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Important Considerations in Improving the Acquisition of Communication Skills by Engineers*

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Communication skills, as discussed in this article, are considered from the point of view of linguistics, communication channels and patterns for engineers, as well as strategies for effective communication and the re-evaluation of engineering curricula that must be incorporated in engineering courses in order to enhance communication-related outcomes. Therefore, it is the intention of the authors to reflect on communication skills for engineers, which are so critical for professional success and, hence, so necessary to be an integral part of engineering education. It is a well-known fact that demand breeds supply. With a constantly growing number of commercial courses like *English for Engineers* or *Communication Skills for Engineers*, which are designed to help engineers to communicate effectively in English, there is no doubt that something is missing in engineering and technology education. Many engineering educators, as well as industry leaders, strongly advocate for the inclusion of the development of the so-called *soft skills* in engineering curricula. This comes from the application of modern technologies and industrial processes, as well as the globalisation of professional and business activities, which have caused a great impact on engineering that demands from engineering graduates well-developed communication skills in native and foreign languages.

INTRODUCTION

Us engineers don't need no English is a phrase that, according to Herbert Hirsh, was common in engineering circles. The idea behind the words was popular both among students and staff, who strongly believed that it was more important and interesting to be advanced in terms of technological subjects rather than have a *radical departure* towards something like English and communication [1].

Despite further advancements and innovations in the modern world, when dynamic technological changes fill in both reality and cyberspace, thus giving more opportunities and excitement for young aspiring engineers, technologists and scientists to be closer to technological wonders, as well as providing them with mobility, nothing seems to change in the attitude towards English and communication skills acquisition.

There is still a trend to take English and communication subjects as something less significant than technological disciplines. Although becoming more technological and complex, engineering work requires communication to be more technological and complicated.

A NEED TO HONE COMMUNICATION SKILLS

Does knowing a language well guarantee its successful usage with real communication impact? Is communication all about mastering the grammar and having a decent scope of vocabulary? How far should one try to expand his/her vocabulary in order to communicate efficiently?

It has been shown by extensive research in applied linguistics that a comparatively limited number

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**As Director of the UICEE, Prof. Z.J. Pudlowski declined to accept the award, which was accepted by Mrs E.A. Danilova.

of words is needed to be able to communicate effectively in any language. It is advocated that for all purposes of communication, only about 2,000 different words are required. This small number of words, compared with what is included in recent editions of dictionaries, if used grammatically correct and context-wise, will serve all communication purposes, but will not make a successful communicator.

As long ago as in 1910, Joseph Devlin, in supporting this statement, wrote in the book *How to Speak and Write Correctly* the following:

> *... a great many people who pass in society as being polished, refined and educated use less* [than 2,000 words]*, for they know less. The greatest scholar alive hasn't more than four thousand different words at his command, and he never has occasion to use half the number* [2].

A successful communicator is not the one who can produce sentences grammatically correct; who is able to be fluent, linguistically elegant and expressive, and even not the one who has a native-speaker insight of how the language works, but the one who is able to get the message across to a listener.

Today, it is often believed that a typical engineering graduate lacks communication skills. Cerri states the following:

> *Very few engineers even believe that communication is an issue for them until they are in the work environment and are faced with what seems to be an inability to connect with and influence people. For the typical engineering student, effective communication skills are assumed to come along as a process of human maturation* [3].

If this is the case, then the lack of communication skills can be the cause for young engineers to be greatly disadvantaged in terms of career advancements and further professional achievements and perspectives. Those born or well-trained communicators can easily craft their role towards senior managerial positions being able to promote their ideas, obtain better funding for projects, achieve better results and feedback, and, as such, promote themselves and gain recognition. Amazingly, while technological in nature, the engineering profession is highly communicative in practice.

According to *King Research*, numerous proprietary studies performed in various organisations from the 1980s to the 1990s aimed at determining the communication activities of professionals found that engineers and scientists spend the majority of their time communicating [4].

