FOR BETTER EDUCATION & TRAINING FOR ENGINEERS

ideas

ACCREDITATION AND PROFESSIONAL PRACTICE

NUMBER 3
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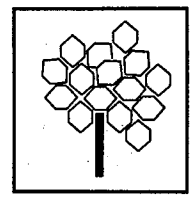
UNESCO

WFEO

COMMITTEE ON EDUCATION AND TRAINING
WORLD FEDERATION OF ENGINEERING ORGANIZATIONS

WFEO HAS A NEW PRESIDENT

At the General Assembly held in Budapest in October 1995, the Argentine engineer Conrado E. Bauer took office as chairman of the Federation



Conrado Ernesto Bauer, Civil Engineer born in the city of La Plata in the province of Buenos Aires in 1927. Graduated at the National University of La Plata, with postgraduate studies in Argentina, Spain and the United States. He was Dean of the Faculty of Physics, Mathematics and Sciences of his University and later on Vicepresident.

He actively practised his profession as a civil engineer founding a consulting firm dedicated to technical and economic studies and engineering projects.

Conrado Bauer has a long and ascending career in official functions where he has been an example of hard work, initiative and executiveness. He started in 1958 as Secretary of Public Works of the Town Council of La Plata, Subsecretary and Minister of Public Works of the Province of Buenos Aires and in the national sphere, Minister of Social Welfare and Minister of Public Works in Argentina.

He participated actively in the Engineering Associations that constitute UADI, the WFEO Argentine National Member, where he was able to demonstrate the clarity of his thinking, his energy and ecuanimity. In 1978, when Prof. Miguel A. Yadarola took over the Presidency of UADI, C. Bauer was invited to set up and preside the UADI Committee on Engineering and Environment of this organization that unites all Argentine engineers. A year later, in 1979, WFEO created its Environment Committee and summoned the National Members to propose Headquarters and President. At the General Assembly held in Djakarta, C. Bauer and M. A. Yadarola stood in favour of the Argentine proposal confronted with another four presentations. The favourable result brought about Conrado Bauer's entry in WFEO as President of the Committee on Engineering and Environment, a position he held for two periods of four years each. When he ended his presidency, Bauer had managed to structure the best Committee in WFEO with concrete and ambitious programs.

Thus the World Federation became familiar with the dynamic personality, and leadership qualities of our President. And when in 1991 at the General Assembly in Arusha Tanzania, it was necessary to cover the new position of President Elect within the Executive Council, to replace William Carroll in 1995, C. Bauer was unanimously elected.

In October 1995, during a touching ceremony at the Headquarters of MTESZ, WFEO National Member for Hungary, Conrado Ernesto Bauer took over the presidency of WFEO for four years. BUENA SUERTE, CONRADO!

FMOI
WFEO

WORLD FEDERATION OF ENGINEERING ORGANIZATIONS
FEDERATION MONDIALE DES ORGANISATIONS D'INGENIEURS

COMMITTEE ON EDUCATION AND TRAINING
JOURNAL IDEAS N° 3
January 1996
CONTENTS

**UNITED NATIONS
EDUCATIONAL
SCIENTIFIC AND CULTURAL
ORGANIZATION**

UNESCO ON ITS 50TH ANNIVERSARY

Education has always been a tool for social and cultural progress of countries. Science also, as a tool for technological and economic progress and for the welfare of Humanity.

Education, Science and Culture should then be the basis for Peace. This was how UNESCO was born in 1946.

Fifty years of activity are showing the wisdom of the founders that at the end of Second World War believed that another such catastrphe could only be prevented through the spread of knowledge and through international cooperation. The creation of UNESCO signified the first time that an intergovernmental organization had been given a major responsibility for the development of international relations in education, science and culture. Henceforth, UNESCO was to work hand in hand with non governmental organizations these fields of activity and an example of this is its support to the programs of action of WFEO, UATI, ICSU, ICET and many regional organizations to comply with common objectives.

Furthermore, it is worth remembering that UNESCO was the promotor of the creation of a worldwide organization that linked engineers of all countries, through their National Federations. At an invitation from UNESCO, existing regional engineering organizations in 1968, were summoned to Paris Headquarters and from those summons WFEO came to be. From similar summons ICET (International Council for Engineering and Technology) was born in September 1994 when at UNESCO Headquarters the joint venture between UATI and WFEO was signed to strengthen the capacity for action of both entities at a worldwide scale.

The world knows what UNESCO has meant in the improvement of education to allow scientific and technological development and to heighten the cultural level of countries. And it is thankful for that.

Also we, engineers united in WFEO, who want to use our knowledge to build a just and more human world, join our voices to say to UNESCO and to whom are and have been its officers and authorities:

UNESCO: Thank you for 50 years of fruitful work in benefit of peace through the impluse given to scientific, cultural and educational development in all countries of the world.

Prof. Miguel Angel Yadarola
President, WFEO Committee on Education & Training

IDEAS is a publication of the WFEO Committee on Education and Training, with partial support of UNESCO, addressed to engineering educators, educational officers at Universities and leaders responsible for establishing educational policies for engineering in each country. The articles it contains reflect the concern of people and institutions linked to WFEO, to provide ideas and proposals with the object of improving formation of engineers.
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UPADI
Pan American Federation
of Engineering Societies

UPADI was founded on July 20, 1949 during the 10th Convention of USAI. It is the first continental engineering organization created in the world. It was born on the basis that USAI (South American Federation of Engineering Societies) gave it 14 years before, in 1935 and dissolved when an organization uniting the engineering of the whole of America was created. UPADI was also the first international organization that structured Technical Committees to support its operation and the first Committee created was the Commitee on Engineering Education in 1956 that has been responsible for the performance of 26 Panamerican Congresses on Engineering Education. This Committee is performing an ambitious program, with economic support from the Canadian Council of Professional Engineers (CCPE), called "Accreditation of Engineering Education in Latin America".The three Seminars held and a preliminary document on the subject, are part of the article that follows the Recommendations of the III Seminar.

III PANAMERICAN SEMINAR "EVALUATION AND ACCREDITATION OF ENGINEERING STUDIES"

1-3 August, 1995
Asunción, Paraguay

UPADI Committee on Engineering Education

Conclusions and Recommendations

1. The internationalization of professional practice in engineering should be a desirable goal to reach within the next decade, for which countries should facilitate mobility of engineers on the basis of similar formative and professional development standards, and the mutual acknowledgement of degrees.

2. To recommend to National Federations, members of UPADI in countries that do not have national evaluation and accreditation programs of engineering studies established, to stimulate the establishment of systems in which the different sectors of the engineering profession participate in a relevant manner, together with other identified academic institutions.

3. It is suggested to the President of UPADI that he send out a notification to all member organizations to avoid the indiscriminate use of the word ENGINEERING or ENGINEER unless the duly certified requirements for this denomination are complied with.

4. It is suggested to the President of UPADI that he recommend all member organizations not to decrease in all programs for formation of engineers, the need to include strong contributions of courses with scientific foundation and with engineering sciences, without neglecting the participation of sociohumanistic sciences, bearing in mind that pregraduate education prepares an incipient engineer to adopt new technologies that require an ample and complete basis in basic sciences and mathematics to be able to appreciate them as a professional.

5. That having analysed the experiences of countries that have adopted systems of evaluation and accreditation, the participants coincided in the convenience of proposing that these processes be considered with emphasis on the qualitative part and not just on the quantitative aspects of the evaluation, adopting criteria of total quality that take into account the final product of the educational process.

6. A recommendation is made to the representatives of member countries of UPADI to seek the mechanisms that will allow them to assist and participate continuously in activities related to the program of Evaluation and Accreditation, coordinated by the UPADI Committee on Education.

7. That the professional development required by the demands of modernization and excellence of engineering knowledge in an interdependent and competitive world, should be based on solid programs of continuing education that representative engineering organizations should promote actively in cooperation with other renowned educational institutions.

8. To request the President of UPADI to make known the recommendations of this Seminar among international and regional engineering organizations such as WFEO, UATI, FEANI, FAE, FEISEAP, FEISCA and others, as well as UNESCO, OAS, IDB, PNUD, etc. proposing to them that they publicize and support programs of Evaluation and Accreditation among their members and receive the cooperation of acquired experiences.

LATIN AMERICA

BASIC STRUCTURE FOR THE ACCREDITATION OF ENGINEERING PROGRAMS IN LATIN AMERICA

UPADI Committee on Engineering Education

Introduction

The basic structure proposed in this document for the accreditation of engineering programs in Latin America, refers exclusively to formation programs that lead to a professional degree.

