems in the left hand and in the fingers. The left hand is typically used to spread out the bulk of material across the sewing table, moving it at the same rate as the seam. The movements performed by this hand are not as fine as those of the right hand and there are fewer movements, but the hand is lifting a greater weight of material.

WORKSTATION DESIGN

The main objective of the studies reported was to reduce strain injuries occurring among machinists, and the direction was to look at modifications which might improve arm postures for these operations. However, it was found that the overall design of the workplace had to be considered first. The design of sewing tables resulted in poor working postures for the machinists, which appeared to be the cause of much of the fatigue and discomfort reported by them.

The main workplace factors which influence the visual and postural demands of the task, and which need to be considered by the manufacturers of sewing machines, were identified as:

- * Seating posture and relationship between the heights of the seat and work surface
- * Clear view of the sewing point and needle foot
- * Fore/aft and lateral position of the pedal in relation to the sewing head
- * Adequate knee room under the sewing table

It is hoped that the further studies which are planned to investigate arm movements in sewing operations, will provide more detailed guidelines for manufacturers on the interrelationships between the layout of the machine controls, the seating and delivery of material, as well as improvements to the detailed elements of the task itself.

100.91

THE EFFECT OF LOW-HIGH OF HOUSE FLOORS ON
PERFORMANCE OF BROILER CHICKS.

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In order to produce well broiler, the chicks must be comfortably housed such as adequate room in the house, a moderate temperature, sufficient air space and ventilation to prevent stuffiness in the house, dry living quarters and light (Winter & Funk, 1960) and Siregar et al (1980) suggested that day old chicks (DOC) should be uniform, feed should be good in quality. The circulation of the air in the house is very important in tropical countries, particularly Indonesia where dirty air usually high of ammonia (NH₃) concentration which is dangerous for the chicks. Ensminger (1980) said that the amount of the fumes (NH₃ fumes) is good indicator of the adequacy ventilation. Sosroamidjojo and Soeradji (1978) suggested that, an animal house should be healthy (easy to clean, good ventilation, keep away defected light), strong, low cost but qualified and comfortable for the animal, while over crowded conditions cause chicks to develop faults such as picking, feather eating, cannibalism and high mortality rate.

Concerning the those mentioned above, an experiment on broiler chicks was carried out at Madra farm, Gianyar, Bali, to study their response on low-high of house floors for 6 weeks (February-March 1985). Here, the observation on the farmer also was carried out during the work. The design of the experiment was CRD with 3 treatments were: ground floors with rice hull (T1), 0.7 m height of floors with rice hull (T2) and 1.0 m height of bamboo slotted floors from the ground (T3). Three hundreds DOC of CP 707 were used in each treatment. They were fed ad lib. with Charoon 511 and 512 for the first 3 weeks and the last 3 weeks respectively. Water was available all times.

The chicks data were analyzed with ANOVA (Snedecor and Cochran, 1961) and if there was a significant among the treatments the analysis was continued with the Duncan's multiple range test (Steel and Torrie, 1960). No statistical analysis was carried out on the farmer data. The experiment resulted the final live weight, weight gain per head of the T3 were significantly higher ($P < 0.05$) and its mortality and respiratory disease was significantly lower ($P < 0.05$) than the others (Table 1). This may have been due to the circulation of the air was better than the others where NH₃ and CO₂ from its manure and respiration could away from the house easily (Sosroamidjojo and Soeradji, 1978). Good air circulation could maintain O₂, keep CO₂ levels low, remove dust or moisture and NH₃ from the building, and maintain suitable temperatures (Ensminger, 1980). In this experiment, high mortality rate and respiratory diseases on T1 and T2 were indicators of the high concentration of the NH₃ and CO₂ in the house.

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Table 1 : The effect of low-high of house floors on
performance (\pm SE) of broiler chicks

Response	Treatment					
	T1		T2		T3	
Initial wt/head (g)	46.3	$\pm 0.1^a$	46.3	$\pm 0.1^a$	46.0	$\pm 0.1^a$
Final wt/head (kg)	1.586	$\pm 0.013^b$	1.615	$\pm 0.011^b$	1.706	$\pm 0.002^a$
Weight gain/head (kg)	1.540	$\pm 0.114^b$	1.578	$\pm 0.011^b$	1.660	$\pm 0.020^a$
Feed Consumption /head (kg)	2.887	$\pm 0.010^a$	2.967	$\pm 0.014^b$	3.213	$\pm 0.009^c$
FCR/head	1.91	$\pm 0.01^a$	2.02	$\pm 0.02^a$	1.94	$\pm 0.01^a$
Mortality (%)	6.00	$\pm 0.01^a$	5.00	$\pm 0.01^b$	2.33	$\pm 0.01^c$
Respiratory diseases	8.0	$\pm 1.2^a$	8.0	$\pm 1.5^a$	3.0	$\pm 0.6^b$

Within each row, values with different superscripts show significances ($P < 0.05$) between treatments.

