European Software Days

Organized by the

John von Neumann Computer Society

in cooperation with the

IQSOFT Intelligent Software LTD and

European Information Technology Association

Sponsored by

Committee for Technological Development and

Prime Minister's Office Coordination Office of Governmental

Information Systems

Budapest
March 16-17, 1995

Report on the European Software Days
March 16-17, 1995
Budapest, Hungary

The objectives of the meeting have been defined as to

- increase awareness about EU activities
  (esp. the fourth Framework Programme)
- promote EITA, recruit members
- make visible Hungarian software results

The program has consisted of three blocks:

I.   Information Technology in Hungary
II. European issues
III. Summaries of European projects with Hungarian participation.

In **block I.** presentation has been given about Hungarian connections to the RTD activities of the EU and also about the National Strategy for Information Technology being developed. the results of a survey about the Hungarian Software Industry has also been presented by IDC Eastern Europe.

Block II. presented European institutions and programmes, like DG-III, the Fourth Framework Programme, European Software Institute. The activities of EITA has also been presented, outlining the advantages and possibilities for joining Hungarian organizations.

Summaries of several EU-financed R&D projects has been presented **block III,** outlining the specific experiences of the Hungarian group participating in PECO, Copernicus, Eureka etc. projects.

The European software Days have been supported by the National Committee for Technical Development and the Coordinative Bureau for Informatics of the Prime Ministers Office widely publicist in the Hungarian press both before and after the event, including announcements in tree daily newspapers and information about the possibilities of joining EITA in the professional press the host of the event was the John von Neumann Computer Society.

RTD CO-OPERATION WITH EU IN HUNGARY
by Sándor Bottka, Vice President,
National Committee for Technological Development

Let me show first the **situation of the Hungarian RTD in the context of European integration**. It is essential for the Hungarian preparation for the EU integration how Hungary is strengthening its RTD co-operation with the EU and its member states, because of:

1. In the field of RTD (Research and Technology Development) Hungary has some comparative advantages namely: the integration ability of the Hungarian RTD community is higher then national average;
2. The integration process have some important RTD- oriented elements, which need long term harmonisation activities (e.g. measurement and testing, environment, standardisation, quality, information technology and telecommunications);
3. Behind a higher added value which is increasing the competitiveness of the national economy one can often find RTD co-operation, so our increased participation in a continental RTD collaboration is our national economic interest;
4. The Hungarian RTD co-operation with Europe is a 'success-story' comparing with the other integration processes, so it can serve as a positive example for the whole nation.

Some basic principles of the 4th FWP of EU:
* multi-annual top-down programming in priority fields of the technology policy, and bottom-up realisation schemes;
* the GDP-related contribution of the member countries is increasing (from ECUs 5.7 to 12.3 billion), the beneficiary ratio of the countries is not GDP-, but knowledge-related;
* the main objectives are strengthening the competitiveness of the European economy and improvement of the quality of life.
* the FWP is built on the real co-operation interest of the member countries and it's open for third countries' co-operation - basically on project-by-project or subcontract base - if it is in the interest of the Union. The programme-level association is theoretically an option, but it legally is very complicated process.

The EU-Hungarian RTD relations
* late 80-s: informal co-operation has started
* 1990: S&T Subcommittee of the EU-Hungarian Joint-Committee;
* February 1, 1994: Ratification of the Europe (Interim) Agreement
* February 1993: Hungary expressed its readiness to start negotiations on the co-operation in the RTD Framework programme, but no clear answer;

* in the beginning some sub-contracts to Hungary, later
* real partnership in some projects (5 specific programme from the 15 programme of the 3rd FWP were open for CEE countries for co-operation);
* some specific RTD co-operation assistance programme (PECO, COPERNICUS)
* PHARE ACCORD (10 MECUs), today TDQM (10 MECUs);

Some lessons from PECO & COPERNICUS actions:
* the ability for preparation RTD applications is existing among the Hungarian researchers (there were over 4,000 applications from Hungary in 92-94);
* the Hungarian researchers are preferring the project-co-operation rather then mobility schemes,
* good share from the winning projects (Poland, Czech republic and Hungary).
* the outcome is not only funding, but European way of thinking and acting.

## New situation - need for new strategy:
* Hungary presented its application for full membership to EU: the preparation for membership is more intensive in political and professional terms,
* trough the increased number of RTD EU-Hungarian projects the Hungarian RTD sector reached the critical level of EU-experience and proved the ability and willingness for co-operation with Europe,
* in the 4th RTD FWP there is no administrative barrier for project-co-operation, there are two decisive elements: the European interest and the Hungarian guarantee for funding our participation.

(Hungarian companies and institutes are participating in 73 COST projects, and 34 EUREKA-projects, with a massive governmental funding and appropriate scheme of guarantee.)

Taking into consideration the strengths of the Hungarian science, the objectives of the health, environment an economy we have to decide the specific fields, where would be desirable to start the program-level association. Trough 1-2 programme-level participation we could take our responsibility in preparation of strategic decisions, and we would obtain the EU procedures in governmental S&T management.

PECO 1992 - Az elnyert EU támogatás mértéke (mECU)
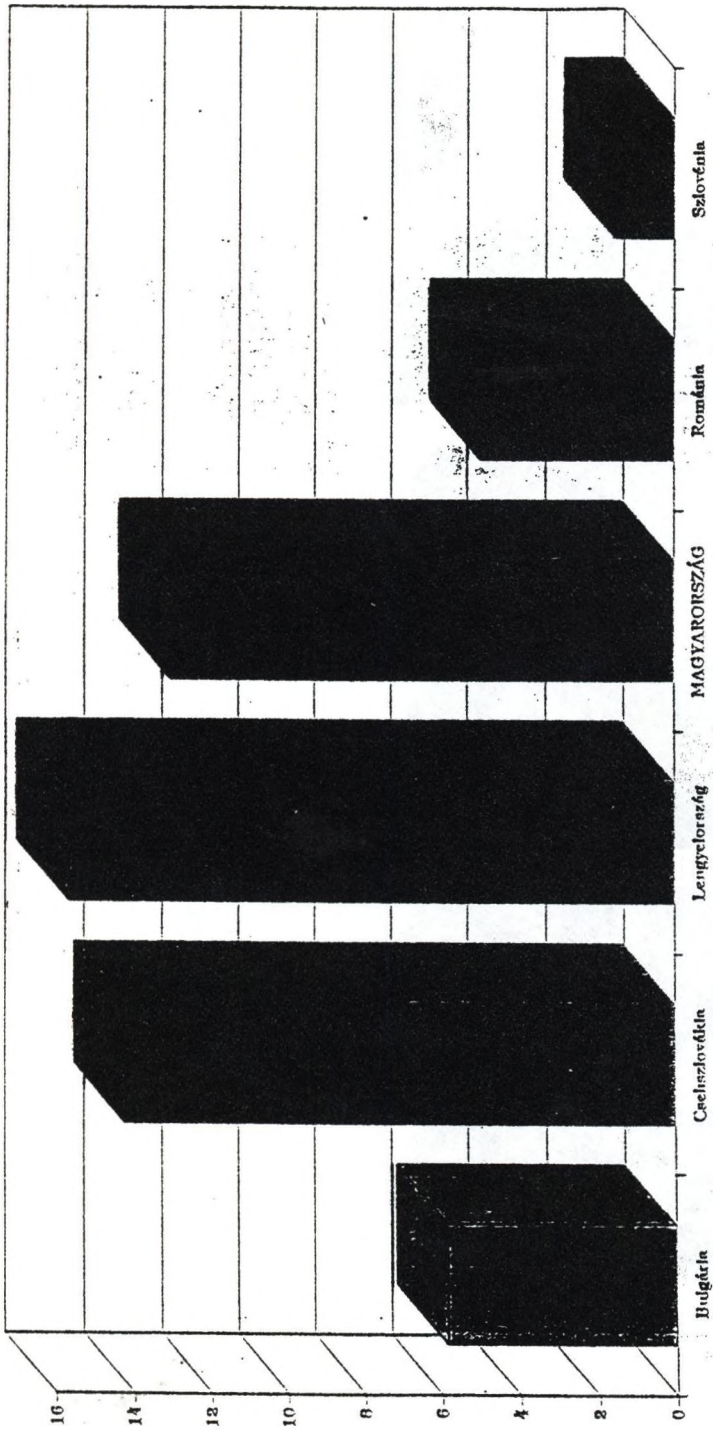
PECO 1992 – Mobilitás EU támogatása (mECU)
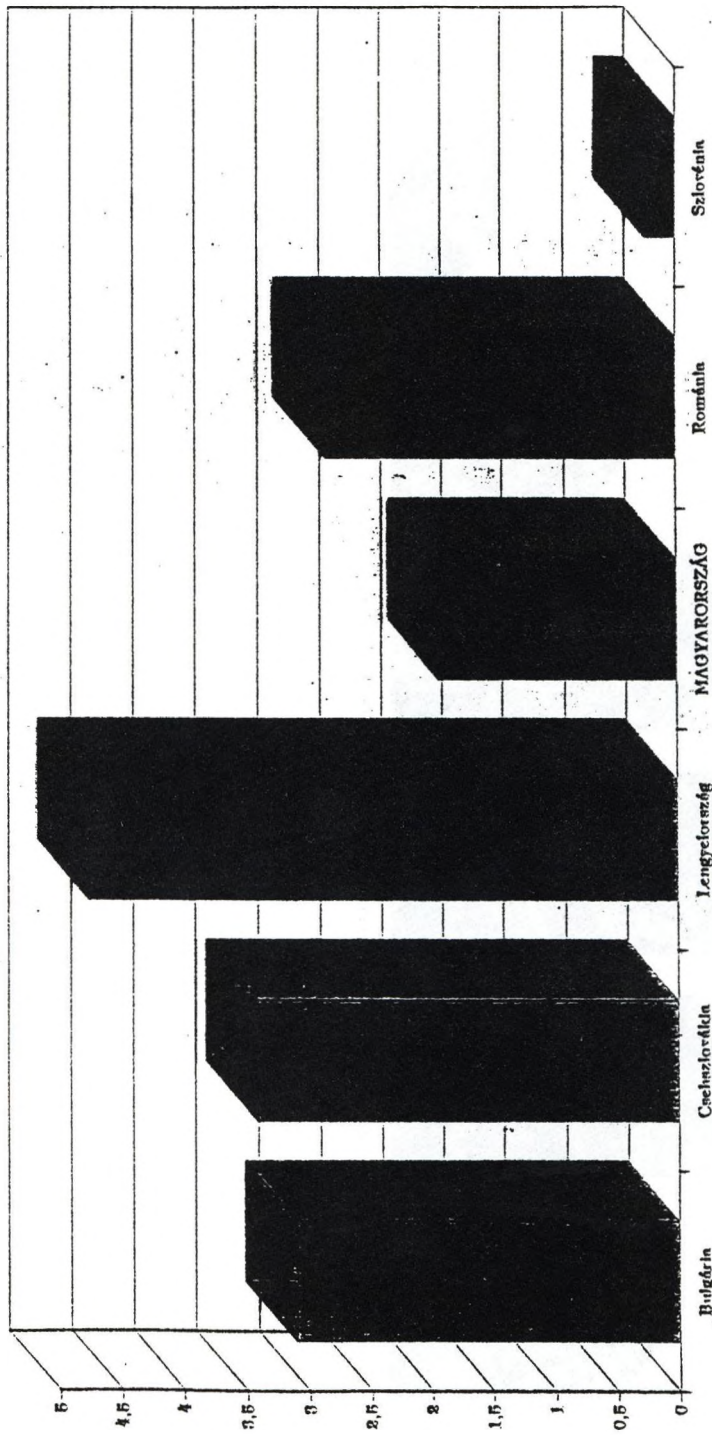
PECO 1992 - Kutatási projektek EU támogatás (mECU)

Bulgária — Csehszlovákia — Lengyelország — MAGYARORSZÁG — Románia — Szlovénia
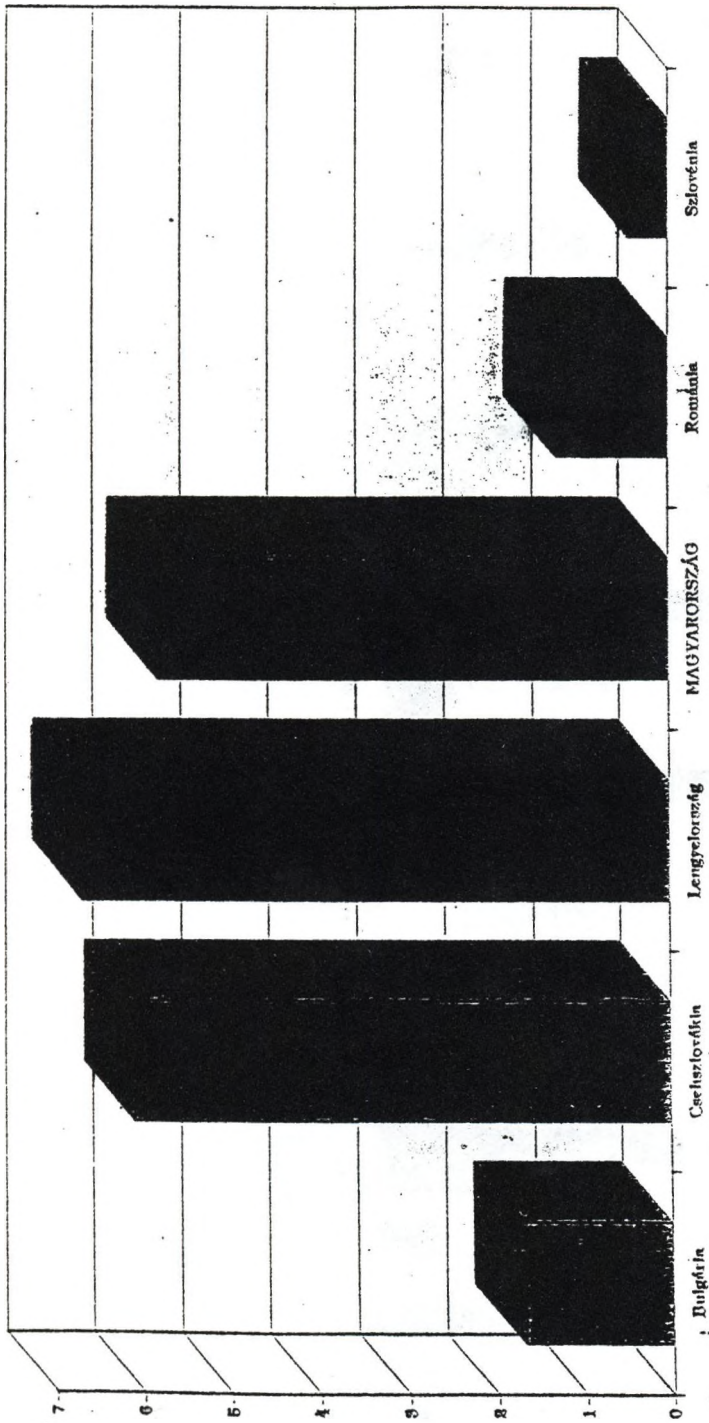
PECO 1994 - A jóváhagyott részvétel száma programonként (db)

Legend:
- A meghatározás biztonsága
- Környezetvédelem
- Nem nukleáris energia
- Emberi erőforrás és mobilitás
- Orvosbiológia

Countries (left to right): Bulgária, Csehország, Észtország, MAGYARORSZÁG, Lengyelország, Románia, Szlovákia, Szlovénia
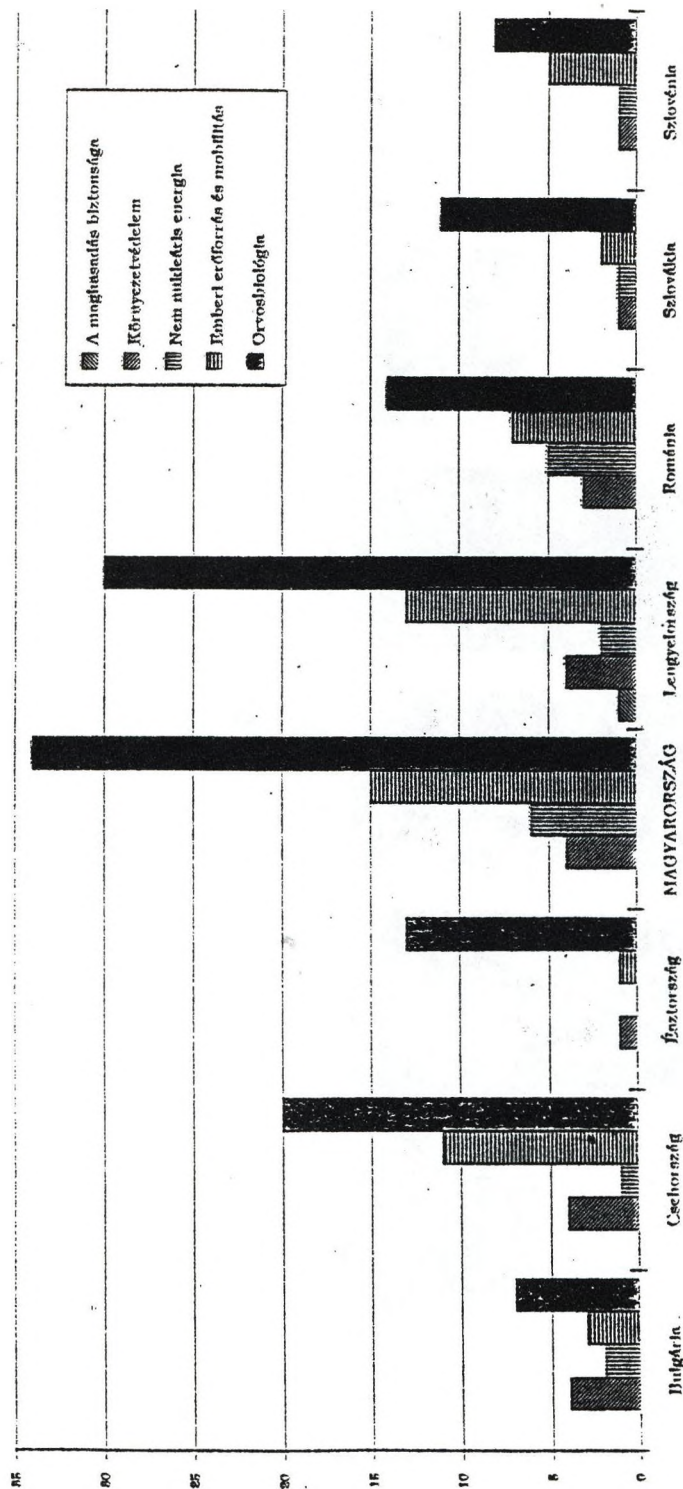
PECO 1994 - A projekt-részvételek száma - összesen (db)

COPERNICUS 94 - Az elnyert EU támogatás mértéke (mECU)

COPERNICUS 94 - *A magyar részvétel szektoronkénti megoszlása*

Informáciotechnológia 32%

Biotechnológia 11%

Mezőgazdaság, élelmiszeripar 15%

Kommunikációtechnológia, telematika és nyelvi engineering 9%

Gyártás, termelés, folyamatirányítás és anyagtudományok 22%

Mérés, ellenőrzés 11%
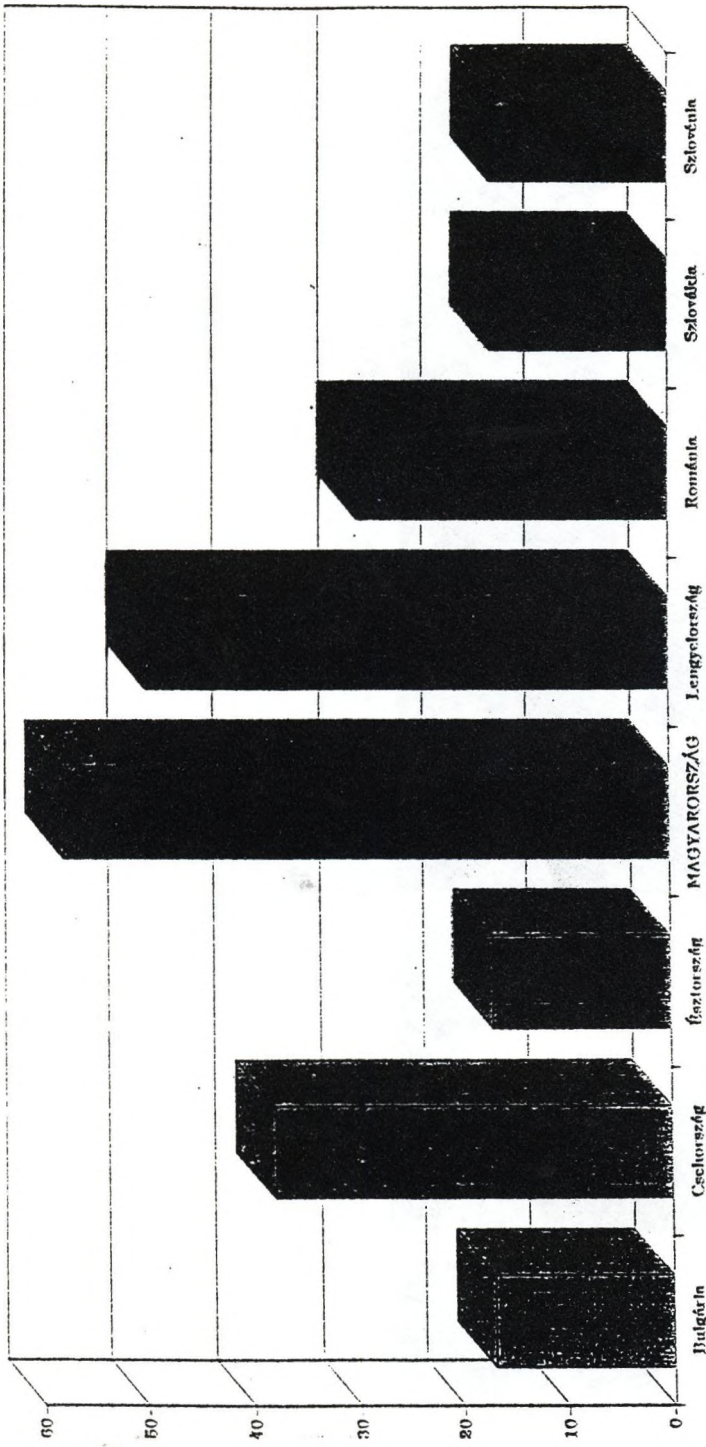
2.sz. melléklet

Magyar részvétel az EUREKA és a COST projektekben (db)

