GLOBAL REPORT ON THE EVALUATION OF THE RESEARCH UNITS ON ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

1. EVALUATION PANELS

The evaluation of the **Electrical Engineering and Computer Science** (EECS) Research Units was carried out in two visits. This report covers both evaluations.

The **first** panel integrated the following experts:

Prof. Luigia Carluci Aiello (La Sapienza, Rome, Italy)

Prof. Tariq Durrani (Strathclyde University, Glasgow, UK)

Prof. Franco Maloberti (Universidade de Pavia, Italy and University of Texas, Dallas, US)

Prof. José Manuel Fonseca de Moura (Carnegie Mellon University, Pittsburgh, PA, US) (Coordinator)

Prof. Moira Norie (Swiss Federal Institue of Technology, ETH, Zurich, Switzerland)

Prof. David Padua (University of Illinois, Urbana Champaign, IL, US)

Prof. Janak Patel (University of Illinois, Urbana Champaign, IL, US)

Prof. Chris Rose (Rutgers University, Brunswick, NJ, US)

The **second** panel integrated the following experts:

Prof. Hans-Dieter Burkhard (Humboldt Universitat Berlin, Berlin, Germany)

Prof. Hyong Kim (Carnegie Mellon University, Pittsburgh, Pensylvania, USA)

Prof. Bruce MacDowell Maggs (Carnegie Mellon University, Pittsburgh, PA, USA)

Prof. José Manuel Fonseca de Moura (Carnegie Mellon University, Pittsburgh, PA, USA) (coordinator)

Prof. Yale Patt (University of Texas Austin - Austin, Texas - USA)

Prof. Adel Razek (Laboratoire de Génie Électrique de Paris, Gif-sur-Yvette, France)

Prof. Marwan A. Simaan (University of Pittsburgh, Pittsburgh, PA, USA)

The visits were organized locally by Dra. Maria José Camecelha de Abreu. The committees were assisted during the evaluation and the visits by Dra. Abreu, Dr. Miguel Oliveira, Dr. Pedro Silva (first round of visits), and Dra. Ana Amorim. The Panel acknowledges their efforts towards the success of the visits.

2. RESEARCH UNITS VISITED

In total, we evaluated 29 research units, either existing units, or proposals for new units. The first evaluation covered 12 Units, see Table l, and took place from December 14 to December 20, 2003, see schedule in Table 2. The second evaluation covered the remaining 17 units, see Table 2, and took place from January 25 to January 31/ 2004, see schedule in Table 3.

<u>Table l: Units Visited by 1st Panel</u>

Unit #   Unit Name and Home Institution

307   Instituto de Engenharia de Sistemas e de Computadores - INESC-ID (Instituto
          Superior Técnico (IST), Lisboa)

319a   Centro ALGORITMI (Universidade do Minho, Guimarães e Braga)

408   Laboratório de Sistemas de Grande Escala (LASIGE) (Fundação da Faculdade
          de Ciências da Universidade de Lisboa, Universidade de Lisboa)

527   Centro de Informática e Tecnologias da Informação (Faculdade de Ciências e
          Tecnologia da Universidade Nova de Lisboa, Caparica)

605*   ADETTI - Associação para o Desenvolvimento das Telecomunicações e
          Tecnologias da Informação (ISCTE)

608*   Centro de Investigação em Sistemas Confiáveis e de Tempo Real - CISTER
          (Instituto Superior de Engenharia do Instituto Politécnico do Porto (ISEP/IPP)

628*   Centro de Estudos e Recursos Multimedia (Universidade Fernando Pessoa)

631 *   Centro de Electrónica, Optoelectrónica, e Telecomunicações (Universidade do
          Algarve, Faro)

720*b   Laboratório de Sinais e Sistemas (Faculdade de Engenharia do Porto (FEUP), Porto)

752*a   Centro de Ciências e Tecnologias de Computação (Universidade do Minho, Braga)

760*   GECAD - Grupo de Investigação em Engenharia do Conhecimento e Apoio à
          Decisão (Instituto Superior de Engenharia do Instituto Politécnico do Porto (ISEP/IPP)