Gunn claims that *without communication there is no engineering* [5]. Indeed, any product or process of engineering is based on communication at any stage of its development. Hence, communication predetermines and directly affects the success or failure of any engineering undertaking.

It was also documented that a professional engineer will spend up to 80% of the time communicating with other engineers, clients and the general community [6].

Very interesting research was done by Raitt, which showed the distribution of time spent by European Aerospace engineers on various communication channels as presented in Table 1.

About a hundred respondents participated in this survey, which showed that engineers were actively involved in various forms of communication. Each form of workplace communication draws on various communication skills. No matter what the form is, it looks like the reality itself; not only work description dictates the need to develop CQ – Communication Quotient – in order to be qualified as a professional. Indeed, effective workplace communication is essential for personal and professional success; therefore, CQ enhancement has to be in the curriculum of any engineering programme.

It is very important that students master the tools, techniques and strategies on how to capitalise on the existing skills in accordance with the personality type, learn how to engage in and build professional relationships elegantly, as well as to be able to gain rapport with others in order to realise positive outcomes.

In their research to find appropriate communication patterns for engineers, Tenopir and King also underlined the following:

> *Engineers are rarely taught advanced techniques of information retrieval, however, and are typically not naturally gifted communicators, making it difficult to fill their complex information needs (which can then impair their ability to produce high-quality work)* [4].

It is assumed to be very important for engineers to determine their information needs, find the appropriate means to satisfy them, refine the information, be able to present their results, and adjust and enhance things after obtaining feedback. Only those specialists who are able to manage the existing information

Table 1: The level of time in percentage spent by engineers on communication [7].

Communication Channels	Level of Time (%)		
	Little	Quite a lot	Very much
Oral, formal			
Staff meetings	66	27	7
Contractor meetings	43	39	18
Presentations	77	22	1
Progress meetings	46	41	13
Brainstorming sessions	74	19	7
Committee meetings	77	19	4
Oral, informal			
Corridor talks	69	23	8
Canteen talks	84	15	1
Impromptu visits	38	39	24
Sports/social phone	38	40	22
Written			
Letter	50	41	9
Memo/telex	28	55	17
Internal report	36	49	15
Conference paper	77	19	4
External paper/article	82	12	5
Giving documents	59	32	9

and effectively convey their innovative courageous ideas, concepts and values will have a specific professional influence on their colleagues and customers, thus being able to ignite the progress in science, technology and manufacture.

As stated by Tenopir and King:

> *Not only is information an essential resource for performing engineering activities, but the principal output from these activities is information in one form or another* [4].

The communication framework for engineers and various communication channels used in their professional activities is depicted in Figure 1.

In the centre of the engineers' communication cycle are the main work activities performed by engineers, such as research, design, teaching, administration, etc. In order to fulfil these tasks, an engineer