A KMÜFA alakulása
1988 - 1995

13. ábra

Folyó áron
Reálértéken

1988 = 100 %

13
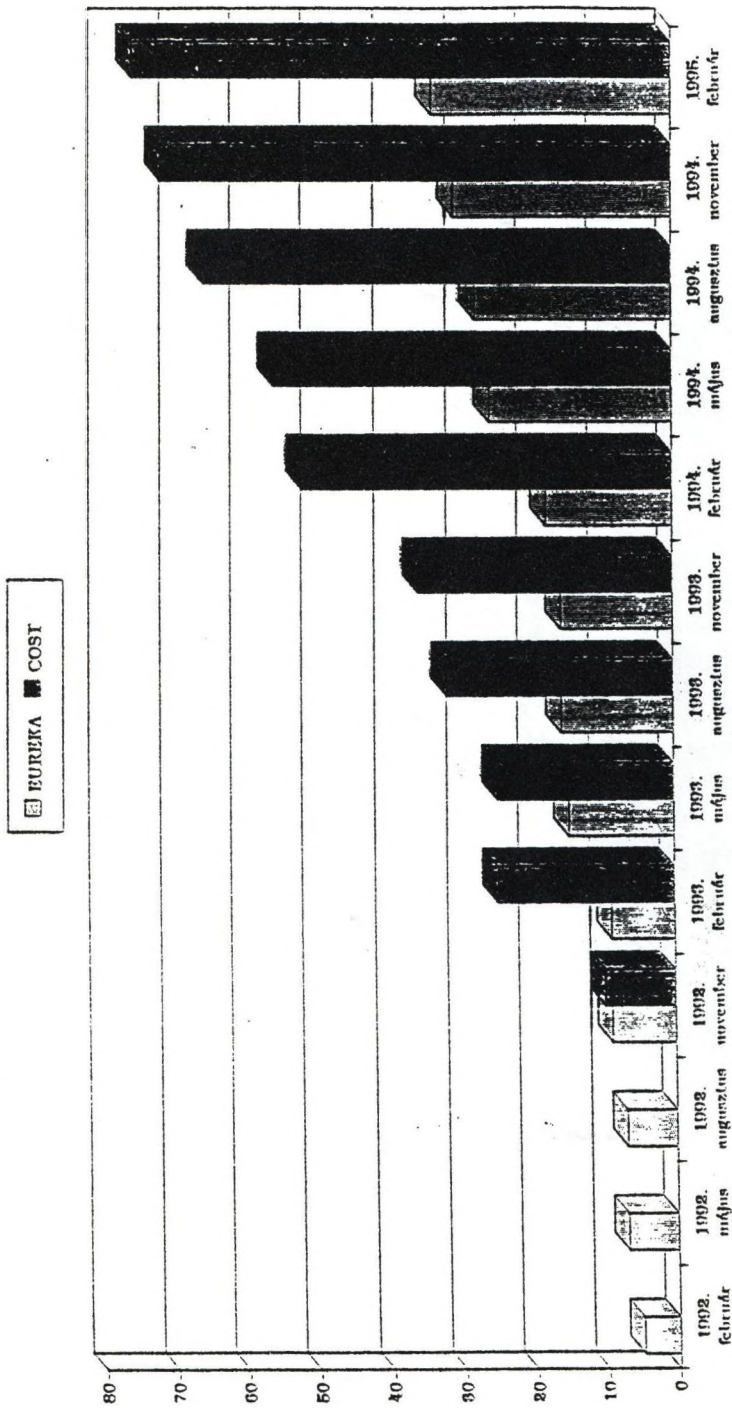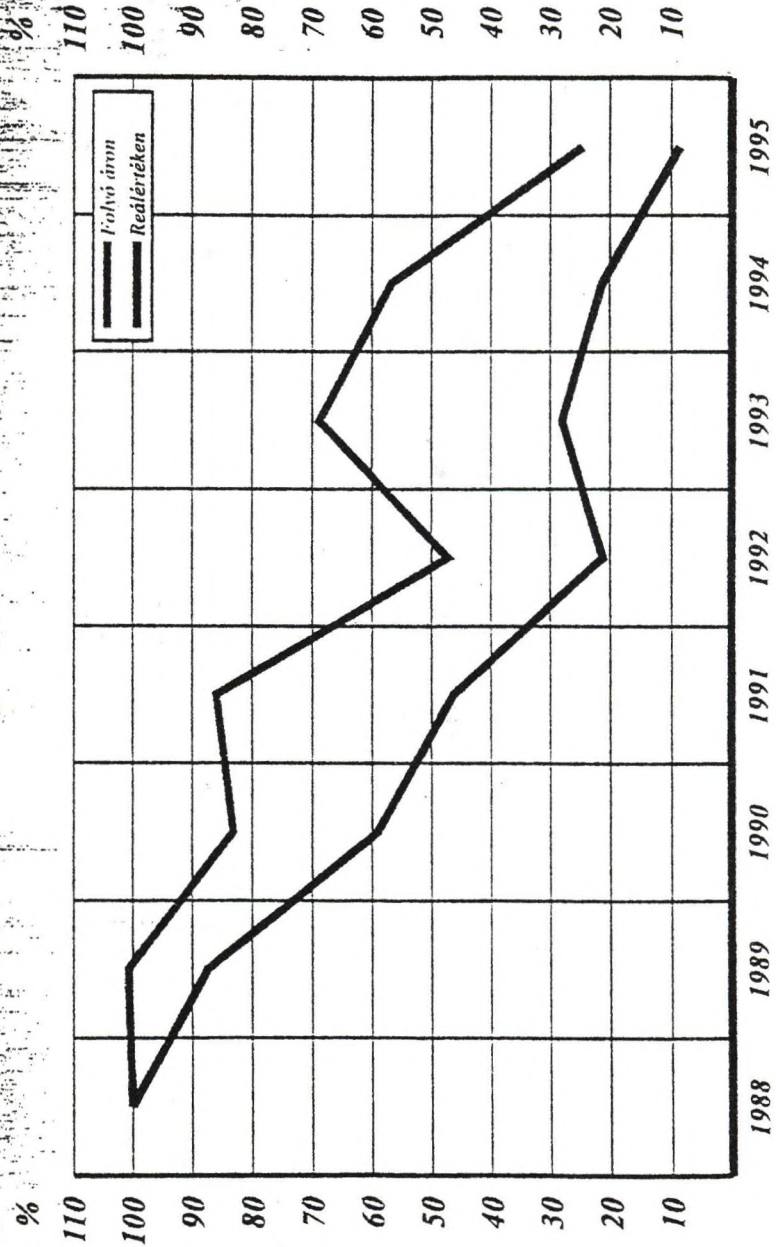
A GDP és a KMÜFA alakulása 1988 - 1995

%
110
100
90
80
70
60
50
40
30
20
10

GDP
KMÜFA reálértéken

1988 1989 1990 1991 1992 1993 1994 1995
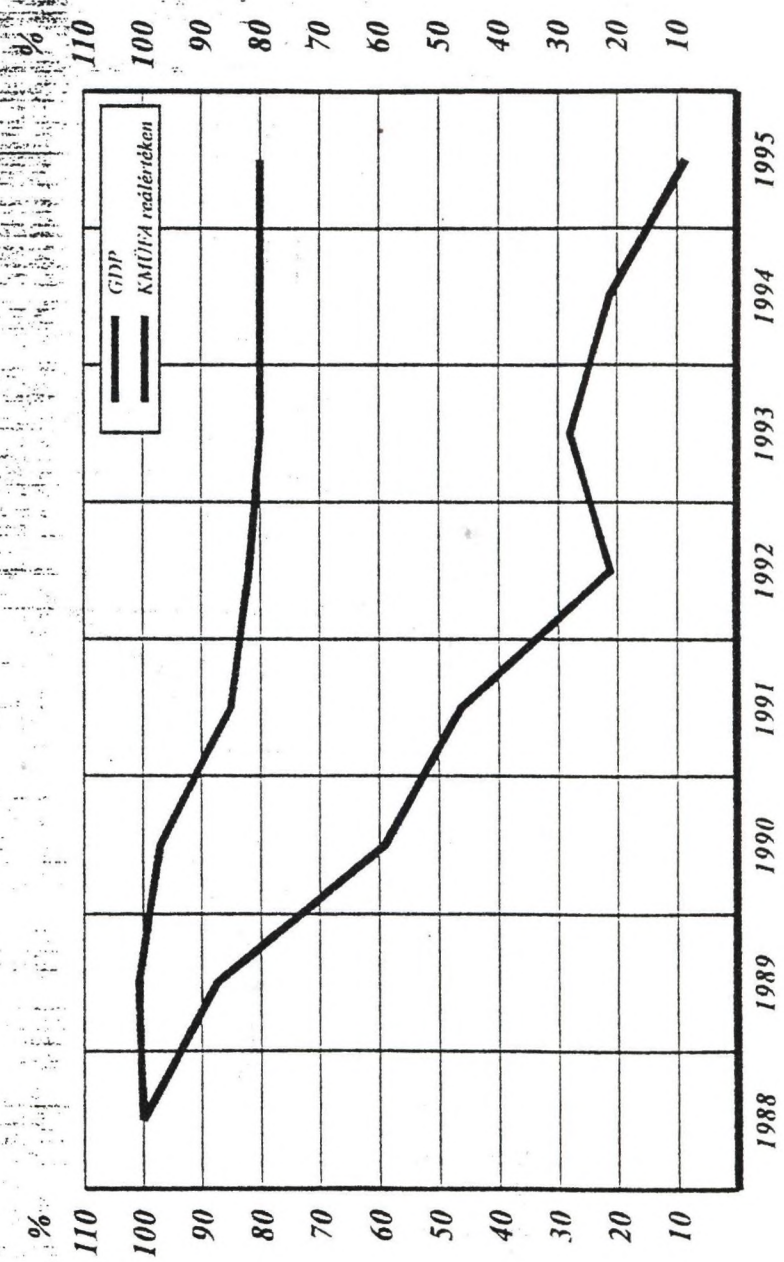
1988 = 100 %

14. ábra

GROSS DOMESTIC EXPENDITURE ON R&D

AS A PERCENTAGE OF GDP

MAJOR ECONOMIES **MEDIUM ECONOMIES** **SMALL ECONOMIES**

	Major Economies		Medium Economies		Small Economies
————	United States	————	Spain	————	Portugal
----------	Japan (adjusted)	----------	Australia	----------	Denmark
— — —	Germany	— — —	Netherlands	— — —	Greece
—·—·—	France	—··—··—	Turkey	—··—··—	Norway
+—+—+	Italy	+—+—+	Belgium	+—+—+	Finland
x—x—x	United Kingdom	x—x—x	Switzerland	x—x—x	New Zealand
ж—ж—ж	Canada	ж—ж—ж	Sweden	ж—ж—ж	Ireland
ж ж ж ж	European Communities	ж ж ж ж	Austria	ж ж ж ж	Iceland
Ө-Ө-Ө-Ө	Russia	Ө-Ө-Ө-Ө	Poland	Ө-Ө-Ө-Ө	Czechoslovakia
					Hungary

Source: OECD and National Authorities.

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TOTAL OF R&D SCIENTISTS AND ENGINEERS

PER 10000 LABOUR FORCE

MAJOR ECONOMIES

	UNITED STATES
	JAPAN (ADJ.)
	GERMANY
	FRANCE
+++	UNITED KINGDOM
××××	ITALY
****	CANADA

MEDIUM ECONOMIES

	SPAIN
****	TURKEY
	AUSTRALIA
	NETHERLANDS
	YUGOSLAVIA
+++	BELGIUM
××××	SWEDEN
****	SWITZERLAND
⊖⊖⊖	AUSTRIA

SMALL ECONOMIES

	DENMARK
	NORWAY
	GREECE
	FINLAND
+++	PORTUGAL
××××	NEW ZEALAND
****	IRELAND
⊖⊖⊖	ICELAND
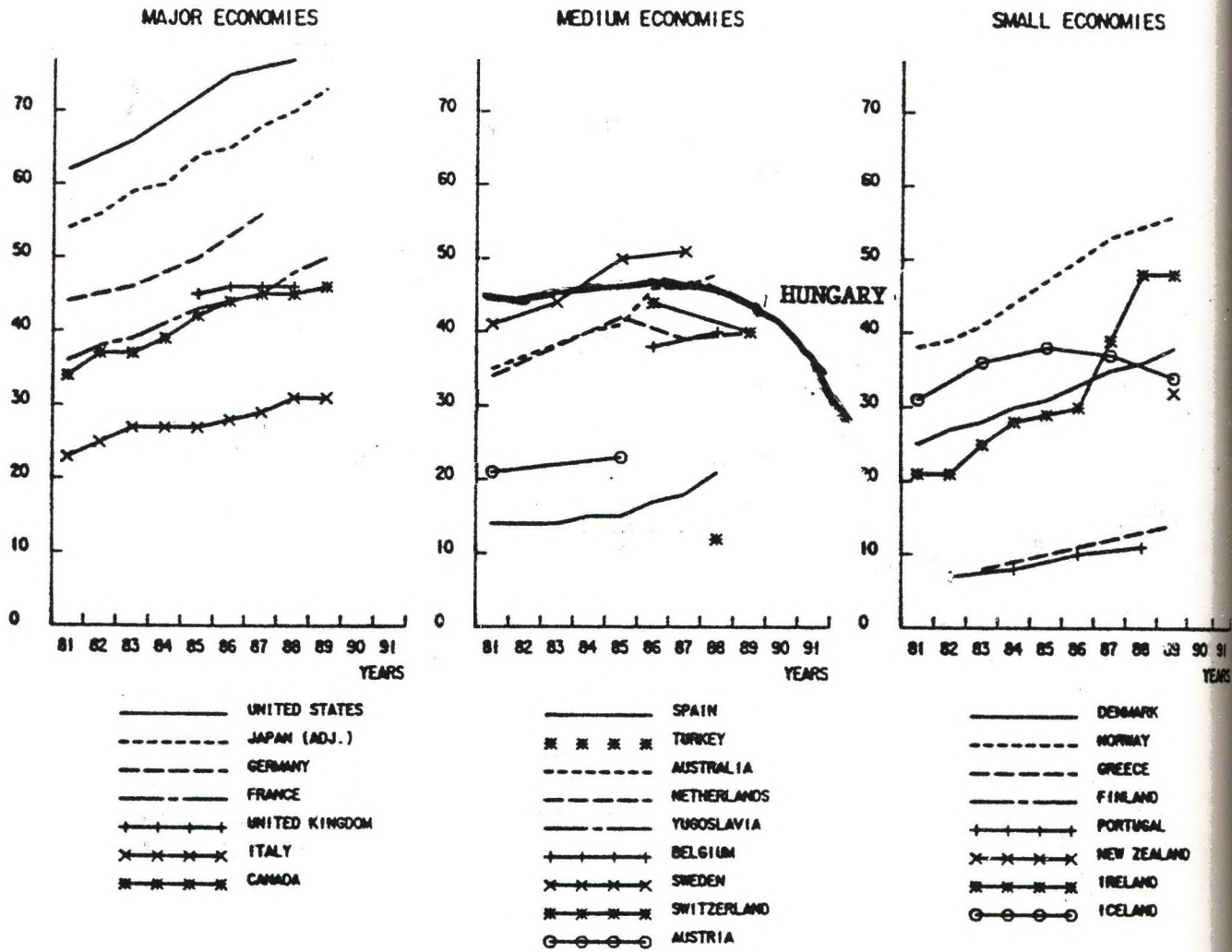
SOURCE. OECD, STIID DATA BANK, NOVEMBER 1991.

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ELFOGADOTT ALKALMAZOTT K+F PÁLYÁZATOK TÁMOGATÁSA (m Ft) 1991-1993
SZAKTERÜLETEK SZERINT

Mezőgazdaság, élelmiszeripar
2189 m Ft

Egyéb
62 m Ft

Építő-és könnyűipar, infrastruktúra
513 m Ft

Környezetvédelem
598 m Ft

Energetika
601 m Ft

Vegyipar, gyógyszeripar
1886 m Ft

Humánegészségügy, diagnosztikumok
665 m Ft

Gép- és műszeripar
2419 m Ft

Számítástechnika, távközlés
1786 m Ft

ÖSSZES: 10.7 md Ft

17
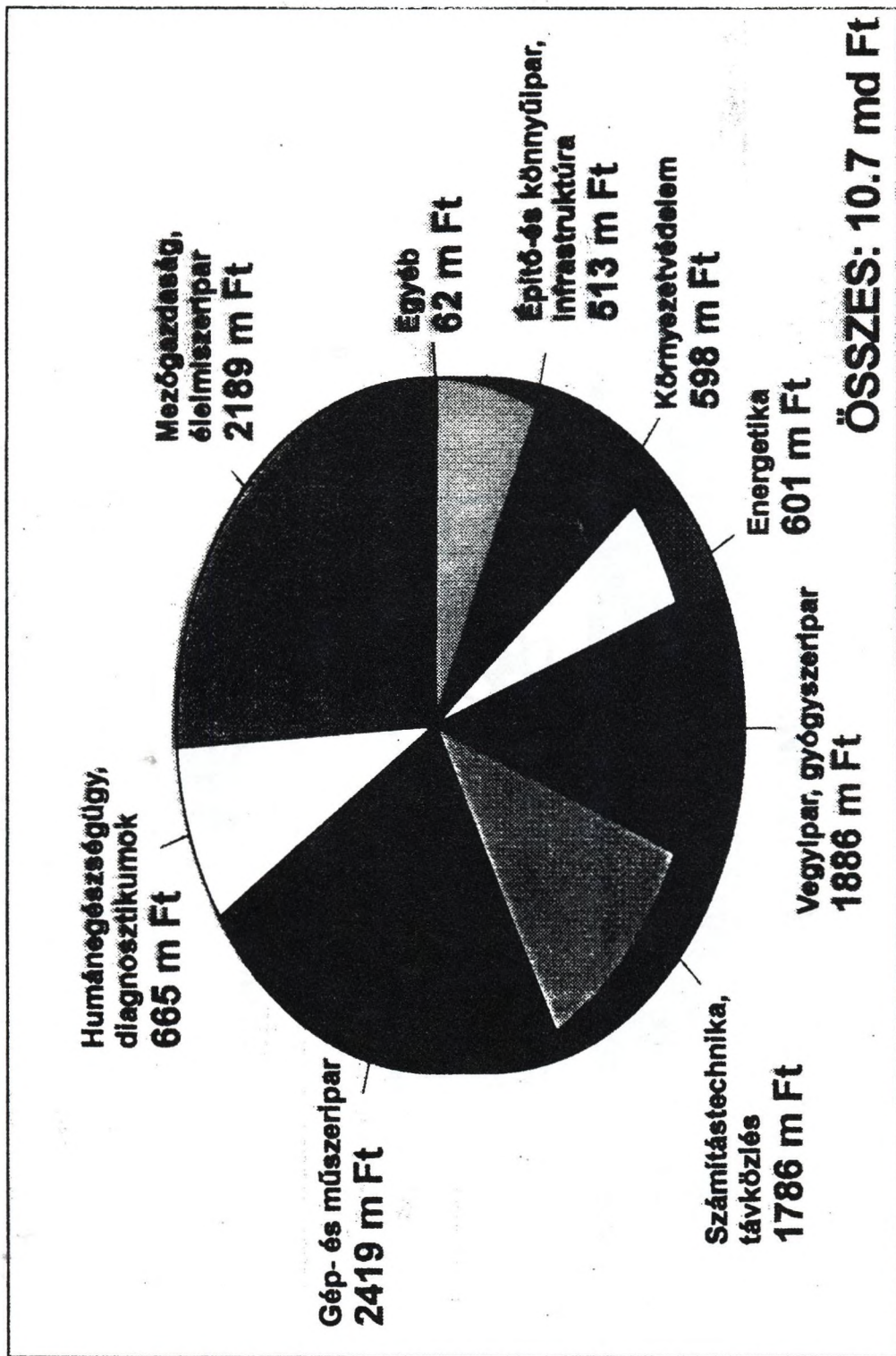
JELENLEGI NEMZETI PROJEKTEK

NEMZETI PROJEKT	MEGADOTT
Nukleáris hulladékok kezelése és elhelyezése	140
Geográfiai információs rendszerek, térinformatika (GIS)	611
Fejlett élelmiszeripari technológiák	227
Gépkocsigyártás beszállítóiparának műszaki fejlesztési támogatása	207
ÖSSZESEN:	1185