821   Centro de Análise e Processamento de Sinais - CAPS (IST, Lisboa)
          *: Proposal for a new Research Unit
          a: These two units represent a split of the original Algoritmi
          b: This proposed Unit comes from existing Unit 48, Centro de Estudos de Física, Acústica
          e Telecomunicações (FEUP)_____

<u>Table 2 Schedule of Visits of 1st Panel</u>

	Time	Unit*	Panel Subgroup
Monday. 12/15/2003	8:00-15:45	307 (INESC-ID. Lisboa)	Whole panel
Tuesday, 12/16/2003	9:00-15:00	319ALGORITMI (Univ. Miinho. Guimarães)	Whole panel
Tuesday 12/16/1999	15:30-17:00	608 CISTER (ISEP/IPP, Porto)	Maloberti, Moura, Patel, Rose '
Tuesday 12/16/1999	15:30-17:00	628 C. Est. Rec. Multimedia (U. F. Pessoa. Porto)	Aiello, Durrani, Norie, Padua
Wednesday 12/17/1999	9:00-15:00	752 CCTC (U. Minho, Braga)	Whole panel
Wednesday 12/17/ 1999	15:30-17:00	631C.Optoel.ETele. (U. Alg.. Faro)	Maloberti, Patel
Wednesday 12/17/1999	15:30-17:00	760 GECAD (ISEP/IPP, Porto)	Aiello, Norie, Patel
Wednesday 12/17/1999	16:30-18:00	720 LSS (FEUP, Porto)	Durrani, Moura, Rose
Thursday 12/18/1999	9:00-14:00	527 CITI (FCT, UNL)	Whole panel
Thursday 12/ 18/ 1999	15:00-18:00	408 LASIGE (FC, UL, Lisboa)	Whole panel
Thursday 12/18/1999	15:00-18:00	821 CAPS (IST, Lisboa)	Durrani. Maloberti, Rose
Friday 12/19/1999	9:00-11:00	605 ADETK ISCTE, Lisboa)	Whole panel

Table 3: Units Visited by 2nd Panel

Unit #	Unit Name	Home Institution
27	Laboratório de Inteligência Artificial e Ciência de Computadores - LIACC	Reitoria da Universidade do Porto
46*	IDMEC - Instituto de Engenharia Mecânica	Instituto Superior Técnico da Universidade Técnica de Lisboa
48	Instituto de Sistemas e Robótica - Pólo de Coimbra	Instituto de Sistemas e Robótica
49	Centro de Estudos de Física, Acústica e Telecomunicações	Faculdade de Engenharia da Universidade do Porto
66	Centro Robótica Inteligente - CRI	Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa - UNINOVA
86	Centro de Automática da Universidade Técnica de Lisboa (CAUTL)	Instituto Superior Técnico da Universidade Técnica de Lisboa
95	Centro de Electrotecnia Teórica e Medidas Eléctricas do IST	Instituto Superior Técnico da Universidade Técnica de Lisboa
127	I.E.E.T.A.-Instituto de Engenharia Electrónica e Telemática e Aveiro	Universidade de Aveiro
147	Instituto de Sistemas e Robótica - Porto	Faculdade de Engenharia da Universidade do Porto
218	Centro de Energia Eléctrica - CEEL	Instituto Superior Técnico da Universidade Técnica de Lisboa
308	Instituto de Engenharia de Sistemas e Comptutadores de Coimbra (INESC Coimbra)	Instituto de Engenharia de Sistemas e Computadores -Coimbra
326	Centro de Informática e Sistemas da Universidade de Coimbra (CISUC)	Faculdade de Ciências e Tecnologia da Universidade de Coimbra
434	Laboratório de Modelação de Agentes (LabMAG)	Fundação da Faculdade de Ciências da Universidade de Lisboa
526	Centro de Inteligência Artificial da Universidade Nova de Lisboa - CENTRIA	Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa
625**	Centro de Sistemas Inteligentes (CSI)	Universidade do Algarve
629**	Centro de Accionamentos e Sistemas Eléctricos	Universidade da Beira Interior
666**	Laboratório de Mecatrónica e Computação Científica (LMC2)	Instituto Superior Técnico da Universidade Técnica de Lisboa

