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The Outcomes and Achievements of the *2nd Global Congress on Engineering Education**

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This Congress achieved bringing together academics, industry, professional bodies and governmental representatives from over 30 nations worldwide, who discussed current issues, problems and challenges in engineering and technology education. Several key issues were raised; including the effects of the globalisation process. The strong German contribution to the Congress indicated the degree of international involvement, including the inaugural meeting of the *German Network of Engineering Education* and the launch of the first issue of the *Global Journal of Engineering Education* published entirely in the German language. The Congress also provided the venue for the *13th General Meeting of the International Liaison Group for Engineering Education* (ILG-EE). Global accreditation and the development of a global curriculum, as well as a workshop on Graduate Courses in Engineering Education, were also well covered. Two Gold Badge of Honour Awards and five Silver Badge of Honour Awards were distributed, and the democratically selected Best Paper Awards were also presented.

THE 2ND GLOBAL CONGRESS ON ENGINEERING EDUCATION

It is my real pleasure to have this opportunity to offer some concluding remarks concerning the academic outcomes and achievements of the *2nd Global Congress on Engineering Education*, held this week at Hochschule Wismar - University of Technology, Business and Design, Wismar, in the Federal Republic of Germany.

The Congress has brought together academics, industry, professional bodies and governmental representatives and confronted them with current issues, problems and challenges in engineering and technology education as they appear on the threshold of the 21st Century. Undoubtedly, because of the large number and the quality of papers presented by German participants, the main emphasis was placed on the German situation, which is on the main concerns of the German academics, and on how German engineering institutions have been able cope with tremendous change.

It is unquestionable that there are several philosophical approaches to engineering education in Germany, which have been mostly driven by the trends and regulations introduced by the European Union. The introduction of the British-type Bachelor courses in German academia has been the prevailing one. Obviously, this move has absorbed most of the ever-shrinking human and material resources in many institutions, and has caused some frictions between German academics.

The second issue seems to be the recent impact of computer technology on engineering and technology education and how best academics ought to take advantage of this technology. Unfortunately, for some the main concern has been how to cope with this challenge.

To a lesser extent, but still noticeable, has been the issue concerning the extent of involvement of German institutions in providing assistance to developing countries and countries in social, political and economic transition. Also, the issue on how effectively

*A revised and expanded version of the concluding address presented at the Closing Ceremony of the *2nd Global Congress on Engineering Education*, held at Hochschule Wismar, Wismar, Germany, from 2 to 7 July 2000.

German institution can assist education institutions in those countries in their efforts to restructure and modernise their university engineering education emerged in the Congress deliberations.

Generally, it is pleasing to report that the presentations aired and addressed a multitude of issues and challenges to engineering and technology education, as well as the same magnitude of possible solutions.

THE GLOBALISATION PROCESS

One of the negative effects of globalisation has been the ever-widening gap in terms of the economic activities, availability of technical and human resources, and the availability of funds, between academic institutions in developed countries and those in the developing world and in countries in social, political and economic transition. Hence, in formulating the Congress objectives, the Congress organisers hoped to attract the interest of many international academics, which would then provide an important input into this vital debate. However, due to the size of the Congress and to the fact that there was only a limited participation from those economically advanced countries, it is our conviction that this objective has not been largely achieved.

On the other hand, some positive discussions and movements towards establishing bilateral collaborative ventures, between universities in developed and developing nations, have been observed at this Congress. It is anticipated that they will materialise in the not too distant future, and will result in some interesting cross-border projects, yet to be established.

Also, there is the continued problem concerning the role of developed countries in the process of assisting those in less privileged countries. It should be pointed out at this stage that only a small number of delegates from developing nations were able to attend the Congress and benefited from this opportunity of interacting with those from developed countries. It is very unfortunate that those who would benefit best from participation in the Congress were unable to come due to the lack of substantial financial assistance. It seems to be one of the ironies of globalisation that there are not many funding agencies that would be prepared to sponsor conference attendance by delegates from developing countries. Therefore, we must acknowledge that we feel that this objective has not been achieved satisfactorily.

