

## **AHP/ANP Applications in Economic Policy, Business, and Management with the T. L. Saaty Decision Making Hackathon at ICEFM 2022**

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Organizers of the Polish-Peruvian 21<sup>st</sup> International Conference ECONOMY - FINANCE - MANAGEMENT (ICEFM2022) entitled "*New Challenges in Economic Policy, Business and Management*", Wieliczka, Poland, October 22 –25, 2022  
Anna Ujwary-Gil, Anna Florek-Paszowska, and Artur Koziół

Under the patronage of the Embassy of the Republic of Poland in Lima, Peru, and the Embassy of Peru in Poland, the city of Wieliczka hosted the 21<sup>st</sup> Polish-Peruvian conference in the series ECONOMY-FINANCE-MANAGEMENT, entitled "*Contemporary Challenge in Economic Policy, Business and Management*" on October 22–25, 2022. The conference was also under the Honorary Patronage of the Honorary Consul of the Republic of Peru and the Honorary Consulate of Romania in Krakow. The main organizers of this conference were the Institute of Economics, Polish Academy of Sciences, IE PAS (Dr hab. Anna Ujwary-Gil, Conference Chair and Head of Scientific Committee), the Mayor of the City and Commune of Wieliczka (Dr. Artur Koziół, Conference Chair - Wieliczka), and the Centrum PUCP, Pontificia Universidad Católica del Perú, Lima, Perú (Dr. Anna Florek-Paszowska, Conference Chair - Perú).

The Polish-Peruvian conference was the most prominent scientific and business event of 2022. We hosted participants from 15 countries, including 68 panelists from Poland, Peru, the USA, Spain, the Czech Republic, Japan, Iran, Brazil, Romania, Ukraine, India, Chile, and Malaysia, as part of an interdisciplinary program combining two disciplines: economics and finance, as well as, management and quality science. The keynote of this conference was to create a platform for sharing knowledge and experience between representatives of the following three environments: science, business, and local governments represented by the mayors of the cities of Łódź, Wrocław, and Sopot. The purpose of undertaking a dialogue between representatives of the worlds of science, business and local governments, as part of the conference, was to achieve common goals, such as increasing the flow of information between science and business practice, increasing the level of economic knowledge in the field of management, and deepening and disseminating models of good and proven scientific and business practices. Our strategic goal during this conference was to expand the scope of the exchange of experiences between the world of science and business practice.

The ICEFM2022 International Scientific Advisory Committee consisted of Anna Ujwary-Gil, Institute of Economics, Polish Academy of Sciences, Warsaw, Poland (Conference Chair and Head of Scientific Committee) and Adam Nalepka, University of Economics, Cracow, Poland (Honorary Chair). The Scientific Committee consisted of Wiktor Adamus, Jagiellonian University, Cracow, Poland; Wiktor Askanas, Member of Canadian Competition Tribunal, Professor Emeritus University of New Brunswick, Canada; Tor Helge Aas, University of Agder, Norway; Beatrice Avolio, Head of the Department of Graduate Studies in Business Academic Department, Centrum PUCP; Pontificia Universidad Católica del Peru, Lima, Perú; Małgorzata Baran, Collegium Civitas, Warsaw, Poland; Krzysztof Bartosik, Institute of Economics, Polish Academy of Sciences, Warsaw, Poland; Barbara Błaszczuk; Institute of Economics, Polish Academy of Sciences, Warsaw, Poland; Ryszard Borowiecki, Cracow University of Economics, Poland; Wojciech Czakon, Jagiellonian University, Cracow, Poland; Ivano Dileo, University of Bari "Aldo Moro", Italy; Ondřej Dvouletý, University of Economics in Prague, Czech Republic; Jorge A. Dulan-Encalada, Universidad de Las Américas Puebla, Mexico; Józefa Famielec, Cracow University of Economics, Poland; Anna Florek-Paszkowska, Centrum PUCP, Pontificia Universidad Católica del Perú, Lima, Perú; Anna Fornalczyk, Comper, Lodz, Poland; Jörg Freiling, University of Bremen, Germany; Marta Gancarczyk, Jagiellonian University, Poland; Bianka Godlewska-Dzioboń, Cracow University of Economics, Poland; Piotr Jedynak, Jagiellonian University, Poland; Beata Jones, Honors Faculty Fellow, Texas Christian University, USA; Krzysztof Klineciewicz, University of Warsaw, Poland; Artur Koziół, Mayor of the Commune and the City of Wieliczka, Poland; Piotr Krajewski, prof. UŁ, University of Lodz, Poland; Christian Lehmann, University of Applied Sciences and Arts, Hannover, Germany; Chaoyun Liang, National Taiwan University, Taiwan; Anna Maria Lis, Gdansk University of Technology, Gdansk, Poland; Marek Lisiński Cracow University of Economics, Poland; Grażyna Leśniak-Łebkowska, Warsaw School of Economics (SGH), Poland; Manuel González López, University of Santiago de Compostela, Spain; Csaba Makó, Szent István University, Centre for Social Sciences Hungarian Academy of Sciences, Hungary;