INFORMÁCIÓTECHNOLÓGIAI ÉS
TÁVKÖZLÉSI PIAC 1992

INFORMATION TECHNOLOGY AND
TELECOMMUNICATION MARKET 1992

0	25	50%
I........i........I........i........I........i........I........i........I........i........I		

United States 35% **35**

European Communities 31%

EFTA 5% **37**

Eastern Europe 1%

Japan 17% **18**

Far East 1%

ROW 9% **9**
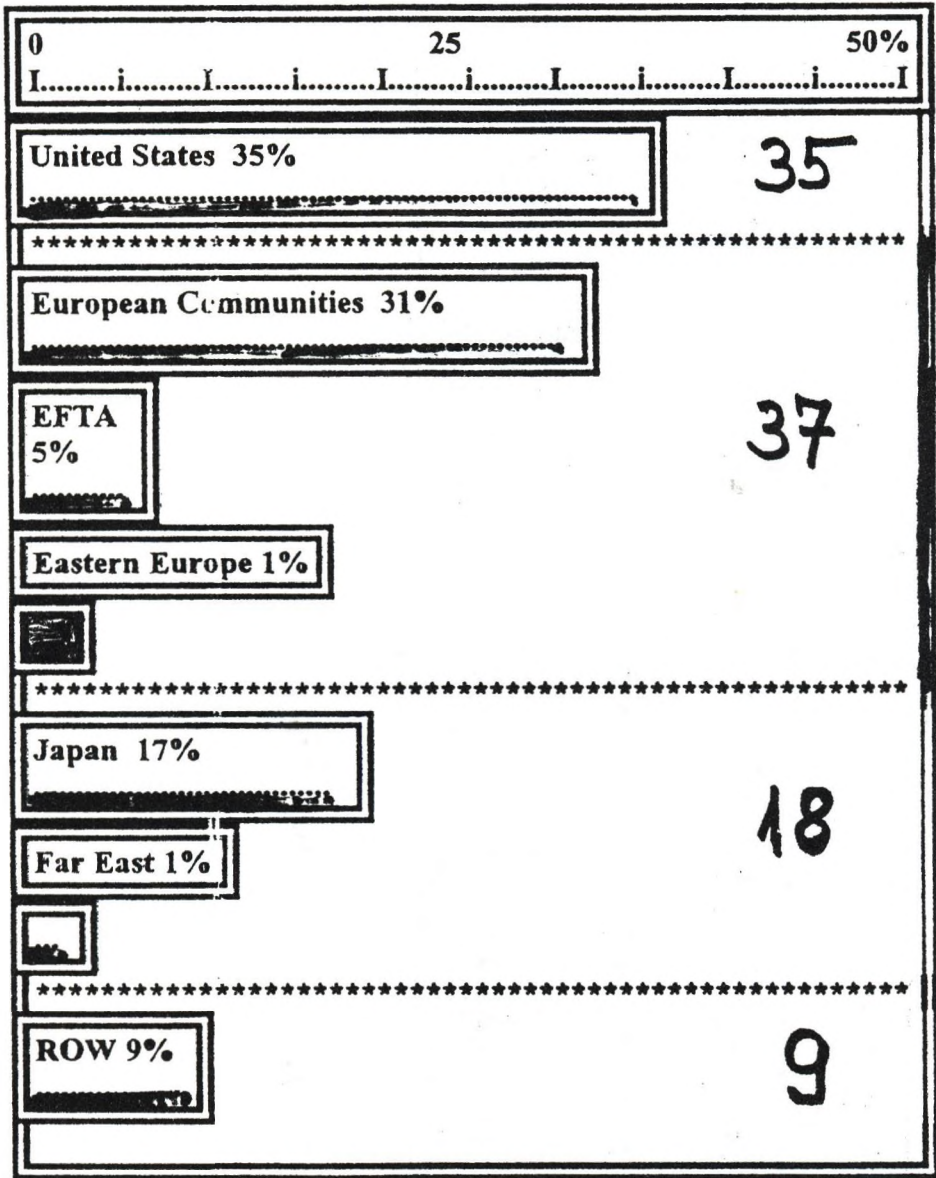
(IDC)

IT RÁFORDÍTÁSOK MAGYARORSZÁGON

Kategória	1992 (%)	1993 (M$)	1993 (%)	1997 (%)
1. Hardver rendszerek	59,7	353	58,2	62,1
2. Szoftver	15,6	101	16,7	15,5
3. Adatkommunikációs eszközök	1,7	10	1,7	1,8
4. Szolgáltatások	23,0	142	23,4	20,5
Teljes ráfordítás (M$)	539	606		867

Forrás: IDC Handbook'94

1993 IT Hardware Markets of Eastern and Central Europe, $M

Country	Value
Bulgaria	49
Czech Republic/Slovakia	350
Hungary	273/**353**
Poland	310
Romania	46
Russia	583
Ukraine	67

Axis ($M): 0, 100, 200, 300, 400, 500, 600 ($M)
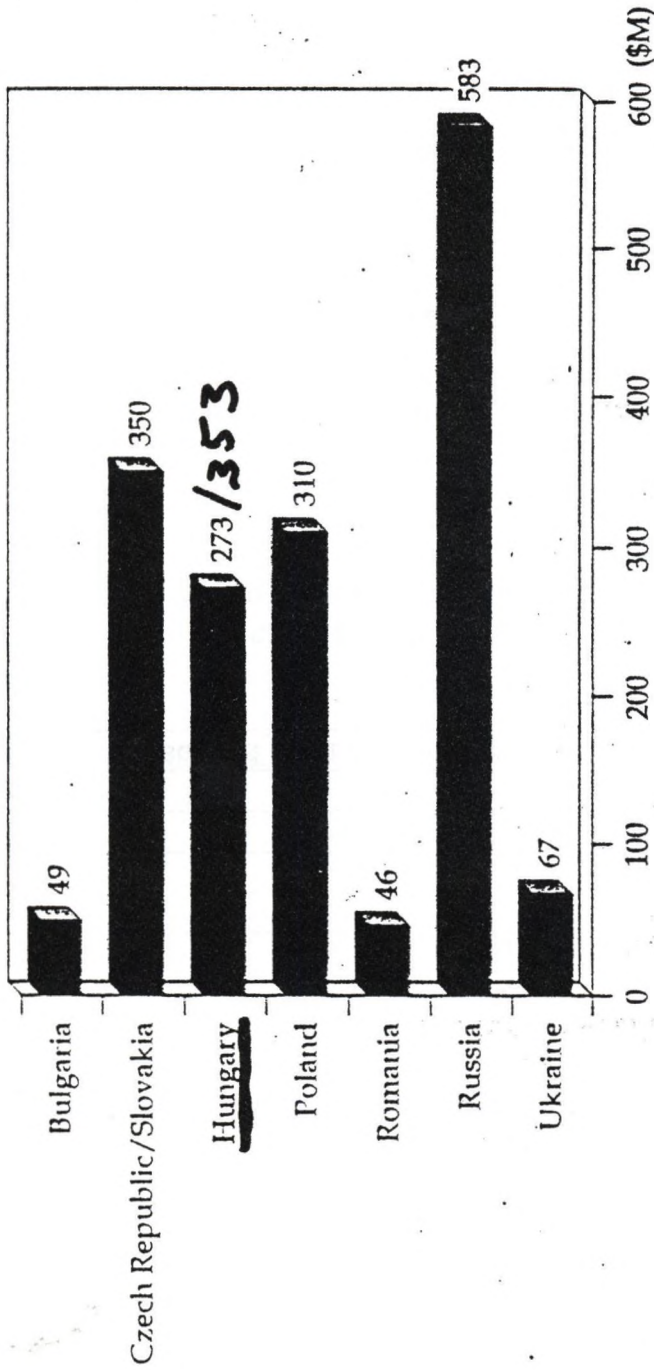
Source: International Data Corporation, 1994

R&D COOPERATION WITH THE EU IN THE IT AREA
Experience and recommendations
Andras Siegler, Deputy Director
MTA SZTAKI - Computer and Automation Research Institute

I. RESPONSE ON EU (EC)-RELATED COOPERATION ACTIONS IN THE IT AREA[*] :
(Actions: S&T COOPERATION ACTION WITH CEE COUNTRIES (92), PECO'93, '94, COPERNICUS'94, PHARE-ACCORD'93, '94, EUREKA, COST)

1. S+T COOPERATION WITH CEE COUNTRIES 1992

Recommended Hungarian proposals	~ 400
in IT and in IT-related areas	30
fellowship (A)	21
S&T network (B1)	1
Conference (B2)	3
Joint project (C)	1
Participation in EC R&D (D)	1
Participation in COST (E)	4

2. PECO
(Topics: Environment, Biomedicine, Nuclear safety, Non-nuclear energy, HCM - only existing projects could be joined through project leaders, no IT)

a) PECO'93 - Hungarian response

	# of awards (out of # of submitted proposals):
Scholarship	27 (792)
Research network	2 (89)
Conference	3(252)
Research project	3 (469)

1993 PECO result was ~900.000 ECUs

b) PECO continuation - Hungarian response in1994
- about 1000 info packages were distributed
- 640 proposals including 102 Hungarian partners were submitted following the first filtering by the European project leaders
- Strongest interest was shown in the HCM programme, mainly in the Biomedical area

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[*] Source: OMFB

Result
- *More than 50 % of Hungarian PECO proposals were successful* (59 Hungarian participants).
- The absolute number of Hungarian partners in accepted proposals is second highest to Russia. If the awarded amount is considered: 1. Russia, 2. Poland, 3. Hungary
- Distribution of Hungarian PECO partners in scientific fields:

Field	# of awards	financial support by EU (ECU)
Environment	4	124.000
Biomedicine	34	528.500
Non-nuclear energy	6	81.000
Networks	15	380.500
Nuclear safety	0	
Total	**59**	**1.135.950**

3. COPERNICUS'94
Total funding by the EU in 1994 for CEE: 57 M ECUs

a) Hungarian participation (as of December 1994):

Sector	submitted proposals	on waiting list	# of awards (# of Hung. partners)
1: Information technologies (DG III)	207	-	25 (35)
2: Communication, telematics (DG XIII)	130	15	15 (20)
3: Manuf., prod., material tech. (DG XII)	263	4	19 (26)
4: Measurment, material anal. (DG XII)	114	3	11 (11)
5: Agricultural and food tech. (DG XII)	122	6	13 (22)
6: Biotechnology (DG (XII)	69	3	8 (10)
Total # of awards (partners)	**905**	**31**	**91 (124)**

Hungary is 3rd after the Czech Republic and Poland as far as the number of applications and the amount of recommended funding is considered. Rate of success in various areas:

IT and communications technologies	15 %
biotechnology	15%
food industry	18 %

b) Companies involved in IT-related COPERNICUS '94 projects (Sectors: 1, 2, 3)
Joint research projects (# of successful awards at the same company):
AUTOKUT R&D Company for the Automotive Industry, IKARUS Coach Factory Ltd., IQSOFT Intelligent Software Co. Ltd. (2), FREESOFT Ltd., GEOMETRIA GIS System House Ltd. (2), LINGWARE Ltd., CADMUS Consulting and Development Ltd., COMPUTER MEDIA Ltd., ML Consulting and Computing Ltd., PICTRON Computing Technics Ltd., ASK Ltd.

- 2 -

c) Public institutions involved in IT-related COPERNICUS '94 projects
<u>Joint research projects</u>:
Budapest Technical University (BTU) Dept. of Geotechnics, BTU Dept. of Process Control, BTU Dept. of Manufacturing Engineering, BTU Institute. of Telecommunication, BTU Dept. of Microwave Telecommunications, University of Miskolc Dept. of Mechanical Engineering, KFKI Research Institute for Measurement and Computing (MTA - Hungarian Academy of Sciences) (3), SZTAKI Computer and Automation Research Institute (MTA) (3), Technical College "Kando Kalman", Research Institute of the Automotive Industry

<u>Concerted actions</u>:
Budapest Technical University, Dept. of Manufacturing Engineering, National Center of Eduactional Technology, KFKI Research Institute for Measurment and Computing (MTA - Hungarian Academy of Sciences), Budapest Technical University, Dept. of Process Control, SZTAKI Computer and Automation Research Institute (MTA) (3)

4. PHARE - ACCORD

<u>1993</u> coordinated by the PHARE Office of OMFB, funds allocated specifically for Hungary. Activities:
- participation in European R&D projects and in EUREKA/COST actions (3.5 M ECU)
- mobility - conferences, scholarships (1.2 M ECU)
- hardware infrastructure (3.0 M ECU)
<u>1994</u>: Mobility call issued in March 1994, submission deadline April 29, 1994. 180 proposals asking for 883 K ECUs. 51 proposals were accepted, total funding was 119 K ECU. Funds were mainly given to researchers in science. IT received 5% only.

5. EUREKA

8 running IT-related projects as of December 1994:
EU 861 ALICES (KFKI Nuclear Energy Res. Inst.)
EU 918 QUACAR (KFKI Measurement and Computing Res. Inst.)
EU 969 IARES (KFKI Particle and Nuclear Res. Inst.)
EU 992 BOTANI (SORING Ltd.)
EU 1061 EUROCAIRN (SZTAKI - IIF)
EU 1063 HPPC-SEA (ML Consulting Corp.)
EU 1156 INTO-ISYTRANS (TECHNOIMPEX Corp.)
EU 1188 SIGMA (PI-HUN Engineering Design Ltd.)
The Hungarian government (OMFB) made a financial contribution in most cases.

6. COST

Hungary participates in 70 of the currently running 112 COST actions. A further 10 participations are being prepared.
As of July 1994:
Informatics: 1 running, 1 in advanced preparation
Telecommunication: 24 running, 2 in advanced preparation

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II. HUNGARY AND RTD ON IT IN THE FOURTH FRAMEWORK PROGRAMME

Hungary became associated member of the EU 2 years ago. Copenhagen decision: increased cooperation with CEE countries: Hungary is enabled to participate in many activities within the 4th FP.

1. Legal background
Activity I. (R&D)
a) Supplement to the Association Agreement between Hungary and the EU: officially permits Hungary's participation in 15 main programmes of the EU with R&D at the first place. <u>Participation is possible primarily via self-financing.</u>

b) Decision of the Commission on 21.11.1994: legal entities and international organisations not associated to any programme can also <u>participate on a project by project basis</u> if the "European dimension" is apparent, i.e. No funding given from this source.
- it is in the interest of community policy,
- more than 2 different institutions from 2 different countries participate,
- the legal entity is based or carries out R&D in a European third country.

Activity II. (Cooperation with third countries)
CEE and other countries are treated within the same Activity (as opposed to the previous period). No Call for Proposals has been issued yet. The position of IT among the priorities is a question.

2. Declared principles and priorities of the 4thFP concerning cooperation with CEE countries:
- providing support in maintaining and re-orienting the research and technology potential of CEE countries (e.g. mobility schemes, reinforcing local university-industry relationships);
- research areas which are specific to the critical needs of CEE countries (e.g. nuclear safety, health);
- dissemination and exploitation of results;
- synchronization with other European RTD programmes (EUREKA, COST), enhancing the coherence of European research
- participation of CEE countries in industrial pre-competitive actions (e.g. in IT)
- harmonizing the CEE information infrastructure with the Western one
- *complementarity with other EU support actions (e.g. PHARE) - e.g. on restructuring the infrastructure of RTD;*
- *harmonization with national actions;*
- *countries participating in Activity II should also participate in Activity I*

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3. How did the above principles appear in the IT Programme (ESPRIT)?

- Special Modalities: "... There will be continuing coordination based on regular consultation to ensure complementarity of activities in the IT programme and in the programme on Cooperation with Third Countries and International Organisations"
- Evaluation criteria (paragraph on "European Dimension"):
  - "Collaboration in projects is more than symbolic and the proposal shows a *significant and balanced participation* between project partners"
  - "If one of the proposers is an organisation from a non-Member State which is not associated and does not financially contribute to this programme, and therefore collaboration with this proposer is intended on a project-by-project basis - *where no funding will be received from the EU for this proposer* - it is clearly described why the participation of this proposer is in the interest of EU policies."
  - "There is clear added value in carrying out the proposed work with international partners at the European level."
  - "Dependence on projects in national or international level is identified."

4. Further problems:

- Conflict may arise between decisions on proposals with CEE participants taken in Brussels and, on the other hand, the right of CEE national financing authorities to decide on whether to finance local research teams or not. How can recommendations made in Brussels be harmonized with national priorities?
- The legal status of CEE participants in EU-supported research consortia is unclear.
- If the CEE participation in a particular project is significant while financing is uncertain then extra risk is put on the project
- Sometimes there are contradictions between Calls/proposals (specific to CEE) and subsequent contracts (subject to EU rules).
- While sufficient advice is given on how to make good proposals, there is little help in contract preparation, cost setting, etc.

III. A WAY TO INTEGRATION OF HUNGARIAN IT RESEARCH WITH WESTERN EUROPEAN PARTNERS

ERCIM (European Research Consortium on Informatics and Mathematics) is a good example in the IT field: Hungary (MTA SZTAKI) is already a member, while the Czech participation is under preparation. ERCIM members are national IT research centers (one from a country) of EU and EFTA countries. A focused cluster of IT application projects is going to be submitted in the 4th FP under the common name "EDGE - European Distributed Generic Environment". Such initiatives with Central or Eastern European participation have a truly European flavour - they are of "bottom up" character and in fact complementary to Brussels' initiatives.

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Companies involved in IT EU projects - COPERNICUS '94

1. AUTOKUT R&D Company for the Automotive Industry
2. IKARUS Coach Factory Ltd.
3. IQSOFT Intelligent Software Co. Ltd. (2)
4. FREESOFT Ltd.
5. GEOMETRIA GIS System House Ltd. (2)
6. LINGWARE Ltd.
7. CADMUS Consulting and Development Ltd.
8. COMPUTER MEDIA Ltd.
9. ML Consulting and Computing Ltd.
10. PICTRON Computing Technics Ltd.
11. ASK Ltd.

Public institutions involved in IT EU projects - COPERNICUS '94
Joint projects:
1. Budapest Technical University, Dept. of Geotechnics
2. Budapest Technical University, Dept. of Process Control
3. Budapest Technical University, Dept. of Manufacturing Engineering
4. Budapest Technical University, Institute. of Telecommunication
5. Budapest Technical University, Dept. of Microwave Telecommunications
6. University of Miskolc, Dept. of Mechanical Engineering
7. KFKI Research Institute for Measurement and Computing (MTA - Hungarian Academy of Sciences) (3)
8. SZTAKI Computer and Automation Research Institute (MTA - Hungarian Academy of Sciences) (2)
9. Technical College "Kando Kalman")
10. Research Institute of the Automotive Industry

Concerted actions:
1. Budapest Technical University, Dept. of Manufacturing Engineering
2. National Center of Eduactional Technology
3. KFKI Research Institute for Measurment and Computing (MTA - Hungarian Academy of Sciences)
4. Budapest Technical University, Dept. of Process Control
5. SZTAKI Computer and Automation Research Institute (MTA - Hungarian Academy of Sciences) (3)

EUREKA

EU 861 ALICES (KFKI Nuclear Energy Res. Inst.)
EU 918 QUACAR (KFKI Measurement and Computing Res. Inst.)
EU 969 IARES (KFKI Particle and Nuclear Res. Inst.)
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EU 1063 HPPC-SEA (ML Consulting Corp.)
EU 1156 INTO-ISYTRANS (TECHNOIMPEX Corp.)
EU 1188 SIGMA (PI-HUN Engineering Design Ltd.)

The Software & Services Industry in Hungary

John von Neumann Computer Society

Budapest, Hungary

March 16, 1995

International Data Corporation
East Europe Group

Hungarian Software Industry Project
Scope and Objectives

- Provide a Detailed Overview of the Structure and Characteristics of the Hungarian Software Industry

- Analysis and Indentification of Key Opportunity Areas within the Context of Worldwide Software Market Trends

- Strategy Recommendation to Promote the Industry

IDC Product Groupings for Software and Services

- Packaged Software
- Professional Services
- Support Services

IDC Definition of Packaged Software

- Packaged Software is defined as commercially available programs for sale or lease from systems vendors and independent software vendors (ISVs).