KEY ISSUES

It was envisaged that the Congress would air and address experiences within the global engineering education community in the context of rapidly changing technology and production processes. Several key issues of importance were identified and listed in the Congress brochure. Three major areas relevant to engineering and technology education were indicated as follows:

- General issues.
- International collaboration.
- Academia/industry collaboration.

Fifteen specific themes were identified, five in each area, with the objective to present research findings describing recent work and approaches to the themes and how they relate to contemporary problems and challenges in engineering and technology education. The following topics provided the themes for the panel presentation sessions in the first group:

- Effective methods in training engineers and technologists.
- Current issues and trends in engineering education and industrial training.
- Curriculum design and evaluation and the relevance of liberal education.
- Application of new technologies in engineering and technology education and industrial training.
- Education for the protection of the environment; sustainable development.

The second group of topics, related to international collaboration, included only two specific themes:

- Transfer of information on engineering and technology education.
- International collaborative programmes and systems.

The following topics belong to the third group of subjects that provided themes for the panel sessions:

- Social and philosophical aspects of engineering and its impact on modern societies.
- Academia/industry interaction programmes.
- Promotion of continuing engineering education and industrial involvement.
- Management of academic institutions and engineering faculties.

Twelve panel sessions, out of the total of 18 panel sessions, belonged to the first category of themes that dealt with general issues in engineering and technology education. Altogether, these topical sessions included over 50 paper presentations. It is clear that the Congress papers well covered the first group's topics envisaged for Congress discussions.

UICEE FAMILY OF ENGINEERING EDUCATORS

It was disappointing to see that only a few papers addressed issues of international collaboration and transfer of information on engineering and technology education. It was therefore pleasing to hear the papers presented by representatives of UICEE Partner institutions in the plenary, session titled *UICEE Network of Engineering Educators*.

Much has been accomplished by the UICEE Partner institutions in a very small period of time. The *Caledonian Centre for Engineering Education (CCEE)*, a satellite centre of the UICEE established at Glasgow Caledonian University in 1998, has been vigorously pursuing their main programme of interest that is research into the design, implementation and delivery of programmes of study in the workplace at undergraduate and postgraduate levels, amongst many other activities.

We have to mention, with regret, the departure of the foundation Co-ordinator of the CCEE, Dr George Burns. He has been *snatched* by the University of Glasgow to lead their executive doctoral programmes in the Business School. We wish Dr Burns all the success in his new position and look forward to our future collaboration in his new capacity.

The other UICEE Partner institutions endeavoured to raise a number of issues in their presentations which are not only relevant to the UICEE Network but also to the entire global engineering education community. The presentation by the Ryerson Polytechnic University in Toronto, Canada, revealed their programme and procedures for the establishment of the *Ryerson Centre for Engineering Education (RCEE)*. This new UICEE satellite centre will operate within the UICEE Network, pursuing the work on research, development and application of multimedia in engineering education. Also, Anna University in India has presented an ambitious programme, including the role of the University in continuos professional development education, which is seen as a model for developing countries.

One of the Congress objectives was to focus on tertiary engineering education at a time when universities face common problems related to the influx of new technologies and advanced production processes.

Also, the Congress organisers thought that participants desired to exchange information on their global collaboration, networking, bilateral linkages, and collaborative projects and ventures so well established through the effort of many UICEE members. It seems that this objective has largely been achieved.

PARTICIPATION AND PRESENTATIONS

It should be reported that close to 140 academics, industry, professional and government representatives from over 30 countries worldwide, including many rectors, vice-rectors and engineering deans, registered at the Congress, participated in the paper presentations and discussion sessions.