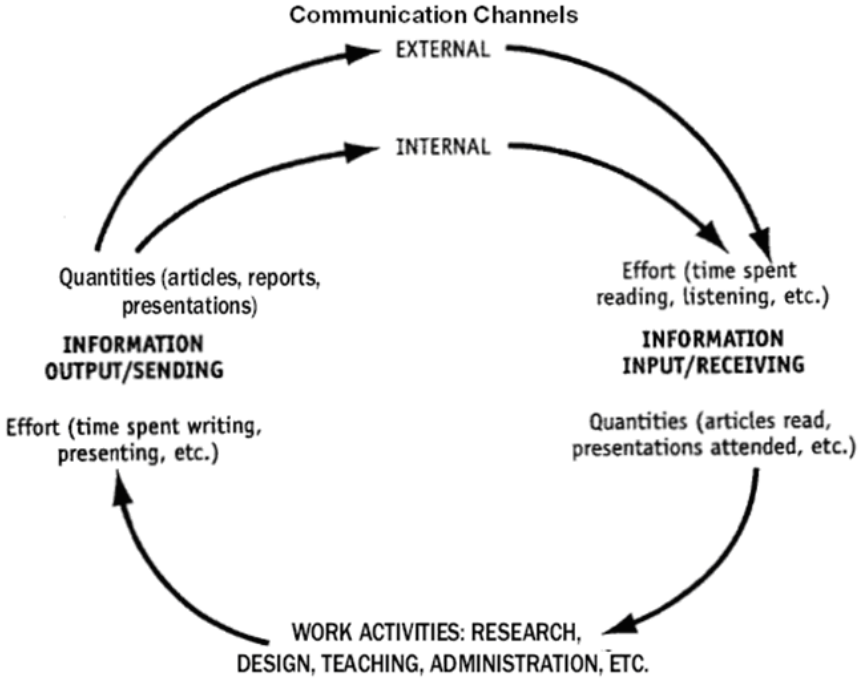

Figure 1: The engineers' communication cycle [4].

should make an effort and spend some time preparing an output of information in written, graphical or oral forms. The next step is to get the message across effectively and efficiently through internal or external channels, ie among the colleagues or clients, committees, experts, etc. Receiving the information also requires effort and time to be spent on reading or listening. Later, the received information requires a thorough analysis and synthesis after which it returns to support and enhance research, design, teaching, administration, etc.

Information output from engineering work involves interpersonal (oral and written) channels of communication. Interpersonal communication involves such channels as informal discussions, advice and consultations, research and presentations, proposals and plans, formal workshops, seminars, trainings or classes. Written communication channels cover such areas as formal publications intended for external audiences, for example, scholarly and trade articles, conference proceedings, books, patent documents, as well as technical reports, proposals or plans that may be created both for internal and external audiences. The target audience may be internal or external, but it is envisaged that engineers tend to communicate more internally than externally [4].

An internal audience may be more supportive and open towards the outputting ideas, excluding the cases when there is an internal interpersonal tension or dislike of the presenter. In this case, the presenter has to have the art of shifting the accent of the audience from his/her personality to the message he/she is delivering.

By the same token, George Bernard Shaw once concluded: *The single biggest problem with communication is the illusion that it has taken place* [8].

It happens because communication is a very complicated process that is conditioned to success only when all the co-participants take active part in the process of formulating and interpreting messages. Krauss states that:

> *At a fundamental level verbal messages convey meanings the speaker has encoded into the words of an utterance, but a listener who has understood the utterance has gone beyond the literal meaning of the words and grasped the particular sense in whish the speaker intended them to be understood* [9].

Any communicative exchange is a joint activity where the meaning emerges as a result of participants' collaborative efforts.

Communication is defined by Canale as:

> *… the exchange and negotiation of information between at least two individuals through the use of verbal and non-verbal symbols, oral and written/visual modes, and production and comprehension processes* [10].

Further, he also lists the following characteristics of communication:

- A form of social interaction;
- Involving a high degree of unpredictability and creativity;
- Taking place in discourse and sociocultural contexts that constrain appropriate language use;
- Limited by psychological constraints;
- Having a purpose;
- Involving authentic language being judged as successful or not by the achievement of the communicative purpose [10].

Another interesting definition of communication may be equally good for describing the working principle of a fax machine. Anthropologists Daniel Sperber and Denise Wilson characterise communication as:

> *… a process involving two information-processing devices. One device modifies the physical environment of the other. As a result, the second device constructs representations similar to the representations already stored in the first device* [11].

In human communication, *information processing devices* stand for people involved in a conversation, *physical environment of a device* is a uniquely human capacity to produce and perceive speech, and the *representations* are mental representations or ideas. Hence, communication is about being on the same wavelength in order to make the information flow smoothly from the source to the destination.

