

GLOBAL REPORT ON THE EVALUATION OF THE RESEARCH UNITS ON MECHANICAL ENGINEERING

At the end of the evaluation the Panel did not produce a Global Report for the area. As an alternative, the present text offers an analysis of the global data emerging from the exercise, as well of the information contained in the reports corresponding to the individual Research Units.

Twenty one Research Units of the Mechanical Engineering area were evaluated in the period 19 to 27 January 2003 by a scientific Panel coordinated by Cristina H. Amon. The other Panel members were Cesar Dopazo, Fabio Gori, Joseph A. C. Humphrey, Thomas Kurfess, Bora Mikic, Aleksandar Ostrogorsky, André Preumont, Fritz B. Prinz, Glenn Sinclair. Their respective affiliations can be found in Annex 2 of the Overall Report.

Of the twenty one research units, 13 had already been evaluated in the previous cycle, 6 were new and 2 resulted from the partition of previous units. This situation, as well as the name, coordinator, host institution and the final classification of all the units, is presented in TABLE 1. The evaluation focussed on the research activities carried out in the period 1999-2001, taking into consideration the reports presented, the discussions that took place during the visits to the units, and the general impression gathered therein. Detailed individual reports were produced for each unit, containing a general appreciation and several suggestions aimed at improving its future performance. Integration of all the above factors led to the classifications presented in the Table.

From the results in the Table it can be concluded that, in general terms, the research units were quite well rated. In fact, fourteen (66.7%) were rated as “Very Good” or “Excellent”, four (19.0%) as “Good” and three (14,3%) as “Poor” or “Fair”. This represents an impressive concentration in the upper end of the distribution curve. Reading the individual units’ reports reinforces this feeling: in general terms, the Panel was quite well impressed with the research being done in the Mechanical Engineering area and with the units themselves. Additionally, it can also be concluded that the new research units had worst performances than the old ones or their partitions. In fact, two of the three worst ratings – one “Poor”, one “Fair” – were ascribed to this group. As a consequence one of the new applicants did not become a Research Unit recognised by the Foundation for Science and Technology (FCT) for the period 2003 – 2005. The classifications’ distribution in this group – three “Very Good” (50%), one “Good” (16.7%) and two (33.3%) “Poor” or “Fair” - was also below that of the two other groups, 76.9%, 15.4%, 7.7% and 50.0%, 50.0%, 0%, respectively. This possibly reflects the positive effect of a learning curve for the units with regular activity and financing before the evaluation.

TABLE 1. Evaluation of the Mechanical Engineering Research Units (1999-2001) - General information