The purpose of proposing this basic structure is to contribute to the development of systems, procedures and policies for the accreditation of engineers formation programs in Latin American countries.

The basic structure endeavours to identify the main aspects of accreditation without including specific details that must reflect national characteristics of each country and, for that reason, its determination will correspond to each of them.

It is expected that adequacy with the suggested basic structure will lead to the establishment of a high degree of equivalence between the different national systems of accreditation and, consequently to the mutual international acknowledgement of the academic qualification of engineers graduated in accredited engineering programs.

The basic structure has been developed under the sponsorship of a project of international cooperation in which Canada, Chile, Colombia, Costa Rica, Mexico, Peru and the U.S.A. participate.

1. THE BASIC CONCEPTS FOR ACCREDITATION

1.1 Definition of engineering and professional practice
1.2 Definition of accreditation
1.3 Objectives of accreditation
1.4 Terms of reference of the accrediting institution

2. CHARACTERISTICS OF THE PROGRAM

2.1 Curricula

2.1.1 Objectives
2.1.2 Mathematics
2.1.3 Basic Sciences
2.1.4 Engineering Sciences
2.1.5 Design and project works
2.1.6 Computers
2.1.6 Complementary studies (for example: humanities, administration, economy and languages)

2.2 Extracurricula activities

2.2.1 Purpose
2.2.2 Types (for example: competences, conferences, sports and cultural events)

2.3 Programe rules

2.3.1 Admittance rules
2.3.2 Rules for promotion
2.3.3 Requirements for the degree
2.3.4 Total duration of the program including preparatory courses, practices or probationary periods

2.4 Program relationships

2.4.1 With the professional union
2.4.2 With industrial enterprises
2.4.3 With governmental institutions
2.4.4 With the community

2.5 Denomination of the program
2.5.1 Use of the word Engineering according to its definition
2.5.2 Conciseness and prevention of ambiguity

3. THE STUDENTS

3.1 Applicants

3.1.1 Number
3.1.2 Capabilities

3.2 Registered students

3.2.1 Number (full time and part time)
3.2.2 Attitudes

3.3 Graduates

3.3.1 Job opportunities
3.3.2 Characteristics of initial employement
3.3.3 Long term professional performance
3.3.4 Success in programs for graduates
3.3.5 Participation in contuining education

4. RESOURCES FOR THE PROGRAM

4.1 Human resources

4.1.1 Body of professors (full time and part time)
4.1.2 Professors' Curriculum Vitae (degrees, professional experience)
4.1.3 Competence for teaching
4.1.4 Professional and research competence
4.1.5 Administrative personnel (full time and part time)
4.1.6 Competence of administrative personnel
4.1.7 Management personnel (full time and part time)
4.1.8 Competence of management personnel
4.1.9 Attitudes of professors and administrative and management personnel

4.2 Physical resources

4.2.1 Financial resources
4.2.2 Infrastructure
4.2.3 Laboratories
4.2.4 Instruments and equipment
4.2.5 Computers
4.2.6 Library

5. ADMINISTRATION OF THE PROGRAM

5.1 Administration

5.1.1 Organization of the program
5.1.2 Organizational environment
5.1.3 Self evaluation, innovament and continuous improvement

5.1.4 Services for students, professors, administrative personnel and management personnel
5.1.5 Financial administration
5.1.6 Communications

5.2 Coherence

5.2.1 Global coherence between the objectives established in the program and the activities, human resources, material resources and administration

6. ACCREDITING ORGANIZATION

6.1 Nature

6.1.1 Autonomous
6.1.2 Financially independent
6.1.3 Objective
6.1.4 Knowledgeable and competent
6.1.5 Sensitive to changes in teaching and in engineering professional practice

6.2 National engineering accreditation council

6.2.1 Participation of the interested parties, industry, academy, government and community
6.2.2 Participation of the professional union in the important specialties for the needs of the country
6.2.3 Participation of the main regions of the country
6.2.4 Highly respected members in terms of experience and reputation
6.2.5 Appropriate number of members for the participation suggested in 6.2.1 and 6.2.3 and proportionate with the magnitude of the accreditation task

6.3 Attributes of a national engineering accreditation council

6.3.1 Define and review accreditation criteria, policies and procedures
6.3.2 Organize and supervise the operation of the accreditation system
6.3.3 Establish and maintain contacts with other national and foreign accreditation institutions

6.4 Operation of a national council in engineering accreditation

6.4.1 Appointment of accreditation committees
6.4.2 Reception and analysis of reports submitted by the accreditation committees
6.4.3 Preparation of the decisions on accreditation and identification of the deficiencies of the program, should they exist, to provide information to the institution

6.5 Accreditation committees

6.5.1 Participation of academic and non-academic sectors
6.5.2 Participation of the professional union in the corresponding specialty
6.5.3 Highly respected members in terms of their experience and reputation
6.5.4 Members without conflicting interests as regards the programs submitted to the accreditation process
6.5.5 Number of members in proportion with the magnitude of the accreditation task

6.6 Permanent staff of the accrediting institution

6.6.1 Appropriate number of persons with adequate competence as regards the magnitude and quality of the accreditation task
6.6.2 Publish the lists of accredited programs and the accreditation procedures and policies
6.6.3 Make the communications with the interested parties in accreditation: industry, academy, government and community, on routine matters

7. ACCREDITATION POLICIES

7.1 Accreditation is applied, individually, to engineering programs
7.2 All plans of studies in the program, including the different options, should satisfy accreditation criteria
7.3 All graduates from the program should comply with the requirements established for the degree
7.4 Accreditation must be established for a limited period of years
7.5 When accreditation is established for a period shorter than the maximum allowed, the deficiencies that must be attended to by the institution should be specified jointly with the requirement of a follow-up report, by the institution, or by a new visit or by either of these.
7.6 An appeal should be submitted against the accreditation decision taken by the national engineering accreditation council.
7.7 A policy allowing removal of the accreditation should be established

8. PROCEDURES FOR ACCREDITATION

8.1 The institution should have the opportunity of answering the appreciations of the accreditation committee before the national engineering accreditation council takes the accreditation decision
8.2 Evaluation procedures should allow flexibility in the mannter of complying with the accredition criteria
8.3 Procedures should exist for evaluation of programs by the institutions and the accreditation committees
8.4 Procedures should exist for regular review, updating and improvement of all aspects related to accreditation

INTRODUCTORY DEFINITIONS

ACCREDITATION AND LICENSING IN THE ENGINEERING PROFESSION

David Reyes Guerra

By definition a profession is distinguished by a body of knowledge that is privy to that calling and its practitioners. To acquire this specialized knowledge a candidate must undergo extensive education and training. This is given to a degree by members of the profession, who attest to the candidate's competency before he/she becomes accepted into the profession. This reaching for professional status, acceptance, or recognition, is or should be sought by any candidate who wishes to practice the profession.

Each profession has its own set of standards for entry into the profession. They mostly require proof of competency by examination of credentials. These are a record of time as an apprentice or intern under qualified professionals; a certificate or diploma issued by competent authority as to having completed a prescribed educational program; acceptance by authority (a professional association, or when proper by governmental authority) to engage in the practice of the profession.

In the case of some professions, specially those that affect the life, health, and welfare of the public, the practice is regulated by government. This they carry out by a licensing process which allows the practitioner to offer and carry out his/her services to the public. The licensing process may be somewhat complicated. Not only the licensing authority has the responsibility to assure the public that the licensed professional has met the requirements (usually a minimal or entry level) to offer his/her services to the public, but the professional is obligated to maintain proficiency in the field. Thus most licenses are limited to a definite time period and must be renewed - in many cases the renewal process requires proof of continued competency.

Registration is the process by which an individual becomes listed as a professional. In many cases the registration process is a simple formality by which the person's credentials are registered with competent authority. Though licensing and registration are referred to as synonymous, they are not such. One (licensing) is the "permit" to practice; the other (registration) is the listing.

To acquire a professional license or to be registered the candidate must show evidence of completing an acceptable educational program. The licensing/registering authority is responsible for defining what is an acceptable educational program. They are interested in setting educational standards that meet the obligation to protect the public and enhance the value of the profession.

Government, though it has the responsibility of regulating the professions, is cognizant of its lack of expertise in the individual professions. Thus it turns to the representatives of the given professions, in most cases the professional association(s) to define, cooperatively, the minimal educational requirements - as well as internships - that are needed to enter the profession.