In their intent to have a clearer understanding of human communication process, scientists tried to illustrate it as if it was a physical model based on the natural structure of a language and how human brain processes verbal and non-verbal information. It gave the opportunity to see communication as a more or less predictable, closed system with input, output and feedback [3].

The acceptance of such a communication model has made it possible to determine its components to be able to teach them to students so that they could

discover their unique communication style and develop assertive communication techniques. These studies also helped to figure out the so-called communication pitfalls that either boost or obstruct the effectiveness of communication during which both the speaker and the listener perform verbal and mental activities. The model takes into account that:

> *These mental and verbal processes are deletion, distortion, and generalization. Deletion is the elimination of useful or important information. Distortion is the process of changing the meaning of a communication. Generalisation is the expansion of a communication message to include other, unrelated applications. These three communication* violations *impede effective communication because they change the resulting communication into something different than originally intended. By understanding the roles of deletion, distortion, and generalisation, communicators can remove the negative effects of these three processes* [3].

Communication is all about not to be heard but to be properly understood. Therefore, if communication does not take place or is distorted on the way to the listener, the speaker has to take the responsibility as he/she is the only one who knows exactly what meaning is being conveyed by the message he/she wants to deliver. Communication skills go far beyond being able to present ideas clearly, link sentences into logical utterances and understandable messages; it is also about interpersonal space awareness, time control, body language, eye contact, cultural peculiarities and even the tone of the voice. It looks like a real art but it can be mastered or nicely performed.

SPICING ENGINEERING WITH LINGUISTICS

There have been many discussions generated about the need to develop communication skills and enhance the so-called communicative competence of engineering students. It was curious to have some insights of what, in fact, is a communicative competence. It was discovered that the definition of this notion is full of controversy and theoretical inconsistency.

In 1965, Chomsky, who was the first to raise this issue among linguists, defined competence as *the speaker-hearer's knowledge of his language*, and performance was described as *the actual use of language in concrete situations* [12]. What is being addressed by Chomsky as competence (ie the knowledge of grammar, syntax, phonology, vocabulary, etc) looks like grammatical or rather linguistic competence, while performance (ie the skills to communicate the ideas and keep the transmission of information among those involved in a talk afloat) is being advocated today as communicative competence.

According to Hymes, communicative competence *is integral with attitudes, values, and motivations concerning language, its features and uses* [13]. The core of Hymes' idea is that grammatical competence is not enough to communicate effectively in a language. It is vitally important to know how language is used by members of a speech community to reach the communication purpose.

In the 1960s, Newmark expressed his dissatisfaction with the then prevailing foreign language teaching that was aimed at preparing *a structurally competent* student. One of his popular examples is about *a stranger asking for a light*. A structurally competent student can accurately manipulate the structure of the language by performing this task in the following ways:

- *Have you fire?*
- *Do you have illumination?*
- *Are you a match owner?* [14].

This example shows that what is grammatically correct does not always justify the purpose of communication as the above mentioned grammatically accurate sentences would not be used by native speakers in order to ask for a light. Along these lines, Hymes is absolutely right by stating that *there are rules of use without which the rules of grammar would be useless* [15].

Canale and Swain made a seminal effort to define communicative competence as the integrity of the following four components [10][16]:

- *Grammatical competence* was seen to encompass *knowledge of lexical items and of rules of morphology, syntax, sentence-grammar semantics, and phonology* [16];
- *Discourse competence* was defined as the ability to connect sentences in stretches of discourse and to form a meaningful whole out of a series of utterances;
- *Sociolinguistic competence* was defined as involving knowledge of the sociocultural rules of language and of discourse;
- *Strategic competence* was seen to refer to *the verbal and nonverbal communication strategies that may be called into action to compensate*

> *for breakdowns in communication due to performance variables or due to insufficient competence* [16].

It should be noticed that traditional language teaching was basically the development of grammatical competence, whereas the modern approach to language teaching is mostly the enhancement of discourse competence. Unfortunately, in the majority of cases, sociolinguistic and strategic competences are still neglected.