Four opening addresses and 20 keynote presentations were made and all touched on a wide range of issues of importance to engineering and technology education. The addresses were followed by open discussions. This format was used in order to ensure a more interactive participation in the Congress.

This time again, each panel session commenced with a lead paper, which was earlier identified as the most representative of the theme of the session. Eighteen such lead paper presentations were made at the Congress, with all speakers raising issues of national and international relevance and presenting their research and ideas on how to help develop engineering and technology education. Close to 70 regular presentations were made, and most of the contributions are included in the Congress Proceedings. Moreover, a few regular papers not included in the Congress Proceedings were presented at the Congress.

It should be mentioned, with regret, that the Congress Programme did not include paper presentations concerning all the topics relating to engineering and technology education that the organisers wished to have identified and discussed. For example, there was very little coverage of issues related to the third group of topics, namely, *Academia/industry collaboration*. However, it was pleasing to see that several other topics and issues, not envisaged in the original set of themes, were addressed in excellent paper presentations and plenary discussions.

UICEE INVOLVEMENT

Since its inception, the UNESCO International Centre for Engineering Educating (UICEE) has carried out a number of projects and activities for the benefit of the global engineering community. These include conducting educational surveys, undertaking research projects, organising functions and seminars and establishing global communication networks. Through its projects and activities, the UICEE endeavours to address, tackle and solve contemporary problems and challenges in engineering and technology education.

Since the last *Global Congress on Engineering Education*, the Centre has been pursuing a number of key research and developmental activities, namely:

- The investigation of the status and quality of environmental engineering education.
- Electronic publishing.
- The development of a global curriculum.
- UICEE Urban Design and Education Programme (UICEE/UDEP).
- The development of Graduate Courses in Engineering Education (GCEE).

The role, structure and major activities of the UICEE, which acts as a national and international clearing-house for the transfer of information on engineering education, and the results of over six years of energetic operation, during which it developed its many linkages, activities and projects for the international engineering community, were presented in great detail by the UICEE Director in the opening address.

GERMAN CONTRIBUTION

The globalisation process must go through various different cultures, and consequently through various different languages. This is now the expression of a new approach to globalisation: the global vision is not to be monopolised by the one nation; the global vision is one wherein all cultures can contribute. This gives a new sense of unity through diversity and embraces the solidarity of humankind and helps to realise part of the UICEE's mission. To this then, there have significant contributions by German-speaking people to engineering education as part of this Congress.

German Issue of the GJEE

A special issue of the *Global Journal of Engineering Education* (GJEE), Vol.4, No.2, has been published entirely in the German language in conjunction with the 2nd Global Congress. Guest Editor of this issue was Prof. Norbert Grünwald, Dean of the Faculty of Mechanical and Environmental Engineering at Hochschule Wismar, University of Technology, Business and Design in Wismar, Germany, reinforcing the local involvement in this issue. Articles were assembled from across Germany, and have served to highlight some strongly relevant progress in the field of engineering education with both regional and international significance.

As it has been published in German, this is aimed at those engineers and educators for whom German is a first or second language. This empowers those whose English language skills may not be so robust, thereby augmenting the international nature of engineering education within the global community. Furthermore, this issue is a special milestone for the UICEE as the exchange of information on engineering education through the GJEE is no longer restricted to just the English language and advancing the availability of information for engineering educators internationally. The opportunity now presents itself for other international languages, such as French, Spanish, Portuguese, etc, to engage in future special issues of the GJEE.

German Network of Engineering Education

Growth and participation in the German Network of Engineering Education has evolved dramatically over the last few years. The first official meeting of this network was held on the last day of the 2nd Global Congress, under the chairmanship of Prof. Grünwald, and included a brainstorming session led by Prof. Klaus-Jürgen Peschges of Fachhochschule Mannheim. The meeting endeavoured to elicit issues of importance for German engineering education. An action-oriented agenda for the German Network has also been formulated at this gathering.