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NECK AND SHOULDER COMPLAINTS AMONG GARMENTS WORKERS IN DENPASAR

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Introduction

In Bali,these last few years garment industries became one of the most important industries in developing foreign currencies earnings and employment opportunity as well.In 1986,US \$ 6,254,879 was earned and about 40,000 workers,mostly female were employed through this industries. In 1988,an increase of 100% was achieved.It is really one of the succesful development programmes beside other attainments achieved from tourism and agriculture.And it will keep growing,and become one of the most expected industries which solve employment matters.And since particular skill is needed to work in such an industry,both employees and employers as well,are strongly hope that they could keep on working as long as possible,as far as financial matters are concerned.Beside that both are also having similar motivation,how to gain benefit as much as possible through productive works.Of course to attain such a condition of work,it must be done in a healthy,safety,comfortable and efficient way,and this can be only reached if a fit man-task system can be organized and developed.

But such a condition was assumed too difficult to be achieved,since workers are mostly obliged to work with existing work condition provided by the employers.Very often they have to work in a very bad working environment as far as ventilation and lighting are concerned.Beside that,they have to work with sewing machines by sitting on seats which both are not appropriately designed.Sewing machines have to be purchased as such from the market,while seats were provided when suitable,without thinking whether they were fit each other.This unfit condition was proofed by observing unnatural working posture showed by the workers.And with such kind of work,neck and shoulder beside other complaints usually raised by the workers,which will influence their performances due to inefficient and ineffective works.To proof that such a condition of work is really exist,a study was carried out.

Method

A questionnaire was conducted among sewing machine workers about their comments of work being done,particularly in regard to impacts on neck and shoulder in form of complaints.Years of work and anthropometric measurement of relevant body parts,were also noted.

Result and discussion

Data collected from the questionnaires showed that as a whole about 32.17% of workers were having neck and 43.48% were having shoulder complaints.In regard to work period,years of work had high correlation with those complaints,also sitting height and stature had similar result.

Table 1. Correlation of complaints, work period, sitting height and stature

Complaints	Work period	Sitting height	Stature
24.21 %	0 - 1	77.63 cm	150.87 cm
24.21 %	2 - 3		
4.03 %	4 - 5		
5.5 %	>5		

Anthropometric data of particular parts of the body and sewing machine height and size showed an unfit condition each other, which was also supported by unnatural body posture found through observation. The situation became more worse with workers having body height above 160 cm. Similar thing happen to those with body height lower than 140 cm. Table 2 showed more clear that results.

Table 2. Anthropometric data of workers and sewing machines

Item	Workers	Sw. Mach.	Item
Sitting height	77.63		Work design height
Elbow height	19.6±2.06	49.3 cm	Seat height
Popliteal height	36.3±2.02	39.0 cm	Seat height
Lower arm reach	41.2±1.50	83.5 cm	Table width
Lower arm reach			Table length

With all those above data, and result of observation at the place, it is understandable that neck and shoulder complaints could emerged. And such a condition can not be tolerated, especially with the benefit which had been given by that industry recently and in the coming years. Therefore improvement become a must.

ERGONOMIC RECOMMANDATIONS FOR THE LOAD CARRIAGE

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Work safety legislation in Europe does not seem designed to limit the risk of accidents associated with handling operations. The ISO recommendations for 55 and 105 kg of handling load are certainly too high. The long physiological study have been realised in our Laboratory from 1980 with different tasks of load carriage : lifting, carrying over 10 m and the association of lifting and carrying loads (10 kg to 50 kg carrying 2/min, 2,5/min and 3/min). The subjects of our study have been the men and women, from 20 to 56 years.