It is advocated that all four components are of great importance and have to be enhanced in order to help learners achieve communicative competence. Nevertheless, communicative competence is not enough for efficient communication.

It is also very important to distinguish the fundamental difference between such notions as *communicative competence* and *communicative performance*. Communicative competence is the tacit or internalised knowledge of the language, ie relationship and interaction between grammatical, discourse, sociolinguistic and strategic competences. Communicative performance can be defined as external evidence of language competence or the actual use of the language and realisation of all these competences in various situations.

Even in the world of animals, the ability to communicate is considered as vital for survival, not to mention professional habitat of Homo sapiens.

All animal species communicate, with some being impressively proficient and accurate in delivering the message across. Nevertheless, none of the animal species achieves the precision and flexibility that characterises human communication, a capacity due, in large part, to the uniquely human ability to use language [17].

It is, therefore, envisaged that communication skills for engineers can be enhanced through language teaching and learning by means of developing communicative competence with special practical activities designed to foster communicative performance. Being quite specific, engineering communication skills should be improved on the basis of specific context with relevant types of engineering activities, which can be naturally conveyed by an appropriately designed course of English for Specific Purposes (ESP).

It should be emphasised that designing curricula and developing syllabi content is only halfway to successfully improving engineering communication skills. It is the responsibility of teachers to create conditions, use innovative approaches and appropriate techniques, and offer such learning activities that would create a proper environment for engineering students to favour communication.

As far back as 1981, Brumfit stated the following:

> *What makes learning* communicative *is not only a matter of teaching and learning content but a methodology which provides opportunities for the learners to learn a second or foreign language in use* [18].

For over three decades, the Communicative Language Teaching (CLT) approach has served to satisfy this need. CLT is characterised by a shift from focusing on the language itself to emphasising the expression and comprehension of meaning through the language use.

Compared to approaches that are primarily or even exclusively form-focused and metalinguistic in orientation, CLT is designed to engage learners in the pragmatic, functional and authentic use of the target language for meaningful purposes; indeed, it does a better job of leading to higher levels of fluency and communicative confidence [19].

It would be desirable that a teaching methodology should implement broadly the elements of Neuro-Linguistic Programming (NLP). The reason for this choice is that NLP methodology is based on the concept of rapport and its primary objective is performance enhancement.

NLP lies in the sphere of modern psychology and is, in fact, a scientifically approved set of advanced communication skills. As stated by the magazine *Psychology Today*:

> *NLP cannot be dismissed as just another hustle. Its theoretical underpinnings represent an ambitious attempt to codify and synthesize the insights of linguistics, body language, and the study of communication systems* [20].

It was observed that when people do things under stress or tension, their reactions are always automatic, ie their performance is controlled on a subconscious level. These subconscious reactions may be positive and useful, but may also be negative and unhelpful. NLP is designed to teach how to communicate more successfully and create the right climate for success. It increases the sensitivity towards the body language and signals that others are sending in order to be able to interpret them correctly and adjust a communication pattern to be accurately understood. Moreover, it helps to handle negative experiences, eliminate stress, phobias and depression, thus being able to gain full consciousness of one's own behaviour, reactions and performance.

Communication is a multi-channel process and it can only be truly efficient if all the parties involved experience no communication barriers, ie they can express themselves clearly, present themselves appropriately and listen effectively. As stressed by Kaye, it is also very important to be an effective listener especially in team-based projects and in all oral communication [21].

Cerri recommends that engineers learn to understand the *human process of perception, communication and cognition* and suggests a *7-Step Effective Communication Process* as follows:

1. Understand which of the five senses (or representational system) the listener is operating and match it;
2. Build an unconscious rapport with the listener by reducing his/her filtering utilising such techniques as mirroring, matching, pacing, as well as leading verbal and non-verbal clues;
3. Uncover the listener's paradigms of reality by quick and elegant questioning;
4. Send the message, ie present ideas and issues that the listener may not agree with, but if the rapport was built successfully, then the listener will be able to hear the message in an unbiased way;
5. Check to determine if the message was received in the intended way;
6. Go back to steps 1-3 if the message was received distortedly;
7. Send the next message [3].