- Three Types of Packaged Software: System-level Software, Application Tools and Application Solutions

Overview of Professional Services' Categories According to IDC Defintions

- IT Consulting

- Custom Software Development

- System/Network Implementation

- Education & Training

- Facilities Management

Hungarian Software Industry Project Scope and Objectives

Research Scope

- Survey of leading 36 software firms representing a total of 85 different software organizations (ca. 1/3 of all software firms in the country)

- Survey tool focused on company demographics and activities

- Secondary IDC source material on worldwide market trends

- Secondary source materials on country competitors, e.g. India, Singapore, Ireland, Israel

Overview of the Value of the Hungarian Information Technology Market (US$Mio), 1993

Multiuser Hardware, 14.2%

Single-user Hardware, 33.5%

Software & Services, 34.7%

Communications, 2.0%
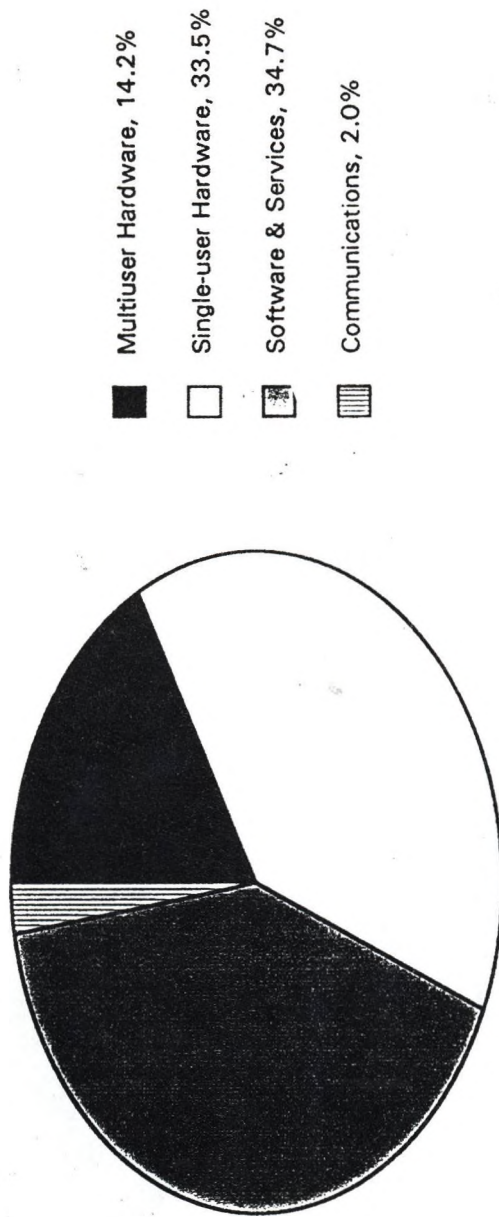
Total = $610.4 million

Breakdown of Estimated Software and Services Revenues by Category for the Hungarian Software Industry, 1993

□ Professional Services, 48.0%

▨ Packaged Software, 32.0%

■ Software-oriented Support Services, 12.0%

▤ Other Services, (e.g. R&D, dataprocessing), 8.0%
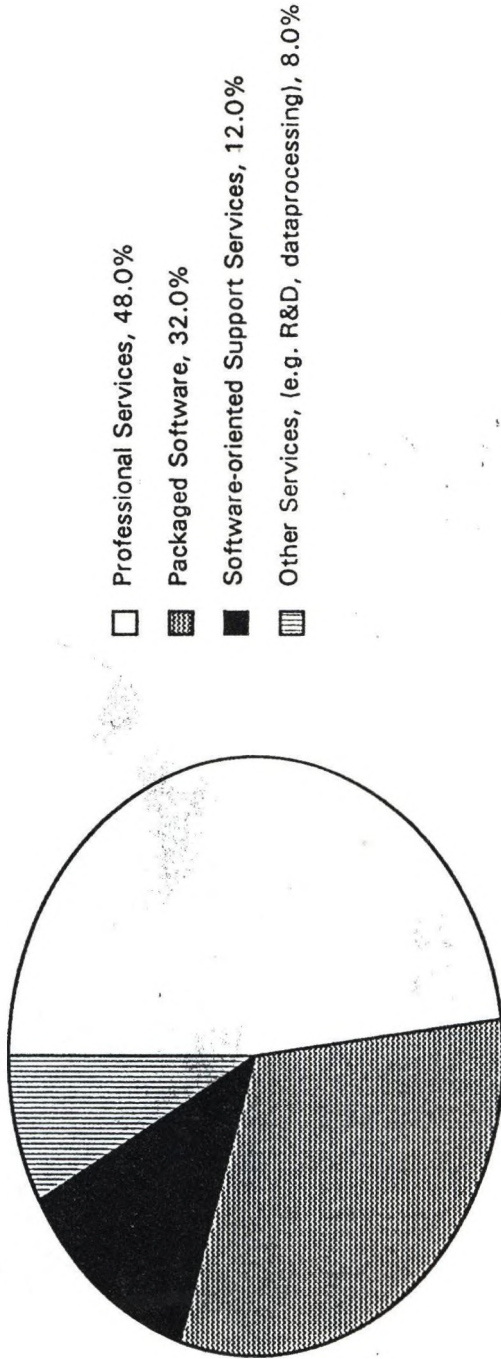
Total = HUF 10323 million ($112.2 million)

Breakdown of Estimated Packaged Software Revenues for the Hungarian Software Industry, 1993

System-level Software, 0.0%

Application Tools, 10.0%

Application Solutions, 90.0%
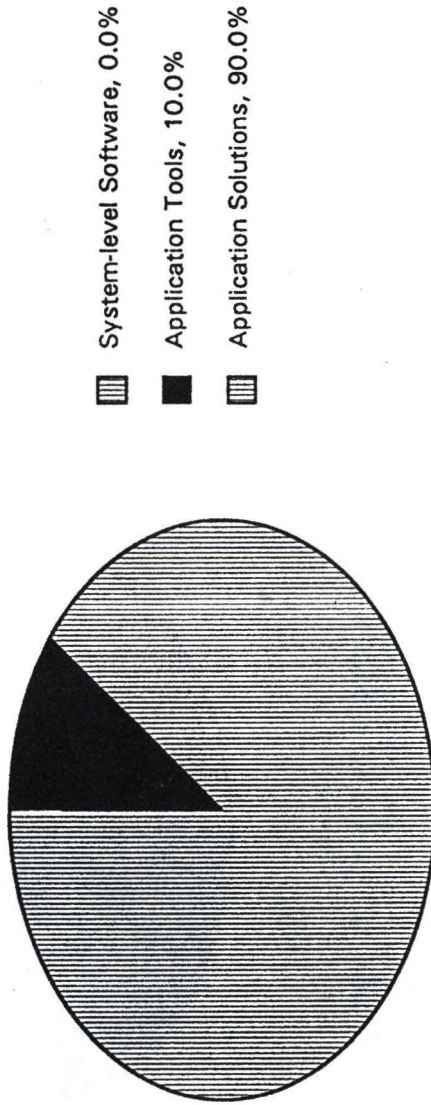
Total = HUF 3303 million ($35 million)

37

Breakdown of Estimated Professional Services Revenues for the Hungarian Software Industry, 1993
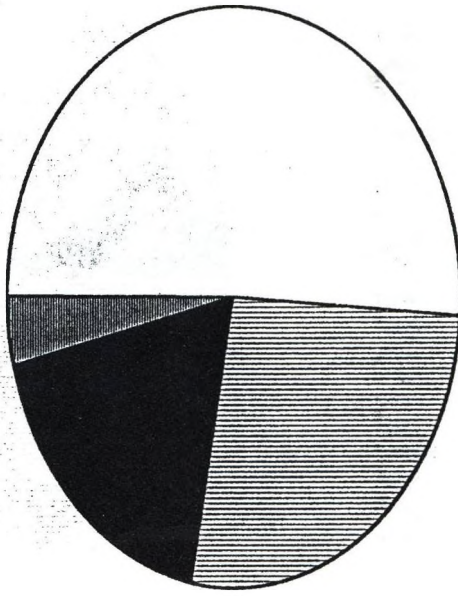
☐ Contract Program/Design/System Imp., 51.0%

▤ IT Consulting & Planning, 27.0%

■ Education & Training, 18.0%

▥ Other, 4.0%

Total = HUF 4995 million ($54.3 million)

38

Overview of the Software Development/Programming Skills of the Hungarian Software Industry

Skill/Expertise	Experts (#)	Companies (#)
C and Object C Programming	150	12
Accounting Knowledge with IT Profession	65	6
Geographical Information Systems	56	6
AEC and other CAD	34	2
Professional Level IT Training & Education	30	3
RDBMS-based Application Development	29	3
Graphic-type Info/Data Processing Skills (MAP)	28	6
Client Server Development Skills (including TP) (Unix, GUI, MS)	27	6
Clipper Application Programming	27	2
Banking Industry Knowledge with IT Profession	25	3
Structured Development Methodology Skills	22	3
OS/2 Environment-based Application Development	20	2
4GL Environment-based Application Development	19	6
Total	532	60

Note: Number of experts and companies is limited to surveyed firms only.

39

Summary Overview of Export Opportunities for the Hungarian Software Industry

System-level Software	Packaged Software		Professional Services/Services
	Application Tools	Application Solutions	Activities
Middleware & Utilities	OCR	CAD/CAM & AEC, GIS	Contract Programming/Body Shopping
	RDBMS Mngt. Systems	Office Applications	Custom Software Development
	Expert System Shells	Cross Industry Applications	Modification of Applications
	Migration Tools		Migration Services (Cobol, Fortran)
	Other Tool (Market Niches)		Localization
			Research & Development
			Education & Training
			Software Maintenance

Source: International Data Corporation, 1995

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Summary Overview of Trends in the Worldwide Software and Services Industry

Technology Trends	Packaged Software Growth Areas	Professional Services Growth Areas
Client/server	**System-level Software:**	Facilities Management
Networking	Middleware & Utilities	
Open Systems	Network operating systems	Education & Training
Distributed Computing	Management Systems	
Relational databases		IT Consulting
Object-oriented Technologies	**Application Tools:**	IT System Design
High-level Datacommunications	CASE	IT Strategy
Interoperability	DBMS Engines	
	Object-oriented Tools	Custom Software
	Testing Tools	Software Reengineering
	Portable GUI Builders	System Migration
	Data Access and EIS Builders	System Integration
	Application Solutions:	
	Spatial Data Management (GIS)	
	Accounting	
	Distribution	
	Workgroup Computing	
	Workgroup Automation	
	Supply-chain Automation	
	Payroll	

Source: International Data Corporation, 1995

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Worldwide Packaged Software Market, 1993

■ Application Solutions, 42%

□ Application Tools, 28%

▤ System-level Software, 30%
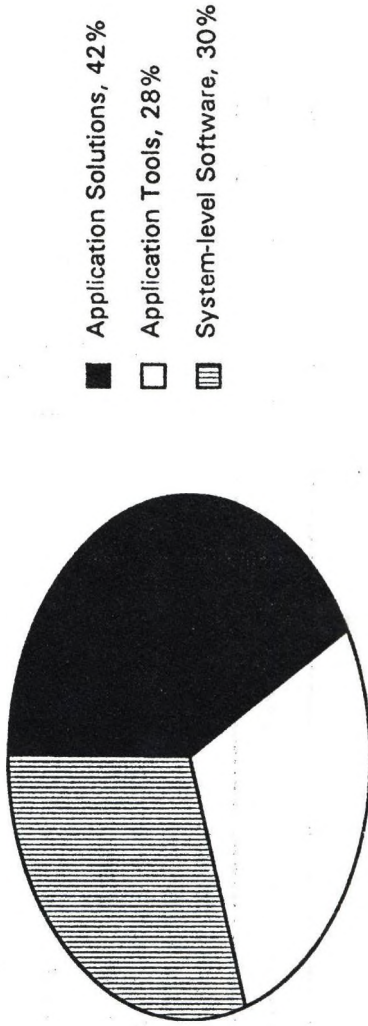
Total = $69.45 billion

42

Worldwide Packaged Software Revenues by Major Geographic Region, 1993-98 (US$Bn)

	1993	1994	1995	1996	1997	1998	CAGR (%)
Tools							
U.S.	8.5	9.8	11.3	13.0	15.2	18.0	16.1
Europe	7.1	7.8	8.7	9.6	10.7	11.9	10.9
Japan	1.7	2.0	2.4	2.9	3.6	4.5	21.3
ROW	2.2	2.6	3.0	3.5	4.1	4.8	16.3
Total	19.6	22.2	25.4	29.1	33.6	39.1	14.9
Solutions							
U.S.	12.4	14.1	15.9	18.0	20.4	23.1	13.3
Europe	10.9	11.8	13.0	14.2	15.6	16.9	9.1
Japan	3.4	3.9	4.6	5.5	6.5	7.7	17.4
ROW	2.4	2.7	3.2	3.7	4.3	4.9	15.4
Total	29.1	32.5	36.7	41.4	46.7	52.6	12.5
System SW							
U.S.	10.5	11.7	12.8	14.0	15.3	16.8	9.8
Europe	6.2	6.5	6.9	7.4	7.7	8.1	5.6
Japan	1.9	2.1	2.4	2.8	3.2	3.7	14.8
ROW	2.2	2.4	2.7	3.0	3.4	3.8	12.0
Total	20.7	22.7	24.9	27.2	29.7	32.5	9.4
All Software							
U.S.	31.4	35.6	40.0	45.1	50.9	57.8	13.0
Europe	24.2	26.1	28.6	31.2	34.0	37.0	8.8
Japan	7.0	8.0	9.4	11.2	13.3	15.9	17.8
ROW	6.8	7.7	8.9	10.2	11.8	13.6	14.7
Total	69.4	77.4	86.9	97.7	110.0	124.2	12.3

Worldwide Software and Services Market, 1993

■ Professional Services, 42%

☐ Support Services, 24%

▣ Packaged Software, 34%

Total = $201.1 billion

Source: International Data Corporation, 1994

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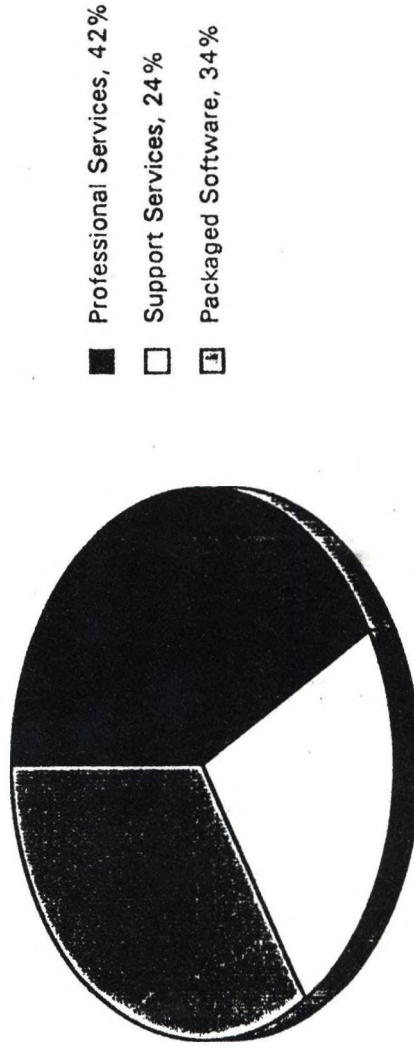
EITA at the European Software Days, 16-17 March 1995

What is EITA?

EITA is the European Information Technology Association. It is a membership association for small and medium sized companies throughout Europe whose main activities are in the field of Information Technology.

EITA currently has about 100 members from all over Europe, including Central & Eastern Europe.

The Membership

The members of EITA have interests in a wide range of technologies as well as providing a range of services, training and consultancy. As small, independent companies they tend to be highly dynamic and innovative and are very interested in collaborating with other members on European research and development projects as well as in their commercial activities.

What does EITA offer?

EITA is able to provide the focus for its members to meet and find out about each other through its conferences and its membership directory. EITA currently organises two major events per year on a relevant topic eg the European Commission Fourth Framework Programme, the Information Society etc. In addition there are working groups which also hold seminars and workshops on focused themes.

One of EITA's main purposes is to represent its members views to the European Institutions. This includes trying to improve access to the programmes for SMEs and to simplify the administrative procedures that are associated with that. Membership of EITA enables companies to participate in that debate.

Access to a network of similar companies is one of the key benefits of membership. Through its events and publications, members are able to find out about the activities of other member companies and are able to share experiences, to propose future collaboration, technology transfer etc.

One of EITA's plans for the future is the implementation of an electronic network based on the Internet and the World Wide Web. It is intended that in addition to providing a high profile for the Association and its members, a range of information on EITA and on other useful business services will be provided. A proposal has been submitted to the European Commission for assistance in establishing such a service.

EITA and Central & Eastern Europe

EITA has been given the opportunity and encouragement to try to identify companies from Central & Eastern Europe that would be interested in joining EITA and in participating fully in the activities of the Association. Membership is open to all small and medium sized companies who work in the field of Information Technology. Normally, membership would be 1500 ECUs per year, but thanks to support from the European Commission, **EITA is able to offer free membership for the first 18 months**. After this period, we hope that those companies that have joined will wish to remain members and a special subscription rate of 1200 ECUs per annum will operate for the following 18 months.

EITA at the European Software Days

We were very pleased to have the opportunity to attend and participate in the European Software Days event. Firstly, it was a very good opportunity to inform Hungarian organisations of the activities of EITA and of the special membership offer that currently exists. Secondly, and of equal importance, it provided the opportunity for EITA to learn about the Hungarian Information Technology industry and the developments that are taking place in Hungary. We were very impressed by the quality of the presentations at the event and we believe that there would be a lot of mutual benefit to Hungarian companies belonging to EITA and we look forward very much to future collaboration.

We would be happy to discuss in more detail the benefits that membership of EITA can bring. Any queries or questions should be directed to Bob Cooper, president of EITA and Chairman/Chief Executive of the MARI Group, one of the member companies of EITA. Bob can be contacted at the following address:

> Bob Cooper
> President
> EITA
> MARI House
> Old Town Hall
> Gateshead
> Tyne & Wear
> UK-NE8 1HE
>
> Tel: +44 191 402 1255
> Fax: +44 191 402 1103
> E-Mail: rwc@mari.co.uk

A copy of the slides used by Bob Cooper at the European Software Days event is enclosed.

WHAT IS EITA?

Keywords:

- **A Membership Association**

- **Small & Medium-Sized companies**

- **Europe-wide**

- **Information technology**

- **Dynamic & Innovative**

- **Cooperation & collaboration**

EITA Membership offers:

- **Collaboration on European-funded Research & Development projects.**

- **Access to a network of innovative, dynamic European IT companies.**

- **Members Directory**

- **Two conferences per year**

- **Working Groups and special events**

- **A voice in Europe**

EITA Membership - Across Europe

UK
European Broadband Systems
ESIS
FEGS Ltd
IBOS Management Company Ltd
Ipsys Ltd
IT Wales
Kainos
MARI Computer Systems Ltd
MARI (Northern Ireland) Ltd
NADA Consulting Group
Northumberland TEC Ltd
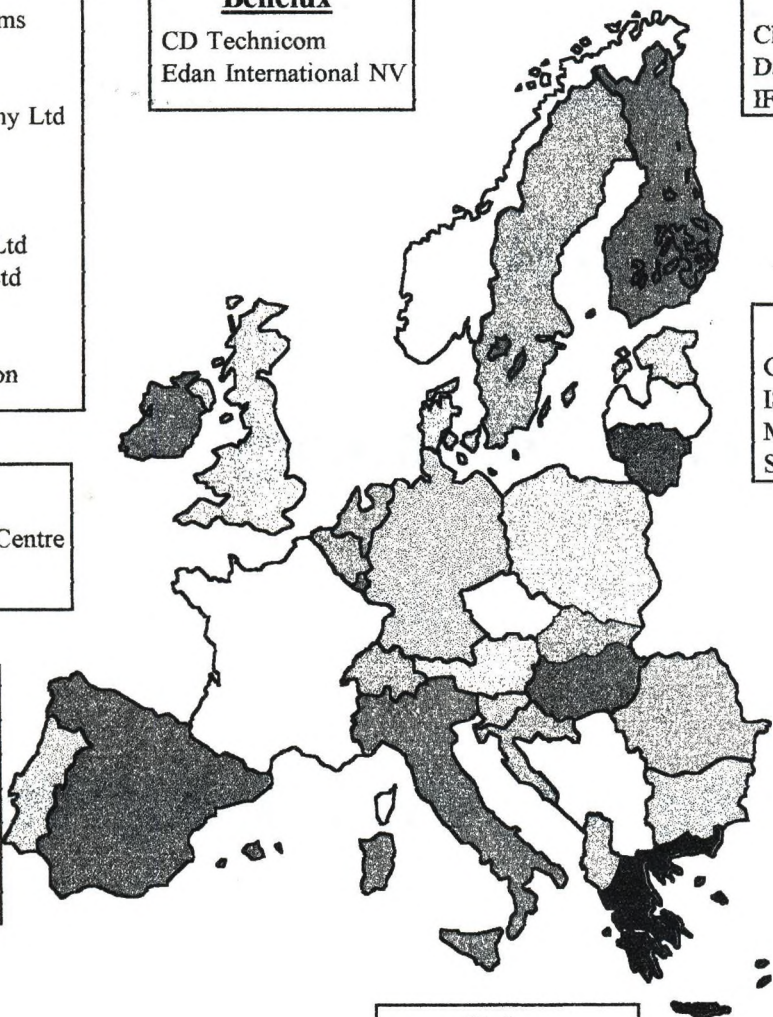Software Industry Federation

Benelux
CD Technicom
Edan International NV

Denmark
Christian F Rovsing A/S
Dansk Data Elektronik A/S
IFAD

Germany
GWI GmbH
ISA GmbH
MAZ Hamburg GmbH
SQS GmbH

Ireland
Information Technology Centre
MENTEC

France
ACP Group
Groupe CESI
INRIA
KTT SA
Selisa SA
Telmat Informatique ZI

Greece
Epsilon SA
Intrasoft SA
Planet SA

Portugal
AITEC
Alfatec
NOVABASE SA
SMD-Informatica

Spain
TransTOOLS SA

Italy
ETNOTEAM SpA
SELEA Srl
System Wizards Srl
TXT

What do EITA members do?