Licensing (registration) is governed by law. It is usually carried out by government, though in certain countries it is delegated by government to recognized professional organizations (associations, societies) who in turn must comply and fulfill the requirements of the law.

This educational need is expressed in most cases through minimal standards, which educational institutions must provide. The process of determining the "compliance" of the educational program to these standards can take many forms, it is a quality assurance program. The best known is accreditation.

Accreditation involves many issues, among which are as major building blocks:

* defining the minimum (basic) standard (criteria) that must be met by an educational program that prepares individuals to gain entry into the profession. This is always based on "state-of-the-art" conditions, thus subject to change as the requirements of the profession change;

* defining the standard that must be met by the educational institution in order to engage in the education for the profession;

* determining who will be the body and individuals responsible for certifying compliance of the educational institution with the standards (criteria);

* determining the process to be followed to gain acceptance (accreditation) of the educational program. This must involve an "inspection" of the program, an evaluation of compliance with the criteria by qualified peers, a time limit between evaluations, and other details needed to give assurance of the "quality" of the educational program;

* designing an appeal and review mechanism.

The protection of the public is always of paramount importance. When dealing with professions, the regulatory authority - government - works in cooperation with the professional associations as well as the educational institutions. Thus the government defines its own practice standards that must be met by the accreditation groups. In other words the accreditor must also be accredited. The accrediting groups must also reflect in their standards the needs of not only practitioners of the profession but also the needs of the educational institutions and their faculty.

The licensing (also registration) authority can use accreditation as the basis for acceptance of graduates of accredited educational programs in professional areas as having fulfilled the educational requirements of licensing or registration.

Accreditation can be the basic building block for quality of educational programs leading to professional practice. The standard or criteria can be construed in such a way that it is a measure of quality and can be an incentive for the educational institution to seek constant improvement of its offerings.

Licensing, accreditation, practice, and registration requirements must be indigenous to each country and its professional needs and culture. Though engineering works in the global community there are always different issues that must be addressed in each country and sometimes within a country. Typical of such are the civil engineering needs for seismic requirements in certain jurisdictions as opposed to any such issues in other parts of the same country. Similar concerns can be found in aspects of other engineering disciplines.

Some countries only offer a terminal professional educational program. They do not offer graduate education beyond the professional degree. Their curricula is terminal in their environment and usually takes longer to complete than that at other countries that offer a basic degree with an opportunity to seek further education in so called "graduate schools". The United States is typical of the latter, where the entry level degree to the profession is a baccalaureate - nominally a four year university program. Those that seek further education can pursue a masters - two years - and a doctorate - nominally three years after the masters. These are called graduate degrees.

The accreditation standards or criteria must be related to the length of the basic educational program. Criteria that is designed for a four year entry educational program is not proper for a program of longer duration or for a graduate or advanced program.

In some countries the licensing, registration, and accreditation of a profession are under a single organization. This is some times a government agency, other times a professional association. There is a very special consideration that must always control any arrangements, and that is the protection of the public; not the protection of the profession or of the educational institutions. The seeking of quality in every aspect of the professional area: education and practice must be the goal that licensing and accreditation seek.

MEXICO

CERTIFICATION AND ITS RELATION TO THE QUALITY OF TEACHING OF ENGINEERING

J. Fernando Ocampo Canabal

In nearly all meetings held to talk about, comment on, think about or relate experiences, activiites, in different symposiums, seminars and events of different natures, as in most articles, quality is talked about along with some of its variations such as total quality or quality as one of the ingedients for excellence.

The term "quality" is also present in the education field and this is how we find ourselves in the situation that one of the objectives of the education modernization program in our country, refers to improving the quality of higher education. However, to improve something it is a prerequisite to know its actual condition. Here is were the certification of an educational program as public recongition of its quality, becomes one of thge elements necessary, if not indispensable, for the taking of steps that allow this improvement.

The certification of educational programs is normal pracxtice and one used in several countries. In Mexico, the State grants both public and private institutions the authorization to impart educational services of a certain type and has been the guarantee of the quality of these services, i.e., it can be said that in some way the central government has carried out vouching duties, be it through the Congress of the Union, state congresses or executive federal and state powers.

However, although the governmental scheme followed in Mexico to certify the quality of educational programs was suitable for the conditoions under which it was established, over time the expasnion of the edeucational system and its growing complexity, have created the need to establish certification systems that efficiently respoind to real educational requirements, and, of course, of a different type than those employed by the government today.

For some time now, the different sectors involved in the formation of professionals and their practice, have been carrying out projects to establish certification bodies for the programs or courses of various disciplines, the field of enbgineering being the most advanced, as it recently put into operation a civil association whodse main objective is certification. This civil association, called the "Engineering Education Accreditation Board" (Consejo de Acreditación de Enseñanza de la Ingeniería - CACEI), was legalized before a Notary on the fifth of July this year, and conseuqnelty is now a legal institution.

There are several important aspects, at the same time interesting, which should be mentioned regarding this association. First is the way in which it is incorporated, as it's members are representatives of the different sectors related to the formation and professional practivce of engineers. On the one hand are the associations representing higher education institutions, amoing them the "National Association of Schools of Engineering" (Asociación Nacional de Facultades y Escuelas de Ingeniería - ANFEI); and on the other, the engineers guilds through the colleges of professionals from different specialities - initially civil, mechanical, electrical and chemical engineers - with the others being incporated later on; a third part represents the government sector, for example the "General Professions Direction" (Dirección General de Profesiones); the remaining part is formed by the manufacturing sector, represented by the corresponding chambers, initially the "National Chamber of the Construction Industry" (Cámara Nacional de la Industria de la Construcción).

Another aspect that should be mentioned is with regards to the finances of the CACEI; it is considered that in a vrery short term the association could become economically independent, as the services to be rendered by this will have a cost for the user. On the other hand, the ends established by the association are as follows:

1. To contribute to knowledge and impreovement of the quality of teaching of engineering in the public and private educational institutions in the country, following a model that responds to the needs of Mexico and to engineering the practice conditions in the nation.

2. To contribuite to the establishment of paradigms and engineering teaching models according to scientific advances and the resources of professional practice, derived both from the needs of the society and those of future professionals.

3. To contribute to improvement of the quality of professional engineering practice.

4. To inform educational institutions, students, parents, employers and those interested public and privatre bodies, about engineering teaching conditions in the different schools in the country.

5. To carry out certification processes for engineering educational programs through the establishment of criterion and procedures for the certification, the formation of commissions and their coordination within the field of engineering; the integration and formation requirements for certifiers in this area; and, the issuance of final certification reports.

6. To establish certification systems, which shall be based on quality criteria, solidly founded on essential aspects of teaching programs, that will also be permanently revisable and conform to educational assessment experiences both in Mexico and in other countries.

7. To perform, at the request of the responsible authorities, the certification of teaching programs, with a limited legal term and founded on the validity and reliability requirements established by the "Engineering and Technology Committee of the Inter-institutional Committees for the Evaluation of Higher Education" (Comité de Ingeniería y Tecnología de los Comités Interinstitucionales para la Evaluación de la Educaión Superior - CIEES).

8. To publish by the broadcasting means its deems fit, the lists of the certified engineering teaching programs.

One of the principal policies of the certification is that the process is voluntary and shall be performed by the board at the express request of the authorities responsible for each teaching program, exactly as stated in points six of the association's ends as mentioned above.

It should be mentioned that the CACEI has, as its main governing body, a General Board constituted by the members, who in this case represent the already indicated sectors; it has a Consultation Board made up of representatives from the involved sectors, with recognized academic and professional authority; a Monitoring Board and, for the operative part, a Board of Directors and the Technical Commissions according to Speciality.

Most or some of the integrants of these bodies, such as the General MNeeting and Board of Directors, have alrteady been appointed, and have started to carry out their duties. Now the process started to perform the frst program certification processes.

Finally, as already mentioned, the action of establishing a certification system for educational services offered by higher education institutions, has a direct affect on the quality of the course graduates and conseuqntly on their professional performance. In the case of engineering, better program quality will result in direct benefits for the manufacturing and service sectors, given that oprofessional engineers graduating from certified programs will generally perform more efficiently than those who graduate from non-cxertified programs. This also contribtes to an improvement of the manufacturing systems, by increasing the efficincy of the operating systems of businesses, and, in general, by increasing the quality of a gropup of elements that form part of goods and service producing companies' activities, making them more competitive with better financial and operating condiitions, as well as providing greater benefits to society,

Going back to the idea of educational services quality, good program quality should produce highly competitive engineers in a labor market that demands a series of attributes from them, such as an excellent preparation in basic sciences and engineering sciences, which must be trasnformed into a great technical and creative capacity, the facility to interact between disciplines, an analytical and theoretical capacity, a high level of responsibility and ethical behavior, as well as the ability to handle the economic aspects of the profesion and a social conscience, as their most important characteristics.