Unit situation	Unit n.	Name	Coordinator	Host Institution	Final classification
Old	46	IDMEC - Instituto de Engenharia Mecânica	Carlos Alberto Mota Soares	Instituto Superior Técnico da Universidade Técnica de Lisbon	Very Good
Old	54	Unidade de Concepção e Validação Experimental	António Augusto Fernandes	Instituto de Engenharia Mecânica - IDMEC - Pólo FEUP	Very Good
Old	130	Mecânica Experimental e Novos Materiais	Joaquim Francisco da Silva Gomes	Instituto de Engenharia Mecânica e Gestão Industrial - INEGI	Excellent
Old	131	Novas Tecnologias e Processos Avançados de Produção	António Pinto Barbedo de Magalhães	Instituto de Engenharia Mecânica e Gestão Industrial - INEGI	Very Good
Old	134	Unidade de Engenharia e Tecnologia Naval	Carlos Guedes Soares	Instituto Superior Técnico da Universidade Técnica de Lisbon	Very Good
Old	151	Centro de Ciência e Tecnologias Aeroespaciais	Jorge Manuel Martins Barata	Universidade da Beira Interior	Fair
Old	225	10 /Unidade de Métodos Numéricos em Mecânica e Engenharia Estrutural	Rogério Augusto Fernandes Martins	Instituto de Engenharia Mecânica - IDMEC - Pólo FEUP	Good
Old	252	Centro de Tecnologias da Produção e Energia	José Carlos Fernandes Teixeira	Universidade do Minho	Good
Old	260	Associação para o Desenvolvimento da Aerodinâmica Industrial (ADAI)	Domingos Xavier Filomeno Carlos Viegas	Associação para o Desenvolvimento da Aerodinâmica Industrial (ADAI)	Very Good
Old	285	Centro de Engenharia Mecânica	José Valdemar Bidarra Fernandes	Faculdade de Ciências e Tecnologia da Universidade de Coimbra	Excellent
Old	416	Unidade de Integração de Sistemas e Processos Automatizados	Fernando Gomes de Almeida	Instituto de Engenharia Mecânica - IDMEC - Pólo FEUP	Very Good
Old	481	Centro de Tecnologia Mecânica e Automação	José Joaquim de Almeida Grácio	Universidade de Aveiro	Excellent
Old	532	Centro de Estudos de Fenómenos de Transporte	João Bernardo Lares Moreira de Campos	Faculdade de Engenharia da Universidade do Porto	Very Good
New	615	CIDEM - Centro de Investigação e Desenvolvimento em Engenharia Mecânica	José Abel Ferreira de Andrade	Instituto Superior de Engenharia do Instituto Politécnico do Porto	Fair
New	667	Unidade de I&D em Engenharia Mecânica e Industrial - UNIDEMI	Jorge Joaquim Pamies Teixeira	Faculdade de Ciências e Tecnologia da Universidade Nova de Lisbon	Good
New	670	CCTAE - Centro de Ciências e Tecnologias Aeronáuticas e Espaciais	Luis Manuel Braga da Costa Campos	Instituto Superior Técnico da Universidade Técnica de Lisbon	Very Good
New	679	Centro de Estudos de Energia Eólica e Escoamentos Atmosféricos	José Manuel Laginha Mestre da Palma	Faculdade de Engenharia da Universidade do Porto	Very Good
New	708	Centro de Inovação e Desenvolvimento em Engenharia Mecânica	Luis Carlos Carrilho Gonçalves	Universidade da Beira Interior	Poor
New	712	Unidade de I&D em análise de ciclo de vida de produtos e componentes industriais soldados	José Oliveira Santos	Instituto de Soldadura e Qualidade	Very Good
Partition	765	Unidade de Estudos Avançados de Energia no Ambiente Construído	Eduardo Guimarães de Oliveira Fernandes	Instituto de Engenharia Mecânica - IDMEC - Pólo FEUP	Very Good
Partition	766	Unidade de Novas Tecnologias Energéticas	Armando Carlos Figueiredo Coelho de Oliveira	Instituto de Engenharia Mecânica - IDMEC - Pólo FEUP	Good

TABLE 2. Evaluation of the Mechanical Engineering Research Units - Comparative chronological and territorial analysis