He also claims that *excellent communication is a process and an ability that can be learned* [3].

CONCLUSIONS

Numerous researchers report the following:

- *… many, if not most, engineers have trouble writing and speaking clearly* [4];
- Billions of dollars are lost in terms of corporate productivity and profitability yearly when engineers have problems with written communication [22];
- Common barriers to communication for engineers include the lack of knowledge or experience, poorly defined ideas, messy written communications, one-sided or inappropriate communication, failure to bridge differences in values, attitudes or perceptions with the audience, and poor listening skills [23].

Williams sees the possibility of the development of an engineering portfolio based on the following five principles:

1. *Defining* engineering communication;
2. *Identifying* appropriate skills and mapping them in the curriculum;
3. *Correlating* portfolio learning objectives to course and programme objectives;
4. *Facilitating* opportunities for students to reflect on their learning;
5. *Assessing* student learning so that students, faculty and programmes can benefit and improve [24].

It is difficult not to agree that good communication skills must be an integral part of modern engineering curricula. The authors believe that engineering curricula have to be re-evaluated to meet the demands and be responsive to the needs of industry and science. Hence, there should be an ongoing incorporation of communication skills across the engineering curriculum so that it will be possible not only to continuously develop communication competence but also communication performance.

It is assumed that a more efficient enhancement of communication skills is achieved not by offering separate communication courses or by integrating them into engineering courses but realising them on the basis of teaching/learning ESP. On the one hand, it is a more natural way to develop communication skills and interpersonal communication abilities via language teaching; on the other hand, ESP gives an opportunity to involve appropriate engineering content, model and exercise tasks that would be relevant to real engineering activities.

The primary objective is for students to be skilful enough to implement appropriate communication patterns to meet engineering communication challenges. It should also be kept under control what approaches, teaching methods and techniques are implemented to make the developed curriculum work. Implementing information and communication technologies may greatly help to prepare competent and confident communicators with good communication tools at their disposal.

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BIOGRAPHIES

Mrs Elena A. Danilova was born in Tomsk, Russia, where she completed her education in 1998 by receiving a diploma with Honours from Tomsk State Pedagogical University (TSPU) in the field of linguistics and teaching foreign languages (English and German). In the same year, she obtained a lecturer position at Tomsk State University in the Department of Roman-Germanic Philology with the responsibility to teach English as a foreign language. Between 2000 and 2006, she was a lecturer in English for Specific Purposes (ESP) at Tomsk Polytechnic University in the Institute of Foreign Languages, Department of Linguistics and Cross-cultural Communication, and, concurrently, in the Institute for International Education.

In 2002, she obtained her Cambridge ESOL Certificate in Advanced English (CAE), and in 2004, she became an alumna of the professional development programme offered by the USA Embassy in Moscow through which she completed the online course called *Integrating the Internet into the Classroom*. She has also enriched her teaching experience by tutoring international students for Preliminary English Test (PET), Key English Test (KET) and First Certificate in English (FCE) at the Solihull College, West Midlands, UK (2002), and the Harvest English Institute, Newark, USA (2003).

Mrs Danilova finds her teaching profession very noble and responsible. In 2004, in order to make her professional experience more efficient, she began a research project on using Information Technologies (IT) for ESP teaching. The field of her scientific endeavour includes the following areas: developing new methods for teaching English to engineers using IT; teaching English online and/or using Internet resources and technologies; implementing a process-oriented approach, and motivating and rewarding learning styles; researching and learning how to design courses on the basis of learning management systems like *WebCT*, *Learning Space*, etc; developing self-study activities for engineering students; and enhancing communication skills.

