ALFA MIRROR Project

Development of a reference model for comparison and recognition of engineering programmes

feb. 2007 – dec. 2009

Final Report

editor M. M. Gola

Project co–ordination

Muzio M. Gola Politecnico di Torino
Ismael Mazon Universidad de Costa Rica
Daniel Samoilovich CRE–Columbus

Torino, Italy, 2010/2011

Editing assistant Tiziana Cianni, Politecnico di Torino
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Professors and students of the Schools of Electrical, Mechanical and Chemical of the Universidad de Costa Rica are to be thanked for their contribution along the project.

Tiziana Cianni and Nathalie Vacchiano of Politecnico di Torino, have taken initiatives for the smooth running of the project.

With great sense of responsibility Tiziana Cianni has taken great care in revising the huge material provided by participants to edit this final report. To her heartfelt thanks.
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**Project Co-ordination and Editing Committee**

- **Muzio M. Gola**  
  MIRROR Q.A. FRAMEWORK developer  
  Facoltà di Ingegneria  
  Politecnico di Torino  
  Torino – Italy  
  muzio.gola@polito.it

- **Ismael Mazón**  
  Project MIRROR coordinator.  
  Facultad de Ingeniería  
  Universidad de Costa Rica  
  San Pedro de Montes de Oca  
  San José, Costa Rica.  
  imazon@eie.ucr.ac.cr

- **Daniel Samoilovich**  
  Executive Director of Association Columbus UNESCO  
  1 rue Miollis, 75015 Paris, France  
  ds.columbus@unesco.org

**Orientation Committee**

- Paulino Alonso  
  Pontificia Universidad Católica de Valparaíso
- João Sergio Cordelro  
  ABENGE
- Muzio M. Gola  
  Politecnico di Torino
- Ismael Mazón  
  Universidad de Costa Rica
- Robson Pederiva  
  Universidad Estadual de Campinas
- Estela Pereira  
  Universidade de Aveiro
- Daniel Samoilovich  
  Association COLUMBUS

The Orientation Committee had the responsibility of establishing the guidelines of the project, to produce the agenda for each meeting, coordinate the discussions, organize the audits and develop the work documents.
### Participant teams

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<td>Instituto Tecnologico y de Estudios Superiores de Monterrey (Electronic Technologies)</td>
<td>Luis Raul Molina Hernandez</td>
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<td>Instituto Tecnológico de Sonora (Electronics Engineering)</td>
<td>José Manuel Campoy Salguero, Ernesto Flores</td>
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<td>Politecnico di Torino (Electronics Engineering)</td>
<td>Muzio M. Gola, Maurizio Rebaudengo</td>
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<td>Pontificia Universidad Católica del Perú (Mechanical Engineering)</td>
<td>Jorge Zegarra, Dante Elías</td>
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<td>Pontificia Universidad Católica de Valparaiso (Civil Engineering)</td>
<td>Paulino Alonso R., Claudia Parra B.</td>
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<td>Pontificia Universidad Católica de Valparaiso (Chemical Engineering)</td>
<td>Gianni Olguin</td>
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<td>Universidade de Aveiro (Chemical Engineering)</td>
<td>José Joaquim Cruz Pinto, Estela Pereira, Inês Portugal</td>
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<tr>
<td>Universidade Estadual de Campinas – Unicamp (Mechanical Engineering)</td>
<td>Robson Pederiva</td>
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<td>Universidad de Costa Rica (Electrical Engineering)</td>
<td>Víctor Hugo Chacón, Ismael Mazón</td>
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<td>Universidade Federal de Pernambuco (Chemical Engineering)</td>
<td>Edmilson Santos de Lima, Maria de los Angeles Peres Palha</td>
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<tr>
<td>Universidade Federal de São Carlos (Chemical Engineering Degree)</td>
<td>Ernesto Antonio Urquieta-González, Antonio José Gonçalves Cruz, Teresa Cristina Zangirolami</td>
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<tr>
<td>Universidad Nacional de San Juan (Mechanical Engineering)</td>
<td>Francisco Alba Juez, Horacio Alberto Aguilar, Osvaldo Hugo Penisi</td>
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<tr>
<td>Universidad De Talca (Mechanical Engineering)</td>
<td>Oscar Fuentes Márquez, Felipe Tirado Díaz, Edgardo Padilla Contreras</td>
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<tr>
<td>Universidad Iberoamericana (Electrical and Mechanical Engineering)</td>
<td>Francisco Martín del Campo</td>
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<tr>
<td>Universidad Nacional de Mar del Plata (Mechanical Engineering)</td>
<td>Guillermo Lombera</td>
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<tr>
<td>Universidad Nacional de Columbia (Chemistry Engineering)</td>
<td>Juan Manuel Velez Restrepo</td>
</tr>
<tr>
<td>Universidad Politecnica de Valencia (Chemical Engineering)</td>
<td>José A. Mendoza Roca, Antonio E. Palomares Gimeno, Gumersindo Verdú Martín</td>
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<tr>
<td>Technische Universität Carolo–Wilhelmina zu Braunschweig (Electrical and Electronic Engineering)</td>
<td>F. Jochen Litterst</td>
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<td>Universidad Politécnica de Madrid (provider of expertise for external evaluations)</td>
<td>Santiago Poveda Martínez</td>
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<tr>
<td>ABENGE, Associação Brasileira de Ensino de Engenharia</td>
<td>João Sergio Cordeiro</td>
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<td>Association COLUMBUS Paris</td>
<td>Daniel Samoilovich</td>
</tr>
</tbody>
</table>
Biographic data of participants

Prof. Francisco Alba Juez, Universidad Nacional de San Juan Argentina – falba@unsj.edu.ar

Prof. Horacio Alberto Aguilar, Universidad Nacional de San Juan, Argentina – haguilar@unsj.edu.ar
Researcher at the Institute of Applied Mechanics, has directed several projects and has numerous publications. One of the Coordinators of the Accreditation Process of Engineering Careers of the San Juan National University before CONEAU. Secretary of Research (1986 – 1999) and Vice Dean of the School of Engineering (1999 – 2005). At present, Director of the Mechanical Engineering career at the School of Engineering and member of the Board of Directors.

Prof. José Manuel Campoy–Salguero, Instituto Tecnológico de Sonora, México – jmcampoy@itson.mx
Communications–Electronics Engineer Degree, from Instituto Politécnico Nacional; Computer M.Sc. Degree from Instituto Tecnológico de Monterrey. Coordinator of Electronics Engineering Program, Instituto Tecnológico de Sonora, (1991–1996); Chair of Electrical and Electronics Engineering Department, Instituto Tecnológico de Sonora (1996–2000). Dean of School of Engineering and Technology, Instituto Tecnológico de Sonora (2000–2009); full professor of Electrical and Electronics Department, Instituto Tecnológico de Sonora. Author of several papers on Control, Computer and Engineering Education.
Since 1989 to now, member of Mexican Engineering Accreditation Board (CACEI); member of the Technical Committee EGEL (1997–2009).

Prof. Víctor Hugo Chacón Prendas, Universidad de Costa Rica – victor.hugo@chacon.cr
Ha dirigido más de 80 Trabajos finales de graduación en Electrónica y Telecomunicaciones, proyectos de bachillerato, licenciatura y maestría en Ingeniería Eléctrica.

1 In alphabetical order
Prof. João Sergio Cordeiro – ABENGE & Universidade Federal de São Carlos, Brasil – cordeiro@ufscar.br

Civil Engineer – USP – 1975, PhD in Civil Engineering; President of Brazilian Association for Engineering Education (2005–2010). Professor of São Carlos National University – Brazil. Professor and Coordinator in Post Graduation course of Environmental Administration.

Member of iNOVA Engineering Program. Director of Technology Center of São Carlos National University (1995–1999).


Prof. Antonio J. G. Cruz, Federal University of São Carlos, Brazil – ajgcruz@ufscar.br


Research on modelling and simulation of (bio)chemical processes. Author and co-author of over 20 publications in scientific journals and more than 70 works in National and International Congresses and Symposia. Member of the Lab. for Develop. and Automation of Bioprocesses (LaDABio).

Prof. Dr. José Joaquim C. Cruz Pinto, Universidade de Aveiro, Departamento de Química, Portugal – jj.cruz.pinto@ua.pt


Research in Chem Eng (Liquid–Liquid Systems) and Polym Mat Sci (Photo–Oxidation, Dynamic Thermal and Viscoelastic Behaviour), ca. 95 publications.

Prof. Francisco Martín del Campo, Universidad Iberoamericana, México City – francisco.martindc@uia.mx

Mechanical–Electrical Engineer Degree,1974, Universidad Iberoamericana, Mexico City; Electronics M.Sc. Degree 1977, University of Kent at Canterbury.

Director Mechanical–Electrical Engineering Department, Universidad Iberoamericana, Mexico City (1986–1994); at present Coordinator of Technological Academic Development Engineering Department.