But, what are the characteristics of a good quality educational program?[1]

The first thing is to define the content of an educational program: synonim for degree course or professional studies, a program is an educational experience organized within an institution - in a school, faculty, center, division or any other similar academic body - that consists of a group of educational courses or modules, coherent, grouped and ordered in series, which with a reasonable aount of depth provide a level of knowledge into the area, and obviously contain a basic backbone or common trunk of the aspects that define engineering as such.

A program should be inserted into the academic system of the institution, with a set of rules and academic structures clearly established according to the model and philosophy of theinstitution, as well as the corresponding organizational structures. The above is called academic norvativity and forms the first element to be taking into account when measuring the quality of a program.

On the other hand, the following are the elements of the quallity of a program: its inputs, the process, the results, and the impact it has.

There currently exists a tendency to base the entire quality of an educational program on the teaching-learning porocess, i.e., considering this as the nucleus or heart of a program, under the hypothesis that its results determine the characteristics of the graduate and, at the end of the day, their professional performance.

However, it isn't so easy to place the success, failure or even the mediocrity of the performance of a professional on one single factor, given that their practice is due to a group of very different factors, and therefore it's not appropriate to bi-univocally establish the cause-effect relation for this case.

Due to this, it is more suitable to assess the quality iof all the elements of an educational program, as well as the way in which they interact.

Taking some of the points referring to quality in the case of manufacturing processes and adapting them to certain elements of an educational program, the following deferences can be made that will result in an improvement in the quality of educational processes:

1. Create in the academic and administrative personnel, a constant attitude of how to improve the services offered, based on the objectives and mission of the institution.

2. Adopt the new philosophy for everyone involved, convincing them that to improve quality they must not only resolve daily academic and administrative problems, but also avoid creating them.

3. Constantly improve attitudes of the personnel attached to the program, promoting innovation in the processes and encouraging change orientated towards the satisfaction of new educational

[1] Quality in Schools of Engineering - David Reyes Guerra

needs and egenerational changes, incorporating these in the planning and development of the program.

4. Promote educational in the workplace; basically with reference to courses given to the professors, in such a wqay that the professor enrichens his/her educational labor using the experiences of his/her colleagues.

5. Estabvlish leadership, as this brings with it responsibility and promotes transformation. Avoid decentralization as much as possible, as this results in better results.

6. Eliminate fear, as the security of a stavble job when there is good performance, tends to get the best results. Communication, respect, trust and confidence in thge professors must be promoted in the program's administration.

7. Eliminate numeraical quotas, such as those that consider that 50% of the students should fail examinations, or others of a similar nature. Encourage the teaching staff to seek the most effective learning assessment methods for their students. The failure of students on occassions in the failure of the professor.

8. Eliminate barriers that prevent recognition of good work by the professors. Every person and their work must be seen from the point of view of their contribution to the sum of the aspects of the program.

9. Establish obligatory continuous educational programs for all personnel on all possible aspects, promiting opportunbities to participate in them.

10. Make all personnel participate in the transformation without creating a spoecial bureocracy for it, but rather using the formation of groups with similar responsibilities and specific objectives, promoting communications. Listenting to the students and to the public is an essential part of this.

It should be mentioned that the ten points listed above constitute a group of propositions that a program may or may not take into account to improve the quality of its acdemic work, but this work must be assessed so as to know if the program is fulfilling its objectives, complying with the group of minimum quality rules and standards established by the certification bodies with the object of basing their decision to certify a program or to deny this recognition.

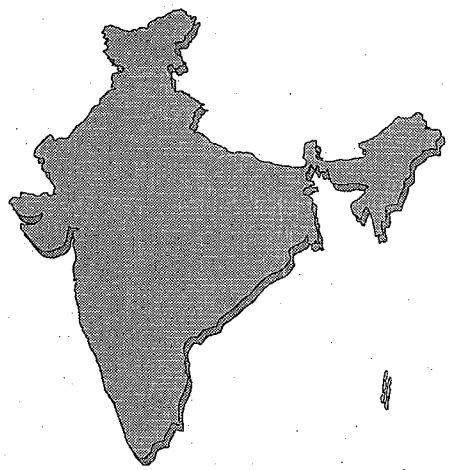
Therefore it is necessary to breakdown, even when this is only theoretically, the elements indicated above, covering any certification process for the assessment of a program's quality.

The whole process requires inputs; on the educational side, these are the professors, the students, the study plan, the infrastructure and financial resources; the first two are the actors in the process, the third, the study plan, gives form to the academic coverage of the knowledge, as well as the characteristics, extension and depth with whicvh this is transmitted to the student; expected levels of behavior, support materials, strategies, values and the abilities that the student must develop, are also established by this. This is the foundation on which a program is based and not simply a list of resopurces and their respective contents.

The certification of a study plan is judged by all of the indicated elements and their subjects are classified into the following groups: Basic Sciences, Engineering Sciences, Applied Engineering, Social Sciences, Humanities and Other Courses, whose programnatical content should respond to the knowledge requirements of engineering in general, and to the specific needs of the speciality under consideration; a minum number of hours of theoretical and laboratory classes must also be established.

The academic personnel form the very important center in the quality of a program, as a group of well-qualified and visionary faculty is able to create a suitabel atnmosphere and an appropriate academic model in which the students can develop themselves the most. When this input is assessed, not only the ratio between full-and part-time personnel and the number of them who have post-graduate studies, is taken into account, but also their academic and professional history, level of updating, production of didactic material and items, participation in technological research and/or development, their performance in the academic or academic/administrative environment and their institutional obligation. All this is based within an institutional framework with suitabel conditions to promote and make attractive the development of an acdemic course in the case of full-time professors, and the motivation due to academic responsibility implied by the participation in a program of part-time professors.

INDIA



ACCREDITATION OF PROFESSIONAL ENGINEERING COURSES AND INSTITUTIONS IN INDIA

The Institution of Engineers (India)

Introduction

The professional engineering courses leading to diplomas and degrees, and Institutions are accredited in India by three different agencies, viz :

- Universities which are affiliating bodies;
- National Board of Accreditation (NBA) of the All India Council for Technical Education (AICTE), which is a Statutory Body in India; and
- The Institution of Engineers (India), the premier professional society of engineers.

The process of accreditation by NBA is multi-level rather than 'yes' or 'no' type single level accreditation. Any programme of an institution is classified in following categories:

- 'A'– Meets all accreditation criteria or excels them.
- 'B'– Meets the minimum criteria and deficiencies are marginal which can be improved within a short time.
- 'C'–Deficiencies exist but the Institution has potential to make up within a foreseeable future, say 1 to 2 years.
- 'NA'– (Not Accredited) Not ripe for accreditation in view of deficiencies.

- '*'– Availed of the provision of withdrawal.

The guidelines and criteria adopted by the NBA lend themselves to a substantially quantitative evaluation of major and core academic parameters in respect of faculty, students and teaching-learning processes.

The Institution of Engineers (India) accredits all professional courses and Institutions based on the following criteria:

- Academic education, which is already accredited by the Universities and the AICTE;
- Training in industries/professions at the desired level;
- Practical experience in the concerned engineering discipline, particularly at the responsible position.

The accreditation by the Institution thus will take at least six years after obtaining engineering degrees, which leads to make the engineers become members of the Institution and then Professional Engineers.

The Institution offers engineers corporate membership of Associate Member, Member and Fellow, according to their experience, qualifications and professional achievements.

It is in this context, every professional society has an important role to play in maintaining the standard and quality of the profession through its membership. The present 2(c) of the Charter, therefore, underlined 'accreditation' as one of the objects of the Institution:

> 'To establish, acquire, carry on, control or advise with regard to colleges, the schools of other educational establishments where students and apprentices may obtain a sound education and training in engineering on such terms as may be prescribed by the Institution.'

Further, the Bye-law 101 of the Institution stresses the purpose of accreditation:

> "The Council shall, on the recommendation of the Education, Examinations and Accreditation Committee, have the power to recognize such university degrees and collegiate or other diplomas or certificates as after scrutiny they deem to prove a sufficient standard of attainment in the subjects referred to, and may exempt graduate or holders of such diplomas or certificates from passing in whole or in part the aforesaid examinations appointed and directed by the Council."