Presently based at the UNESCO International Centre for Engineering Education (UICEE) in the Faculty of Engineering at Monash University, Melbourne, Australia, Mrs Danilova is enrolled as a full-time postgraduate student (PhD candidate) in the Faculty of Arts via the Monash Asia Institute (MAI), with the UICEE Director acting as the Main Supervisor. Her current studies focus on research into the curriculum development for English and communication studies in engineering and technology courses, with particular emphasis on ESP.

In 2006, Mrs Danilova received the *UICEE's Women in Engineering Education Scholarship*, enabling her to commence her postgraduate studies at Monash University, and in 2007, received two highly competitive scholarships: the *Monash International Postgraduate Research Scholarship* and the *Monash Graduate Scholarship*.

Her research has, so far, been recognised by the UICEE Best Paper Diamond (First Place) Award for a paper presented at the *9th Baltic Region Seminar on Engineering Education* (Gdynia, Poland, 2005) and the UICEE Best Paper Silver (Fourth Place) Award at the *11th Baltic Region Seminar on Engineering Education* (Tallinn, Estonia, 2007).

Zenon Jan Pudlowski graduated Master of Electrical Engineering from the Academy of Mining and Metallurgy (Kraków, Poland), and Doctor of Philosophy from Jagiellonian University (Kraków), in 1968 and 1979, respectively.

From 1969 to 1976, he was a lecturer in the Institute of Technology within the University of Pedagogy (Kraków). 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.

In 1992, he was instrumental in establishing the International Faculty of Engineering at the Technical University of Lodz, Poland, of which he was the Foundation Dean (1992-1995) and Professor (in absentia) (1992-1999). He was also appointed Honorary Dean of the English Engineering Faculty at the Donetsk National Technical University in the Ukraine in 1995.

His research interests include circuit analysis, electrical machines and apparatus, implementation of computer technology in electrical engineering, software engineering, methodology of engineering education and industrial training, educational psychology and measurement, as well as human aspects of communication in engineering. His achievements to date have been published in books and manuals and in over 350 scientific papers, in refereed journals and conference proceedings.

Professor Pudlowski is a Fellow of the Institution of Engineers, Australia, and of the World Innovation Foundation (WIF), UK. He is a member of the editorial advisory board of the *International Journal of Engineering Education*. He is the founder of the Australasian Association for Engineering Education (AAEE) and the *Australasian Journal of Engineering Education* (AJEE), and 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* (GJEE) and the *World Transactions on Engineering and Technology Education* (WTE&TE). He was on the editorial boards of the *International Journal of Electrical Engineering Education* (1993-2005) and the *European Journal of Engineering Education* (1993-2005). Prof. Pudlowski was the Foundation Secretary of the International Liaison Group for Engineering Education (ILG-EE) (1989-2006) and is currently its Chairman.

Professor Pudlowski was a member of the UNESCO International Committee on Engineering Education (ICEE) (1992-2000). He has chaired and

organised numerous international conferences and meetings. He was the Academic Convener of the *2nd World Conference on Engineering Education*, the General Chairman of the *East-West Congresses on Engineering Education*. He was also General Chairman of the *UNESCO 1995 International Congress of Engineering Deans and Industry Leaders*, and General Chairman of the *Global Congress on Engineering Education*, to name a few.

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, Prof. Pudlowski received an honorary doctorate from the Donetsk National 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, UK. He was elected a member of the Ukrainian Academy of Engineering Sciences in 1997. In 2002, he was awarded the title of an Honorary Professor of Tomsk Polytechnic University, Tomsk, Russia, and was an External Professor at Aalborg University, Aalborg, Denmark (2002-2007). He is listed in 14 *Who's Who* encyclopaedias, including the Marquis *Who's Who in the World*. He has been recently appointed to the Register for External Reviewers of the Oman Accreditation Council (OAC).