EITA members are active in a large number of areas. These include:

•**Software Quality**

•**Client/Server Technology**

•**Databases**

•**Networking & Systems Integration**

•**Informatics**

•**IT Training**

EITA

EITA AND
CENTRAL & EASTERN EUROPE

EITA can now offer

FREE MEMBERSHIP
to companies
from Central & Eastern Europe.

Membership entitles you to:

• **full participation in EITA events**

• **inclusion in the Members' Directory**

opportunities to collaborate on European Research & Development projects

Join EITA if you are interested in:

- **Technology transfer**

- **Access to new markets**

- **Developing new trading partnerships**

- **Collaboration on European-funded Research & Development**

THE EUROPEAN ECONOMY,

EASTERN EUROPE AND SOFTWARE

SOME ACTIVITIES SUPPORTED BY THE

EUROPEAN COMMISSION.

J. Folkmanis, DG III F
(Industry, IT)

EUROPEAN SOFTWARE DAYS
BUDAPEST, MARCH 95

THE EUROPEAN ECONOMY

THE EUROPEAN SOFTWARE INDUSTRY

HOW THE COMMISSION OPERATES

R+D AND SME ACTIONS FOR EASTERN EUROPE

THE COMMISSION ENDEAVOURS TO ENABLE THE
RIGHT BUSINESS ENVIRONMENT TO DEVELOP,
FOR HEALTHY ECONOMIC ACTIVITY IN EUROPE.

IN PARTICULAR, TO REDUCE IMPEDIMENTS FOR
BUSINESSES TO OPERATE ACROSS (EUROPEAN,
BUT ALSO INTERNATIONAL) BORDERS.

ECONOMIC ENVIRONMENT

	EEC	USA	JAPAN	
POPULATION	326	249	123	Million
GDP :	4732	5178	2808	Billion $
OF WHICH (%):				
– AGRICULTURE	3	2	3	
– INDUSTRY	39	31	39	
– SERVICES	58	67	58	
EXPORTS	440	466	338	Billion $
IMPORTS	483	570	275	

Source : OECD / EUROSTAT   1989

IEEE – 3

Industrial Facts and Trends

Decline in Community Balance of Manufactured Goods:

1985	116	BECU
1990	50.5	BECU

R&D Expenditure as a Proportion of GNP (1991):

European Community	2.1% (same as Japan in 1981)
Japan	3.5%
US	2.8%

Accounting of advanced technology goods for exports:

European Community	17%
Japan	27%
US	31%

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MAJOR INDUSTRIES IN THE COMMUNITY
(BILLION ECUs)

ELECTRONICS
CHEMICAL
FOOD & DRINK

TEXTILE & SHOES
AUTOMOBILE

300
200
100
0

1980
1990
2000

ESPRIT

AT-2

GD030

58
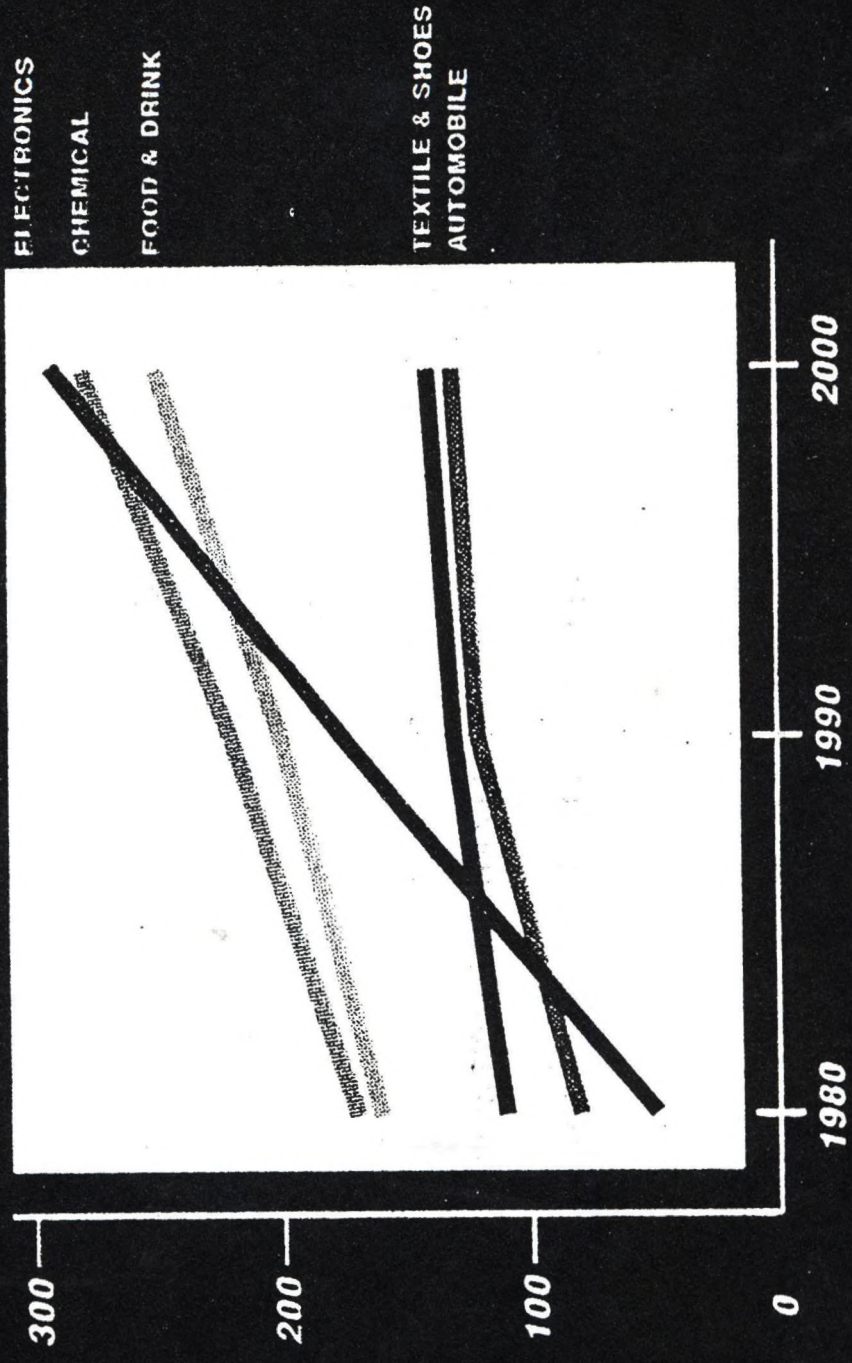
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┌─────────────────────────────────┐
│   EUROPEAN SOFTWARE DAYS         │
│   BUDAPEST, MARCH 95             │
└─────────────────────────────────┘
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WESTERN AND EASTERN EUROPEAN ECONOMIES
SOME OBSERVATIONS

ECONOMIC MANAGEMENT IS DIFFICULT , BUT IT IS VITAL TO GET IT RIGHT, FOR A STABLE SOCIAL AND INVESTMENT CLIMATE.

ENTERPRISES ARE BECOMING MORE INNOVATIVE, MORE GLOBAL, MORE AUTONOMOUS AND THE PACE IS INCREASING.

TRENDS TO LIBERALISATION AND PRIVATISATION, MUST BE BALANCED BY A LEAN, BUT KNOWN AND EFFECTIVE REGULATORY FRAMEWORK.

INFRASTRUCTURE MUST BE UP-TO-DATE.

INDUSTRY IN DECLINE OR DOWNSIZING IS A DIFFICULT SOCIO-ECONOMIC PROBLEM, WHICH NEEDS SOCIALLY AND ECONOMICALLY ACCEPTABLE SOLUTIONS.

SOFTWARE INDUSTRY - MARKET SIZE

WORLD 1994

COMPUTER SYSTEMS AND SERVICES   425 BECU

   POTENTIAL GROWTH 8 %

OF WHICH SOFTWARE AND SERVICES   220 BECU

   PREDICTED GROWTH 10 %

WESTERN EUROPE 1994

COMPUTER SYSTEM AND SERVICES   130 BECU

   PREDICTED GROWTH 5 %

OF WHICH SOFTWARE AND SERVICES   60 BECU

   PREDICTED GROWTH 6 %

EASTERN EUROPE 1994

COMPUTER SYSTEMS AND SERVICES   3,6 BECU

   PREDICTED GROWTH 13 %

OF WHICH SOFTWARE AND SERVICES   1,4 BECU

   PREDICTED GROWTH 12.5 %

Source:EITO

EUROPEAN SOFTWARE DAYS
BUDAPEST, MARCH 95

EUROPEAN SOFTWARE INDUSTRY
SOME OBSERVATIONS

PREDOMINANTLY SERVICES PLAYERS IN EUROPE,
 SOFTWARE PRODUCTS PATCHY

FRAGMENTED MARKETS

GOOD TECHNOLOGY BASE,
MEDIOCRE COMMERCIAL REPUTATION

DEMAND GOOD, BUT CUSTOMERS BECOMING
CHOOSY. BUY AMERICAN.

HOW DO WE ENABLE A HEALTHY INDUSTRY ?

REGULATION; MINIMAL BUT ADEQUATE

INFRASTRUCTURE

R + D; FRAMEWORK PROGRAMME

SME PROGRAMMES

1993 - 1997 FINANCIAL PERSPECTIVE

BECUs IN 1992 PRICES

	COMMITMENT APPROPRIATIONS	1987	1992	1997
1	COMMON AGRICULTURAL POLICY	32.7	35.3	39.6
2	STRUCTURAL OPERATIONS	9.1	18.6	29.3
3	INTERNAL POLICIES	1.9	4	6.9
4	EXTERNAL ACTION	1.4	3.6	6.3
5	ADMINSTRATIVE EXPENDITURE	5.9	4	4
6	RESERVES	0	0	1.4
		51	66.5	87.5

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MAASTRICHT

ARTICLE: 130F: OBJECTIVES

STRENGTHENING THE SCIENTIFIC AND TECHNOLOGICAL BASES OF COMMUNITY INDUSTRY AND ENCOURAGING IT TO BECOME MORE COMPETITIVE AT THE INTERNATIONAL LEVEL

PROMOTING ALL RESEARCH ACTIVITIES DEEMED NESSESARY BY VIRTUE OF OTHER CHAPTERS OF THE TREATY

ARTICLE 130G: ACTIVITIES

IMPLEMENTATION OF RESEARCH, TECHNOLOGICAL DEVELOPMENT AND DEMONSTRATION PROGRAMMES - PROMOTING COOPERATION

DISSEMINATION AND OPTIMISATION OF THE RESULTS

TRAITING AND MIBILITY OF RESEARCHERS IN THE COMUNITY

FOURTH FRAMEWORK PROGRAMME (1994 to 1998):

AMOUNTS AND BREAKDOWN

	Ecu million (current prices)
First activity (Research, technological development and demonstration programmes)	9 432 [1] [2]
Second activity (Cooperation with third countries and international organizations)	540
Third activity (Dissemination and optimization of results)	330 [3] [4]
Fourth activity (Stimulation of the training and mobility of researchers)	744
MAXIMUM OVERALL AMOUNT	11 046 [5] [6]

FOURTH FRAMEWORK PROGRAMME (1994 to 1998):

AMOUNTS AND BREAKDOWN

Indicative breakdown of the themes and subjects in the first activity

		ECU million (current prices)
A.	Information and communication technologies	3 405
	1. Telematics	843
	2. Communication technologies	630
	3. Information technologies	1 932
B.	Industrial technologies	1 995
	4. Industrial and material technologies	1 707
	5. Measurements and testing	288
C.	Environment	1 080 (⁷)
	6. Environment and climate	852
	7. Marine sciences and technologies	228
D.	Life sciences and technologies	1 572
	8. Biotechnology	552
	9. Biomedicine and health	336
	10. Agriculture and fisheries (including agro-industries, food technologies, forestry, aquaculture and rural development)	684
E.	11. Non-nuclear energy	1 002
F.	12. Transport	240
G.	13. Targeted socio-economic research	138
		9 432 (¹) (²)

KEY TECHNOLOGIES

- COMPETITIVITY
- EUROPEAN INTEGRATION
- SOCIETAL NEEDS

A SOUND TECHNOLOGY BASE

- GENERIC R&D
- PEOPLE-HUMAN RESOURCES
- LINKS BETWEEN PEOPLE / TECHNOLOGIES

ENVIRONMENT FOR EFFECTIVENES

- PRE-NORMATIVE RESERACH - OPEN STANDARDS
- INTERNATIONAL RELATIONS
- PROSPECTIVES - NEEDS / TECHNOLOGIES
- DIFFUSION / DISSEMINATION / VALORISATION
- INFRASTRUCTURE
- TRANS-EUROPEAN NETWORKS

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RESULTS OF ESPRIT PROJECTS

- DIRECT CONTRIBUTIONS TO PRODUCTS OR SERVICES   270
- TOOLS AND METHODS USED OUTSIDE ESPRIT   167
- DIRECT CONTRIBUTIONS TO INTERNATIONAL STANDARDS   58
                                                        ‾‾‾‾
                                                        495

1500 PARTICIPATING ORGANISATIONS

- 613 SME s PARTICIPATE IN 67% OF PROJECTS
- 482 UNIVERSITIES & RESEARCH INSTITUTES PARTICIPATE IN 81% OF PROJECTS
- OVER 170 PARTICIPATING USERS COMPANIES
- 3000 RESEARCHERS IN BASIC RESERACH

  (OVER 1000 DOCTORAL AND POST-DOCTORAL)

ESPRIT TECHNOLOGY RESULTS
(EXAMPLES)

- ASIC DESIGN TECHNOLOGY, ALLOWING SHARP REDUCTION OF DESIGN TIME

- WORLD CLASS, HIGH SPEED, BIPOLAR SEMICONDUCTOR TECHNOLOGY

- PCTE CONCEPT IN SOFTWARE DEVELOPMENT, A WORLDWIDE INDUSTRY STANDARD

- T800 TRANSPUTER, FIRST IN 1989 SALES OF 32−BIT RISC PROCESSORS

- OPTICAL CHARACTER RECOGNITION TECHNOLOGY, OUT− PERFORMING COMPETITORS

- WORLD BEST ALGORITHM FOR DIGITAL IMAGE COMPRESSION

- COMMUNICATION ARCHITECTURE, SETTING THE STANDARDS IN FACTORY COMMUNICATION

- ROBOT OFF−LINE PROGRAMMING TECHNIQUES, FOR HIGHER SAFETY AND PRODUCTIVITY

FROM THE LABORATORY TO THE MARKET AND BACK

- **SYNERGY BETWEEN:**

  - Universities/Research Institutes

  - Suppliers of technology (including SMEs)

  - Users

  Essential to make innovation possible

- **OTHER REGIONS ACHIEVE SYNERGY THROUGH PROCUREMENT/VERTICAL INTEGRATION**

- **COOPERATION ENABLING FAIR COMPETITION - LEVELLING THE FIELD?**

- **THE COMMUNITY HAS AN ESSENTIAL CATALYTIC ROLE TO PLAY**

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IT Programme implementation
New Procedures

Information Day Brussels
13 December 1994

- The Call
- Information
- SME support
- Evaluation
- Calendar
- Participation
- Contract
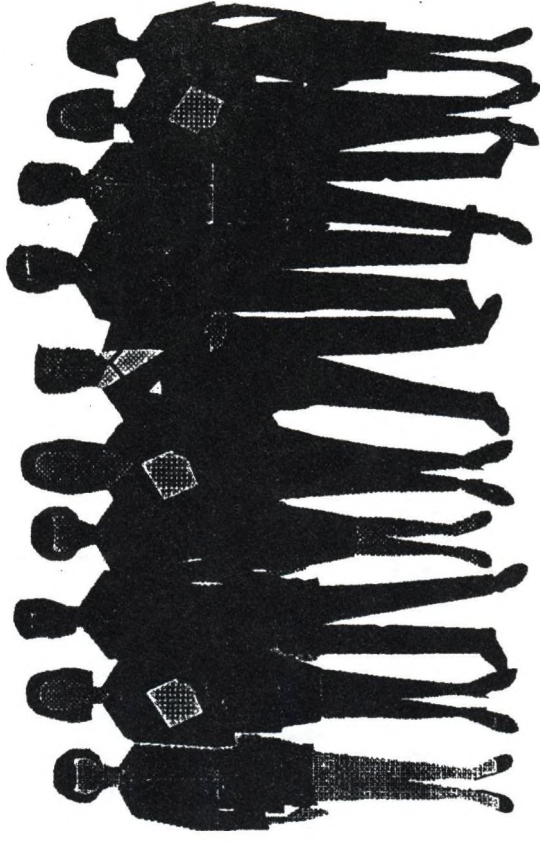
IT Programme implementation
The Call

- Published on 15 December 1994

- Focused on part of Work programme

- Continuous submission for
  - SME Exploratory awards
  - First phases of Open LTR projects
  - Non-specific accompanying measures

- First in series of quarterly calls
  - 15 March, 15 June, 15 September, 15 December

- Tentative plan for year ahead

European Commission   DG III: Industry   RTD: Information Technologies

IT Programme implementation Information

Work programme

Information Package
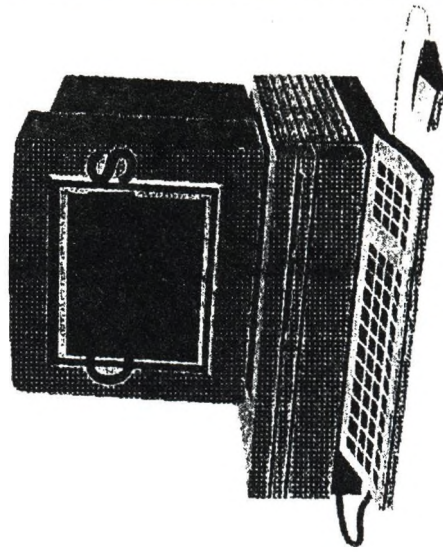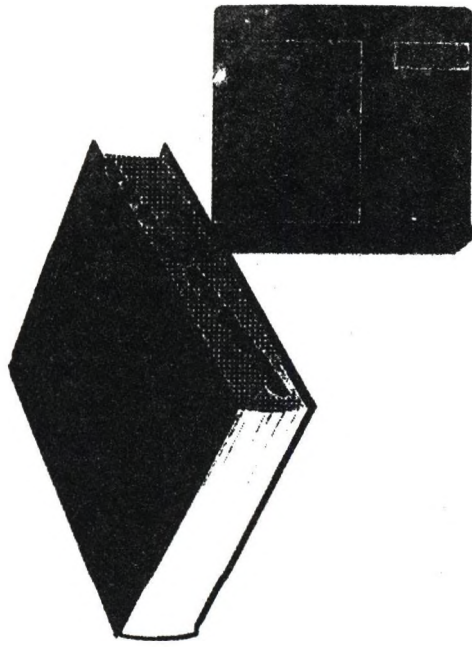
I. General Information

II A Industrial RTD Projects

II B Long Term Research

II C Accompanying Measures

II D SME Exploratory Awards

Guide on the Information Available

European Commission	DG III: Industry	RTD: Information Technologies

IT Programme implementation
SME Support

- ## WP tasks especially relevant to SMEs, eg:
  - Best practice actions
  - Awareness and training actions

- ## SME Exploratory Awards
  - Help to SMEs new to the programme to participate
  - Support to expand idea to proposal

- ## Cooperative RTD projects
  - Support of SMEs without own RTD capacity
  - To have RTD organisations carry out the work

European Commission   DG III: Industry   RTD: Information Technologies

IT Programme implementation
SME Exploratory awards

Proposers are eligible if:
- No more than 500 employees
- No more than 50 MECU turnover
- No more than 1/3 owned by large company
- Not previously received award under IT programme in FP4

At least two SMEs from different States
(exceptionally single SME)

Support to prepare proposal for:
- Normal industrial RTD project for a Call
- SME oriented proposal submitted at any time
  (share of proposing SMEs in proposal >50%)
- Cooperative RTD project submitted at any time

Support: max 3/4 cost, 22.5 KECU, +22.5 if feasibility included

EXPLORATORY COOPERATION STEPS

- PHARE PROGRAMME INCLUDING: TEMPUS, ACE

- SUBCONTRACTS OF R&D - PROJECTS

- VLSI DESIGN TRAINING ACTION

- NODES OF NETWORKS OF EXCELLENCE

- COOPERATION SCHEME WITH CENTRAL AND EASTERN EUROPEAN COUNTRIES

COOPERATION WITH CENTRAL

& EASTERN EUROPEAN COUNTRIES

1992 CALL FOR PROPOSALS

DEADLINE FOR CALL 7TH AUGUST 92, 55 MIO ECU:

- FELLOWSHIPS GO WEST/GO EAST
- NETWORKS
- CONFERENCES, SYMPOSIA, WORKSHOPS
- JOINT RESEARCH PROJECTS
- SELECTIVE FRAMEWORK PROGRAMME PARTICIPATION
- COST

COUNTRIES ELIGIBLE: AL, BG, CS, EE, HU, LT, LV, PL, RO

AREAS:

ENVIRONMENT, BIOMEDICAL AND HEALTH, SOCIAL SCIENCE AND ECONOMICS, INFORMATION TECHNOLOGY AND TELECOMMUNICATIONS, MATERIALS, PRODUCTION AND MANUFACTURING TECHNOLOGY, AGRO-INDUSTRY AND FOOD.