Member of Mexican Engineering Accreditation Board (CACEI); coordinator of the CACEI Electrical & Electronics Engineering Committee; member of the Technical Committee EGEI.

Author of several papers and books, on electric circuits, electronics, strategic planning, engineering education.
Prof. Dr. Dante Elías, Pontificia Universidad Católica del Perú (PUCP), Perú – delias@pucp.edu.pe


Author of several papers on modeling of percussion drilling, and on modeling and development in parallel mechanisms for rehabilitation or training (gait simulator, exoskeleton, flight simulator, ankle simulator, and others).

Prof. Ernesto Flores, Instituto Tecnológico de Sonora, México – eflores@itson.edu.mx

He holds a master degree from Monterrey Institute of Technology and Advanced Studies. Has worked as a Consultant at the OECD Programme on Institutional Management in Higher Education (IMHE) supporting an OECD review programme, leading two regional reviews (in Mexico and Brazil) peer-reviewing in five other regions (in US, Chile and Spain).

In 2002, he was invited to collaborate with the Strategic Planning and Regional Development Office of the Executive Office of the President of Mexico where served as planning analyst for Federal Government offices. Since 2004, he is working at the Sonora Institute of Technology (Instituto Tecnológico de Sonora, ITSON) as planning co-ordinator. In addition, he has led international projects in the field of innovation-based regional development.

Prof. Oscar Fuentes Márquez, Universidad de Talca, Chile

†2010


Director of the School of Mechanical Engineering (2008–2010).

Advising on public and private companies metalworking sector in steel structures, manufacturing processes with CNC machines, welding modern systems. Welding Inspector certified by D1.1/D1.1M AWS Structural Welding Code _Steel.

He passed away few months after the end of this project.

Prof. Muzio Gola, Politecnico di Torino, Italy – muzio.gola@polito.it


Vice–Rector for Quality, Evaluation and Accreditation, from 2005, Director CEQUA–POLITO. Former Director of Dipartimento di Meccanica.

Member or president of the Evaluation Board of various Italian higher education institutions. From 1995 member or leader in international projects on projects on Quality Assurance of higher education (SECAI, H3E, Leonardo 2, E4, TREE, QUESTE, ALFA–MIRROR, AIRQUAL, GRINSA, UNIQTTOOL). Member in expert panels for OAQ (Swiss Accr. Agency).
Prof. Dr. F. Jochen Litterst, Technische Universität Braunschweig, Germany – j.litterst@tu-bs.de
Member of steering committees of evaluation commissions of teaching and research. 2004 Hon. Doctor of Humane Letters (Univ. of Nebraska). Since 2005 again full professor at Inst. For Condensed Matter Physics, TU Braunschweig. Since 2008 also member of Department of Humanities and Educational Sciences, since 2009 Dean of Department of Electrical Engineering, Information Technology, Physics.
Numerous stays abroad as guest scientist in USSR, France, USA and Brazil. About 280 publications mostly in nuclear solid state physics.

Prof. Dr. Guillermo Lombera, Universidad Nacional de Mar del Plata, Argentina – glombera@fi.mdp.edu.ar
Ph.D. in Materials Science (1991), Mechanical Engineer (1984), Professor of “Project Management” and “technology transfer” at the National University of Mar del Plata.
Director of the research group “computer-aided engineering” at the Mechanical Engineering Department. Author of more than 50 articles in the areas of materials, numerical simulation, welding technology and project management. Member of several international scientific organizations.
Evaluator of the National Commission on Accreditation of University (CONEAU) (2005), Coordinator of the “RedVITEC” (National network U–E relationship) 2006, At present the vice–rector of Science and Technology of the University.

Prof. Ismael Mazón, Universidad de Costa Rica – imazon@cu.ucr.ac.cr
Member of Evaluation Teams of engineering programs in Costa Rica. From 1991 Member of international projects on Automatic Control and Quality Assurance projects (CYTED, ALFA, ALFA–MIRROR, EC–LA, INCO).

Prof. Dr. José A. Mendoza Roca, Universidad Politécnica de Valencia, Spain – jamendoz@iqn.upv.es
Degree of Industrial engineering in1995. Ph.D. in 2000. Lecturer from 1995 and associate professor in Chemical Engineering area from 2002. I teach on environmental engineering and in particular on wastewater treatment. Research is focused on membrane processes (for municipal and industrial wastewater treatment) and on recycling of industrial wastewaters.
Prof. Luis Raul Molina Hernandez, Instituto Tecnologico y de Estudios Superiores de Monterrey, Mexico – luis.molina@itesm.mx

Physic Science Degree 1981, Instituto Tecnológico y de Estudios Superiores de Monterrey, México; Electronics M.Sc. Degree 1985, Instituto Tecnológico y de Estudios Superiores de Monterrey, México.


Research interest focused on Optoelectronic Devices, Image processing and Parallel Computing.

Prof. Gianni Olguin Contreras, Pontificia Universidad Catolica de Valparaiso, Chile – gianni.olguin@ucv.cl

Chemical engineer from the Pontifical Catholic University of Valparaíso in 1997, Bachelor degree in Engineering Sciences in 1996. PhD (c) in Chemical Engineering at University of Queensland Australia.


Prof. Edgardo Padilla Contreras, Universidad de Talca, Chile – epadilla@utalca.cl


Participation in the redesign of professional profiles based on competencies for careers in the Faculty of Engineering.

Prof. Dr. Antonio E. Palomares Gimeno, Universidad Politécnica de Valencia– UPVLC, Spain – apalomar@iqn.upv.es

Claudia Parra, Curriculum Advisor, Pontificia Universidad Católica de Valparaíso, Chile – claudia.parra@ucv.cl


Director of Manpower, Concepción from 1988 to 1997. Head of the Department of Educational Quality Assurance at the PUCV from 2004 to 2006, in charge of the University undergraduate programs accreditation processes. Curriculum Advisor at the Faculty of Engineering of the PUCV from 2006 to September 2009 in charge of engineering programs innovation and redesign.

Prof. Robson Pederiva, University of Campinas, Brazil – robson@fem.unicamp.br


His research interests are mainly on vibrations of mechanical systems and machine monitoring for fault detection and identification.

Author of over 70 paper published on conference proceedings and journals. His is leader of the laboratory of vibration and control.

Prof. Osvaldo H. Penisi, Universidad Nacional de San Juan, Argentina – openisi@unsj.edu.ar

He obtained his degree of Electromechanical Engineer in 1979 in the San Juan National University. He obtained his PHD in Mechanical Engineering in 2004 at the same University. In 2001 he was granted a research scholarship in the Robotics and Mechatronics Laboratory of the School of Engineering of the Università degli Studi di Cassino, Italy. For twelve years since 1979 he worked as a Welding Engineer. Since 1992 he is Teacher at the School of Engineer of the UNSJ. Since 1996 he is Full Professor of Mechanisms in the Mechanical Engineering career. He is author and co–author of several papers, which have been presented at Conferences or published in national and international journals.

Profª Estela Pereira, Universidade de Aveiro, Portugal – m.estela@ua.pt


Scientific activities include research on optical properties of semiconductors and diamond thin films, as LED and Lasers of GaN/InGaN. Over 70 publications in scientific journals.

From 1988 to 1994 Institutional Coordinator for the Erasmus program at the University of Aveiro, including participation in the ECTS pilot project. National promoter for ECTS and DS (1996 – 2003), ECTS councillor for European universities. Member of the management committee of Tuning, ALFA – Mirror, BEFLEX, BEFLEXPLUS projects.
Prof.ª Maria de los Angeles Peres Palha, Universidade Federal de Pernambuco, Brazil – angeles@ufpe.br
Chemical Engineering Degree (1979), MSc Degree in Biochemistry (UFPE, 1987), DSc Degree (UFRJ, 1999). Associate Professor at Universidade Federal de Pernambuco. Coordinator of the Chemical Engineering Undergraduate Program at UFPE since 2005.
She operates at Departamento de Engenharia Química, Centro de Tecnologia e Geociências. She has experience in the Biochemical Processes, mainly in the following subjects: Zymomonas mobilis, enzymatic kinetics, Cladosporium cladosporioides, cells auto-immobilization and bio-pigment production. Participates to several research projects, including bio-corrosion and solid waste residues.

Prof.ª Inês Portugal, Universidade de Aveiro, Chemistry Department, Portugal – inesport@ua.pt
Pedagogical activity: Biochemical and Chemical Reaction Engineering; Chemical Eng. Laboratories; Orientation of Chemical and Chemical Eng. graduate and master students. Research interests: Chemical Reaction Eng, Catalysis and Chemical valorisation of renewable resources. Author of 2 book chapters, 13 papers in scientific journals and over 40 papers in conference proceedings.