Zbigniew Makiela, Jagiellonian University, Poland; Carlos Mariño, Research Director, Centrum PUCP; Pontificia Universidad Católica del Perú, Lima, Perú; Percy Marquina, Director General of Centrum PUCP; Pontificia Universidad Católica del Perú, Lima, Perú; Mieczysław Morawski, Warsaw University of Technology, Poland; Enrique Mu, Business Management, Accounting & Ethics; Carlow University, USA; Wiktor Patena, Higher Colleges of Technology, Dubai, United Arab Emirates; Halina Piekarz, Frycz Modrzewski Academy, Cracow, Poland; Yuji Sato, Chukyo University, Japan; Aldís G. Sigurðardóttir, University of Twente, The Netherlands; Roberto Solano-Mendez, Universidad de Las Américas Puebla, Mexico; Włodzimierz Sroka, WSB University, Dąbrowa Górnicza, Poland; Kazimierz R. Śliwa, Frycz Modrzewski Academy, Cracow, Poland; Andrzej Szablewski, Institute of Economics, Polish Academy of Sciences, Warsaw, Poland; and Jon Mikel Zabala-Iturriagoitia, Deusto Business School, Deusto University, Spain.

The ceremonial opening of the conference was performed by:

**Conference Chairs:**

Artur Koziół (The Mayor of the City and Commune of Wieliczka, Poland)  
Anna Ujwary-Gil (Institute of Economics, Polish Academy of Sciences, Poland)  
Anna Florek-Paszkowska (Centrum PUCP, Pontificia Universidad Católica del Perú, Lima, Perú)

**Ambassadors:**

Hubert Wieland Conroy (Embassy of Peru in Poland, Warsaw)  
Antonina Magdalena Śniadecka – Kotarska (Embassy of Poland in Lima, Perú)  
Tomasz Grodzicki (Vice-Rector for Medical College, Jagiellonian University, Poland)

**Institutional Directors:**

Martyna Kobus (Institute of Economics, Polish Academy of Sciences, Poland)  
Percy Marquina (Centrum PUCP, Pontificia Universidad Católica del Perú, Lima, Perú)

**Representative of the Ministry:**

Dariusz Latoszek (Ministry of Economic Development and Technology, Poland)



Ambassador Hubert Wieland Conroy (Embassy of Peru in Poland, Warsaw) during the official opening of ICEFM 2022

As part of the two-day deliberations, twelve sessions were held, including a scientific panel of honorary guests opening the conference led by Anna Ujwary-Gil and Anna Florek-Paszkowska. The scientific panel was attended by Professor Marian Gorynia (President of the Polish Economic Society, Poznań University of Economics), Dr. Percy Markina (Director of the Centrum PUCP, Pontificia Universidad Católica del Perú, Lima, Perú), Professor of Jagiellonian University Wiktor Adamus and Professor Mieczysław Morawski from the Warsaw University of Technology. During the panel, we discussed contemporary topics related to the post-pandemic economy, challenges related to social responsibility, a smart ("compact") city and its management, and the digital transformation of smart enterprises considering recommendations for urban development.