OTHER AD-HOC ACTIONS

INDUSTRY ROUND TABLES

CEE NET

BALTIC INFORMATION INFRASTRUCTURE

SME INFRASTRUCTURE; BUSINESS ADVISORY CENTRES

EITA ACTION

SME'S AND EASTERN EUROPE

SME'S ARE THE MANIFESTATION OF
ENTREPRENEURIAL AND SPECIALISED
COMMERCIAL ACTIVITY; AN ESSENTIAL
ELEMENT OF EASTERN EUROPEAN
REJUVENATION.

SME INFRASTRUCTURE HAS BEEN THE MAIN
ACTIVITY;

BUSINESS ADVISORY CENTRES.

EAST EUROPE SESSION AT EITA CONFERENCE, PARIS, NOV. 94

SOFTWARE SME'S ARE VERY BUSY, BUT THERE ARE MANY FICKLE MARKETS.

HEAD-HUNTING BY WESTERN PARTNERS (OFTEN QUITE WELCOME !)

CEC FUNDING IS WELCOME, BUT IS ASSOCIATED WITH DIFFICULTIES.

INVESTMENT FOR LONGER-TERM STRATEGY.

PRACTICAL SKILLS TRAINING.

PRACTICAL TECHNOLOGY TRANSFER.

EUROPEAN SOFTWARE DAYS
BUDAPEST, MARCH 95

EITA EE ACTION

PURPOSE : **TO HELP EASTERN EUROPEAN SOFTWARE HOUSES LINK TO WESTERN PARTNERS.**

PIGGYBACK ON EXISTING EVENTS :

- **GDANSK, OCTOBER 1994, INFOMAN**

- **VILNIUS, OCTOBER 1994, INFOBALT**

- **BUDAPEST, MARCH 1995, EUROPEAN SOFTWARE DAYS**

MEMBERSHIP

EUROPEAN SOFTWARE DAYS
BUDAPEST, MARCH 95

EITA EE ACTION

FUTURE STEPS IN DELIBERATION

PIECEWISE EXPANSION TO OTHER COUNTRIES;
BULGARIA, ROMENIA, SLOVENIA...

TECHNOLOGY TRANSFER ACTION

EUROPEAN SOFTWARE DAYS
BUDAPEST, MARCH 95

<u>SUMMARY</u>

WE TRY TO DO THE RIGHT THING, THE RIGHT WAY FOR THE BUSINESS ENVIRONMENT. PLEASE DO GUIDE US - OFTEN YOU WILL KNOW BETTER.

EUROPE IS A COMPLEX POLITICAL ANIMAL - PRODUCING THE RIGHT STIMULI FOR CHANGE IS NON-TRIVIAL.

A NUMBER OF "TOOLS" ARE AVAILABLE.

"THE RIGHT TOOL FOR THE RIGHT JOB".

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PRESENTATION
of
ESI

1995

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Themes of presentation

- What is software ?

- What is software industry ?

- What are the problems to be solved in the field of software ?

- What is ESI's contribution for solving the problems identified ?

- Who is ESI ?

- How is ESI involved in the creation of the future "Global Information Society" based on the future telecom and IT infrastructures ?

- What are ESI's promises ?

- Why should software dependent industry become member of ESI ?

- ESI's future

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1. Definition of software

(1) **Software is intelligence of immaterial nature** which is physically processed by information-, telecommunication- and control- hardware, usually called *computers, telecommunication systems or and (micro-) electronics*.

(2) **Software is the governing "product" in all systems** providing for intelligence or for entertainment.

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1. Definition of software

(3) Differentiation in any intelligent system (product or organisation)
is only made by software, ranging from 25% value share e.g. in
modern tool machinery to 90% share in computer based systems.

More than 85% of business in industrialised economies depend on it.
Software market growth rate is therefor still between 12% and 18% p.a.

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2. Types of computer software(1): Software as a "product" for constructed use

Market relevance

5%

Individual Software ...

... produced for reasons of uniqueness. mostly because of strategic importance or because of technical dependencies

10%

Specialised software composed from customized standard com-ponents plus individual extensions ...

... for optimal support of business processes

35%

Standard Application Software such as SAP or MS Application products etc.

50%

Standard "generic" user software, e.g. WORD, EXCEL etc.

Basic level & system communication software, e.g. WINDOWS, OS/2, NOVELL, etc.

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2. Types of computer software(2): Services associated with software

- "Associated services:" come together with software, such e.g.

  - Strategy building for software investment

  - **Business Process** identification and (Re-) Engineering

  - User needs identification and **Requirements Engineering**

  - **System conceptualization**, architecture definition and system specification

  - **System composition, integration, generation, or "programming"**

  - Introduction and operation of new systems

  - Maintenance, **system evolution** and technology update

 - **Education and training**

  - and many more ...

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3. The "software (SW) industry"

- Not yet really an industry - comparable to car industry in 1915 !

- **70% of all software "production"** takes place **at users' organisations**-despite the trend towards outsourcing.

- Information Technology (IT) plus Telecommunication(T) - worldwide for the **second largest economic segment** (after "Tourism Industry")-and **software makes more than 50% of it !**

- Too little efforts have been made in "SW industry" in taking over **organisational issues** which have been proven to be successful in **industries with longer traditions** (such as car industry)

- There is a lack in applicable methods of **"economisation"** in **professional software engineering for providing a transparent view** into business.
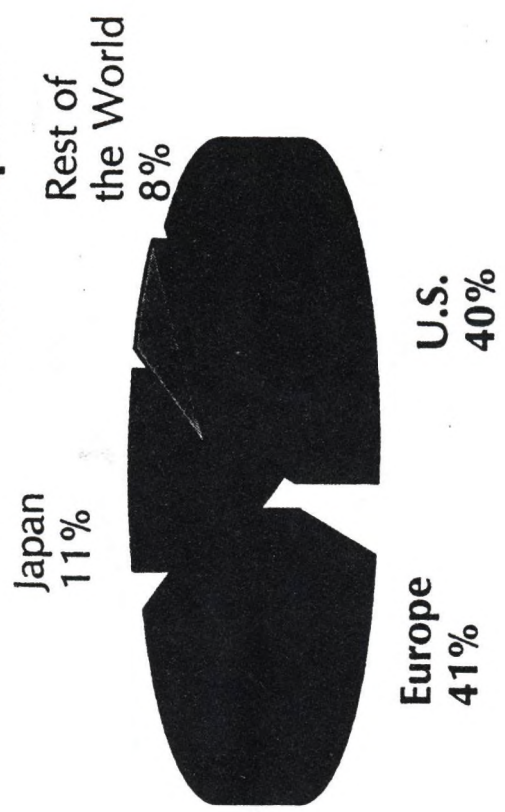
4. The International Software Market

USA : Increasing Reliance on European Revenue Contribution

Share of World Software Production
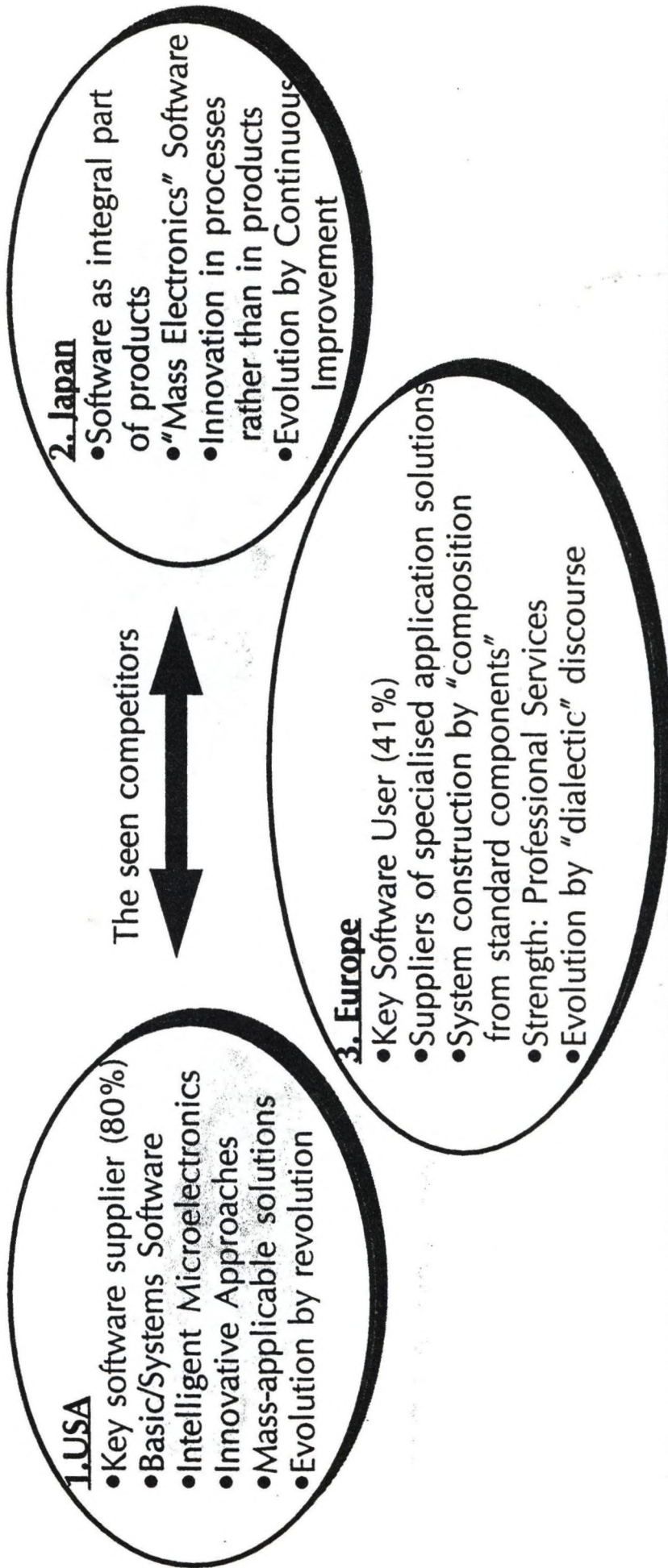
Europe
16%

Japan
4%

Rest of
the World
2%

U.S.
78%
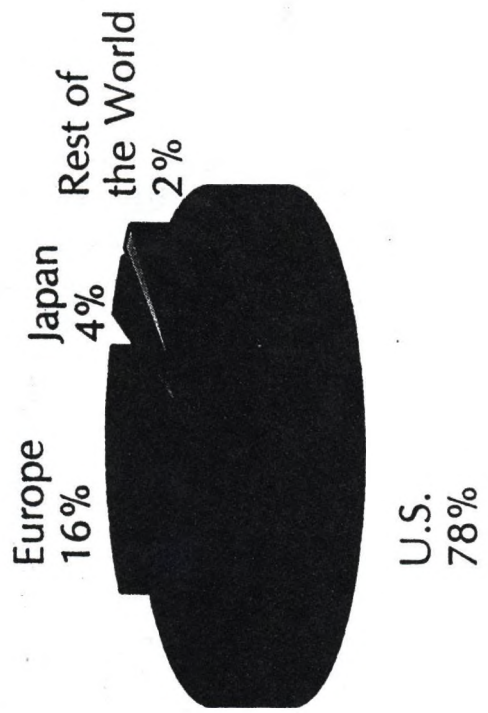
Share of World Software Consumption

Rest of
the World
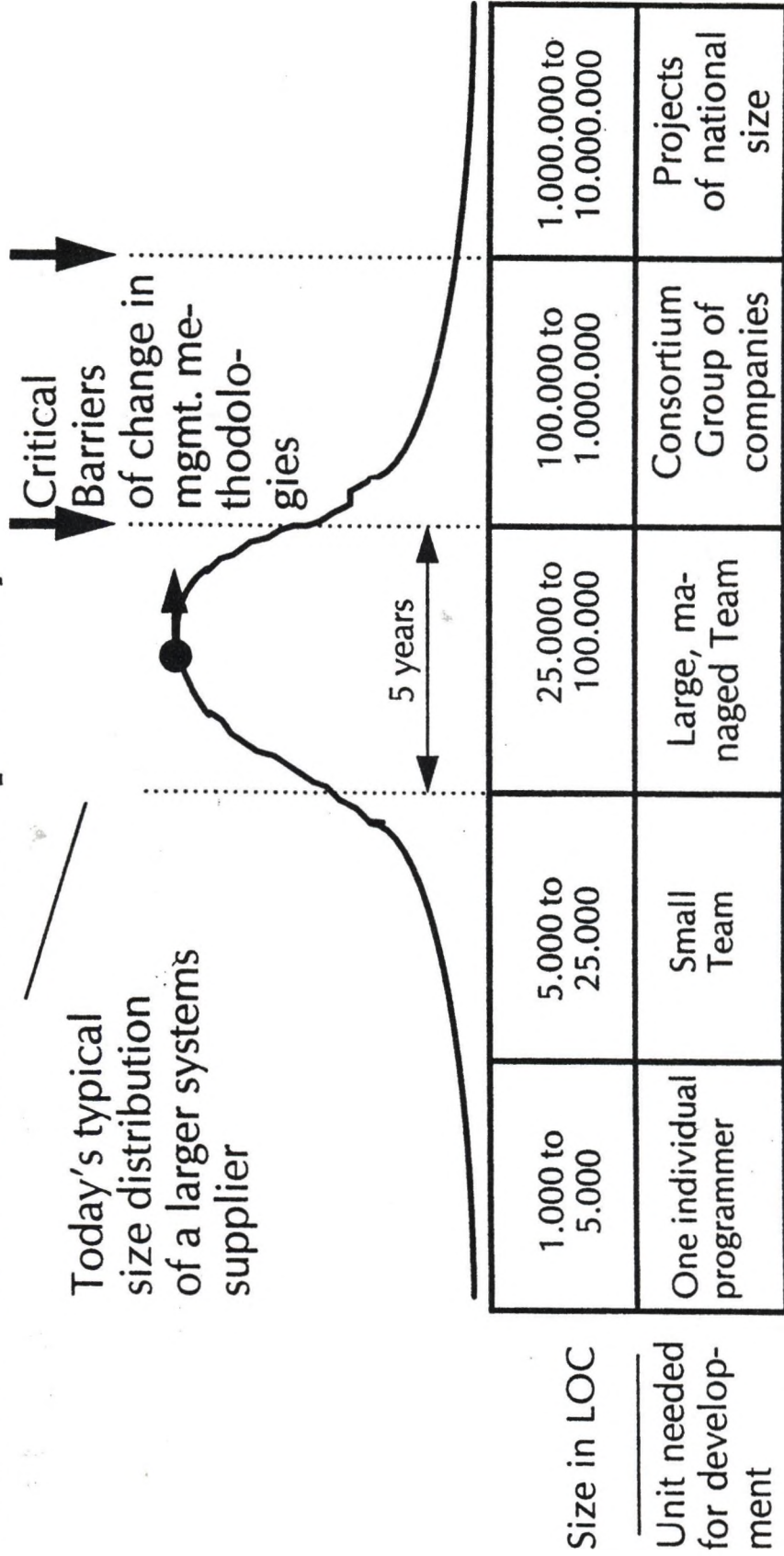8%

Japan
11%

U.S.
40%

Europe
41%

Source: Gartner Group an the European Information Technology Observatory, 1994/95

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5. Software in the triade : Strengths and weaknesses of global software competitors

1. USA
- Key software supplier (80%)
- Basic/Systems Software
- Intelligent Microelectronics
- Innovative Approaches
- Mass-applicable solutions
- Evolution by revolution

2. Japan
- Software as integral part of products
- "Mass Electronics" Software
- Innovation in processes rather than in products
- Evolution by Continuous Improvement

3. Europe
- Key Software User (41%)
- Suppliers of specialised application solutions
- System construction by "composition from standard components"
- Strength: Professional Services
- Evolution by "dialectic" discourse

The seen competitors

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6. Unsolved Problems(1) : The management of size and complexity

Today's typical size distribution of a larger systems supplier

Critical Barriers of change in mgmt. me-thodolo-gies

5 years

Size in LOC	1.000 to 5.000	5.000 to 25.000	25.000 to 100.000	100.000 to 1.000.000	1.000.000 to 10.000.000
Unit needed for development	One individual programmer	Small Team	Large, ma-naged Team	Consortium Group of companies	Projects of national size

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6. Unsolved problems (2) : The virtual "conflict" between productivity and quality

Composition from quality approved reusable objects

"Clean Room" Development

Programme Construction through Formal Methods

Rapid Application Development (RAD)