The results shows that the physiological strain depends proportionally from carried tonnage, not only from the mass of load. So, for the repetitive tasks it have to limit not only the unitary mass of load, but especially the tonnage. The time of carrying loads over 30 kg is limited not simply by the cardiovascular factors, but also by the biomechanical factors; it is potentially dangerous for the spine's integrity; the efficiency of work decrease when the load increase,

It is very important to distinguish two rhythms of task execution :

- the repetitive load carriage when the task is repeated more than once by 5 min by the several hours regularly,
- the occasional load carriage when the task is repeated less than once by 5 min, not regularly by the work-shop.

We have shown that the obstacles of course can increase the cardiac strain of load carriage about 100%. The age over 45 years is the limiting factor for carrying loads over 15 kg.

In the last part of study the professional store-keepers have been examined. The cardiac strain observed on professionals is not different from the average untrained subjects. In their job posts the cardiac strain observed on professional store-keepers is acceptable if they have no time pressure.

The ergonomic recommendations for the repetitive load carriage are :

- maximal load to carry over 10 m by a man **25 kg**
- maximal load to carry over 10 m by a woman **12,5 kg**
- maximal tonnage to carry over 10 m by a man **3 t/h (50 kg/min)**
- maximal tonnage to carry over 10 m by a woman **1,5 t/h (25 kg/min)**

Some correction's coefficients (CC) have to be applied for distance, task's characteristic, age, conditions of lifting. The maximal tonnages only have to be multiply by these correction's coefficients.

Maximal tonnage to carry for sex, age and distance in t/h.

Distance	Age-sex		M 18-45	M >45	M <18	W <18
	!	CC !			W 18-45	W >45
	!	1	1	0,8	0,5	0,4
20 m	!	0,5 !	1,5	1,2	0,75	0,6
10	!	1 !	3	2,4	1,5	1,2
4	!	2 !	6	4,8	3	2,4
2	!	3 !	9	7,2	4,5	3,6
1	!	4 !	12	9,6	6	4,8

Carriage conditions	Maximal carried tonnage	CC
Carrying in the reference conditions only	3 t/h	1
Lifting from the ground, carrying and set down	1,5 t/h	0,5
Load carriage in unfavourable conditions	1,5 t/h	0,5

ERGONOMIC ASPECTS OF BALINESE TRADISIONAL HOUSING

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In the tradisional life of Balinese people, material and spiritual matters are always put together including in their efforts to reach their welfare ("jagadhita") and permanent happyness ("moksha"), as final objective where all elements forming the human body is back to its sources. This concept lead to the ergonomic matters in their life also consist of spiritual ergonomic and physical ergonomic. Man (as microcosmos) is believed has similar elements with the universe (as macrocosmos), where man as a content and universe is the container that suitable for live, giving source of life and also as the final objective. The man has very restricted element consist of spirit, energy and body and the universe has the unrestricted ones.

The human body can be devided into three parts (legs, body, and head), so do the universe into "bhur loka" (lower stratification), "buah loka" (midle stratification) and "shuah loka" (uper stratification).

Both body are made from five kind of element that's called "Panca Maha Butha" (solid things, liquid things, air, light, vaccum), called pratiwi, apah, bayu, teja, and akasa.

Based on this concept Balinese (as microcosmos) would like always to imitate the macrocosmos in constructing their environment and building.

The problem is man never know what is the form and the dimension of the macrocosmos look like. But they are very sure and believe there is similarity between microcosmos and macrocosmos in element composition and also in physical divisions. So to imitate the macrocosmos. will be the same as imitating the man.

This concept has been applied in various level of environment such as for the space structure of traditional village pattern, houses, building, even the components of the building, and people will live in the middle parts.

Vertically the three parts divisions will consists of lower, middle and upper parts. Horizontaly the direction of the axis will follow the position of mountain as a holy (head) direction and the position of the see as a lowest direction.

For more detailed division, sun rise directions or the direction of earth movement can be used as an additional factor. This matter influanced the arrangement of sleep position, where spiritually the head as directed to the mountain and mechanically to the east direction.

The Balinese traditional houses has several kind of buildings with each of them has a special function such as the building for prying, sleeping, ceremony, cocking, and paddy storage. The central outdoor space is the center of orientation of buildings. The buildings are arranged as a compound pattern where the setting follows a tight tradisional building codes and setting/zoning regulation (astha kosala, and astha bumi).

The distances between buildings allow a good circulation of the air that touch each side of building, and maintaince a good ratio between covered and open area. The distance is determined by a traditional measurement based on the lenght of foot as the basic unit measurement with a traditional accounting calleed "astha wara" (Sri, Indra, Guru, Yama, Ludra, Brahma, Kala, Uma).