Honorary guests panel chaired by Anna Ujwary-Gil and Anna Florek-Paszowska

The second panel was dedicated to cooperation between science and local government, which was led by Dr. Artur Koziół (President of the City and Commune of Wieliczka) and Professor Zbigniew Makiela from the Jagiellonian University and WSB University in Dąbrowa Górnicza. The panel was opened by a Professor of Cracow University of Economics, Stanisław Mazur (Rector of the Cracow University of Economics), presenting cooperation projects between the university and the local government, conditioning their further development. The Mayor of Łódź, Hanna Zdanowska, raised the subject of climate protection and economic benefits. Jacek Sutryk, Mayor of Wrocław, presented the subject of social innovation as a factor in the development of modern cities, and Dr. Jacek Karnowski, Mayor of Sopot discussed civic self-government in the context of the well-being of citizens. The first day was focused on scientific panels and presentations of contemporary topics and problems faced by local governments.



Academic and city mayors panel chaired by Artur Koziół and Zbigniew Makiela

On October 23, 2022, three parallel sessions were held. Parallel session 1 was chaired by Enrique Mu (Carlow University, USA) and Hannia Gonzalez Urango (INGENIO, Universitat Politècnica de València, CSIC, Spain; Latin American Studies Association, USA). Hannia Gonzalez Urango presented “Hard context indicators for assessing and monitoring sustainability in the private sector.” Jan Brzozowski and Marcin Stonawski (Cracow University of Economics, Poland) presented “Comparative analysis of adaptation strategies of Ukrainian refugees in Poland and Venezuelan refugees in Peru.” Carlos Arturo Hoyos Vallejo (Centrum PUCP, Pontificia Universidad Católica del Perú, Lima, Perú) presented “Deep involvement of multi-stakeholders to build long-term sustainable competitive advantages: A foresight study with a public university.” Jarmila Duháček Šebestová and Šárka Čemerková (Silesian University in Opava, School of Business Administration in Karviná, Czech Republic) presented “Plan or die: Entrepreneurs' response to crisis situation.” Zbigniew Makiela (Jagiellonian University, Poland; WSB University, Dąbrowa Górnicza, Poland) presented “The Smart City concept and 4T capitals in the city development policies of the Metropolis GZ.” Parallel session 2 was chaired by Rafael Fernández Concha (Centrum PUCP, Pontificia Universidad Católica del Perú, Lima, Perú). Here, Małgorzata Kutera (Jagiellonian University, Poland) presented “Cryptocurrencies as a subject of financial fraud.” Julianna Ramirez Lozano (Centrum PUCP, Pontificia Universidad Católica del Perú, Lima, Perú) presented “Latin America social entrepreneur profile: Leadership, culture, good communication and commitment to social/environmental issues.” Vitaliy Tsyganok (Institute for Information

Recording of National Academy of Sciences of Ukraine) presented “Strategic business planning technology,” and Rafael Fernández Concha (Centrum PUCP, Pontificia Universidad Católica del Perú, Lima, Perú) presented “An analysis of the communicated identity of the Online Program Managers (OPM).” Finally, parallel session 3 was chaired by Aleksander Jakimowicz (Institute of Economics, Polish Academy of Sciences, Poland). During that session, Agnieszka Domańska (Warsaw School of Economics, Poland) presented “Quality of life as a keynote between city smartness and sustainability. Perspectives of indexes and indicators.” Renata Wojciechowka (Warsaw School of Economics, Poland) “Scio ergo me” (“I know therefore I am”). Dominika Bąk-Grabowska and Katarzyna Grzesik (Wroclaw University of Economics, Poland) presented “Satisfying employee interests depending on the age and form of employees’ employment.”