Table 4 Schedule of Visits of 2 nd Panel

Day of visit	Time	Unit	Panel Subgroup
Monday, 01/26/2004	09:00-11:15	66 CRI (UNINOVA,	Whole group
Monday, 01/26/2004	13:30-15:00	95 CETME (IST/UTL, Lisboa -IST)	Patt, Razek, Simaan
Monday, 01/26/2004	13:30-16:00	434 LabMAG (FC/UL, Lisboa -FCUL)	Burkhard, Maggs, Moura
Monday, 01/26/2004	15:00-16:30	86 CAUTL (IST/UTL, Lisboa -IST)	Patt, Razek, Simaan
Tuesday, 01/27/2004	09:00-13:00	147 ISR Porto (FEUP, Porto -FEUP)	Whole group
Tuesday, 01/27/2004	13:00-14:30	49 CEFAT (FEUP, Porto - FEUP)	Kim, Moura, Razek, Simaan
Tuesday, 01/27/2004	14:00-16:30	27 LIACC (UP, Porto - Campo Alegre)	Burkhard, Maggs, Patt
Tuesday, 01/27/2004	14:30-16:15	308 INESC Coimbra (Porto - FEUP)	Kim, Moura, Razek, Simaan
Wednesday, 01/28/2004	09:00-13:00	127 IEETA (U.Aveiro,	Kim, Razek, Simaan
Wednesday, 01/28/2004	09:00-13:00	326 CISUC (FCT/UC, Coimbra)	Burkhard, Moura, Patt, Maggs
Wednesday, 01/28/2004	14:00-16:30	48 ISR Coimbra (Coimbra)	Whole group
Thursday, 01/29/2004	09:00-11:45	526 CENTRIA (FCT/UNL, Caparica)	Burkhard, Maggs, Moura, Patt
Thursday, 01/29/2004	09:00-12:00	2 1 8 CEEL (IST/UTL, Lisboa -IST)	Kim, Razek, Simaan
Thursday, 01/29/2004	14:00-15:30	666 LMC2 (IST/UTL, FCT)	Burkhard, Kim, Maggs, Moura, Razek, Simaan
Fhursday, 01/29/2004	15:30-17:00	46 IDMEC (IST/UTL, FCT)	Burkhard, Maggs, Patt
Thursday, 01/29/2004	15:30-17:00	625 CSI (U.Algarve, FCT)	Kim, Moura, Razek, Simaan
Friday, 01/30/2004	09:00-10:30	629 CASE (UBI, FCT)	Kim, Moura, Razek, Simaan
Friday, 01/30/2004	09:00-10:30	86 CAUTL (IST/UTL, Lisboa -IST) (Linguistic group)	Burkhard, Maggs

3. TYPICAL VISIT

A typical visit started with an overall presentation by the Unit Leader that described the Unit and reviewed its activity and accomplishments in the last three years. This session ended with a brief question and answer period. The Panel took this opportunity to determine any constraints to the Units activity as perceived by the researchers and the Unit management, as well as to clarify the Units vision and future directions. The initial session was followed by visits with the several groups of the Unit. The Panel engaged in pointed discussions to understand the scientific and technical problems pursued by the individual researchers, their specific approaches, contributions, and results, and how they viewed their work in the international context. Some of the visits ended with a final session where the Panel addressed parting issues of a global nature. In some visits the panel had lunch with the Unit, which provided additional opportunity for discussions in a less structured setting.

4. PROGRAMMATIC FUNDING

The coordinator met on Sunday December 14, 2003 with the President of the Fundação para a Ciência e Tecnologia (FCT), Professor Ramôa Ribeiro who explained the goals of the evaluation and the funding mechanisms of the FCT. Professor Ramôa Ribeiro indicated that an important task for the evaluation panels was the award of Programmatic Funding to the research Units. Professor Ramôa Ribeiro set the total programmatic funding to be awarded to equal the total programmatic funding awarded in the previous evaluation (three million and two hundred thousand euros, 3.200.000 euros).