The dimension of the door for entrance gate of houses derived from the man who hold up his right hand with an additional measurement (pengurip) depend on the direction of the door face for the hole night, and the wide of man with arms akimbo for the wide hole of the door.

The hight of the floor is arranged to overcome the humidity caused by the capilarity of ground water (since the floor is made of traditional building material). The level of the floor corespond to the values of building function. The higher of level is the higher of functional value of the building.

The wide of steps canbe determined by the length of foot with an additional wide of foot, and the hight of step with one fist ("musti").

Other ergonomic aspects can be found also in the hight and dimension of fixed bed and the arrangment of the number or position of the joist that support an elastic sheet wich made of bamboo.

The space between the edge of roof and the top of wall always allow the movement of the air and create a good cross ventilation.

From the examples above can be seen that Balinese traditional housing has many ergonomic aspect that principally can be developed and maintained. But we know the development should include several kind of fasilities that has not been regulated. So the basic principle in Balinese traditional ergonomic aspects should be nodefied and take it into account in adapting the development need.

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Title of paper

Human Interface Design in Traffic---Traffic Guide Sign And
Unsafe Driving Behaviors At Fork Roads---

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1. Objectives

Traffic deaths in Japan are keeping the same level of 9000 or more every year for last 5 years. Strong legislative measures conducted by authorities seems not effective. More ergonomic ways had better be taken to improve the current situation. Redesign of traffic guide sign should be taken into consideration as high priority issue. This study aims to prove that poorly ergonomic design of guide sign causes very serious dangerous situation, which hardly be solved by legal control.

2. Method

Major three fork roads in Yokohama city with inadequate design of traffic guide sign from ergonomic point of view were chosen to be studied. Continuous observation of traffic flow for 1-2 hours with an aid of video-tape recording with timer superimposed was conducted. Unsafe driving behaviors recorded were categorized by the degree of danger, and frequency of them was analyzed in relation to the road construction as well as design of guide sign.

3. Results and Discussion

Actual direction of major regions are against the common sense of geography due to the cubic crossing of roads right after the fork road at the Hodogaya interchange on an expressway (A). A tunnel passageway to prevent traffic jams has been completed a year ago at Takashima-cho junction near the Yokohama station(B). But very few driver knows this. The lane along the central line for city center of route No.1 changes suddenly to the lane for the right turning only at the crossing section of Mitsusawa(C). The common ergonomic problems for them are that traffic guide sign indicating right directions are located just over the fork road, not ahead the divergent point of the roads. Therefore, many unfamiliar drivers were confused with sudden notice by the sign and tended to change directions sharply(Fig.1)

These urgent change of their minds caused serious confusion near the fork roads. Quite a number of cars were observed to have taken unsafe driving behaviors. Some cars dared to try to cross several lanes almost orthogonally to change direction on the expressway(A), and a car behind this was forced to stop urgently. It was a near accident of head-side collision. Some cars went back on the expressway to correct his direction.

Observed number of cars who did unsafe change of their directions was larger than expected, varied 70-250 vehicles among 2000-3200 vehicles passed through during the observing period. Frequency rate of unsafe driving was between 3.4 and 7.9%. (Table1)

Frequency distribution of mean time between unsafe driv-

ing behaviors at each fork road showed the same pattern. The highest frequency was less than 30 seconds. In another words, more than half of the unsafe drivings at the fork roads were observed every 30 seconds (Fig.2). Whenever occur, they concentrate. This implies such an unsafe driving behaviors are caused by some structural background rather than by individual carelessness.

Major structural reason is the wrong location of traffic guide sign. It is no use to indicate very crucial information on the stage of action taking which should be based on. It's too late. Location of the signs is equivalent to the timing of displaying proper information. Redesign of the guide sign can be treated as a design of human interface in traffic.

When we consider human interface design, design should be followed after the cognitive process concerning time and space, and never depends on attention and/or memory. Contextuality as well as legibility, noticeability and understandability are considered very important aspects for adequate human interface in traffic.

4. Conclusion

Very frequent unsafe driving behaviors at fork roads regardless of downtown roads or expressway were caused by poorly designed guide signs lacking considerations of human cognitive natures. 70-250 cars showed very unsafe change of their directions among 2000-3200 cars during only 1-2 hours observation. Redesign of traffic guide signs is urgently needed and is possible by introducing new concept of contextuality in designing traffic signs.