In conformity with the Charter and the Bye-Law, and partially modifying the policy in existence since 1964, the Institution evaluates undergraduate professional engineering courses in India and awards recognition to courses meeting the requirements for its various classes of membership, viz, Studentship, Technician, Senior Technician, Associate, Associate Member, Member, Fellow and Professional Engineer. In case of foreign

qualifications and courses in the frontier areas of engineering or courses not formally recognized, such cases are considered on an individual merit for equivalence. Wherever necessary, advice of the respective national society of engineers is solicited. Qualifications accredited by Accreditation Board for Engineering and Technology (ABET), USA; Engineering Council, UK; and constituents of FEISCA are normally accepted.

The Institution currently accredits:

- Undergraduate engineering courses (Bachelor of Engineering) – an acceptable course by the All India Council for Technical Education;

- Diploma courses in engineering being conducted by State Boards of Technical Education/other establishments, viz, defence, railways and various other training institutes;

- Advance level courses in science and engineering as exempting from Section A examination only; and

- School level courses as exempting from Studentship examination.

This paper primarily deals with the processes relating to the accreditation of the undergraduate engineering courses as exempting from Sections A and B of Institution examinations and other science and engineering courses as exempting from Section A of Institution examination.

Why Accredit Courses ?

The engineering course accreditation system was established as early as 1964, and is well known within India to government, universities and their affiliate Colleges/Faculties of Engineering, Industry, States Board of Technical Education and to other educational institutions.

Accreditation serves a useful function in raising tertiary education standards based on a peer review process. Universities, colleges and the faculty members benefit from exposure to new ideas and suggestions. Students also benefit from accreditation because the course of study which they are about to embark on has credibility in the profession. Many employers require that applicants for professional engineering positions be able to prove that they are eligible for membership of the Institution. Many overseas professional engineering societies give due credit to the accredited courses and membership of the Institution.

The Institution's accreditation system is also recognized internationally through the mutual agreement between IEI, the Indonesian Institute of Engineers, Jakarta (Indonesia); The All-Union Council of Scientific and Engineering Societies (VSNTO), Moscow (USSR); The American Society of Mechanical Engineers (ASME), USA; The American Society of Civil Engineers (ASCE), USA; The Hungarian Federation of Technical And Scientific Societies (MTESZ), Budapest (Hungary); Union of Engineers and Technicians of

Yugoslavia (SITJ), Belgrade (Yugoslavia); The Scientific and Technical Unions of Bulgaria (CCNTS), Sofia (Bulgaria); and Verein Deutscher Ingenieure (VDI), Dusseldorf (West Germany), and have become a signatory.

Recently, the Institution has held discussions and conducted visits with counterparts of other nations to globally maintain the best practice in accreditation systems.

In essence, the Institution sets the standards for engineering courses and training schemes in India and is in active collaboration with the educational planning and re-orientation programmes of the government. This is the reason that the Institution is represented on the governing bodies of almost all universities, educational institutions, national laboratories and several government and industrial organization.

Features of the IEI Accreditation System

Diploma Level Courses

A State Board of Technical Education seeking IEI recognition of a diploma course in engineering provides the (a) course outline and break-up analysis, (b) Prospects and syllabus of such courses; (c) Break-up analysis (hourly basis) both for teaching and examination scheme; (d) Question papers leading to final examination; and (e) Specimen copy of the Certificate awarded, with the condition that Physics, Chemistry, Mathematics, English and Drawing are included in the course syllabi. On receipt of such a proposal, the same is being assessed at the Headquarters of the Institution and thereafter sent to three expert members for their considered opinion, who in turn forward the same, with their recommendation, to the Institution.

Degree Level Courses

The courses conducted at any college/institute approved by the All India Council for Technical Education, a statutory requirement to start a specific engineering course in any college, seeking IEI recognition provides the following:

- 'Rules and Syllabi' of the course;
- Question papers leading to final examinations;
- Academic Staff with their qualifications;
- List of equipment in the workshop and in the laboratory of the department; and
- Plans and layout of various buildings, workshops, laboratories of the department with their approximate floor areas.

Preliminary Assessment

On receipt of the material from the college, a preliminary assessment is being made as to whether or not the fully developed course is likely to meet its requirements. Accreditation at this stage is requested only after the first batch passes out from the college. Preliminary assessment does not constitute formal recognition, but it does meet the Council's recognition requirements for the grade of 'Associate', pending formal recognition of the course.

Appointment of Expert to Visit the College

On satisfactory preliminary assessment, a sub-committee is formed, consisting of an expert, the Chairman and the Convener, from the panel being maintained discipline-wise, by the President, from outside the State in which the college is located.

Assessment by the Sub-committee

The sub-committee so nominated is expected to evaluate the course against the following prescribed criteria before submitting its report:

- Admission: Minimum qualification required, generally 10 + 2, admission procedure, and mode of admission–on the basis of merit or donation or both;

- Course content and duration of the course: The course should cover all essential subjects and examination of the syllabus of each subject;

- Teaching scheme: There are adequate teaching hours devoted to each subject, methods of teaching, experiment carried out and workshop practice followed by the students;

- Examination scheme: Standard of examination question papers is as high as that of the Institution Examination;

- Academic staff: Qualification of teaching staff of the Department, vacancies, if any, and student/staff ratio. Student/staff ratio is considered to be satisfactory if it is around 15:1;

- Laboratories and workshops: Well-equipped laboratories and workshops are maintained with modern equipment and there is enough scope for students to understand practical problems;

- Lecture halls, auditorium, library, etc: Adequacy of accommodation in lecture halls, auditoriums, etc. Each department has a library of its own, providing reading room and having adequate number of books and journals; and

- Administration: Governing body consists of adequate representation of educationists and philanthropists. Annual report and audited accounts should also be seen for development work and overall activities with reference to expenses.

On the basis of aforementioned points, an individual member in the sub-committee prepares an accreditor's report and submit to the Convener, who in turn send to the Chairman for forwarding to the Headquarters with his recommendations.

On receipt of the recommendations, in respect of diploma and degree courses, from the chairman/experts/sub-committee, the recommendations are placed before the Equivalence Committee followed by Education, Examinations and Accreditation Committee and the Council. The Council of the Institution is, however, the final recommending authority for any course.

Provisional Recognition

In case of a developing course/inadequate infrastructural facilities, the course is assessed for provisional recognition, which is usually for a period of three years. Graduates of courses with provisional recognition are admitted as 'Associates'.

Full Recognition

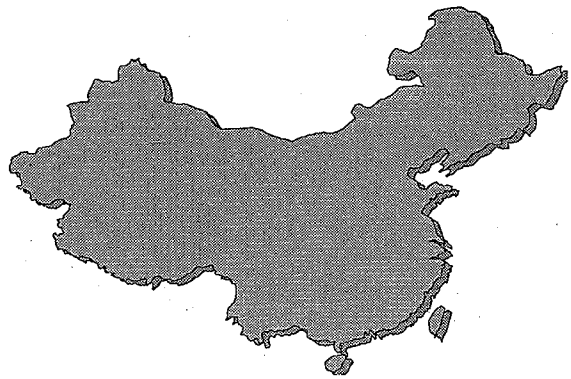
A fully developed course is assessed for full recognition.

The Institution receives no subsidies from the Government or other sources to meet the cost of accreditation, except the reimbursement of travel and daily expenses of sub-committee members by the respective college. Other costs are met by the Institution and its members– the panel members–give their time free of charge.

Challenges of Change

The accreditation system followed by the Institution has been in place for many years. The Institution is mindful of the challenges of change that are occurring in engineering education due to a large number of private engineering colleges in the country and the requirements of engineering standards and the delivery systems for engineering courses.

CHINA



THE ACCREDITATION/EVALUATION SYSTEM OF CHINA'S HIGHER ENGINEERING EDUCATION

Institutional Paper

1. Accreditation system

The Evaluation Committee for Higher Education and the Academic Committee of the State Council are co-responsible for the accreditation of China's higher engineering education.

The Evaluation Committee for Higher Education is a consultative committee to the State Education Commission. Entrusted by the State Education Commission, it is to give appraisal of higher institutions both for general education and for adult education, applied for by governments at the level of province, autonomous region and municipality directly under the central government. It is also to provide consultation for the State Education Commission in decision-making. Its members are appointed by the State Education Commission, and the term of office is 3 years.

