



Universitatea *Transilvania* din Braşov

HABILITATION THESIS

Titlu:

Energy and Informatics, toward Intelligent and Energy Efficient Applications

Domain:

Electrical Engineering

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A. Summary

The habilitation thesis has as main objective illustrating the evolution and concerns as a researcher and professor of the candidate Prof. dr. Paul Nicolae BORZA. The thesis is based on his professional, scientific and didactic activity for more than 35 years as an electric engineer in remarkable institutions in Romania and abroad, namely: Brasov Truck Company in 1980-1982, "Politehnica" University of Bucharest, period 1990-1993, Transilvania University of Brasov from 1980 to present, as well as in the Siemens Program and System Engineering company, and then in Siemens AG - Corporate Technology Group during 2002-2009. The thesis reviews the stages of the candidate's evolution, from assistant to teacher, from the development of applications in the following fields: mechanical, encapsulated systems, the development of applications based on the mimetic between the bio-systems and the technical systems of energy management and energy storage. The candidate's achievements in the field of scientific research in the field of electrical and electronic engineering are presented, as well as the way he has been involved in the training of young engineers or specialists in the above-mentioned fields. He coordinated a number of 5 PhD students, 3 Romanians and 2 foreigners. He registered 3 patents, one of which is in the legal deposit phase. It is worth highlighting the over 35 research contracts that he has coordinated or integrated, the over 40 scientific papers published in journals or proceedings of international conferences, of which 19 are ISI Proceedings. The Hirsh index is 6, the i-10 is 3, with 143 quotes (June 2017 on Google Scholar). He has published a number of 3 book chapters on his own in collaboration with monographs in prestigious international publishing houses, and has co-published two other monographs. At national level, a number of nine chapters of books, included in scientific monographs, were published in recognized publishing houses. He was an active promoter of the European level of hybrid energy storage technology and vice-chair, led two COST projects and organized the 2015 European EESCAP 2015 European Symposium. He collaborated with members of institutions such as INRETS / IFSTTAR (University of Poitiers France), Ikerlan IK4 (Spain), TEI and NTUA (Greece), Erasmus University Rotterdam (Netherlands), Brussels University (Belgium), Genoa University, Trondheim Institute of Technology, New University of Lisbon (Portugal), Hasso Platter Institute (Germany), National University of Ireland (Ireland), being invited either to provide courses for specialists and young engineers, or to collaborate in the field of scientific research.

The evolution of Prof. Borza can be summarized in three main stages: i). The stage of his accomplishment as a researcher when he came into contact with the field of biology and completed his doctoral thesis at "Politehnica" University of Bucharest; ii). The stage of

developing technical skills and research in the field of encapsulated electrical systems, as well as the completion of its training in the field of modern educational technologies; iii). Stage of knowledge development in the field of electrical and hybrid energy storage systems and their applications.

The empowerment thesis illustrates the professional development of the candidate and summarizes the first scientific papers referring to developments in the field of medical instrumentation, then the numerous implementations using dedicated systems, among which is the implementation of the first system measuring system services as a beneficiary Hidroelectrica.

The following is a description of knowledge development in the field of electrical energy storage systems with a special focus on hybrid storage electrical systems composed of batteries, supercapacitors and combustion cells. Together with Professor Louis Francois Pau, a solution is proposed for the development of information processing systems based on the latest scientific and technological conquests in the field of quantum physics, condensed matter and nanotechnologies. This direction, considered to be deeply original, can lead to a radical change in almost all human activities in a more distant future.

In the career development plan, we propose new implementations of electrical and electronic systems based on the mimicry between the biological and technical systems. The author considers the knowledge and use of bio-system paradigms as one of the most prolific ways of developing new, original and performing technical systems. The development of design, sizing, reliability, energy modeling, modeling, prediction, and development of related control functions are all areas where it believes that innovative aspects will largely be the result of mimetic-based developments with live systems.

The information-energy fusion as a target and also a fundamental means of transforming into the "intelligent" systems of the current management systems will form the target of future research to the author of the power engineering competence thesis.