Prof. Santiago Poveda Martínez – Universidad Politécnica de Madrid, Spain – santiago.poveda.martinez@upm.es
Santiago Poveda Martínez, Aeronautical Technical Engineer in Aircraft at the Technical University of Madrid (UPM), Aerospace Vehicle Department: Associate Professor, Graphic Engineering. Assistant Director of Economic Affairs of the School of Aeronautical Engi. (UPM).
Coordinator and evaluator of quality assessment for engineering education (SECAI).
Section Chief of Quality Control and Metrology at the Nat. Inst. of Aeronautical Technol. (INTA). Participation in the design of ground support equipment for TD1, TD2, OTS satellites and of Spacelab (INTA). At Iberia Airlines, member of the Hydraulic Systems Maintenance Eng. and Head of Ground Support Equipment.

Prof. Maurizio Rebaudengo, Politecnico di Torino, Italy – maurizio.rebaudengo@polito.it
He holds a Laurea degree in Electronic Engineering (1991) and a Ph.D. degree in Computer Engineering (1995), both from Politecnico di Torino. Since 1997 Assistant Professor at the Department of Control and Computer Engineering, Politecnico di Torino, since 2005 Associate Professor.
His research interests are mainly related to Testing of Digital Circuits, Reliability Design of Digital Systems and Ubiquitous Computing. He has published over 150 papers on journal and conference proceedings.
Since 2003, responsible for the Quality Assurance for the School of Engineering in Information Technologies at Politecnico di Torino.
Prof. Paulino Alonso Rivas, MSc, Pontificia Universidad Catolica de Valparaiso, Chile – palonso@ucv.cl

Electrical engineer from the Pontifical Catholic University of Valparaiso, Civil Electrical Engineer from the Technical University Federico Santa Maria. Winner of LASPAU (Latin American Scholarship Program of American Universities), then Master of Science in Electrical and Computer Engineering at Oregon State University, Corvallis, OR, USA. In the year 1972 joined PUCV as full professor in the school of Electrical Engineering. In 1990, Professor of the Christian Brothers University, in Memphis, Tennessee, USA.

Nominated Director of the School for three consecutive three-year terms, 1984 to 1990, again three consecutive three-year terms (1993–2002). In 2002 named Dean by the members of the Faculty of Engineering, again in 2005 and 2008 until today.

Daniel Samoilovich, Executive Director of the CRE–Columbus Association, Paris, France – ds.columbus@unesco.org

Since 1993 Executive Director of Association Columbus, linking European and Latin American universities, promoting international co-operation and institutional development (member universities participate in regional development, i.e. incubators and SME’s support). Founding Director of Istituto Superiore “Mario Boella” for Information & Communication Technologies (Turin, Italy) in 1999–2001. He collaborates with the Torino Wireless Foundation, which promotes the development of the Piemontese ICT District (R+D, acceleration of enterprises and risk capital development).

Columbus and Torino Wireless, with other Piemontese institutions, are launching the Turin Euro–Latin American Forum for knowledge–based regional development (www.forumtorino.org).

Prof. Edmilson Santos de Lima, Centro de Tecnologia e Geociências, Universidade Federal de Pernambuco, Brazil – dellima@ufpe.br

Geology Degree in 1977, PhD Degree in 1986 from UCLA. From 1989, Professor Geology at Universidade Federal de Pernambuco. Author of over 100 papers on various subjects in geology and environmental geology.


Research Fellow from the Brazilian Research Council, Member or leader of national (CNPq, FACEPE) and of international projects (ALFA–MIRROR, EXCEED–DAAD, CAPES COFECUB).

Prof. Felipe Tirado Díaz, Universidad de Talca, Chile – ftirado@utalca.cl


Director of School of Mechanical Engineering (1990 – 2001) and (2003 – 2007).

Participation in the redesign of professional based on Competencies in the Mechanical Engineering Program, Universidad de Talca.

Director of Curriculum Management Unit of the University since 2008.
Prof. Ernesto A. Urquieta–González, Federal University of São Carlos – UFSCar, Brazil – urquieta@ufscar.br


Prof. Dr Juan Manuel Vélez Restrepo, Universidad Nacional de Colombia, Medellín Campus – jmvelez@unal.edu.co

Mechanical Engineering Degree in 1983. Master Eng in 1991 and PhD in 1997 of the Sao Paulo University, Brazil.

From 1985 Professor to the Materials Science an engineering, Phase Transformation of Metals and Alloys and Tribology courses at the School of Mines, National University of Colombia in the Medellín Campus.

Director of Materials Engineering Department, 2003; Associated Dean for Research 2002– 2003; Dean of School of Mines 2006 – 2010. Leader of the Materials Science and Technology Research group.

Director of Leonardo da Vinci project: scientific and technological literacy and innovation in learning. National University of Colombia in the Medellín Campus.

Prof. Gumersindo Verdú Martín, Universidad Politécnica de Valencia, Spain – gverdu@iqn.upv.es


Vice–Rector for International Affairs from 2005 to 2009.

Director of the Department of Chemical and Nuclear Engineering from 1997 to 2004.

Director of the Master degree “Industrial safety and environment” from 2006. Currently, the main research areas are: “medical physics”, “nuclear safety” and “radiations”.

Prof.ª Teresa C. Zangirolami, DEQ/UFSCar, Brazil – teresacz@ufscar.br


Research interest focused on Biochemical Engineering applied mainly to vaccines production, E. coli high cell density cultivations and 2nd generation ethanol production. Over 50 works published as conference papers, articles and book chapters. Supervision of research initiation (16), MSc (8) and PhD (6) students.
Executive Summary (D. Samoilovich)

A EU- LA collaborative initiative by 18 universities and 2 networks

- During 3 years, with the support of the European Union (Alfa Program), they developed the MIRROR- Q.A. FRAMEWORK.
- Areas of application
  - Mechanical Engineering.
  - Chemical Engineering.
  - Electronic & Telecommunications Engineering.

A concrete contribution to the EULAC H. E. Common Space in engineering

All Partners
- Take into account the recent trends on curricular design and evaluation of academic programs.
- Capitalize on the convergence between curricula impelled by the Bologna process and on subregional integration processes in Latin America (e.g. Mercosur)

The MIRROR- Q.A. FRAMEWORK has been developed in clear-cut steps

Evaluation criteria have been agreed upon in order to evaluate
1. Learning outcomes (knowledge and skills obtained by the students)
2. The coherence of those outcomes with the professional roles to be exercised and the related competences.
3. The key processes of curricular design, implementation and review.
   - A common language to express these criteria have been also agreed.
   - The documentary evidence for each criterion have been identified.
   - The criteria have been integrated in a reference model for comparison and, eventually, evaluation/accreditation of curricula.

Main elements of the MIRROR- Q.A. FRAMEWORK

- Evidence that the Programme design takes into account the requirements from the relevant stakeholders.
- Evidence that the Programme exposes students to an appropriate learning environment, with up-to-date equipment;
- Evidence that the Programme appropriately certifies that Learning Outcomes have been reached (how the exams have a certifying value)

The MIRROR- Q.A. FRAMEWORK has been validated experimentally

- It has been developed at 17 participant institutions from Argentina, Brazil, Chile, Colombia, Costa Rica, Germany, Italy, Mexico, Peru, Portugal, & Spain.
- The resulting applications have been reviewed by two external peers.
- Subsequent improvements to the model have been adopted.

Emerging outcomes

- A reflection of the participant academic units on the teaching-learning processes and the outcomes reached by the graduates have been clearly stimulated
- Proposals for content and processes improvements have been identified and implemented.
- Internal quality assurance procedures have been improved.
• Participating institutions can better communicate their academic offer.
Additional benefits:
• Agreement for studies recognition are now better supported.
• Student mobility between partner institutions is facilitated.

The experience is available in a reference document
The Final Report will include:
• the validated **Q.A. Framework**, 
• the bases for its application to other programs, 
• a review of “good practices” for each criterion.

For the first time different key elements are combined in one single framework
• Description of quality assurance procedures,
• Communication with stakeholders,
• Communication with students,
• Communication with evaluators and auditors,

The MIRROR - Q.A. Framework supports internal QA procedures & accreditation processes
It provides the core information of any self evaluation.
Value added:
• Synthetic, simple, easy to complete (no cumbersome, heavy paper work).
• Flexible: it has been tested in several different national and institutional contexts.
• A powerful tool to organize the available information (... and detect major gaps!).
• Relies in ICT.
• Sustainable: it collects the minimum sets of information, being at the same time a solid basis for internal quality assurance.
Extrait du "FORMULARIO DE CANDIDATURA"

**Título del proyecto**
Desarrollo de un modelo de referencia para intercomparación y reconocimiento de carreras de ingeniería.

**Palabras clave**
Evaluación internacional comparada, reconocimiento de programas de estudio, resultados de aprendizaje, renovación curricular.

**Duración del Proyecto**
24 meses.

**Objetivos del Proyecto**
Desarrollar y aplicar un modelo que permita la comparación entre resultados y procesos clave de programas de estudio en el área de las ingenierías, utilizando criterios previamente acordados, a fin de estimular un reconocimiento de los programas y una reflexión sobre la oferta académica entre las instituciones participantes.