The Academic Committee of the State Council is responsible for ratifying and announcing the list of educational and research institutions which it authorizes to grant Bachelor, Master and Doctor degrees. The qualifications for the grantors of different degrees are specified by the State. Institutions can apply to the authority concerned for qualification. The Academic Committee will call for assessment by experts and, upon approval by the State Council, publish the accreditation.

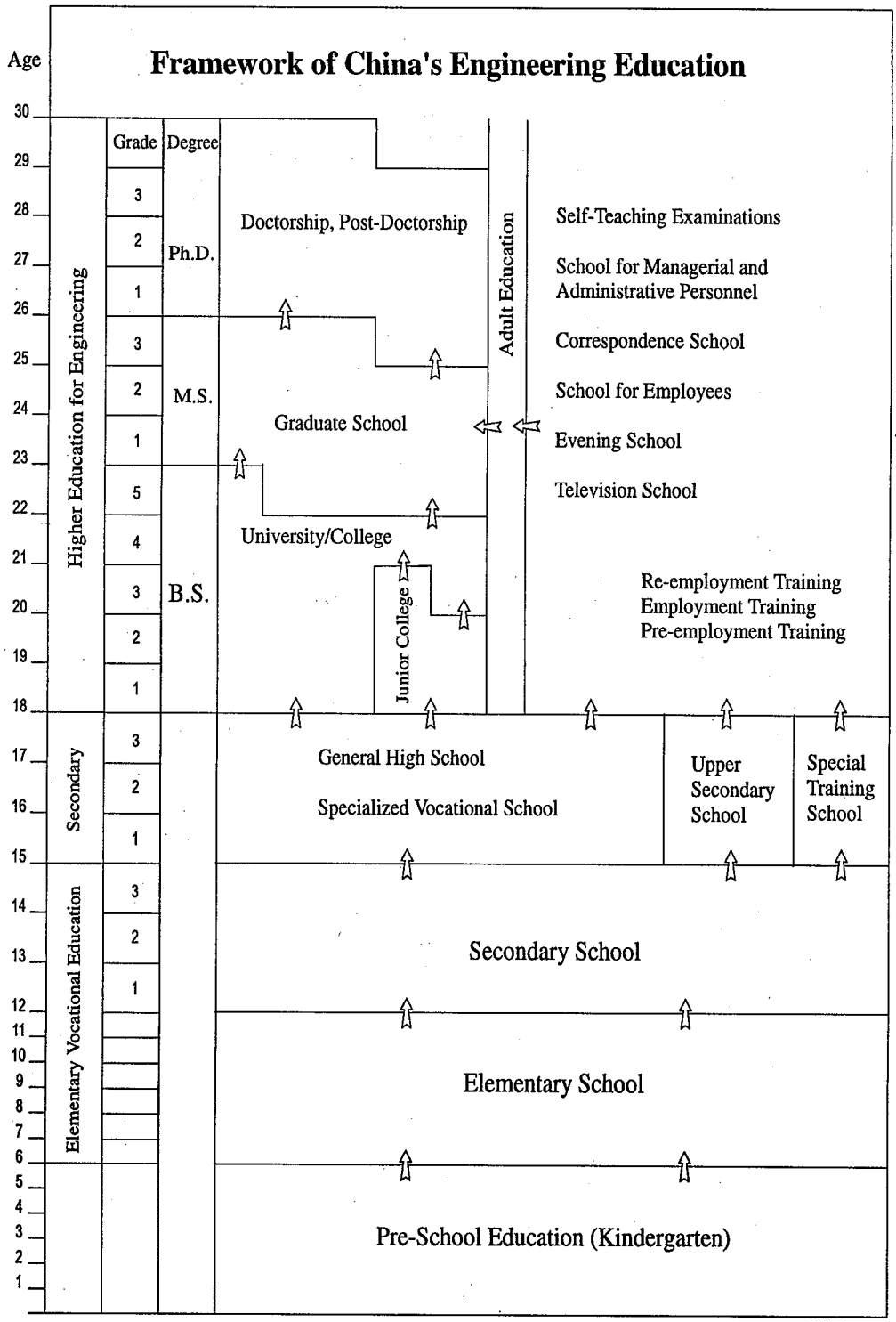
2. Evaluation

The evaluation of undergraduate education is directed by the Evaluation Office of Higher Education Dept. of State Education Commission, and is carried out by the Engineering Division of the same dept. In accordance with the evaluation program for higher engineering education, evaluation is carried out in terms of teaching

facilities, teaching conditions and teaching effectiveness so as to guarantee good quality and level of teaching.

The evaluation of post-graduate education is directed by the Quality Control Office of the Academic Committee of the State Council. It aims to re-assess the qualifications of the institutions authorized to award Master and Doctor degrees in accordance with the criteria set up by the State. The Quality Control Office will select MS. and Ph.D. dissertations for assessment and receive feedback from employers of graduates on a regular basis.

The Quality Control Office is also responsible for the overall evaluation of the graduate schools of 33 universities across the country. Evaluation is carried out with respect to the set-up of graduate schools, the achievement of discipline development and the qualities of their graduates, etc.


Framework of China's Engineering Education
Age
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Grade
Degree
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Ph.D.
3
2
1
M.S.
5
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3
2
1
B.S.
Higher Education for Engineering
Secondary
Elementary Vocational Education
Doctorship, Post-Doctorship
Graduate School
University/College
Junior College
Adult Education
Self-Teaching Examinations
School for Managerial and Administrative Personnel
Correspondence School
School for Employees
Evening School
Television School
Re-employment Training
Employment Training
Pre-employment Training
General High School
Specialized Vocational School
Upper Secondary School
Special Training School
Secondary School
Elementary School
Pre-School Education (Kindergarten)

UNITED KINGDOM

ACCREDITATION OF TRAINING AS PREPARATION FOR PROFESSIONAL PRACTICE IN THE UK

Jack C. Levy

REGISTRATION OF ENGINEERS IN THE UK

In the UK the registration of engineers is the responsibility of The Engineering Council. There are three Sections of the register: Charter of Engineers (CEng), Incorporated Engineers (IEng) and Engineering Technicians (EngTech).

For each of the Sections registration is in three stages:

Stage 1	-	An accredited education qualification (See IDEAS 2)
Stage 2	-	Training, preferably by an accredited training course
Stage 3	-	Experience, including some of a responsible nature

In addition, for CEng and IEng the candidate must pass the Professional Review which includes an interview.

After gaining the academic qualification (Stage 1) the Training and Experience stages require a minimum of four years total.

Training Requirements for Chartered Engineers (Stage 2)

The Engineering Council specifies that trainees should reach standards that will enable them to:

a. apply the code of professional conduct of a Chartered Engineer;

b. make appropriate provision in engineering projects to ensure safety and the required standards of quality and reliability;

c. fulfill responsibilities to their employers, colleagues, customers, other engineers and the community at large;

d. apply theoretical knowledge to the design, manufacture, construction, marketing, operation and maintenance of the particular products or services with which their employing organisations are concerned;

e. have a working knowledge of the general factors affecting an industrial organization such as:

- the financial, economic, environmental and commercial constraints;
- limitations imposed by the qualities of the manpower and materials avaiable;
- the operational and maintenance requirements that may affect engineering decisions;

f. understand the vital importance of good industrial relations, safety, health and welfare not only to employees but in the general public interest;

g. understand the point of view of others and the promotion of good personal relationships within an organization;

h. cultivate sound judgement and to accept responsibility for decisions.

At the conclusion of the period, trainees must be able to accept increasing responsibility in their particular branch of engineering.

Experience Requirements (Stage 3)

Those intending to become Chartered Engineers will be considered to be gaining responsible experience when their employment requires them to develop and prove fully their technical competence and to demonstrate a satisfactory range of functions and characteristics which may include:

a. The exercise of independent technical judgement requiring both practical experience and the application of engineering principles;

b. direct responsibility for the management or guidance of technical staff and other resources;

c. innovation in technical matters through such activities as design, development, research and manufactuing technology;

d. professional and personal integrity and a responsible attitude to engineering and changes in the field of technology;

e. understanding and taking account of financial, economic, commercial, statutory and national considerations;

f. creation of systems and procedures and proving their cost-effectiveness;

g. design, development and manufacture of products, equipment and processes to a competitive level of cost, safety, quality, reliability and appearance;

h. involvement in human and industrial relations.

The Professional Review

Having successfully fulfilled the requirements for Stage 3 the final hurdle for the aspiring Chartered Engineer is the Professional Review.