Unit n.	Name	Town	Region	Classification 1999-2001	Classification 2002-2003	FTEs 2000	FTEs 2003	Financing 2000-2002 (€)	Financing 2003-2005(€)
46	Instituto de Engenharia Mecânica-IDMEC	Lisbon	LVT	Very Good	Very Good	73	93	1,182,067.9	1,234,950.0
134	Unidade de Engenharia e Tecnologia Naval	Lisbon		Very Good	Very Good	9	14	125,558.5	210,100.0
433	Centro de Estudos em Inovação, Tecnologia e Políticas de Desenvolvimento	Lisbon		Excellent	Excellent	12	14	146,418.0	189,000.0
667	Unidade de Investigação e Desenvolvimento em Engenharia Mecânica e Industrial - UNIDEMI	Almada			Good		9		48,600.0
670	Centro de Ciências e Tecnologias Aeronáuticas e Espaciais - CCTAE	Lisbon			Very Good		8		32,400.0
712	Unidade de I&D em Análise de Ciclo de Vida de Produtos e Componentes Industriais Soldados	Oeiras			Very Good		10		81,000.0
Data for the Lisbon and Tagus Valley Region [FTEs; Financing (Euros)]:						94	148	1,454,044.4	1,796,050.0
766	Unidade de Novas Tecnologias Energéticas-IDMEC	Porto	North		Good		4	0	36,400.00
416	Unidade de Integração de Sistemas e Processos Automatizados - IDMEC	Porto		Very Good	Very Good	9	10	100,807.1	171,500.0
54	Unidade de Conceção e Validação Experimental	Porto		Good	Very Good	6	8	157,952.6	97,200.0
130	Mecânica Experimental e Novos Materiais	Porto		Very Good	Excellent	15	22	277,431.4	442,000.0
131	Novas Tecnologias e Processos Avançados de Produção	Porto		Fair	Very Good	5	6	53,013.9	72,900.0
216	Unidade de Fluidos e Energia	Porto		Good		9		187,367.9	
225	Unidade de Métodos Numéricos em Mecânica e Engenharia Estrutural	Porto		Fair	Good	14	16	151,235.5	129,600.0
532	Centro de Estudos de Fenómenos de Transporte	Porto		Very Good	Very Good	6	8	71,494.4	97,200.0
615	Centro de Investigação e Desenvolvimento em Engenharia Mecânica - CIDEM	Porto			Fair		6		20,250.0
679	Centro de Estudos de Energia Eólica e Escoamentos Atmosféricos	Porto			Very Good		7		81,700.0
765	Unidade de Estudos Avançados de Energia no Ambiente Construído	Porto			Very Good		6		72,900.0
252	Centro de Tecnologias da Produção e Energia	Guimarães		Good	Good	19	30	259,092.26	243,000.0
Data for the North Region [FTEs; Financing (Euros)]:						83	123	1,258,395.1	1,464,650.0
260	Laboratório de Aerodinâmica Industrial	Coimbra	Centre	Very Good	Very Good	14	18	192,353.1	218,700.0
285	Centro de Engenharia Mecânica	Coimbra		Excellent	Excellent	11	12	203,171.5	237,000.0
481	Centro de Tecnologia Mecânica e Automação	Aveiro		Good	Excellent	13	21	130,948.3	463,500.0
151	Centro de Ciência e Tecnologias Aeroespaciais	Covilhã		Good	Fair	9	20	137,601.7	67,500.0
708	Centro de I&D em Eng ^a Mecânica	Covilhã			Poor				0.0
Data for the Centre Region [FTEs; Financing (Euros)]:						47	71	664,074.6	986,700.0
Global data for Portugal [FTEs; Financing (Euros)]:						224	342	3,376,514.1	4,247,400.0

A more profound analysis cannot be made without the information gathered by the Panel itself, as part of it is of a subjective nature. Henceforth, to complement the data herein, it is probably informative to make a comparative analysis between the results of the present evaluation and those of the previous one. It is also interesting to cross that analysis with a territorial one, to assess whether the good global performance is determined by specific regions or corresponds to the country in general. TABLE 2 presents that analysis, and also the total amount of financing (from the “Plurianual” and “Programmatic” Programmes) received by each unit. As mentioned elsewhere, the “Plurianual” financing for the period 2003 - 2005 was calculated taking as a basis the number of FTEs in December 2003, and the following annual values per FTE Researcher (in Euros): Excellent – 4,500; Very Good – 4,050; Good – 2,700; Fair – 1,125; Poor – 0. The analysis of the “Programmatic” funding will be done in a specific section, together with that of the other areas.

When analysing the Tables, it must be taken into consideration that Unit 433 - Centre of Innovation, Technology and Development Policies Studies, was not evaluated in 2003. In effect, since the last evaluation it had been integrated in an Associated Laboratory, and was thus excluded from the exercise and from TABLE 1. However, to allow comparability with the 1999 - 2001 evaluation, it was included in TABLE 2, with the same classification, and with the updated number of FTE PhDs and the amount of the “Centro” financing. Hence, twenty two Research Units (RUs) appear in this Table, in spite of the fact that only twenty one were evaluated.