Para asegurar su aplicabilidad y sostenibilidad, el modelo resultante será validado a través de su implementación en una variedad de contextos representada por los programas académicos de las instituciones miembros de la red.

**Objetivos específicos**
- Desarrollar criterios para la evaluación 1) de resultados de aprendizaje, 2) de la coherencia de esos resultados con los roles profesionales que se desea alcanzar y 3) de los procesos clave de diseño, implementación y revisión curricular.
- Expresar estos criterios a través un lenguaje común consensuado.
- Identificar la evidencia documental del cumplimiento de cada criterio.
- Integrar estos criterios en un modelo de base para intercomparación y, eventualmente, evaluación/acreditación de programas de estudio.
- Validar experimentalmente el modelo en las instituciones participantes.
- Estimular una reflexión sobre procesos de enseñanza/aprendizaje y resultados alcanzados por sus egresados.

**Grupos objetivo del Proyecto**

**Beneficiarios directos**
- Directivos universitarios con un interés en los objetivos, métodos y resultados de los programas de formación de ingenieros (primero y segundo ciclo o ciclo único), en particular vicerrectores académicos y responsables de cursos, departamentos y facultades en carreras de Ingeniería Electrónica, Mecánica y Química.

**Beneficiarios indirectos**
- Responsables gubernamentales: se benefician con un instrumento útil para el reconocimiento de diplomas, mecanismos de mejora de la calidad y desarrollo de sistemas transnacionales de evaluación.
- Estudiantes: se benefician con una mejora de los programas, mayores oportunidades de movilidad y mayor transparencia en la descripción de los programas de estudio.
Descripción general del Proyecto

La idea central del proyecto MIRROR es promover un proceso de evaluación comparada entre carreras de grado de ingeniería basado en criterios reconocidos como esenciales para caracterizar un programa académico y evaluar su calidad.

No existe una definición simple de calidad educativa en una carrera universitaria. Los criterios varían de acuerdo al enfoque y a las disciplinas.

Las universidades que integran la red conocen y valoran experiencias anteriores en el área de la evaluación comparada, con particular énfasis en los resultados del aprendizaje, tales como el proyecto de “Evaluación Internacional comparativa” desarrollado por el Danish Evaluation Institute (EVA) en el área de las Ciencias Agrarias; el proyecto “Transnational European Evaluation Project” (TEEP) en Historia, Veterinaria y Física; experiencias nacionales como el desarrollo de un modelo informativo por el Comitato Nazionale per la Valutazione del Sistema Universitario (CNVSU) y el Proyecto “CampusOne” de la Conferencia de Rectores de las Universidades Italianas (CRUI); la experiencia de las agencias nacionales de evaluación (QAA, NVAO, CONEAU, CNA, CENEVAL, ...) y la acreditación de ingenierías en América Latina (MERCOSUR, Argentina, Brasil, Colombia, México, ...).

Esta red reconoce cuatro factores centrales esenciales para analizar y comparar los resultados y procesos clave de programas académicos:

1. El nivel de cumplimiento de la carrera de grado con las expectativas de la sociedad (profesionales, instituciones, empleadores potenciales o mercado de trabajo). Requiere la especificación de los principales roles profesionales de los graduados en un lenguaje comprensible para los actores externos, y la explicitación de competencias necesarias para cumplir con esos roles. (A los fines de este proyecto, por competencias se entiende el conjunto de conocimientos y habilidades aplicadas en un contexto laboral).

2. El desarrollo del programa académico en congruencia con dichas expectativas en forma eficaz y sostenible. Requiere que el programa de grado sea expresado en términos de resultados de aprendizaje, analizándolos a través de las competencias profesionales obtenidas por los egresados, teniendo en cuenta la duración de los estudios y la carga académica del estudiante expresada en créditos educativos.

3. La efectiva disponibilidad de recursos que permiten crear un ambiente adecuado de aprendizaje. Requiere verificar la disponibilidad de docentes, personal de apoyo, infraestructura y equipamientos adecuados.

4. La verificación de resultados de aprendizaje alcanzados por el estudiante. Requiere que los métodos de evaluación del estudiante permitan determinar si, y hasta dónde, los objetivos han sido transformados en resultados de aprendizaje.

El análisis de estos cuatro factores se efectuará a nivel de programa académico y de los cursos que lo componen:

- para cada programa académico, descripción de la estructura general y contenido, incluyendo el equilibrio entre los distintos elementos (cursos obligatorios, electivos, proyectos, capacitación práctica, etc.); equilibrio entre formación de base, formación especializada y habilidades; y equilibrio entre los métodos de enseñanza-aprendizaje.
- para cada curso, descripción de los prerrequisitos, objetivos, contenidos, metodología, horas presenciales y procedimientos de evaluación del estudiante.

Mientras que para el análisis de procesos es suficiente verificar su existencia y eficacia respecto a los objetivos perseguidos (fitness for purpose), limitándose por razones de economía a los
más significativos, el análisis de los resultados requiere de un consenso amplio sobre metas aceptables (fitness of purpose / benchmarks).

El trabajo se desarrollará en 4 fases:

- Desarrollo de la metodología y acuerdo sobre los criterios a utilizar para evaluar el diseño y la implementación de los programas de estudio; identificación del tipo de evidencia necesaria para evaluar su cumplimiento (desarrollo del modelo de referencia).

- Trabajo en cada institución para recopilar la información necesaria de acuerdo a criterios acordados (dossier informativo).

- Visitas externas recíprocas por parte de dos representantes de otras universidades de la red para verificar la consistencia de la información recopilada y la aplicabilidad del modelo; dicha visita culminará con un breve informe por parte de los pares externos en el que se establecerá si la información cumple o no con los criterios establecidos (auditoría del dossier informativo).

- Trabajo de puesta en común con conclusiones y recomendaciones para la mejora de los programas de estudio en las instituciones participantes y otras potencialmente interesadas (validación del modelo).

A través de esta información, se podrá llegar a un juicio informado concerniente a las metas y resultados del programa, facilitando así su reconocimiento académico y profesional. Esta información asegurará también que las calificaciones obtenidas por el estudiante sean comprensibles en otros contextos, haciendo más fácil su valoración y mejorando las posibilidades de empleo del graduado en su país y en el extranjero.

El modelo desarrollado estará disponible en la Web y su carácter sintético facilitará su aplicabilidad y sostenibilidad más allá de la duración del proyecto. El dossier informativo preparado sobre la base del modelo podrá ser compilado y actualizado en forma relativamente económica (en comparación con un proceso de autoevaluación), convirtiéndose así en un instrumento que facilite a las instituciones participantes la mejora de su calidad y – previa validación externa – una mayor transparencia y el reconocimiento de sus programas de estudio.

**Valor añadido del Proyecto**

Como resultado de esta experiencia, las universidades participantes tendrán la oportunidad de:

- Fomentar una confianza mutua que permita la movilidad de estudiantes y graduados.

- Sentar las bases para el reconocimiento de estudios y acuerdos de colaboración entre programas académicos (doble diploma, masters conjuntos, etc.).

- Desarrollar procesos de renovación curricular y mecanismos para la mejora de la calidad.

- Aplicar una metodología e instrumentos innovadores para analizar la relación entre los procesos de enseñanza-aprendizaje y los resultados obtenidos en un programa académico.

- Alcanzar mayor visibilidad internacional.

- Contribuir a la construcción del Espacio Común de educación superior UEALC en una disciplina estratégica.
Actividades a desarrollar y sus procedimientos

De acuerdo a lo explicado en la Descripción general del Proyecto ... , el trabajo se desarrollará en 4 fases, lo cual implica que los miembros y/o el Comité de Orientación ... se reúnan 4 veces a lo largo de los 24 meses que dura el proyecto. Las actividades realizadas en cada reunión y entre cada una de ellas, se describen a continuación.

Primera reunión

- Desarrollo de la metodología y acuerdo sobre los criterios a utilizar para evaluar el diseño y la implementación de los programas de estudio; identificación del tipo de evidencia necesaria para evaluar su cumplimiento (desarrollo del modelo de referencia).
- Designación del Comité de Orientación.
- Preparación del plan de trabajo detallado.

Entre la primera y la segunda reunión:

- Trabajo en cada institución para recopilar la información necesaria de acuerdo a criterios acordados (dossier informativo).

Segunda reunión:

- Verificación preliminar del modelo de referencia.
- Organización de las visitas externas.

Entre la segunda y la tercera reunión:

- Visitas externas recíprocas por parte de dos representantes de otras universidades de la red para verificar la consistencia de la información recopilada y la aplicabilidad del modelo; dicha visita culminará con un breve informe por parte de los pares externos en el que se establecerá si la información cumple o no con los criterios establecidos (auditoría del dossier informativo).