5. RESULTS OF EVALUATION

Each Panel held plenary discussions on the two last days of each evaluation: Friday and Saturday December 19 and 20, 2003, for the 1st Panel, and Friday and Saturday January 30 and 31, 2004, for the 2nd Panel. During these plenary sessions each Unit was discussed at length. The Panels voted on a scale of l (poor) to 5 (excellent) on each subgroup, on the leadership of the Unit, and on the Unit as a whole. These evaluations translate a qualitative assessment that goes beyond the multiple quantitative indices used by the evaluators in their work. The Panels wrote the evaluation reports for each Unit and determined the programmatic funding to be awarded to each Unit. These reports were entered directly on the FCT evaluation database and as such are considered attached to this overall report.

In line with the explanation of Professor Ramôa Ribeiro to the Coordinator, the Panels understood that Programmatic Funding is opportunistic, being targeted to making a definitive difference in the research activity of a researcher, a group, or a Unit and targeted to excellence. The Panels ruled out awarding programmatic funding to support infrastructure costs like Utilities and building maintenance costs. Rather, programmatic funding is awarded towards strengthening the research capability and international impact and international presence of the researchers or research groups. We emphasize the use of these funds towards extended visits of the Portuguese researchers in foreign research institutions, the recruiting of post-docs and researchers (nationals and foreign), to function as seed money to launch new research programs within the Unit, and to help defray travel costs of Portuguese researchers when establishing international consortia to bid for European research funding in the context of Framework Program 6. In accordance with previous experience, the Panels decided to apply the Programmatic Funding along the following major directions:

1) Support individual researchers with an incipient funding basis, whose activity shows promise and should be supported. Typically, these researchers joined recently their current Unit, or are part of a new Unit or of a Unit with major identified weaknesses. This funding will help these researchers to launch or sustain their activity in the near future.

2) Support certain groups whose activity was ranked excellent and for which the programmatic funding will help recruiting post-docs, support otherwise unsupported research activities, or strengthen their national and international relations.

3) In a few cases, the programmatic funding is allocated globally to the Unit with responsibility given to the management of the Unit to determine their best use.

For specific details on how the programmatic funding is to be used in each case, see the Units' reports. Tables 5 and 6 summarize the results of the evaluation and the programmatic funding awarded to each Unit.

Table 5: Evaluation Results-for Units Visited by 1st Panel

Unit#	Overall Quality	Programmatic Funding (€)
307	Very Good	450000
319	Very Good	350000
408	Very Good	100000
527	Very Good	100000
605	Good	0
608	Excel lent	200000
628	Poor	0
631	Very Good	100000
720	Good	0
752	Good	0
760	Very Good	150000
821	Good	50000

Table 6: Evaluation Results for Units Visited by 2nd Panel

Unit #	Overall Quality	Programmatic Funding (€)
27	Very Good	250000
46	Fair	50000
48	Very Good	180000
49	Poor	0
66	Good	0
86	Good	0
95	Fair	0
127	Very Good	200000
147	Very Good	180000
218	Fair	75000
308	Good	50000
326	Very Good	400000
434	Good	25000
526	Very Good	125000
625	Fair	40000
629	Good	75000
666	Fair	25000

Final Comments and Recommendations

Besides the recommendations specific to each Unit, which are included in the individual eports, the panel identified several general issues that are listed here.

1) There is noted progress and development of the research Units with respect to previous evaluations, which is a clear sign that the research landscape in Portugal has a very positive slope. This is reflected by many indicators. To cite a few: more and better publications, more substantial funding, supervision of more graduate students, more invited talks, and increased number of citations.

2) The number of PhDs at the research Units has increased significantly over the last few years. This is a result of the consistent supervision of PhDs at the research Units, which has lead to many having completed their degrees in the last few years, and to the return of many researchers sent to foreign Universities who have completed their PhD. Several Units have doubled in size since the last evaluation, for example, from 20 to 40 researchers with the PhD. This has lead in some cases to a partition of the Units in new Units. The Panels looked very careful at these divisions and only sanctioned those where it made sense, as, for example, with the division of Algoritmi in two Units: Algoritmi and CCTC.

3) *Impact of previous evaluations*: The Units have taken to heart many of the recommendations of previous evaluations and consistently referred to these recommendations and to their efforts to address them. The Panels confirmed these in many instances.

4) *Publications*: there was a consistent concern in many Units to improve their publication record to emphasize quantity as well as quality-more articles, and publish these articles on first rate International Journals and International Conferences.