Object Oriented(OO) System Construction

Programming in ADA (-like) languages

Rapid Prototyping

4th/5th Generation Language Generation

"Classical" Programming

Productivity

Quality

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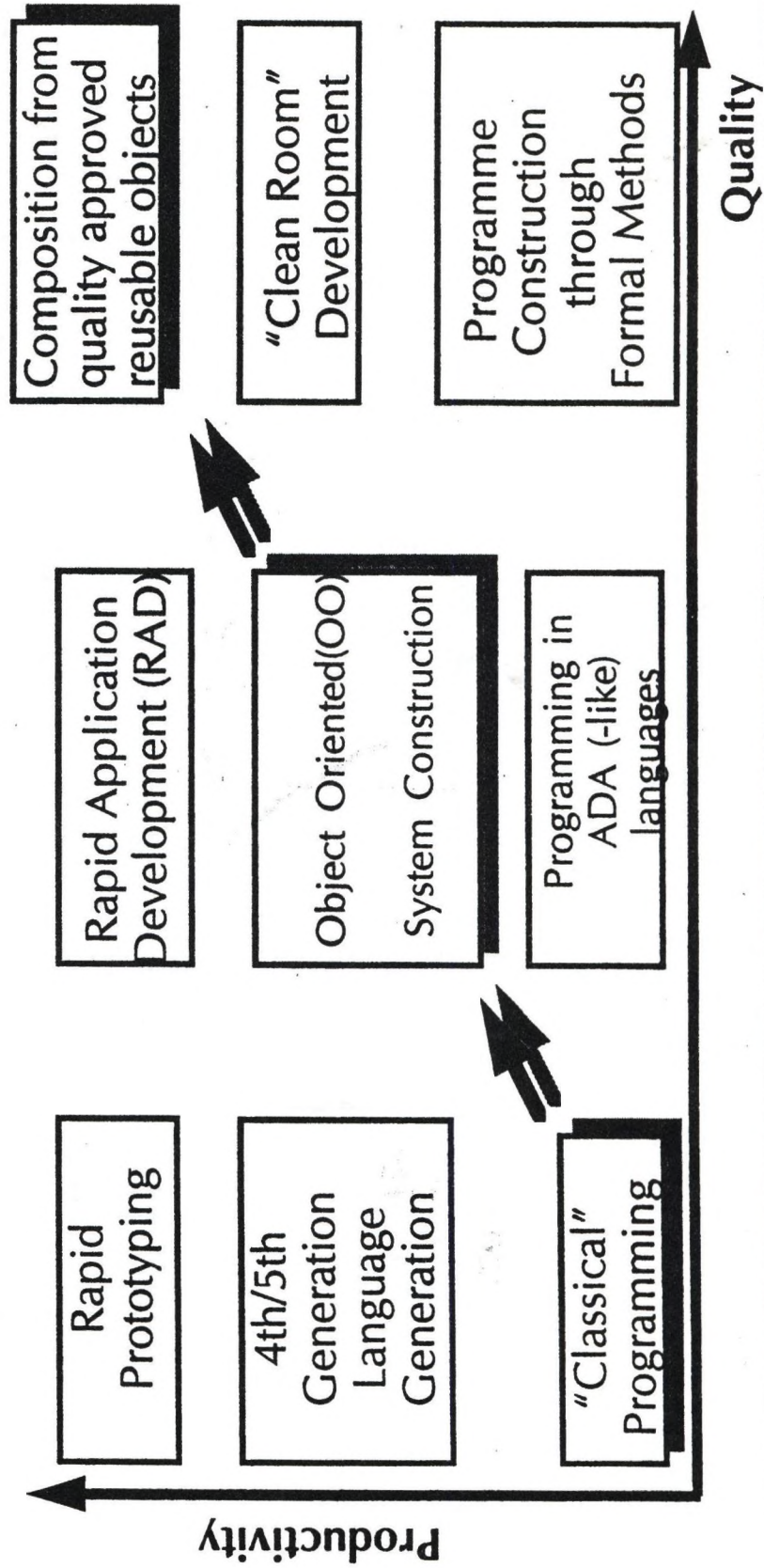
6. UNSOLVED PROBLEMS (3) : Mastering products and process simultaneously
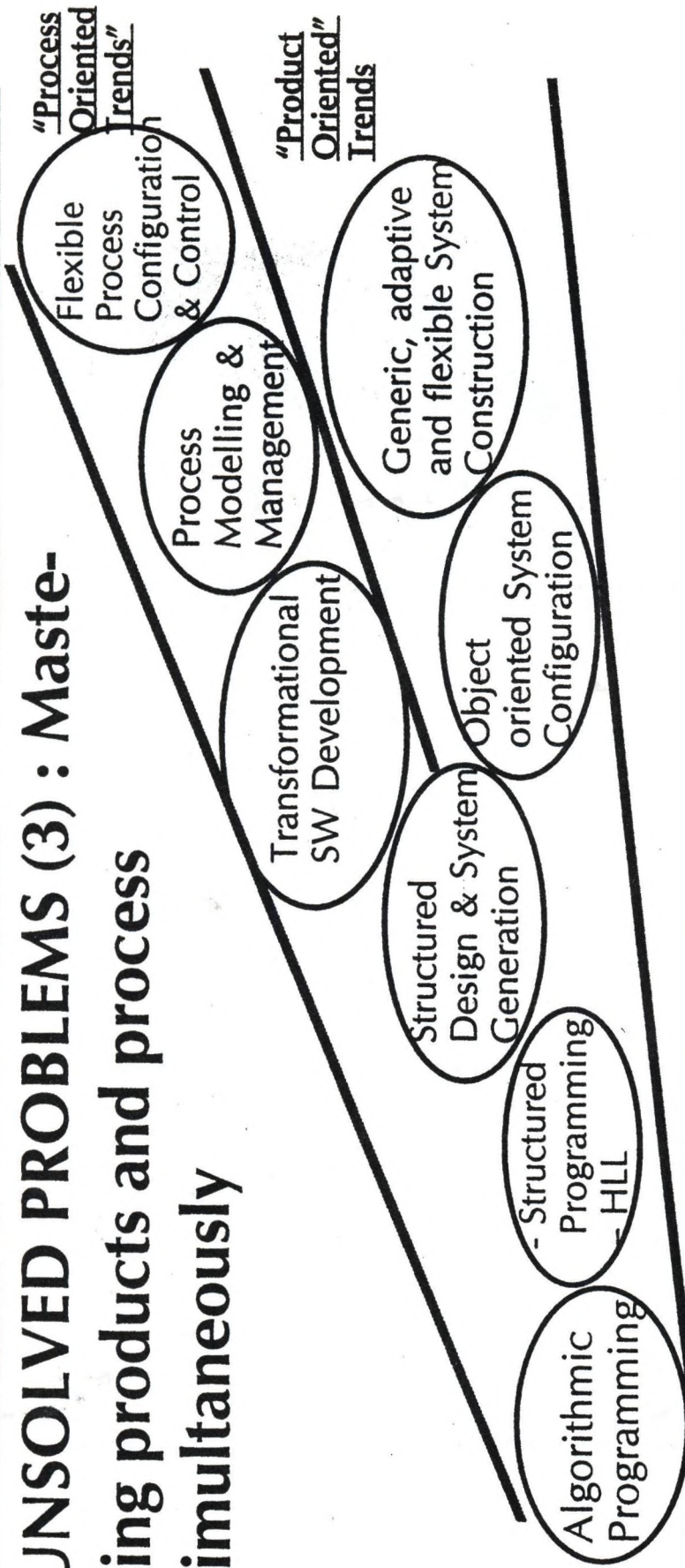
"Decades"				
Keyword of Decade	- "Programming" - "Computation"	- Structured Programming - GOTO-LESS Programming	- System Analysis & Design - Formal Methods	- Software Management - Reusability - MM Interfaces	- Flexible & adaptive System Generation - Requirements driven System Construction

"Process Oriented" Trends

"Product Oriented" Trends

- Algorithmic Programming
- Structured Programming – HLL
- Structured Design & System Generation
- Transformational SW Development
- Object oriented System Configuration
- Process Modelling & Management
- Generic, adaptive and flexible System Construction
- Flexible Process Configuration & Control

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ESI 6. Unsolved Problems (4): Positioning of today's relevant Software Engineering themes

SOFTWARE ASPECTS

(Life Cycle-) Methodologies

	Requirem. Engineering	Design	Architectures	Construction	Verification	Maintenance	ORGANISATION	Technology
Strategy	Business Processes		Safe Investment "Infrastructures"			Re-Engin. of "Legacy Systems"		New Architec. / New Paradigm
Management & Resourcing	Selection of Reusable Processes	Design Strategy	(Ref.) Architectures	Reuse		Migration towards		Integration Architec.
Engineering	Requirem. Engineering	OOA / OOD	Architectural Models	Config. Mgmt.	Teaching	Modification		Client Server
Quality in Products & Processes	Customers Quality Attrib.	Reuse	Architect. Attributes	Integration of qualified comp.	Formal Methods	"Re-Qualification" of Legacy SW / "Geriatric" Metrics	Process - Organis.	Comp. of certif. Comp.

ESI's Segment

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6. Unsolved problems (5) : Unprofessionalism in process management : The essence of "ESI's White Book of SW Engineering" - Study (a)

ESI's most recent European-wide study (together with Gartner Group, Madrid branch, as ESI's subcontractor) on software engineering practices:

- Selection of addressees: **600 heads of EDP or IT in larger SW dependent companies,** active in Finance, Energy, Manufacturing, Trade, Public Services, Transportation and Distribution, Telecom, and others. Sample from about 13% response level from all over Europe.

(cont.'d)

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6. Unsolved problems (5) : Unprofessionalism in process management : The essence of "ESI's White Book of SW Engineering" - Study (b)

Result:

(1) New measures actually envisaged by IT/EDP decision makers for solving software problems:

- Solution through software technology, OO methods, CASE : Still **major believe that the famous "Silver Bullet"** (killing the "Werwolf" of the IT/ software crisis) **must exist. (?)**

- Training and motivation of staff : Make the organisation and its **people learn to meet the new challenges.**

- **More involvement of both users** (the "end customers who pays) **and management** : Satisfaction key client to be own achieved !

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6. Unsolved problems (5) : Unprofessionalism in process management : The essence of "ESI's White Book of SW Engineering" - Study (c)

(2) Top management starts to take influence on IT / EDP by...

– more transparent and tougher **budget control**

– introduction of **quality standards in software processes**

– evaluation and decision in strong favour of **outsourcing**

– **opening of minds of EDP management** for decentralization, for professionalising management in quality and business processes and for shift towards business - aspects such as time-to-market and productivity.

(cont.'d)

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6. Unsolved problems (5) : Unprofessionalism in process management : The essence of "ESI's White Book of SW Engineering" - Study (d)

(3) However : The most "shocking" insights on problems on EDP / IT management level: which we discovered

- EDP / IT departments are still "islands" within the organisations analyzed although they are key to companies' future

- The term "Software Quality" is still neither well known nor well conceived and understood

- Only about 50% of IT/EDP management knows about professional software process improvement methods.

(cont.'d)

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6. Unsolved problems (5) : Unprofessionalism in process management : The essence of "ESI's White Book of SW Engineering" - Study (e)

- Major misconception : **Quality is seen to be in conflict with productivity.** (i.e. it is perceived as an additional factor)

- **Strong resistance against metrics** which contribute better than any other reason for transparency and by this for a better decision and sharper control basis.

(4) The **consequence for ESI's strategy : Start with awareness building on** relevant themes, then initiate "catalysation for change"

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7. ESI's "RAISON d'ETRE" : Its Mission Statement

ESI's Mission is

to support its <u>members</u>* and European Industry

to improve <u>competitiveness</u> *

by promoting and disseminating <u>best practice</u>*

in <u>software engineering</u>*(and management)

* will be explained in the sequel

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Company	Nation	Area	User / Supplier
Bilbao Bizkaia Kutxa	Spain	Bank	User
GMD	Germany	R&D	Supplier
Board Telecom Eireann	Ireland	Telecomm.	User
Iberdrola	Spain	Energy	User
Bull S.A.	France	Computers	Supplier
IBV	Spain	Techn. Services	User
Cap Gemini Segoti	France	Software	Supplier
INRIA	France	R&D	Supplier
Eritel	Spain	Software	Supplier
Lloyd's Register	U.K.	Classification	User
ESB Int'l Ltd.	Ireland	Energy	User
Matra Hachette	France	Aerospace	User / Supplier
Etnoteam	Italy	Software	Supplier
Olivetti S.P.A.	Italy	Computers	Supplier
Finsiel	Italy	Prof. Services	Supplier
Sema Group	U.K.	Software	Supplier
SNI	Germany	ComputerSupplier / User	
SPRI	Spain		(User)
EC	EU		(User)

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9. ESI's market - its members (2)

END-CUSTOMER

SUPPLIERS

Supporting IT Systems (based on Software from the suppliers) providing the fundament for User's Business-Processes.

ESI's R & D - Members and strategic allies

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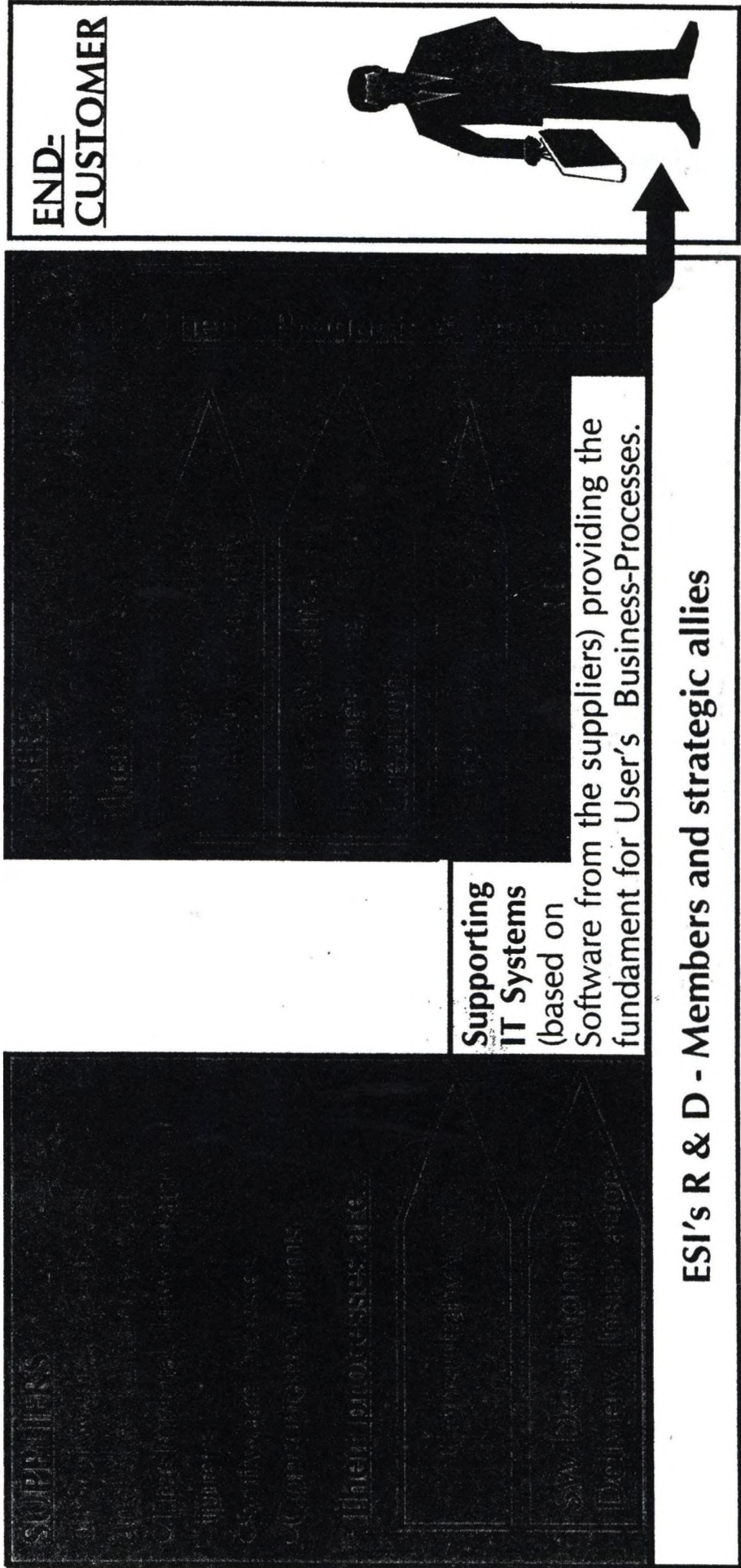
9. Software based competitiveness (1)

- Software horizontally penetrates all organisational and technical systems with between 25% to 85% of their value and therefore **takes direct influence in productivity and business success**

- H. von Pierer, Chairman of SIEMENS: **"More than 50% of Siemens' today's business depends on software"** !

- **Software makes the differentiating characteristics in products,** in administrative technical and organisational processes in strategy building and implementation, and by these amplifies competitiveness of European industry and enterprises as a whole.

(cont.'d)

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9. Software based competitiveness (2)

- **Competitiveness** has many factors : The basic ones are **to meet economic key criteria**: short and predictable time-to-market, managed cost, high productivity, superior quality, high flexibility in meeting customer demands and unbeaten customers' satisfaction.

- E.g. **Telecom operators as service** will have to cope with market requirements said to request the delivery of 100 new services every year – and **each such service means some (heavy) piece of associated software– two "pieces" per** week.

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10. ESI's approach for improving competitiveness: Introduction of "Best Practice" (1)

- ESI today is a first change agent and an improvement catalyst, but just another technology supplier.

- ESI does not to proclaim (own) new methods and tools; ESI rather **engages in communication of best practices collected** from experienced industrial software engineers and software managers.

- ESI's way of **"capturing" best practice know how** is to make available models of software processes, of metrics, of empirical statistical data and of "experience stories" - all to be stored in ESI's repositories.

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10. ESI's approach for improving competitiveness: Introduction of "Best Practice" (2)

- ESI's approach to make the necessary change happen is through (1) **awareness campaigns**, through **training** (2) and education, through **information services**, (3) offered within the new "Global Information Infrastructure" realised on top of European Data Highways and through (4) **consultancy to decision makers**,

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11. House of ESI's services (with reference to the chapters in ESI's 1995 Workplan)

Consultancy
= Chapter 7

Training = Chapter 5	**Strategic Alliances = Chapter 9**	**Events** = Chapter 6
Publication = Chapter 4		**Info Services** = Chapter 4

Improvement Programmes = Chapter 2 : Spice, Best Practices

Support = Chapter 8

Marketing:
= Chapter 1

+

A marketing plan under development

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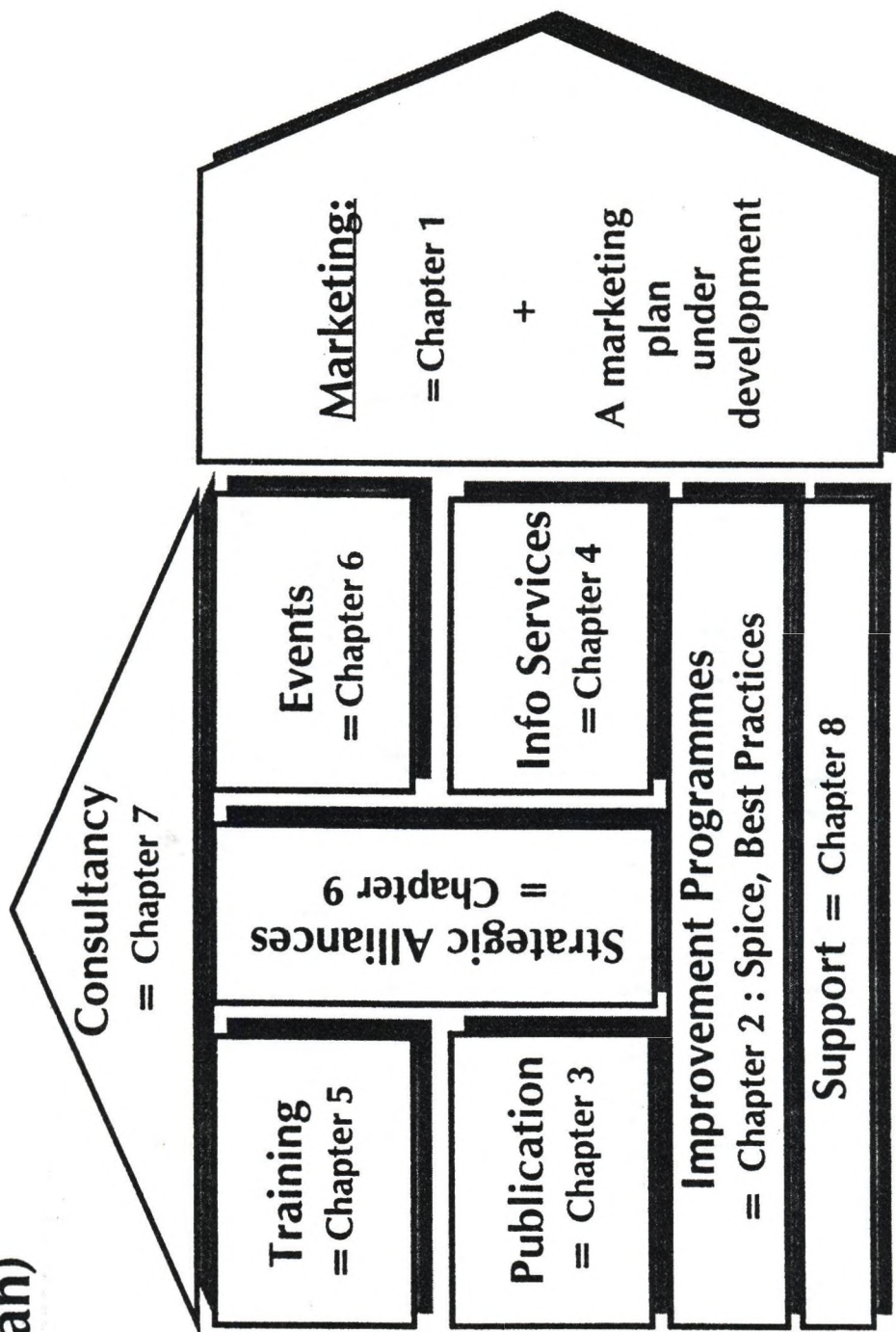
12. Strategic Alliances: ESI's today's "TECH-NICAL PROJECTS" (1)

(1) **SPICE - a methodology package under ISO standardisation for software process improvement**

- Close contractual co-operation with ESI's counterpart in the

  US: **SEI, Pittsburgh.**

- Performing intensively the **European trials** applying the

  "SPICE Improvement Rules" first time worldwide.

- **Evaluation** and interpretation of the **worldwide SPICE**

  trials' results

- **Introduction of SPICE** and alike methods to ESI's

  member organisations

(cont.'d)

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12. Strategic Alliances: ESI's today's "TECH-NICAL PROJECTS" (2)

(2) Exploitoition of the most rich SW methodology collection in Europe, which is **EUROMETHOD**, being a "Best Practice Reservoir" for software engineers and software managers (in progress).

(3) **Reuse of software under economic aspects** (in planing).

(4) **Introduction of metrics to software industry and to software** process organisations (in progress).

(5) **New such projects** will be founded conforming to ESI's strategy and in consistency with ESI's members' interests.

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13. ESI's future "Lead Projects"

"**Lead Projects**" shall ideally **demonstrate ESI's competence** and capabilities by interpreting several aspects. Two Projects are actually under definition:

(1.) "**The Learning Organisation**" **for sustainable change**

 (a) From individual learning to **organisational learning**

 (b) ESI supports such learning through **best practice** experience
  exchange and self organised learning

(2.) **The globalisation of software processes: "The Global SW Enterprise" (GSE)**

 (a) Availability of **global sources in software** products and services

 (b) **Optimal allocation of software processes** to infrastructural
  software process suppliers

 (c) "**Transport Logistics**" of software through modern telecom

 (d) Based on G/ - project "Global Engineering Network" (GEN)

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14. ESI's contribution to the creation of the "Global Information Society"

- Major inputs:
  - (1) **EC's White Book** on future welfare based on new infrastructures.

  - (2) **Bangemann Report** and follow-ups on the creation of future European IT & T infrastructures

  - (3) **Al Gore's** proclamation on the creation of a **Global Information Infrastructure.**

- **ESI will act as an "Electronic Competence Node"** within the global Internet network, providing information on software processes, software metrics and statistics and experience stories.

- ESI supports for the launch of a Lead Project **"Global SW Enterprise"** (GSE) on the basis of the "Global Engineering Network" (GEN)

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15. ESI's EMBEDMENT IN THE EUROPEAN SCENE

European Commission and its programmes

European industrial Associations and Boards

ESI Member Companies' internal initiatives and programmes

National European programmes

UK: STARTS

...