Tercera reunión:

- Verificación final del modelo.
- Trabajo de puesta en común con conclusiones y recomendaciones para la mejora de los programas de estudio en las instituciones participantes y otras potencialmente interesadas (validación del modelo).
- Preparación del plan de difusión.
- Preparación de la documentación final de resultados (instrumentos, modelo de referencia, etc.).

Cuarta reunión (Sólo comité de orientación):

- Validación de la documentación y decisión sobre las acciones ulteriores de difusión.
English summary of the submitted project

Project Title
Development of a reference model for comparison and recognition of engineering Programmes.

Key words
International comparative evaluation, recognition of curricula, learning outcomes, curricular renovation.

Objectives of the network
The network has been organised based on previous bilateral and multilateral relations, from the expression of a will to collaborate in the development of a reference model for comparing academic programmes, using common criteria supported by sufficient evidence.

The participant universities:
• know and value previous experiences in the area of evaluation.
• take into account the recent trends on curricular design and evaluation of academic programmes
• wish to contribute to the construction of the EULAC (Europe, Latin America and the Caribbean) higher education Common Space in the area of engineering, starting from the convergence between curricula impelled by the Bologna process and processes of subregional integration in Latin America (e.g. Mercosur).

Objectives of the project
To develop and apply a model allowing the comparison between curricula’s key outcomes and processes in the area of engineering, using previously agreed criteria, aiming at stimulating programme recognition and a reflection on the academic offers of participant institutions.

In order to assure its applicability and sustainability, the resulting model will be validated through its implementation in a variety of contexts represented by the different academic programmes of the network’s member institutions.

Specific objectives
• To develop criteria for evaluating: 1) learning outcomes (knowledge and skills obtained by the students), 2) the coherence of those outcomes with the professional roles to be exercised 3) the key processes of curricular design, implementation and review.
• To express these criteria through a common agreed language.
• To identify the documentary evidence for each criterion.
• To integrate these criteria in a reference model for comparison and, eventually, evaluation/accreditation of the curricula.
• To validate the model experimentally by applying it at the participant institutions.
• To stimulate a reflection of the participant academic units on the teaching–learning processes and the outcomes reached by the graduates.

Expected results
• A validated reference model for comparing academic programmes
• An informative dossier, resulting from the application of the methodology to the academic programmes at each participant institution
• An innovative methodology and instruments, to analyse the relationship between the teaching–learning processes and the results obtained in an academic programme.
• Implementation proposals for academic and managerial improvement in Engineering.
• A contribution to the construction of the EULAC higher education Common Space in a strategic discipline.

The four development stages:
1. Development of the methodology and agreement about the criteria to evaluate the design and implementation of academic programmes; identification of the necessary evidence to evaluate their fulfilment (development of the reference model).
2. Work at each institution to collect the necessary information according to the agreed criteria (informative dossier).
3. Reciprocal external visits from two representatives of other universities participating in the network, to verify the consistency of the collected information and the applicability of the model. This visit will end with a brief report by the external peers, establishing if the information fulfils or not the established criteria (informative dossier audit).
4. Final work with conclusions and recommendations for the improvement of academic programmes within participant institutions and others potentially interested (validation of the model).

Through this process, an informed judgement concerning the degree programme’s goals and outcomes will be reached, facilitating its academic and professional recognition. Such information will also ensure that the qualifications obtained by the student are comprehensible in other educational contexts, making them easier to appraise and improving graduates’ employability in their home countries and abroad.

The developed model will be available on the Web and its synthetic character will facilitate its applicability and sustainability beyond the project duration. The informative dossier based on the model may be compiled and updated in a relatively economic way (compared to a self-evaluation process), becoming thus an enabler for the participant institutions to improve their quality and – via external validation – enabling wider transparency and recognition of their academic programmes.
Outline of the project (I. Mazòn)

Introduction

In the frame of the globalization of higher studies, one of the main tasks of the Bologna process for the European universities is to increase the attraction of international students.

Latin American universities need to build a space in this globalization process and want to participate more actively of it.

On both regions, most of the institutions want to modernize their curricula and the teaching and learning process, particularly on the engineering programs, mainly for their strategic impact on the social and economic development.

On this project the partners are working on engineering, an area of great interest for both regions. The purpose is that the academic authorities can obtain benefits of the experiences on curricular reforms and the constant improvement of quality programs existing now. To take advantage of the local, nationals or European mechanisms (VI Frame Program, Marie Curie Scholarships, ALFA, Alban,...), to obtain a better valorisation of the programs taken by the students and a simplification of the process for admission to other universities.

In this sense the institution included on the project has recognize the previous experiences on evaluation, taking in consideration the new tendencies on curricular and evaluation design of academic programs, and it wants to build an European and Latin American (EULA) common space for superior education on engineering, from the curricular convergence of the Bologna declaration and the regional and sub regional process on Latin America (Ex: MERCOSUR).

The criteria used to evaluate the programs are based on the following facts:

- Professional competencies: knowledge and learning outcomes obtained by the student.
- The coherency between the professional competencies and the roles of the professional exercise.
- The process of curricular design, implementation and review.

The partners want to develop a common language, identify the documented evidences that satisfy these criteria, integrate those criteria on a reference model for comparison purposes and eventually the evaluation/accreditation of curricula. They also want to validate the model experimentally by applying it to the partner institutions and stimulate the reflection among the partners about the process of learning and the competencies obtained by the graduates.

Other objectives of the project are to create academic collaboration agreements between the institutions, increase the mobility of students between the partner institutions and create reference documents with de model validated and the bases to be applied by other institutions.

The programs to be analysed are: Chemical Engineering, Mechanical Engineering and Electronics Engineering. Each institution has to choose one of those programs to collect the information requested by the model.
General description of the project

The central idea of the MIRROR project is to promote a comparative evaluation process between engineering degree programs based on agreed criteria, which is essential to characterize an academic program and to evaluate its quality. There is no simple definition of quality in education. Criteria may vary according to the approaches and the disciplines. This network recognizes four essential central factors to analyze and compare academic programs:

1. **The extent to which the degree program matches external expectations** (professionals, institutions, potential employers and labour market). It requires the specification of the main professional roles of the graduates in a language understandable to the stakeholders, and the statement of the necessary competencies to fulfill those roles. *(For the aims of this project, competencies are designed as a set of knowledge and skills applied in a work context).*

2. **The development of the academic program in congruence with those expectations in an efficient and sustainable form.** It requires the transcription of the degree programs in terms of learning outcomes, analyzing them through the professional competencies obtained by the graduates, taking into account the duration of studies and the academic workload expressed in terms of educational credits.

3. **The real availability of resources allowing the creation of an adequate learning environment.** It requires the verification of the faculty, administrative staff, infrastructure and equipment availability.

4. **The verification of learning outcomes achieved by the student.** It requires the specification of the assessment methods necessary to determine if and to what extent the educational goals have in fact been turned into learning outcomes.

The analysis of these four factors will be done at the academic program and course levels:

- For each academic program: description of the general structure and contents, including the balance between the different elements (compulsory or elective courses, projects, practical training, etc.); balance between basic contents, specialized contents and skills; and balance between teaching–learning methods.
- For each course: description of the prerequisites, objectives, contents, methodology, course hours and assessment procedures.

For the analysis of the processes it is enough to verify their existence and efficiency related to the desired objectives (fitness for purpose), limiting the number of them (to diminish costs) to the most significant ones. On the other hand, the results analysis requires a large consensus about what are considered to be acceptable values or standards (fitness for purpose/benchmarks).

The work was designed to follow four stages:

- Development of the methodology and agreement about the criteria to evaluate the design and implementation of academic programs; identification of the necessary evidence to evaluate their fulfilment *(development of the reference model).*
- Work at each institution to collect the necessary information according to the agreed criteria *(informative dossier)*
- Reciprocal external visits from two representatives of other universities participating in the network, to verify the consistency of the collected information and the applicability of the model. This visit will end with a brief report by the external peers.
- Establishing if the information fulfils or not the established criteria *(informative dossier audit).*
- Final work with conclusions and recommendations for the improvement of academic programs within participant institutions and others potentially interested *(validation of the model).*

Through this process, an informed judgement concerning the degree programs goals and outcomes will be reached, facilitating its academic and professional recognition. Such information will also ensure that the qualifications obtained by the student are comprehensible in other contexts.
educational contexts, making them easier to appraise and improving graduates employability in their home countries and abroad.

The model is designed to be available on the Web and its synthetic character will facilitate its applicability and sustainability beyond the project duration. The informative dossier based on the model may be compiled and updated in a relatively economic way (compared to a self-evaluation process), becoming thus an enabler for the participant institutions to improve their quality and via external validation – enabling wider transparency and recognition of their academic programs.
Background and perspectives of the MIRROR project (M. M. Gola)

Why Q.A. of higher education is a desirable objective

There is a great variety of engineer names, which multiply by the variety of profiles each can have. For certain professions the profile may be regulated, but the situation is so fluid that we have to accept innovation asking in exchange precise descriptions. Simultaneously along the lines of requirements coming both from “a) – outside the academia” and “b) – inside the academia”. The same holds much in the same way for any other profession, it is not an exclusive feature of the engineering education.