5) *Inbreeding*: Inbreeding is still endemic. The Panels were repeatedly told that this is difficult to overcome with the recruiting policies in place at Portuguese Universities. Some Units took small steps to combat inbreeding by recruiting on the international arena post-docs and graduate students. The Panels supported these efforts.

6) *Funding*: The Units consistently reported the difficulties they experienced in the last year and a half with the delays in receiving their funding from FCT (base funding, programmatic, and projects); for example, their 2003 funding had not yet been received. They also referred to delays in receiving from FCT the last installment of research projects long completed.

7) *Management*: with some very good exceptions, including, for example, CISUC, Algoritmi, or CISTER, the management of the Units is weak and lacks strategic vision: inability to provide figures regarding the overall activity of the Unit; unable to identify research priorities within the Unit

or which new directions could be started if funding was available; incapacity to pick winners; incapacity to seed new initiatives. FCT should consider ways to strengthen the management of the research Units.

8) *Technology transfer*: there were several examples of start up companies launched to commercialize the research results of several research Units. Of note in this regard is Centro de Informática e Sistemas da Universidade de Coimbra (CISUC) that described several very successful examples of companies that were either launched by former or current researchers from CISUC or are commercializing research results from CISUC's activity and that keep strong connections with CISUC. Further, these companies also help create a job market to keep locally many of the researchers formed at CISUC. The evaluators were very encouraged by this development that was also noted at a few other Units.

6. WRITTEN REPORTS

Although there is progress on the summary reports written by the Units, there still is much room for improvement. We repeat here some comments made about the organization of the reports for future reference. The Evaluation Panels make a strong recommendation that the FCT transmit to the Units these recommendations. The written reports were in general poorly organized. The report should be organized in the following way. Each report should begin with a mission statement, stating the strategic goals of the Unit, followed by the major accomplishments of the Unit and summary tables for numbers of PHds and MSc graduated by the Unit, books and papers published (by category, see below), annual funding and their sources, international relations, technology transfer, and any other indices that can describe the Unit research activity. This should be followed by a description of the research groups. Each research group should demonstrate their research activity: major research accomplishments, impact of the research contributions, list of publications (grouped and separated by books, International Journals, International Conferences with full review, book chapters, International Workshops, others), description of industrial relations, list of international contacts, list of key prototypes, list of recent PhD graduates, list of projects with a short description (one or two sentences). Rather than having a vitae for each member in the staff, it is more helpful to have a one-page vitae for the key professors, and a table that summarizes the information for the staff (most recent degree and institution, laboratory and department affiliation). The vitas should be in an Appendix. The report should also have a table summarizing, for each research group and for the Unit as a whole the total funding for each project: funding source, total funding, duration, research funding, and (most important) what fraction of the total funding of the project per year comes to the Unit.

7. ORAL REPORTS

We repeat here many of the comments made regarding the oral presentations by the research Units. The evaluation Panels would like to see the following during a site visit:

1) *Visit organization*: The visit should have an initial presentation followed by visits to the research groups. The visits with each research group should last between 1/2 h and 45 min to allow for ample discussion.

2) *Overall presentation*: The initial presentation should be short and allow for ample discussion with the Panel. It should emphasize the main points and be as informative as possible.

3) *Major contributions*: The presentation by the coordinator and the presentations in each research group should clearly identify a few of the.major research contributions of the Unit and of the group. This list should be specific and emphasize the intellectual contribution and the impact made.

4) *Demos*: It is always more impressive to see software or hardware really working, rather than to hear a description. If a live demo is not feasible, sometimes a video is a good substitute.

5) *Technical discussion*: The panel wants to understand, for at least some of the research projects, what are the key areas and contributions that make this world-class research.

6) *Posters*: Many labs use posters to summarize each project; this makes it easy for the panel to get a good impression of the breadth of work in the lab, and to choose which projects are interesting for further discussion.

7) *Summary budget information*: The Director, during the initial meeting, should summarize the income and expenses of the Unit of the past and current years broken down with reference to source, purpose, etc.

8) *Priorities*: The Director should summarize requests for funding, and indicate priorities for using programmatic and basic funding.