The Professional Review is an occasion when a candidate is assessed by senior engineers. The Review normally includes an interview and a written report which contains a description of the types of work on which the candidate has been engaged and indicates his or her responsibility. The occasion acts as a final check on competence and, if successful, the candidate is then eligible to become a Charter Engineer.

AN EXAMPLE: THE INSTITUTION OF ELECTRICAL ENGINEERS (IEE)

The Engineering Council approves various Engineering Institutions to accredit on its behalf educational courses and also training programmes. The largest of these institutions is the IEE which has 133.000 members of whom 53.000 are Chartered Engineers. The IEE has developed a schedule of training for its own branch of engineering which fulfills The Engineering Councils' Stage 2 requirements.

The preferred method by which engineers meet the training standards is by their employers running a training scheme which is accredited by the IEE. In 1995 there were more than 200 such schemes.

Procedure for Accreditation

Organisations wishing to have their training scheme accredited must apply to the IEE and be able to demonstrate that the following components are evident:

a. support for the training scheme from Board level;

b. evidence that the scheme contributes to the formation of professional engineers;

c. detailed programmes of activities, each of which has an identifiable training objective and which contains the elements set out in the Institution's training publications;

d- an environment in which a potential Chartered Engineer can undergo professional training. This means that the scheme must be suitable for entrants who are studying to fulfil or have fulfilled the Institution's educational requirements. It must also provide contact with technology and working practices which will be relevant both to immediate employment and to a lifetime career in the profession;

e. a training record compiled by the trainee, preferably in the format recommended by the Institution. It should be supported by an engineering note book (log book) giving details of work done together with sketches, observations, calculations, etc.

f. involvement and approval of professional engineers in the design of the scheme, its development and monitoring. In large companies this is achieved ideally through a training review committee, chaired by a senior Chartered Engineer;

g. a monitoring (tutoring and advisory) system in which trainees are guided and supported by snior Chartered Engineers;

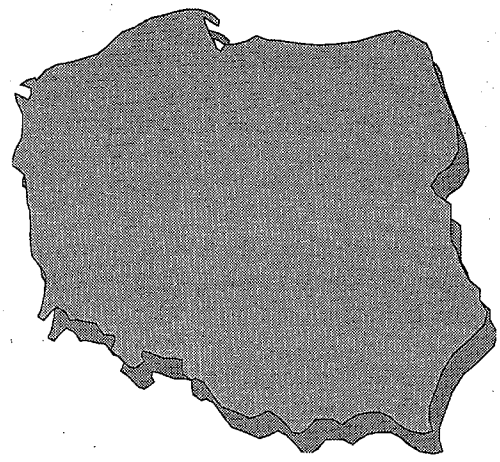
h. a programme of training mentors and a system of monitoring standards;

i. a system to assess the progress of trainees and the fulfillment of the training objectives which will ensure that only those with the potential to become Chartered Engineers complete the training successfully;

j. adequate staff and resources to support the scheme.

Normally it is not possible to assess whether a scheme will meet the requirements without a visit to the site where the training will take place. The visit is undertaken by three people on the IEE's accreditation panel plus a staff member from the IEE Training Secretariat. Regular meetings are held at the IEE of the Mentors who are the firm's employees responsible for ensuring that the training is effectively carried out.

POLAND



QUANTITATIVE ANALYSIS OF PRACTICAL EDUCATION IN EUROPE AS A PREMISE FOR ACCREDITATION
on the example of FIG - Federation Internationale des Geometres

Z. Adamczewski
President APS Commission for Education and Professional Development
Polish Federation of Engineering Associations (N.O.T.)
Committee on Professional Development

Origin of the Problem

In 1990 FIG published a report by Dr. A. L. Allan of University College, London, entitled: "The education and practice of the surveyor in the private sector within the European Economic Community". Dr. Allan, former president of FIG Commission on Professional Education, carried out his research in cooperation with institutions training surveyors in various countries and national associations of surveyors within the framework of the Geometres Liaison Committee established by the EEC in 1972. The ultimate goal of this group was to provide analytical data for Eurpean integration in the field of geodesy.

In 1991 the author, who was Pas President of the Association of Polish Surveyors, familiarised the Polish surveying community with the above mentioned report on education, and recently proposed a new numerical approach to the results obtained by Dr. Allan, which was realised in his work entitled: "Usefulness of foreign models in redesigning the educational profile of land surveyors in Poland". The work presents results of quantitative analysis of the educational coherence of professional training of engineers in 12 European countries and its implications for accreditation.

Numerical approach to Allan's concept.

Dr. A. L. Allan distinguished three levels in the professional training of surveying engineers. These levels may be identified with the successive years of engineering studies: level 1 - year I, level 2 - year I, II, level 3 - year I, II, III of studies. In his original study Allan used a graphical representation of the share of individual specialist subjects in the practical education programme. Following digitalisation of Allan's diagrams we obtain the enclosed table, (Table 1) of the 12 European countries and 25 practical subjects.

Rows of the table correspond to individual subjects, for which original English names have been provided. Columns correspond to countries marked by international letter symbols, e.g.: B for Belgium; I for Italy, etc.

Numbers in the table designate the first (1), second (2) and third (3) level of education. If the training is carried out on an incomplete level this is marked by half points e.g. 1.5; 2.5.

The total of a given row represents the intensity of studies of a particular practical subject, while the total of a column expresses the general professional training burden assumed by a student in a given country. Thus we can immediately see that, for example subject N° 3, topographical suverying, shows the greatest intensity, while students in Belgium and then France carry the heaviest training load.

The enclosed Table 2 is a correlation table of practical education of surveyors in the European countries. It provides coefficients of correlation for column vectors, that is, it illustrates the educational correlation between individual pairs of countries.

The last column of Table 2 shows the average coefficient of correlation between a given country and other listed countries, the average of a row. This may be regarded as an index of correlation between a particular country and the whole European system of education.

An attempt at a conclusion

The average coefficient of correlation for the whole European system of surveyors education is 0.502.

It may be regarded as a certain index of coherence of the European system of practical education for surveying engineers. It is difficult to say objectively whether it is high or low. We believe that it is an expression of important coherence of the system. We are not attempting to delimit the importance of multiple correlations, because we are merely suggesting a methodology of the quantitative study of education.

Table 2 shows both certain similarities in the correlation of education between Great Britain and Spain, as well as differences signalled by a high negative correlation in the case of Greece and Italy.

Initial analysis of the Polish system of practical education of surveyors.

The results of this analysis that are not presented here, showed considerable similarities with the German system. The quantitative study of the correlation between the Polish system and the European system may be carried out for academic studies, however it would be very difficult to conduct for professional training. In Poland, practical education of land surveying engineers is partly in the form of practical training at professional land surveyors or geodetic enterprises. The proportion of these two forms is 1:1.

B	DK	F	D	GR	IRL	I	L	NL	P	E	GB	
1	.33	.38	.38	.31	.10	.38	.53	.23	.29	.25	.21	0.31 B
	1	.68	.78	.76	.37	.07	.53	.81	.65	.69	.68	0.58 DK
		1	.66	.68	.16	.10	.68	.65	.48	.53	.48	0.50 F
			1	.90	.34	.05	.71	.90	.75	.79	.73	0.64 D
				1	.37	-.08	.56	.86	.68	.78	.70	0.59 GR
					1	.04	.32	.35	.41	.69	.82	0.36 IRL
						1	.32	-.04	.14	-.03	.05	0.09 I
							1	.63	.54	.59	.60	0.55 L
								1	.77	.82	.76	0.61 NL
									1	.78	.73	0.57 P
										1	.95	0.62 E
											1	0.61 GB

TABLE 2

SCHEDULE
THE SCOPE OF PROFESSIONAL TRAINING OF SURVEYORS IN THE PRIVATE SECTOR
according to Dr. A. L. Allan (original English names)