A – Outside Academia.

- Which are the professional roles to which that particular engineer is being prepared when he still is a student?
- Which are the functions she/he will cover when at work, at least in her/his first five or ten years of career?
- Which are the key competencies which are typical of those roles / functions? (which means knowledge and skills used in a working context)

The Programme must be designed around those roles / functions /competencies, in order not to create a mismatch between exit outcomes and exit requirements.

It is difficult, and would be very risky, to believe that all the above can be defined without consultation with external stakeholders or without prospective studies from the employers’ and professional side. Self reference is lurking!

Then the Programme must be able to fulfil its own prophecies.

The borderline between the world outside and the world inside the academy is quite fuzzy. There is no mechanic one-to—one relation between the tools we transmit to the student and the task she/he will be asked to solve.

B – Inside Academia

Then, to the best of our knowledge we have to make an hypothesis, and build subject specific knowledge / understanding / skills / know–how, plus transversal skills towards that aim.

This knowledge building has an external effectiveness: the capability of rapidly grasping those competencies which were taken as the far objective. This happens outside, and success will be checked only with a follow up of alumni performance over a certain time span.

But it has also an internal effectiveness (not to be confused with efficiency, which tells us how much effort was necessary): the single steps though which pieces of knowledge are gradually built. This is fully in the hands of ourselves, the professors i.e. the professionals who know how Learning Outcomes must be transmitted and, last but not least, how to verify whether they were effectively reached by the students. (student assessment or examination as Learning Outcome certification).

This all what professional teaching is about. A first class university professor should be excellent in this professionalism, besides of course striving to be an excellent researcher with high level papers. Otherwise, why she/he does not move to a pure research institution?

This is were Quality Assurance of higher education comes in.

Let us remark that "to assure …" means “to give confidence that …"
Therefore "to assure" is largely dependent on the fact that each party is qualified and willing to discharge his/her job competently and on time.

Moreover, in our context "quality" means "satisfaction of explicit requirements".

The Mirror project was driven by a clear cut choice: Quality in simple language is:

- **Specifying worthwhile learning goals:**
  
  drawing on contributions from stakeholders outside the university, the degree program must identify overall learning goals which will enable students to satisfy their further study and career aspirations.

- **Enabling the majority of students to achieve these goals:**
  
  the degree program must expose students to the learning experiences that will be most effective in helping them achieve stated goals.

- **It also involves establishing quality assurance procedures.**

  Quality and Quality Assurance of Programmes must be viewed as part of an international movement which centres on describing, developing, and certifying target competencies and learning outcomes.

The Quality (and Quality Assurance – Q.A.) Framework developed within the ALFA Mirror Project was developed around such main ideas, or core principles.

More formally: a reasonable level of confidence in the quality of a degree program can be ensured if and only if a Q.A. Framework is deployed around the following set of core principles to be made available in a public document:

- the Programme must be clearly designed around External Requirements and Target Competencies which are in agreement with the needs of the employers and the labour market; such relations should be present already at the design phase, and not only (as it often happens) at the award stage or the final project
- the Programme must be clearly implemented with up-to-date Learning Outcomes, which are in agreement (content, amount, level) with the target competencies
- the Programme must expose the students to an appropriate learning environment, with appropriate and state of the art equipment (& laboratories, rooms, but also instructors, methods …)
- the Programme appropriately certifies that the Learning Outcomes have been reached; the exams have a true certifying value.

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\(^2\) H3E, Position Paper on Quality and Quality Assurance, A proposal for a formalised procedure for achieving good quality teaching of engineering in European universities, (WG2, John Sparkes coord.), march 1999
Boundary conditions and perspectives to the Q. A. FRAMEWORK

(Internal) Quality Assurance comes well before any external Evaluation or Accreditation process.

It should make sure that a well behaved Programme is not born just short before an external evaluation or accreditation comes, neither that Quality Assurance consists only of inspections, audits and controls.

Rather, it must inform the degree Programme's day-to-day operations, becoming an open window on the institution. Therefore, the degree Programme must provide the outside world with a basic set of uniformly organized information that enables stakeholders to make informed judgments about the degree Programme's aims, methods and the learning environment provided to the student; helps orient prospective students, and facilitates second-party and third-party evaluation/accreditation.

Meeting these needs calls for an approach based on permanent monitoring: the Programme must be asked to produce and maintain a set of appropriate information.

Additional considerations stay behind the development of the "MIRROR – Q.A. FRAMEWORK" during the activity of the ALFA-Mirror Project group.

• To be truly effective, any systematic approach to quality assurance must thus be compatible with the environment to which it is applied.

• Its benefits must outweigh the time, money and effort put into it.

• Degree programs have always been rather loosely organized: alliances between fiercely independent actors driven by disparate motivations. Quality assurance measures can be effective only if they change or regulate these actors' conduct, less by coercion than by suggestion and example; by the kind of give and take that results in voluntary participation, a determination to get things done, a readiness to cooperate, a willingness to shoulder responsibility.

• Quality assurance programs involve a fairly complex administrative apparatus that collects and processes data and ensures compliance with organizational and regulatory requirements. It is essential that these day-to-day tasks be handled by trained staff who can help the faculty accomplish its aims and relieve it of much of the burden involved.

• Ensuring that the faculty understands what the quality assurance program is seeking to achieve is equally important. The message must be clear: each faculty member must know precisely what he or she is expected to do, and how it will contribute to enhancing the degree program's quality. This is not a question of appealing to the individual's good will, but of emphasizing that the real focus and pivot of quality assurance is the Programme.

It is worthwhile, at this point, to underline that the core principles adopted by ALFA-Mirror satisfy the ENQA Standards and Guidelines of 2005:

3 checking that learning outcomes gained and assesses at school match the competences to be developed ⇒ ENQA: development and publication of explicit intended learning outcomes; careful attention to curriculum and programme design and content

• designing the Programme learning outcomes against external requirements (employers, labour market perspectives, society ...) and properly define sets of competences that the degree holder will be required to exercise when at work ⇒ ENQA: regular feedback from employers, labour market representatives and other relevant organisations

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3 ENQA, Standards and Guidelines for Quality Assurance in the European Higher Education Area, Helsinki, 2005
• having procedures for the setting and checking of exam papers and for their distribution, for the invigilation of exams and for the marking and monitoring of students' responses, etc. ⇒ ENQA: Students should be assessed using published criteria, regulations and procedures which are applied consistently

It is also very interesting to see the new developments of a very important national agency such as the Dutch NVAO for the accreditation of Programmes (however, in line with NVAO criteria already applied in the Accreditation Framework started in 20034).

It examines the content and quality of the Programme, focussing on six questions all of them covered by the MIRROR- Q.A. FRAMEWORK:

1. What is the intention of the Programme?
2. With what curriculum?
3. With what staff?
4. With what facilities?
5. How does the programme intend to guarantee quality?
6. Are the objectives being achieved?

The “intention of the Programme” and “curriculum” are explored by NVAO along the following lines, which I consider to be the “core”:

• Level and orientation are in line with the current requirements set by the occupational field and the discipline from an international perspective in terms of the programme content
• The curriculum has demonstrable links with current developments in the occupational field and the discipline
• The learning outcomes are adequately translated into the learning objectives of the curriculum. Students follow a course programme that is cohesive in terms of content.
• Interim and final exams, final projects and the way in which graduates function in practice or in subsequent education demonstrate what level has been realised. Exams and assessments are valid, reliable and clear to the students

It is evident that the development of the Mirror already at the time of submission, in fall 2004, adhered to the same principles, being at the same time a Quality Assurance Framework, i.e. a tool for Quality Assurance and Assessment of Engineering Education and an instrument for comparison and cross-validation of academic Programmes.

The MIRROR project facts and deeds

As already stated, the ALFA “Mirror” Project aims at the development of a reference model for comparison and recognition of engineering programmes:

to develop and apply a model allowing the comparison between curricula’s key outcomes and processes in the area of engineering, using previously agreed criteria, aiming at stimulating programme recognition and a reflection on the academic offers of participant institutions.

Specific objectives of the ALFA Mirror Project were:

• To develop criteria for evaluating: 1) learning outcomes (knowledge and skills obtained by the students), 2) the coherence of those outcomes with the professional roles to be exercised 3) the key processes of curricular design, implementation and review.

• To express these criteria through a common agreed language.

• To identify the documentary evidence for each criterion.

• To integrate these criteria in a reference model for comparison and, eventually, evaluation/accreditation of the curricula.

• To validate the model experimentally by applying it at the participant institutions.

• To stimulate a reflection of the participant academic units on the teaching–learning processes and the outcomes reached by the graduates.