TABLE 1
OVERALL FREQUENCY OF UNSAFE DRIVING BEHAVIORS AT FORK ROADS

PLACE	TIME OF OBSERVING (MIN.)	TRAFFIC AMOUNT (CARS)	UNSAFE DRIVING CARS	FREQUENCY OF UNSAFE CARS (Σ)
A	55	1952	69	3.5
B	60	2563	86	3.4
C	120	3158	249	7.9

A: DAISAN KEIHN EXPRESSWAY, HODOGAYA INTERCHANGE
 B: TAKASHIMA TUNNEL PASSAGE WAY
 C: MITSUSAWA NISHIMACHI CROSS SECTION

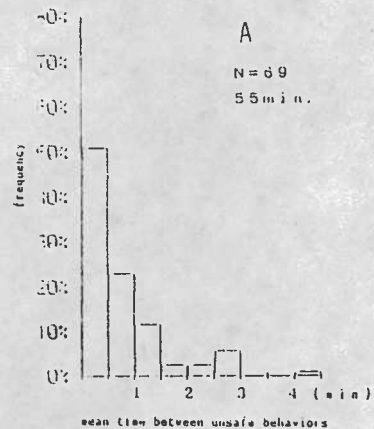


FIG.2 FREQUENCY DISTRIBUTION OF MEANTIME BETWEEN UNSAFE DRIVING

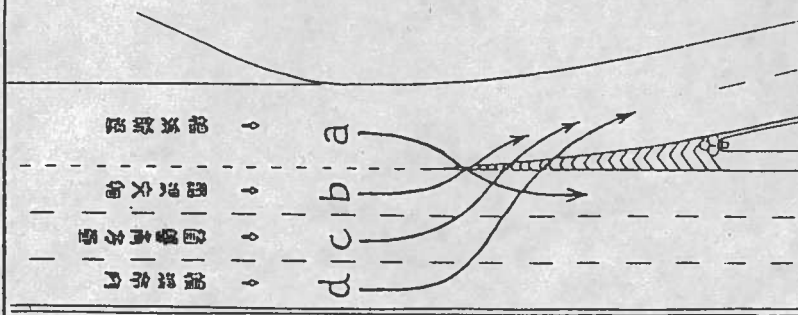


FIG.1 UNSAFE DRIVING AT FORK ROAD (A)

CHECK-LIST

MATERIALS STORAGE AND HANDLING

	<u>DO YOU PROPOSE ACTION?</u>			<u>REMARKS</u>
1. Clear everything out of the work area which is not in frequent use.	<u>NO</u> / /	<u>YES</u> / /	<u>PRIORITY</u> -- / /	
2. Provide convenient storage racks for tools, raw materials, parts and products.	<u>NO</u> / /	<u>YES</u> / /	<u>PRIORITY</u> -- / /	
3. Use specially designed pallets to hold and move raw materials, semi-finished goods and products.	<u>NO</u> / /	<u>YES</u> / /	<u>PRIORITY</u> -- / /	
4. Put stores, racks, workbenches, etc. on wheels for easy handling.	<u>NO</u> / /	<u>YES</u> / /	<u>PRIORITY</u> -- / /	
5. Use carts, moveable racks, cranes, conveyors or other mechanical aids when moving heavy loads.	<u>NO</u> / /	<u>YES</u> / /	<u>PRIORITY</u> -- / /	

WORKSTATIONS

DO YOU PROPOSE ACTION?

REMARKS

6. Put switches, tools, controls and materials within easy reach of workers.

NO YES PRIORITY
 / / -- /

7. Use lifts, levers, or other mechanical measures to reduce the effort required by the worker.

NO YES PRIORITY
 / / -- /

8. Provide a stable work surface at each workstation.

NO YES PRIORITY
 / / -- /

9. Use jigs, clamps, vices or other fixtures to hold items while work is done.

NO YES PRIORITY
 / / -- /

10. Adjust the height of equipment, controls or work surfaces to avoid bending postures or high hand positions.

NO YES PRIORITY
 / / -- /

11. Change work methods so that the workers can alternate standing and sitting while at work.

NO YES PRIORITY
 / / -- /

12. Provide chairs or benches of correct height with a sturdy backrest.

NO YES PRIORITY
 / / -- /