	B	DK	F	D	GR	IRL	I	L	NL	P	E	GB	
1. Geodetic Surveying	2	3	3	3	3	1	1	3	3	3	2.5	3	30.5
2. Hydrographic Surveying	1	1	1	1	2	3	0	0	1	1	1.5	2	14.5
3. Topographical Surveying	2	3	2.5	3	3	3	2	3	3	3	3	3	33.5
4. Cadastre & Remembrement	3	3	3	3	3	1	2	3	3	2	2	2	30
5. Engineering Surveying	1	3	3	3	3	2	1	3	3	0	2.5	3	27.5
6. Mine Surveying	2	0	1	0	1	3	0	1	0	0	2	2	12
7. Mineral Management Valuation	0	0	0	0	0	0	0	0	0	0	0	0	0
8. Mineral Planning and Development	0	0	0	0	0	0	0	0	0	0	0	0	0
9. Rural and recreational Land Management	2	2	3	0	0	0	1	1	0	0	0	0	9
10. Agricultural Valuations	2	0	2	1	1	0	2	1	0	0	0	0	9
11. Forestry and Woodland Management	0	0	2	0	0	0	1	1	0	0	0	0	4
12. Farm Buildings and Equipment	0	0	1	0	0	0	2	0	0	0	0	0	3
13. Building Design	1	0	0	0	0	0	2	0	0	0	0	0	3
14. Construction Economics	2	0	0	0	0	0	2	0	0	0	0	0	4
15. Tender and Contract Documentation	2	2	0	0	0	2	2	0	0	0	0	1	9
16. Contract Administration	0	0	1	0	0	2	2	2	0	0	0	1	8
17. Project Management	1.5	0	1	0	0	2	2	2	0	0	0	1	9.5
18. Building Maintenance and Construction	2	0	0	0	0	0	2	2	0	0	0	0	6
19. Urban Property Management	3	0	2	0	0	0	1	2	1	0	0	0	9
20. Property Marketing and Investment	2	0	0	0	0	0	1	1	0	0	0	0	4
21. Property Valuation	3	0	2	1	2	0	2	2	0	0	0	0	12
22. Urban Development	2	2	2	2	2	0	0	2	1	0	0	0	13
23. Physical Planning	1	2	2	0	2	0	1	0	1	0	0	0	9
24. Economics of Planning and Development	0	0	1	0	1	0	0	0	1	0	0	0	3
25. Planning Control Administration	0	0	0	1	1	0	0	0	1	0	0	0	3
	34.5	21	32.5	18	24	19	29	29	18	9	13.5	18	

TABLE 1

READERS CORNER

Each edition of this Journal IDEAS, will have a Readers Corner, with the purpose of receiving comments from people or persons responsible in WFEO National Member Associations and other Institutions that have received the previous issue free of charge. The ideas and proposals contained in the letters received plus the information they may provide to enrichen our knowledge, will be valued. That is why we wish to publish them so that all readers can update their information with background from different countries in the world, and exchange ideas between themselves.

30th, May, 1995

Dear Sir,

Re: RESOLUTION ON ACCREDITATION

Our attention has been brought to the resolution on accreditation which was announced as a major output of the November 1994 Third World Congress on Education and Training, sponsored by WFEO and held in Cairo, Egypt.

The Institution of Engineers of Kenya has a keen interest in implementing this resolution and would be grateful if you could provide us with additonal information. We especially would like to express our interest in any assistance we can receive from the WFEO Committee on Education and Training in setting up a national accreditation system.

We look forward to hearing from you about this important resolution.

Yours faithfully,

Eng Prof. A. V. Otieno
Honorary Secretary
The Institution of Engineers of Kenya

November 17, 1995

Dear Prof. Yadarola:

Thank you very much for sending us the second issue of IDEAS.

For your information, this University has started up an institutional self-evaluation process and our Faculty of Engineering is a unit for analysis in this program.

This activity is performed prompted by an agreement that the University of Patagonia "San Juan Bosco" reached with the Secretariat of University Policies belonging to the State Ministry of Culture and Education.

The self-evaluation process will be finally achieved with an external evaluation, performed by outstanding personalities of renowned experience from the higher education institutions environment and an agreement has been reached between both parties to carry out this task.

I would be grateful if you could send me IDEAS N° 3 that will deal with "Accreditation and Professional Practice".

Sincerely,

(Signed) Eng. Roberto Aguirre - Dean of the Faculty of Engineering
National Uiniversity of the Patagonia "San Juan Bosco"
Comodoro Rivadavia - Argentina

November 22, 1995

Dear Sir:

Thank you very much for sending us the publication IDEAS N° 2, which has been received with great interest by our organization.

As regards the general comment requested in the last paragraph of your letter, this University is in fact carrying out a pilot project on the use of Norm ISO 9000 in education for the implementation of a Quality System as part of the programs presently in force on internal and external evolution.

I would be grateful if you could send me a copy of IDEAS N° 3, and at the same time wish to express that we are at your disposal for any consultation on the main theme of your letter or on any other matter you may consider pertinent.

I take this opportunity to send you a copy of the paper submitted at the Seminar "Search for Methodologies for quality programs on the basis of dialogues Enterprise-University", organized by the Argentine Industrial Union that took place on November 15.

We commit ourselves to cooperate with this initiative of WFEO and remain, sincerely yours.

(Signed) Miguel Guerrero - Director
Centre of Technological Application
El Salvador University - Buenos Aires - Argentina

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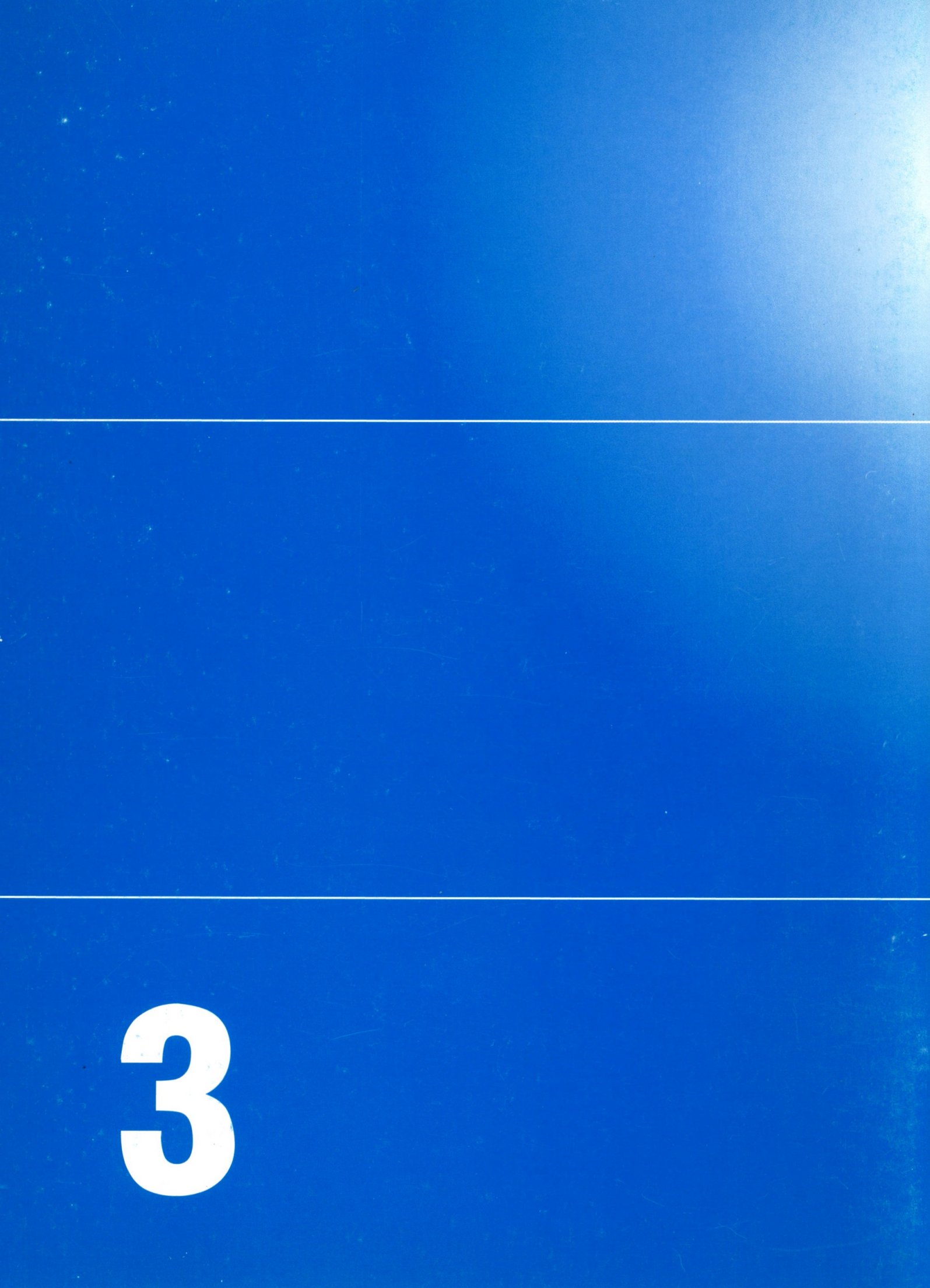
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