IL-GEE MEETING

The Congress also provided the venue for the *13th General Meeting of the International Liaison Group for Engineering Education* (ILG-EE). The Group's discussions were mostly concerned with future activities in engineering and technology education. Since the UICEE is the host of the ILG-EE Secretariat, and has been promoting the ILG-EE in the international arena, the special role of the UICEE was considered and acknowledged. High on the agenda was the contribution of members of the ILG-EE to the research and development activities of the UICEE, and how effectively members of the ILG-EE can be involved in them.

The Group discussed and supported the involvement in a number of international conferences and meetings on engineering education carried out or being currently organised by the UICEE, some of which have led to the *2nd Global Congress on Engineering Education*. The objective of these conferences was, and still is, to serve the international engineering education community, and to raise the profile of engineering education on the global scene.

High on the agenda was the issue of continuation of this series of Congresses with the *3rd Global Congress on Engineering Education* to be staged in 2002, with venue yet to be determined. The Group has for many years been concerned about the coordination of future international meetings. With the high

proliferation of meeting on engineering and technology education, carried out by many international groups, this process cannot be controlled and rationalised. We have to accept the fact that any organisation has the right to organise meetings on engineering education, and that there is no possibility of coordination of all the potential meetings. The UICEE has long ago realised this fact and is pursuing its well-established series of conferences and seminars. However, the UICEE always welcomes potential co-sponsors and collaborators.

As one of the last resolutions, the ILG-EE decided to continue its work and existence. No firm resolution was carried out as to the *14th General Meeting of the ILG-EE*. However, the UICEE proposed that the next annual meeting coincide with the *3rd Asia-Pacific Forum on Engineering & Technology Education*. This Forum is being organised by the UICEE, and will be staged in Taiwan in July 2001. The ILG-EE Secretary was asked to consult members of the ILG-EE further on this matter. Nevertheless, the UICEE will be more than happy to provide the venue for the ILG-EE meeting in 2001 at one of its international conferences.

GLOBAL CURRICULUM

It should be emphasised at this point that several important initiatives, which may have a strong impact on the role, status and quality of engineering and technology education in the world, have been formulated and initiated at this Global Congress. It is also anticipated that many new initiatives and activities will emerge in the near future as a consequence of this Congress.

The issues of accreditation of foreign engineering courses, recognition of foreign professional qualifications and mobility of academic staff and students were very well addressed and discussed at the Congress. It seems that with the enormous progress in globalisation, these issues are still in their infancy. We have waited for a global system of accreditation and recognition of foreign qualifications for too long. Hence, we should not be complacent; we should speak out when we see that things are going the wrong way, and this is one of the areas of neglect. We cannot single out one particular organisation that could be blamed for this deficiency. All the organisations for engineering education, which aspire to be involved in international affairs, have to be held responsible for this gross inadequacy.

During the *1st Global Congress on Engineering Education* held in Cracow, Poland, in 1998, the UICEE strongly advocated for research and development of a global curriculum in engineering education. However, there was strong opposition by some delegates from one particular nation to this project. Such a development requires the engagement of substantial financial and human resources not presently available to the UICEE alone. With the lack of commitment to this project by other international universities, which would be in a position to contribute to this venture, no significant progress has been made so far in the project. However, the UICEE still believes that the development of a global curriculum is the correct way to go.

The UICEE is planning to initiate this global process by establishing a project on the research and development of a global curriculum for environmental engineering education in the first instance as a pilot project. It is hoped that members of the UICEE will play a significant role in this endeavour. Should the project be successful, the UICEE will be further encouraged to continue this research and development on a much larger scale and will vigorously seek collaborators and sponsors for this complex project.

The issues of the teaching standards in academia and the quality of engineering and technology education have also been aired and addressed at the Congress. They are definitely at stake with the lack of proper funding and extremely conservative approaches to education by many governments. We must ensure that academic staff engage in fundamental and applicable research into engineering teaching and learning processes and the application of modern technology and media to engineering education practice. We must ensure that engineering academics entering academia have an opportunity to expand their knowledge of education, educational psychology, methodology of teaching and learning, especially relevant and tailored for engineering and technology education.