Guests and participants of ICEFM2022, October 24, 2022

On October 24, 2022, three online parallel sessions were held. Parallel online session 4 was chaired by Alvaro Talavera Lopez (Universidad del Pacífico, Perú). During this session, Risley Rengifo Tello (Pontificia Universidad Católica del Perú) and Alvaro Talavera Lopez (Universidad del Pacífico, Perú) presented “Management model for the evaluation of university performance using AHP and fuzzy inference systems.” Ivan Luis Infanzon Gutierrez (Pontifical Catholic University of Peru) and Alvaro Talavera Lopez (University of the Pacific, Peru) presented “ANP model to determine a vulnerability index and earthquake mitigation policies.” Govind Seepersad (The University of The West Indies, St. Augustine, Trinidad and Tobago, West Indies), Shivani D.R. Seepersad (The University of The West Indies, St. Augustine, Trinidad and Tobago, West Indies),

and Dave Goorahoo (California State University, Fresno, CA, USA) presented “Averting sanitary disasters in the greater Caribbean area – prioritizing threats to agribusinesses in Antigua and Barbuda using a multi-criteria decision making approach.” Vigneshkumar Chellappa (Indian Institute of Technology Guwahati, India) and Grzegorz Ginda (AGH University of Science and Technology, Poland) presented “Usefulness of crisp AHP/ANP judgment scales to differentiate risk assessment.”

Parallel online session 5 was chaired by Rafikul Islam (International Islamic University Malaysia, Kuala Lumpur). Here, Leticia Galleguillos Peralta (Universidad del Bío-Bío, Chile) presented “Critical factors for female entrepreneurship success through the AHP method, Arauco Province, Chile case.” Nuno Torre (Sao Paulo State University, Brasil) and Valério Salomon (Sao Paulo State University, Brazil) presented “Multi-criteria decision making approaches for hydraulic supplier selection – AHP application.” Mohammad Khalilzadeh (Centrum PUCP, Pontificia Universidad Católica del Perú, Lima, Perú); Ali Heidarib (Pontificia Universidad Católica del Perú, Lima, Peru) and Sayyid Ali Banihashemic (Iran University of Science and Technology, Tehran, Iran) presented “Prioritization of the infrastructural construction projects of industrial parks with the hybrid ANP-BWM method.” Finally, Rafikul Islam presented “Employee performance evaluation using the Analytic Hierarchy Process.”

Parallel online session 6 was chaired by Beatrice Avolio (Centrum PUCP, Pontificia Universidad Católica del Perú, Lima, Perú) who presented “Factors that contribute to the underrepresentation of women academics worldwide: A literature review.” María del Carmen Arrieta Quispe (Centrum PUCP, Pontificia Universidad Católica del Perú, Lima, Perú) presented “Business school’s student satisfaction toward emergency remote teaching.” Carlos Vílchez-Román (Centrum PUCP, Pontificia Universidad Católica del Perú, Lima, Perú) presented “The societal relevance of research output of three Latin American business schools.” Finally, Anna Kowalczyk-Kroenke presented “Chasing an employee. How to build cooperation with employees of the IT sector?”

The second day featured three business panels, where we invited business representatives from the USA, Romania, and Peru. The plenary business panel was opened by John Saaty, son of Professor Thomas Saaty (1926-2017), one of the most famous mathematicians in the USA, doctor honoris causa of the Jagiellonian University, creator of the Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP) decision-making methods and their applications in solving problems of the public sector and business.

The plenary business panel was chaired by Rozann W. Saaty (Creative Decision Foundation, USA); John Saaty (CEO and Co-founder - Decision Lens, USA); Enrique Mu (Carlow University, USA) and Anna Florek-Paszowska (Centrum PUCP, Pontificia Universidad Católica del Perú, Lima, Perú) and was dedicated to “What is AHP? Origins, state of the art, applications.” John Saaty presented “Decision making in the public sector: the inside story.”





Chairs of plenary business panel: Rozann W. Saaty (on screen), Enrique Mu, Anna Florek-Paszowska, and John Saaty



Chairs of plenary business panel: Enrique Mu, Anna Florek-Paszowska, and John Saaty (left to right)

At the end of the conference, a final business session in the form of a discussion panel was led by Dariusz Latoszek from the Ministry of Economic Development and Technology, Poland. He is chief specialist for cooperation between the countries of Latin America and the Caribbean and former commercial counselor at the Embassy of the

Republic of Poland in Chile and former consul in Peru and Nigeria. A total of eleven panelists took part in the discussion including:

John Saaty (CEO and Co-Founder - Decision Lens, USA)  
Tomasz Lubowiecki (CEO 7R SA - Logistics and Development Sector)  
Bogusław Kwiatkowski (CEO Answear.com - Clothing Sector)  
Ștefan Porojan (Counsellor to the Minister, Economic and Trade Promotion Office,  
Romanian Embassy in Poland)  
Juan Risi (Agribusiness Director, PRODIGIO Company, Peru)  
Sergio Hoyos (Leader in Sustainability in Marketing and Clothing in Alpaca and Vicuña,  
Peru)  
César Ramírez (CEO Eureka Latam Innovation & Sustainability, Peru)  
Kazimierz Murzyn (CEO, Klaster LifeScience, Kraków)  
Irena Łobočka (CEO, Cluster "Sustainable Infrastructure")  
Marius Gălbenușă (President of the Romanian Association for Sustainable Local  
Development, Romania)

The discussion chaired by Dariusz Latoszek focused on topics such as:

- Why Poland? Why Peru? Reasons for establishing/developing relations with Poland and Peru. Coincidence, conscious choice, or simple extension after dealing with other countries?
- Successes and challenges in business relations with the other country.
- Proposals to improve the relationship: the role of public institutions (including government and regional administration) and the private sector - proposals for support from these institutions.
- Personal impressions from this conference (business aspect), expectations for the future, and suggestions for further steps in business cooperation.



Business session chaired by Dariusz Latoszek and panelists

Simultaneous with this conference, organizers held the TL Saaty Decision Making Hackathon, a workshop dedicated to students from all over the world. This is the second time this event has been organized and the first time in Poland and Europe (the first Hackathon was held in Pittsburgh, USA). After the AHP Hackathon training conducted by the Creative Decision Foundation, the Mayor of Wieliczka introduced three issues for the thirteen registered groups to solve:

- 1) Management of social services through modern communication systems. Creating an information exchange model.
- 2) Managing a system of integrated public transport connections (railway, bus) with the assumption of increasing the participation of people using organized connections, in favor of resigning from individual transport.
- 3) Management of activities aimed at strengthening the area of environmental protection. Creation of new ecological projects with a monitoring system.

While working on the business cases proposed by the Mayor of Wieliczka, the students analyzed real cases and proposed specific solutions. Student presentations were assessed based on the teams' ability to analyze the information, clearly define the problem, effectively use decision-making methods (AHP/ANP), show creativity, and communicate the recommended course of action. The winners were selected by a panel of judges experienced in AHP/ANP. Among the judges were members of the international AHP/ANP community composed of scientists and practitioners, as well as professionals who work with both the public sector and business partners.



Hackathon session with students

The second AHP-Hackathon training, available to students from all over the world, is an event organized in Poland and Europe (the first was held in Pittsburgh, USA). The opening ceremony of the international competition between groups of students was performed by the Mayor of Wieliczka, Artur Koziół, and Rozann W. Saaty, President of Creative Decision Foundation, providers of prizes for the winning teams. The AHP-Hackathon lasted three days, during which the students learned methods and techniques for solving complex problems in a non-standard way. They used hard data, personal perspectives, and experience to approach the most difficult decisions without fear by changing the method of analysis for problematic issues. In the first part of the Hackathon, students learned about the methods developed by the outstanding Professor Thomas L. Saaty (1926-2017), one of the most famous mathematicians in the USA, creator of the Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP) decision-making methods. These methods revolutionized decision making in the public sector and business arena. After the training conducted by the Creative Decision Foundation (USA), thirteen registered groups of students from Poland and Peru got acquainted with the issues presented by the Mayor of Wieliczka. Working on the “business case” proposed by the Mayor of Wieliczka, the students analyzed real cases and proposed specific solutions. The winning team and the best solved problem were announced on October 24 during ICEFM 2022. The judges panel included members of the international AHP/ANP community and was composed of scientists and practitioners as well as professionals who work with both the public sector and business partners.

In addition to the academic presentations, we also had the opportunity to visit the world-unique Wieliczka Salt Mine, UNESCO.



Underground chapel of St. Kinga in the Wieliczka salt mine

This conference was a unique event in Poland. We hope that the next one will attract equally excellent guests, panelists, and participants. We plan to organize the 22<sup>nd</sup> edition of ICEFM 2024 in Peru, for which we cordially invite you!