In order to assure its applicability and sustainability, the resulting MIRROR–Q.A. FRAMEWORK was to be, and effectively it was, validated through its implementation in a variety of contexts represented by the different academic programmes of the network’s member institutions.

The MIRROR NETWORK composition eventually stabilised on the following active participants:

Latin America
Argentina Universidad Nacional de Mar del Plata
Argentina Universidad Nacional de San Juan
Brazil ABENGE, Associação Brasileira de Ensino de Engenharia
Brazil Universidade Federal de São Carlos
Brazil Universidade Federal de Pernambuco
Brazil Universidade Estadual de Campinas – Unicamp
Chile Pontificia Univers. Católica de Valparaíso

Chile Universidad de Talca
Colombia Universidad Nacional de Colombia
Costa Rica Universidad de Costa Rica
Mexico Instituto Tecnológico y de Estudios Superiores de Monterrey
Mexico Universidad Iberoamericana
Peru Pontificia Univers. Católica del Peru
The Mirror Project work has followed the four scheduled stages during the years 2007/2009:

- Development of the methodology and agreement about the criteria to evaluate the design and implementation of academic programs; identification of the necessary evidence to evaluate their fulfilment (development of the reference model)

**I Plenary Meeting in San José de Costa Rica, August 2007**
- Work at each institution to collect the necessary information according to the agreed criteria (informative dossier); exchange of experience

**II Plenary Meeting in Madrid, March 2008**
- External visits from two representatives of other universities participating in the network, with the double purpose to verify the consistency of the collected information and the effective applicability of the model. This visit will has ended with a report by the external peers, establishing if the information fulfils or not the established criteria (informative dossier audit). January–March 2009 (Table 1 shows details of the visiting teams)
- Final work with conclusions and recommendations for the improvement of academic programs within participant institutions and others potentially interested (validation of the model). Revision and follow up activity after the IV meeting

**III Plenary Meeting in Campinas, November 2008**

- Six months extension, project closure, final version of all Q.A. Frameworks, by December 2009.

Of course, preparatory work of the first two meeting was extremely valuable. It was the time were the core principles were discussed and adopted.

But the external visits proved to be “the” crucial factor for the success of the project. It was the phase when participants were involved in two synergic ways: covering the double role of evaluated and evaluators. It was then the time when a really deep discussion developed, problems arose, each one had to compare the solution he/she had given to them and solutions proposed by others. These visits combined the efforts of three institutions: the one which was visited, and two others one from Latin America and one from Europe (Table 1).

Thanks to this self-reinforcing process of learning and exchange the project really gained momentum. This was, if necessary, a proof that Quality Assurance measures and how they are communicated rely on two catalysts for change:

- **Open access**: The very fact that documentation is freely available encourages a spirit of transparency. As a result, the organization can communicate itself more effectively.
- **Clear-cut rules**: people are inclined to give more careful thought to expectations that are clearly and appropriately expressed. This leads them to emulate the improvements they see around them, a process that openly accessible information helps spread.

Thanks to this, a collection of tested and discussed documents was made available to the Orientation Committee on the last meeting. Some revisions were further suggested by comparing proposals set forth by the different participants. It is predicted that by the conclusion of the project, due end of 2009, an result of average high value will be made available to participating institutions to help other Programmes go along the same lines.
Table 1 – Visited and visiting institutions in the external visits

<table>
<thead>
<tr>
<th>University visited</th>
<th>Team from Europe provided by:</th>
<th>Team from Latin America provided by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universidad Nacional de Mar del Plata</td>
<td>Universidad Politécnica de Madrid</td>
<td>ABENGE</td>
</tr>
<tr>
<td>Universidad Nacional de San Juan</td>
<td>Universidad Politécnica de Madrid</td>
<td>Inst. Tecnol. y de Est. Sup. de Monterrey</td>
</tr>
<tr>
<td>Universidade Federal de São Carlos</td>
<td>Universidade de Aveiro</td>
<td>Universidad Nacional de Colômbia</td>
</tr>
<tr>
<td>Universidade Federal de Pernambuco</td>
<td>Universidade de Aveiro</td>
<td>Pontificia Universidad Católica de Valparaíso</td>
</tr>
<tr>
<td>Universidad Estadual de Campinas</td>
<td>Universidade de Aveiro</td>
<td>Universidad de Costa Rica</td>
</tr>
<tr>
<td>Pont. Univ. Católica de Valparaíso (Ing. Química)</td>
<td>Politecnico di Torino</td>
<td>Universidad de Costa Rica</td>
</tr>
<tr>
<td>Pont. Univ. Católica de Valparaíso (Ing. Electronica)</td>
<td>Politecnico di Torino</td>
<td>Universidad de Costa Rica</td>
</tr>
<tr>
<td>Universidad de Talca</td>
<td>Politecnico di Torino</td>
<td>Universidad de Costa Rica</td>
</tr>
<tr>
<td>Universidad Nacional de Colômbia</td>
<td>Universidad Politécnica de Valencia</td>
<td>Instituto Tecnológico de Sonora</td>
</tr>
<tr>
<td>Universidad de Costa Rica</td>
<td>Universidad Politécnica de Valencia</td>
<td>Universidad de Costa Rica</td>
</tr>
<tr>
<td>Inst. Tecnol. y de Est. Sup. de Monterrey</td>
<td>Techn. Universität Braunschweig</td>
<td>Universidad de Costa Rica</td>
</tr>
<tr>
<td>Universidad Iberoamericana</td>
<td>Techn. Universität Braunschweig</td>
<td>Universidad de Costa Rica</td>
</tr>
<tr>
<td>Instituto Tecnológico de Sonora</td>
<td>Techn. Universidad Braunschweig</td>
<td>Universidad de Costa Rica</td>
</tr>
<tr>
<td>Pontificia Universidad Católica del Perú</td>
<td>Universidad Politécnica de Valencia</td>
<td>Universidad de Costa Rica</td>
</tr>
<tr>
<td>Universidad Politécnica de Valencia</td>
<td>Universidad de Aveiro</td>
<td>Universidad de Costa Rica</td>
</tr>
<tr>
<td>Universidade de Aveiro</td>
<td>Universidad Politécnica de Valencia</td>
<td>Universidad de Costa Rica</td>
</tr>
<tr>
<td>Politecnico di Torino</td>
<td>Techn. Universidad Braunschweig</td>
<td>Universidad de Costa Rica</td>
</tr>
<tr>
<td>Techn. Universität Braunschweig</td>
<td>Politecnico di Torino</td>
<td>Universidad de Costa Rica</td>
</tr>
</tbody>
</table>
**Outcome: the populated tables of the MIRROR–Q.A. Framework**

Information is conveyed in Tables (compatible with screen spaces) organised as shown in Table 2:

- four key “aspects” of the evaluation are considered:
  - A–Requirements and objectives,
  - B–Teaching, learning and assessment,
  - C–Learning resources,
  - D–Monitoring, analysis, review
- each “aspect” is clarified through a certain number of “factors” separately indicated, even though it will be of great value to consider their interconnections
- the “factors” listed in the table below represent the “minimum set” needed in the framework.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Factors</th>
<th>Required evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>Stakeholders with whom external requirements were identified</td>
<td>Table A1: Interactions with external stakeholders</td>
</tr>
<tr>
<td></td>
<td>Requirements identified: professional roles and the competencies needed to fill them</td>
<td>Table A2: External requirements</td>
</tr>
<tr>
<td></td>
<td>Intended learning outcomes: knowledge, understanding and skills the student is expected to gain, and which are needed to develop professional competencies</td>
<td>Table A3: Intended learning outcomes and associated course work</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Characteristics of students at enrolment</td>
<td>Table B1a, B1b: entry qualifications (selective admissions, orientation)</td>
</tr>
<tr>
<td></td>
<td>Program structure and content</td>
<td>Table B2: Curricular content</td>
</tr>
<tr>
<td></td>
<td>Teaching materials and methods</td>
<td>Table B3: Contact hours</td>
</tr>
<tr>
<td></td>
<td>Student assessment methods</td>
<td>Annex II: Modules’ descriptions</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>Faculty qualifications</td>
<td>Faculty CVs: hypertext link in Table B2</td>
</tr>
<tr>
<td></td>
<td>Technical and administrative support</td>
<td>Table C1: Premises and equipment</td>
</tr>
<tr>
<td></td>
<td>Infrastructures (lecture halls, classrooms, laboratories, libraries, facilities, equipment, etc.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Student guidance, counselling, academic support and welfare services</td>
<td></td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Student intake and progression (internal effectiveness)</td>
<td>Table D1: Student enrolment and progression data</td>
</tr>
<tr>
<td></td>
<td>Student and graduate satisfaction</td>
<td>Table D2: Further information, special initiatives</td>
</tr>
<tr>
<td></td>
<td>Professional outlets for graduates (external effectiveness)</td>
<td>Opinions of students participating in or about to complete the degree program</td>
</tr>
<tr>
<td></td>
<td>Data analysis and commentary</td>
<td>Job placement data</td>
</tr>
<tr>
<td></td>
<td>Periodic review activities</td>
<td>Table D3: Degree program analysis, monitoring and review</td>
</tr>
</tbody>
</table>

Table 2 – Structure of the MIRROR–Q.A. Framework

Table 3 in the next page underlines the logical structure of the MIRROR–Q.A. Framework.
I level (design) evidence

<table>
<thead>
<tr>
<th>Main / reference Roles &amp; target Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of Scholarly or Professional Roles or for which the Programme is specifically designed to prepare graduates; broad declaration of Competencies</td>
</tr>
</tbody>
</table>

Table A2 - External requirements required to fill role - to exercise functions in role.