The UICEE response to this need has been the establishment of an international project on the development of Graduate Courses in Engineering Education (GCEE). The inaugural workshop, held in conjunction with the *3rd UICEE Annual Conference on Engineering Education* in Hobart, Australia, last February, has initiated this process. Several institutions and individuals have become involved in this project, and have started developing teaching materials for the subjects envisaged in the courses. The presentation of recent developments will take place in this lecture theatre after the Closing Ceremony of the Congress. However, there is still room for new collaborators and we would cordially invite you to take this opportunity and attend this GCEE session.

It seems that this Congress has provided us with some ideas on what is really happening in

engineering and technology education globally, and what directions we should take to develop those ideas further.

It appears that a constant and serious engagement in engineering and technology education research, global networking and collaboration, development of a global curriculum, joint development and exchange of teaching materials, mobility of staff and students and exchange of information are the only ways to go. Our opening presentation demonstrated that the UNESCO International Centre for Engineering Education is vigorously pursuing these ideas, but we will never succeed without your support and active participation in our research and development activities.

We again appeal to the rectors, vice-rectors, deans and other senior academics who have participated in the *2nd Global Congress on Engineering Education* to support our collective endeavour, to encourage other staff in their faculties to become involved in research and development activities in engineering and technology education, and finally to recognise and promote the efforts of those staff who are engaged in such activities.

BADGE OF HONOUR AWARDS

UICEE Gold and Silver Badges of Honour for *distinguished contributions to engineering education, and for outstanding service to the Centre*, were presented last night at the Congress Banquet. The recipients of the UICEE Gold Badge of Honour were our distinguished colleagues Professor Colin U. Chisholm, Dean of the Faculty of Science and Technology at Glasgow Caledonian University, Glasgow, Scotland and Professor Norbert Grünwald, Dean of the Faculty of Mechanical Engineering/Process and Environmental Engineering, University of Technology, Business & Design, Wismar, Germany.

The UICEE Silver Badges of Honour were presented to Professor Algirdas V. Valiulis, Vice-Rector of the Vilnius Gediminas Technical University, Lithuania; Professor Gregor Büchel, Dean of the Faculty of Information Technology at the University of Applied Sciences Köln, Germany; Professor Franklin Fong-Ming Lee, Dean of the Faculty of Engineering, at the Chinese Culture University, Taiwan; and Professor George G. Rogozin of the Donetsk State Technical University, Ukraine.

Additionally, the UICEE Silver Badge of Honour was also awarded to Professor Adinarayana Kalanidhi, Vice-Chancellor of Anna University, India, at the *13th General Meeting of the International Liaison Group for Engineering Education.*

BEST PAPER AWARDS

The UICEE Best Paper Awards for the Most Significant Paper Contributions to the *2nd Global Congress on Engineering Education* were awarded on this occasion. Participants at this Congress had the opportunity to vote for those papers that had been included in the volume of Congress Proceedings and had also been presented. These awards covered the five categories of Diamond, Platinum, Gold, Silver and Bronze. This is definitely the special occasion for celebration of academic excellence.

The Diamond award is conferred upon F-M. Lee from Chinese Culture University, Taipei, Taiwan for his keynote address titled *The East-West dialogue on engineering education in the 21st Century*. The Platinum award goes to P. Eyerer, B. Hefer (both from Fraunhofer Intitute for Chemical Technology in Pfinztal, Germany) and D. Krause (from University of Stuttgart, Stuttgart, Germany) for their keynote address called *Reformation of technical education by project-orientated education*. The Gold award is presented to S. Kolari from Tampere Polytechnic, Tampere, Finland, and C. Savander-Ranne from Helsinki Polytechnic, Helsinki, Finland for their paper entitled *Why do our students not learn as we wish them to?* The Silver award is bestowed on N.Grünwald and D. Schott, from the Univeristy of Technology, Business and Design, in Wismar, Germany for their opening address dubbed *World Mathematical Year 2000: modern mathematical learning in engineering education – taking the German societal environment into consideration*. And the Bronze award is accorded to H. Ewald of Univeristy of Technology, Business and Design, in Wismar, Germany, and G.F. Page of John Moores University in Liverpool, United Kingdom, for their paper called *Performing experiments at remote locations using the Internet.*