Comparison of Tables 1 and 2 evidences a number of interesting conclusions. First, from 2000 to 2003 the number of financed FCT Research Units in the Mechanical Engineering area increased from 15 to 22 and the corresponding number of FTEs from 224 to 342, 46.7% and 52.7%, respectively. Second, all the units are located in the Lisbon and Tagus Valley (LVT), North, and Centre regions, the former two being predominant. This applies to both the 1999 - 2001 and the 2002 - 2003 evaluations, and is also reflected in the number of FTEs. Another conclusion is that the best ratings (“Very Good” and “Excellent”) are also prevalent in the North and LVT regions. The situation is summarized in Table 3 for the two evaluation cycles.

The overall quality of the ratings increased from one evaluation to the other as the proportion of “Very Good” and “Excellent” went from 53.4 to 68.2%. This was mainly a consequence of the increase of the number of units with higher ratings, since the number of units in the remaining ratings remained nearly constant. However, it is worth mentioning that the overall performance of the Centre region did not significantly improve

TABLE 3. National distribution of the classifications of the RUs in the two cycles

Regions	Situation in 2000				Situation in 2003			
	Very Good + Excellent	Good	Fair + Poor	Units per Region	Very Good + Excellent	Good	Fair + Poor	Units per Region
LVT	3	0	0	3	5	1	0	6
	37.5%	0.0%	0.0%	20.0%	33.3%	25.0%	0.0%	27.3%
NORTH	3	3	2	8	7	3	1	11
	37.5%	60.0%	100.0%	53,3%	46.7%	75.0%	33.3%	50.0%
CENTRE	2	2	0	4	3	0	2	5
	25.0%	40.0%	0.0%	26.7%	20.0%	0.0%	66.7%	22.7%
National - n.: (%)	8	5	2	15	15	4	3	22
	53.4%	33.3%	1.3%	100.0%	68.2%	18.2%	13.6%	100.0%

The increase in the number of Research Units was also not homogeneous across the three regions. It was clearly greater in the LVT region, followed by the North and Centre regions (100.0%, 27.3%, and 25.0%, respectively). This was not reflected in the number of FTEs and the financing received, as can be concluded by inspection of TABLE 2. In fact, the number of FTEs increased 57.4%, 48.2% and 51.1%, respectively, to 148, 123 and 71. Also, the global financing for the 3 years period augmented 25.8% from 3,376,514.1 to 4,247,400.0 Euros (that is, from 4.139,8 to 5.024,6 *Euros/researcher.year*). This variation is reflected in the 3 regions by increases in financing of 23.5%, 16.4% and 48.6%, respectively, to 1,796,050.0, 1,464,650.0 and 986,700.0 Euros, corresponding to 3,274.9, 3,410.3 and 3,117.7 *Euros/researcher.year*, respectively, in 2000 - 2002 and 4,045.2, 3,969.2 and 4,632.4 *Euros/researcher.year*, in 2003 - 2005.

In conclusion, the Research Units of the LVT region are staffed by a relatively higher number of FTEs, and, on average, were better rated in the last evaluation, thus obtaining a higher global financing in the 2003 - 2005 period. The North region has the highest number of Research Units, but occupies the second place in the number of FTEs, average ratings and global financing and the third in financing per FTE researcher. The Centre Region occupies the third place in number of FTEs, global financing and average ratings (the second, after exclusion of the Unit rated as "Poor") and the second in financing per FTE researcher.

At a deeper level of analysis, it can be concluded that the dominant position of the LVT and North regions is basically due to one institution in Lisbon, and two in Porto. On the other hand, in the Centre Region, the last evaluation showed that the one Research Unit in Aveiro registered an impressive improvement in its rating. It is now the recipient, globally and per ETI researcher, of the highest financing in that region, implying that it received a proportionally bigger amount of "Programmatic" financing. This increased the intra-regional disparities, as the two Units at Covilhã showed the opposite trend, one of them even failing to classify as a FCT Research Unit.