<table>
<thead>
<tr>
<th>Subject areas &amp; Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particular choice of Subject Areas in coherence with stated competencies;</td>
</tr>
</tbody>
</table>

Table A3 - Intended learning outcomes and associated course work

knowledge, understanding and skills the student is expected to gain, and which are needed to develop professional competencies.1,2

<table>
<thead>
<tr>
<th>Teaching, learning and assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - Overall structure of Programme, deployment of Subject Areas in Course modules.</td>
</tr>
</tbody>
</table>

Table A3: Intended learning outcomes and associated course work

<table>
<thead>
<tr>
<th>Resources and services</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - Faculty qualifications.</td>
</tr>
</tbody>
</table>

Table B2: Curricular content

2 - Technical and administrative support. 3 - Infrastructures (classrooms, labs, libraries, facilities, equipment, etc.).

Table C1: Premises and equipment

4 - Student guidance and support.

<table>
<thead>
<tr>
<th>Monitoring, analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - Student enrolment and progression data (internal effectiveness).</td>
</tr>
</tbody>
</table>

Table D1: Student enrolment and progress data

2 - Student, graduate, (employer) satisfaction. (Student opinion surveys)

3 - Time to work. (Placement surveys)

Table D2: other data

<table>
<thead>
<tr>
<th>Data collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who, when, how for systematic collection of data on student progression, surveys of students' opinions</td>
</tr>
</tbody>
</table>

Review of Table D3: Degree program analysis, monitoring and review

Periodic assessment of Programme adequacy and effectiveness
The tables are divided in five sets. The following is a brief description of each one.

**Table A0 – Front page. Historical Background. Presentation of the Program** (this one in practice a commented index to facilitate the approach to the document).

**Aspect A – External requirements and learning outcomes.**

Tables A1: interaction with external shareholders: This table provides the bases for a systematic, open approach to determining the educational requirements of prospective employers. It identifies the party or parties who promote consultation, the external stakeholders involved, and the type and frequency of interactions. Hypertext links to documents on record are also provided.

Table A2: External requirements. Specifies the professional roles for which the degree program is designed to prepare graduates. These roles are described in terms of the functions exercised in them and the competencies required in order to fulfil them.

Table A3: Intended learning outcomes and associated course work. The knowledge, understanding and skills expected of the student are shown in relation to the course work and other educational activities whereby they are developed. The table thus details how teaching activities are organized in order to achieve the intended learning outcomes on several different level (knowing and understanding, knowing how to act, ability to make judgments, communication skills, self learning skills, knowing how to be).

**Aspect B – Teaching, learning and assessment.**

Table B1a: Entry qualifications (selective admissions) – Table B1b: Entry qualifications (for orientation): Attention to the overall quality of the educational process also centers on enter qualifications, distinguishing between the qualifications that students are requited to have in cases where admission to the degree program is restricted or selective, and those that are recommended for orientation purposes, i.e. will help students make informed decisions based on their own aptitudes.

Table B2: Curricular content– Table B3: Contact hours. These tables provide the information needed to organize resources and manage time. The first gives details of course titles and the number of teaching hours involved, while the second provides direct access to class schedules.

**Aspect C. – Resources.**

Table C1: Material resources and equipment: Provides details for the facilities and equipment used for teaching activities.

**Aspect D – Monitoring, analysis and review.**

Table D1: Student enrolment and progression data.

Table D2: Further information: Contains additional information introduced at the discretion of each degree program concerning student background and achievement, faculty stability, etc.

Table D3: Degree program analysis, monitoring and review: Summarizes the processes carried out as part of continual degree program improvement, detailing motivations, actions, and responsibilities for changes made to the program.
During the development of the project it was not possible to develop a scheme for the review checklist. Indeed, in the context it was considered premature, in view of the fact that a meaningful application would require official adoption of the MIRROR–Q.A. FRAMEWORK by the Faculty and an experimentation of at least two–to–three years on the field. It was agreed that this should be left to a possible continuation of the project in the years to come with further financing.

Part II of this Final report shows all the populated tables. (See Map in page 4)
Conclusions of the Orientation Committee

At the closure of the last Orientation Committee meeting in Torino, June 15–16–17 2009, instructions for a further revision of the populated tables were issued, and the following concluding remarks were agreed.

The development of a “effectively working” internal Quality Assurance system requires the availability of a framework and documentation: such documents has been developed during the present ALFA–MIRROR project; it is the outcome of research activity consisting in a survey which has produced the MIRROR–Q.A. Framework, i.e., a communication tool for QA of Engineering Education;

Three main needs were emphasized:
A – The institution and its degree Programmes must be able to choose the features of their quality management system independently, as this Q.A. Framework must be adapted to their size, academic aims, history and local context. The same is true of the information which will be needed to highlight quality factors and underpin control and improvement. The institution owns its quality management system, and it must be able to be evaluated/accredited on the basis of this Q.A. Framework.

B – Quality management must not consist only of inspections, audits and controls. Rather, it must inform the degree Programme's day-to-day operations, becoming an open window on the institution.

C – The degree Programme must provide the outside world with a basic set of uniformly organized information that enables stakeholders to make informed judgments, helps orient prospective students, and facilitates second–party and third–party evaluation/accreditation.

Meeting all three of these needs calls for an approach based on permanent monitoring: the Programme must be asked to produce and maintain a set of appropriate information, collected in an “information protocol” developed around a scheme here called Q.A. Framework Matrix (presented in Table 3).

The resulting information protocol has been titled the “MIRROR–Q.A. Framework”: it contains all the qualitative and quantitative parameters needed to arrive at an informed judgment about the degree Programme's aims, methods and the learning environment provided to the student.

The MIRROR–Q.A. Framework is thus the foundation for all future evaluation/accreditation processes. It must satisfy minimum requirements for content and form so that degree Programmes of the same or similar type offered by different institutions can be readily compared.

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5 Paulino Alonso, Joao S. Cordeiro, Muzio M. Gola, Ismael Mazón, Robson Pederiva, Estela Pereira, Daniel Samoilovich
The proposed MIRROR–Q.A. FRAMEWORK, presented as a collection of tables, marshals the essential information that provides the basis for regarding a Programme as “assessable for accreditation purposes”.

The FRAMEWORK has been tested against the needs of different institutions.

On completion of the Framework and of the associated Tables by each ALFA–MIRROR participant, we are in agreement that the implementation of MIRROR–Q.A. FRAMEWORK has the following advantages and features.

The populated tables of the MIRROR–Q.A. FRAMEWORK give a clear and concise picture of the educational Programme on offer.

Prior to the implementation of this Framework there is difficulty in comparing different Programmes as a result of different criteria to be followed. The concise standard format of information, concerning the common core of almost all criteria, can now be used in comparing different educational Programmes.

It is envisaged that current national procedures will not be superseded by the MIRROR–Q.A. FRAMEWORK, rather that this Framework will overcome the difficulty in comparing Programmes which are described using different formats.

The MIRROR–Q.A. FRAMEWORK captures the critical information which is required by stakeholders such as employers, the labour market, students, educational policy makers and educational establishments. It collects and collates all the details which are strictly necessary.

In the absence of any currently prescribed model, this Framework can be adopted as a Programme design tool as a checklist for its evaluation and as a guideline for the implementation of internal Quality Assurance.

The MIRROR–Q.A. FRAMEWORK is structured in a modular manner, making it possible to be effectively used in a web medium, therefore allowing access by the public at large, making it an instrument for transparency and control.

In the release of this Framework and associated Tables the SIG A4 anticipates that the format is flexible enough to be adapted to the individual institutional needs. However, it is recommended, to facilitate comparability, that the general format and the appearance of the tables should be maintained.

Moreover, the MIRROR–Q.A. FRAMEWORK should be flanked by periodic (presumably annual) reviews, where systematic observations and governing actions are given the appropriate evidence, thus proving that the Q.A. systems are effectively in operation. Support processes can be addressed in the tables purposely designed, and are essential in highlighting the quality of the organization in the planning and delivery of educational Programmes. The combination would describe quality factors and the actions involved in control, highlighting the degree Programme’s strengths and weaknesses, corrective measures, review activities and follow-up, and their effects over time.