I congratulate those Congress participants who have succeeded in gaining these awards. Expanded versions of these excellent but diverse award papers will be published in the *Global Journal of Engineering Education* in the near future.

CONCLUSION

In conclusion, I wish to congratulate the colleagues who have received the UICEE awards. Also, again I wish to express my sincere gratitude to all of you for your participation in, and contribution to, this Congress. I look forward to meeting you all again at one of the many conferences organised by the UICEE and most definitely at the *3rd Global Congress on Engineering Education*.

On behalf of the Congress participants, I wish to express our gratitude to the host of this Congress, Hochschule Wismar, to all the sponsors, co-sponsors and supporters for their intellectual, moral and financial support.

I wish to thank you very much for your participation, and declare the *2nd Global Congress on Engineering Education* to be closed.

BIOGRAPHY

Zenon Jan Pudlowski graduated Master of Electrical Engineering from the Academy of Mining and Metallurgy (Cracow, Poland), and Doctor of Philosophy from Jagiellonian University (Cracow), in 1968 and 1979 respectively. From 1969 to 1976 he was a lecturer in the Institute of Technology within the University of Pedagogy (Cracow). Between 1976 and 1979 he was a researcher at the Institute of Vocational Education (Warsaw), and from 1979 to 1981 was an Adjunct Professor at the Institute of Pedogogy within Jagiellonian University. From 1981 to 1993 he was with the Department of Electrical Engineering at The University of Sydney where, in recent years, he was a Senior Lecturer.

He is presently Professor and Director of the UNESCO International Centre for Engineering Education (UICEE) in the Faculty of Engineering at Monash University, Clayton, Melbourne, Australia. He was Associate Dean (Engineering Education) of the Faculty of Engineering between 1994 and 1998. His achievements to date have been published in books and manuals and in over 250 scientific papers, in refereed journals and conference proceedings.

In 1992, he was instrumental in establishing an International Faculty of Engineering at the Technical University of Lodz, Poland, of which he is the Foundation Dean and Professor (in absentia) (1992-99). He was also appointed Honorary Dean of the English Engineering Faculty at the Donetsk State Technical University (DonSTU) in the Ukraine in 1995.

Professor Pudlowski is a Fellow of the Institution of Engineers, Australia. He is a member of the editorial advisory boards of many international journals. He was the 1st Vice-President and Executive Director of the AAEE and the Editor-in-Chief of the AJEE since its inception in 1989 until 1997. Currently he is the Editor-in-Chief of the *Global Journal of Engineering Education*, and is the Foundation Secretary of the International Liaison Group for Engineering Education (ILG-EE).

Professor Pudlowski has chaired and organised several international conferences and meetings. He received the inaugural AAEE Medal for Distinguished Contributions to Engineering Education (Australasia) in 1991 and was awarded the Order of the Egyptian Syndicate of Engineers *for Contributions to the Development of Engineering Education on both National and International Levels* in 1994.

In June 1996, Professor Pudlowski received an honorary doctorate from the Donetsk State Technical University in the Ukraine in recognition of his contributions to international engineering education, and in July 1998 he was awarded an honorary Doctorate of Technology from Glasgow Caledonian University, Glasgow, Scotland, United Kingdom. In 1997, he was elected a member of the Ukrainian Academy of Engineering Sciences.