Germany: National SW Initiative

Ireland: IDA programmes

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ESSI (European SW-Initiative) as EC's "Broad Band Programme"

International SW projects and Competence institutions such as in ...
...USA : SEI, SPC
...Asia : Macau: UNU/IIST
India : 3S
...Australia : SWE-Institute
...Canada: SWE-Institute

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16. ESI's promises towards member organisations

- ESI acts first as an information and an "**Experience Agent**" for software suppliers and software users.

- ESI acts as a "**Change Agent**" for changing organisations towards improvement towards better software, and professionalisation of its engineering, its management and its use.

- **Changing** positively all **software related competitiveness key factors**
  - Manageability
  - Cost savings in SW processes
  - Increase of productivity and quality at the same time
  - Attainment to time-to-market predictions

- **Introduction of Improvement of software organisation's maturity level**

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17. MATURITY LEVEL UPGRADE

Management Visibility

Organisational Level

5 = Optimised

4 = Managed

3 = Defined

2 = Repeatable

1 = Initial

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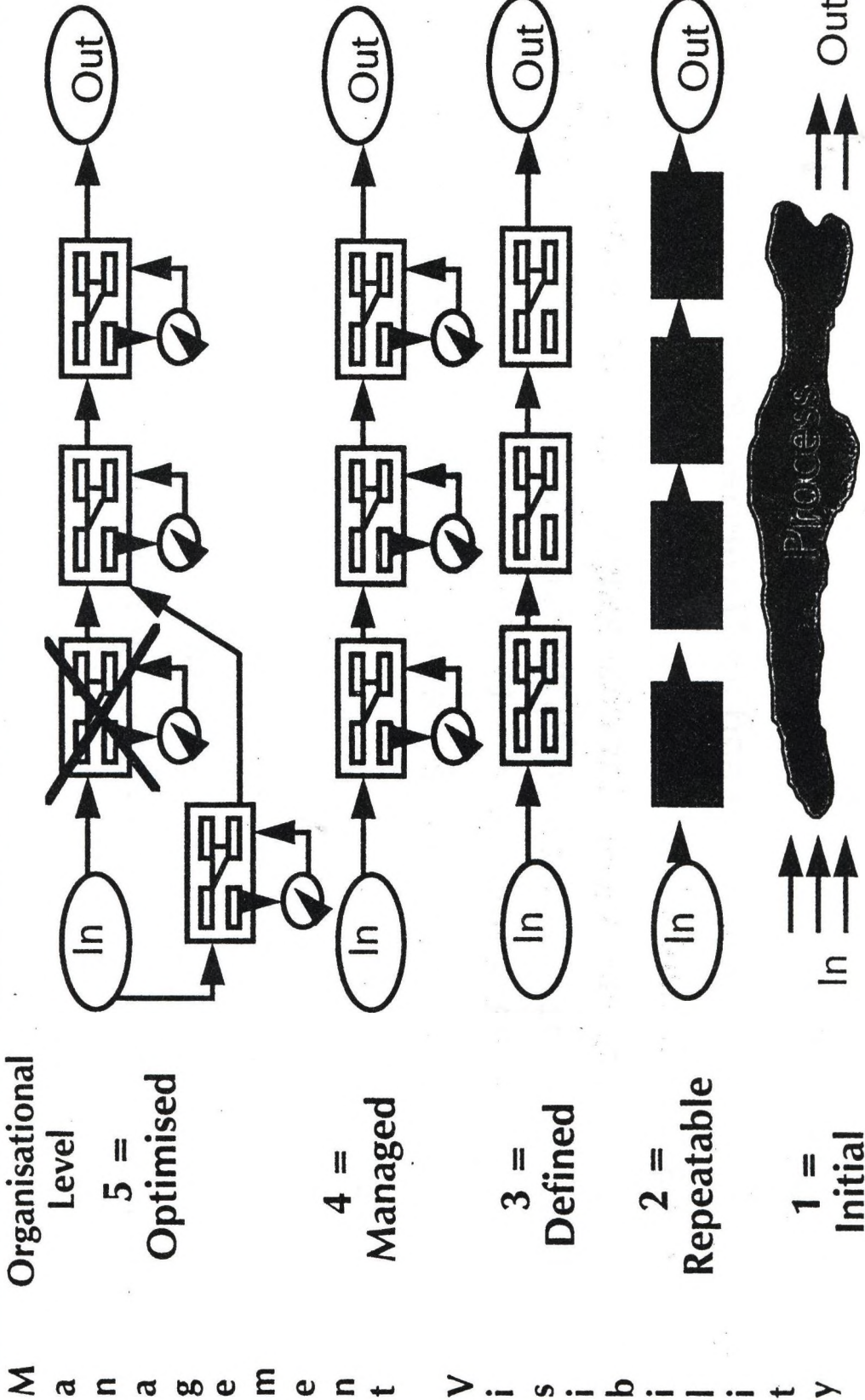
18. Key results(1) : Cost decreases and savings at SIEMENS

Cycle Phase

Level	Require-ments	Design	Imple-mentation	Module test	Syst.-test	Post Delivery	Relative costs per Defect / per Level
Managed 4	5%	10%	50%	20%	10%	<5%	1
Defined 3	3%	5%	7%	25%	50%	10%	2,6
Repeata-ble 2	0%	0%	5%	15%	50%	30%	3,5
Relative Repair Costs	1	1	1	12	24	450	

Minimal Cost Reduction 3,5 : 1

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19. Key result(3) : Increase in productivity related to maturity level

PI = Productivity Indicator

Commercial SW, IS type SW

Technical SW, embedded type SW

CMM Level
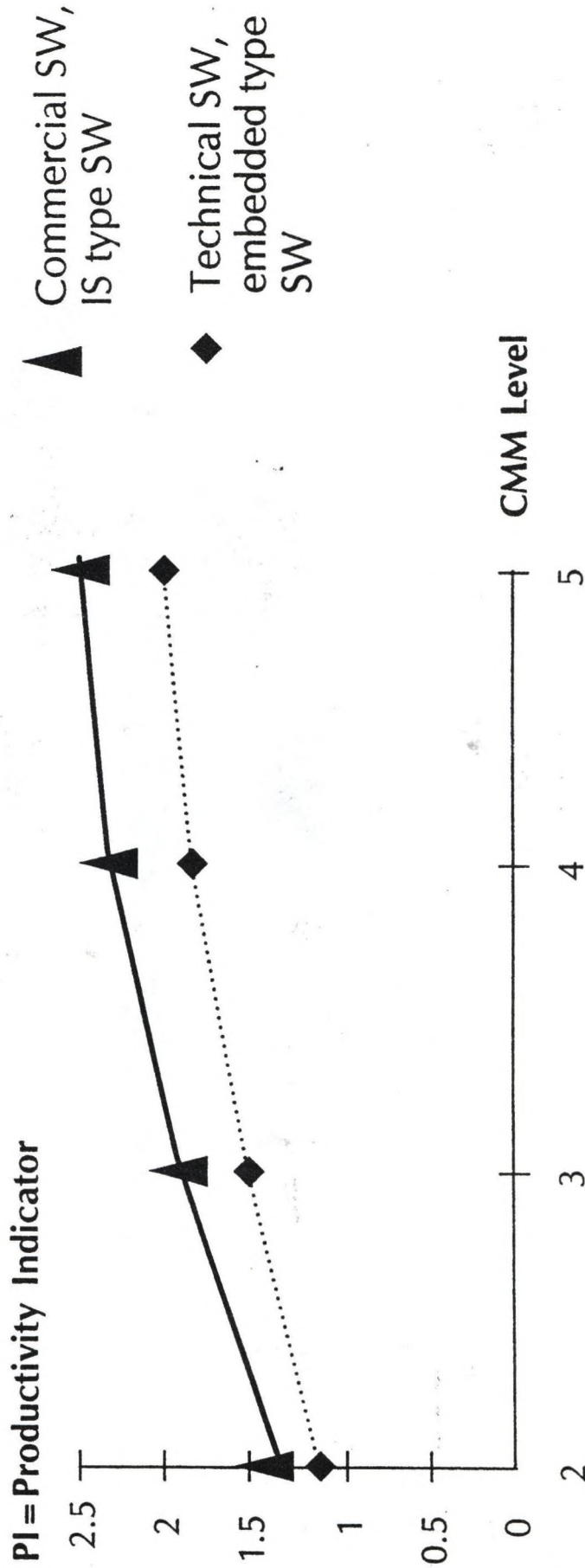
Source: Synspace(Switzerland) on basis of QMS data

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20. Key results (2) : Cost decrease savings and productivity gains at Raytheon (US)

Increase in SW productivity

Start of improvement initiative

117.2 Million $ Savings

Cost of SW defect identification and repair in proportion of overall system cost

50%	175%
40%	150%
30%	125%
20%	100%
10%	75%
0%	50%
	25%
	0

1987 1988 1989 1990 1991 1992 1993 1994

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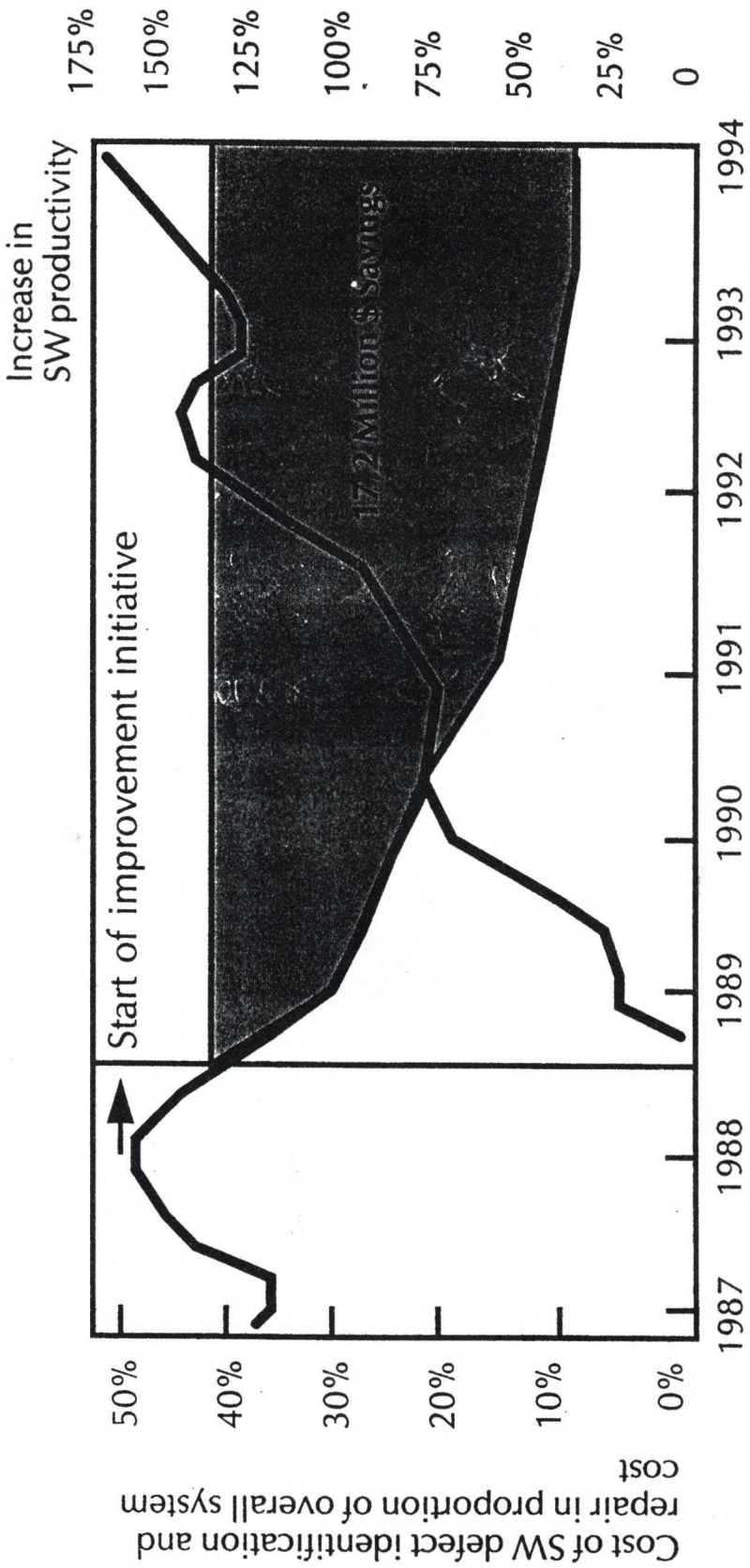
21. Key result (4) : Attainment of time- to - market targets (1)

(a) Influences of timeliness on business result

Losses in profits

40 %
30 %
20 %
10 %
0 %

50% development cost overrun

product cost 9% to high

ship product 6 months later
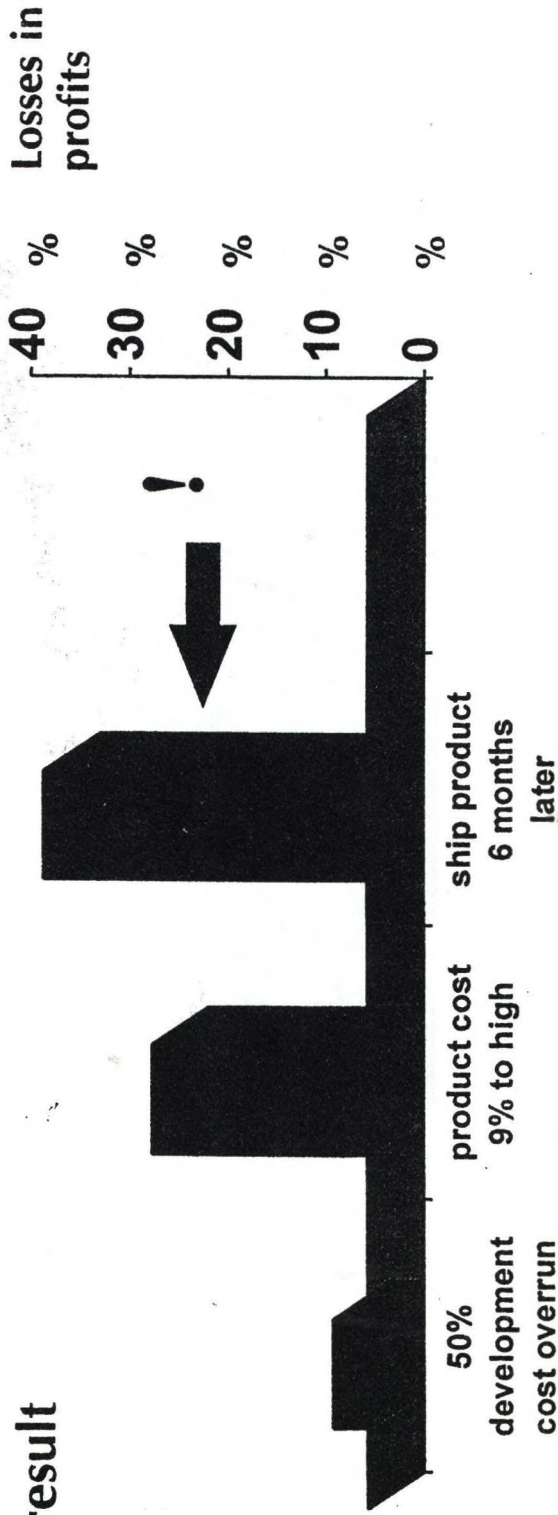
conclusion: lateness in delivery is the most influential factor in profit reduction

(cont.'d)

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21. Key result (4) : Higher Maturity Level - better predictability of time-to-market (2)

Level	Process Characteristics	Predicted Performance
5 Optimizing	Process Improvement is institutionalized: *Exact predictions, earlier delivery*	
4 Managed	Product and processes are quantitatively controlled	
3 Defined	Repeatability over a range of project is possible	
2 Repeatable	Project mgmt. in place; repeatability of experience once made is possible	
1 Initial	Performance is unpredictable and delivery mostly too late	

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SW Metrics for management

Chart 1 : Software Development Process and Product QUALITY (at Motorola)

Chart 2: CUSTOMER SATISFACTION (at Motorola)

Chart 3: CYCLE TIME and PRODUCTIVITY (at Motorola)

Chart 4 : Software Engineering TECHNOLOGY ROAD MAP (at Motorola)

Chart 5 : KEY PROCESSES PROFILE (at Motorola) (comparable to BOOTSTRAP profile)

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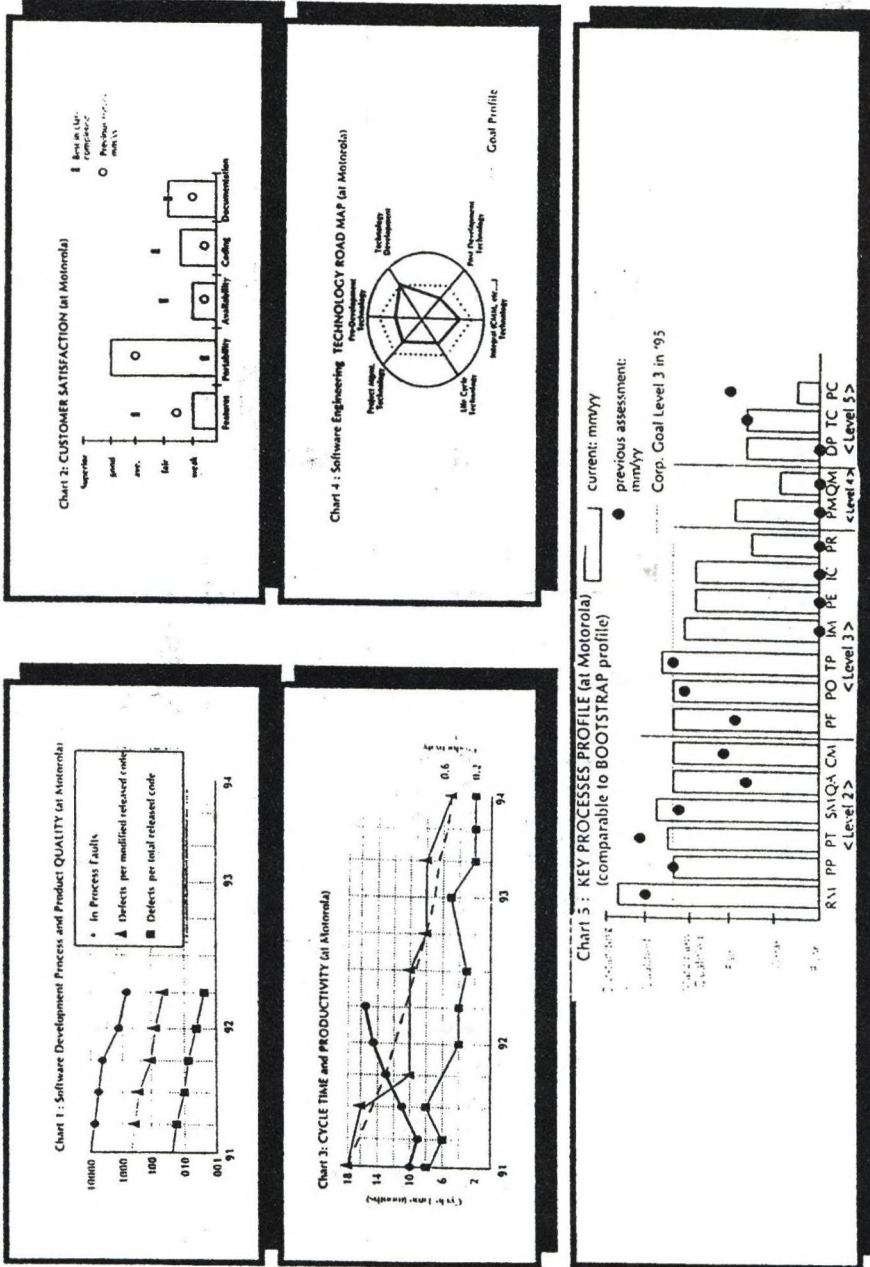
23. Who shall join ESI as a member

As a "Sponsoring Member"

- **Large user organisations, active** in Finance, Telecom, production, Energy or Trade, or large Administrations

- **Large to medium system and service suppliers,** facing changes in their business and relying on the well functioning of new software

As a "Corporate Member"

Small to mid size software systems developers, integrators and suppliers ...

... facing tougher competition and looking for their own competitiveness increase in an international environment

... showing motivation to keep themselves in business by positive adoption to future professionality standards

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29. ESI's consultancy for governmental organisations

- ESI acts as an absolutely neutral advisor e.g. helping to prepare decisions on public technology programmes.

- ESI acts as an awareness agent introducing and explaining future scenarios specifically about new software based services, (business) processes and the related software.

- ESI today acts as an agent giving decision support, e.g. when preparing the procurement of new IT systems.

- ESI provides expertise in planing future infrastructural IT & T systems.

- ESI offers services in evaluating project plans, software projects and the supplied systems in specific w.r.t. quality of such systems and their associated processes.

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30. ESI's Future

"The problem with the future is that it is no more what it used to be."

G. Weinberg

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Copernicus Large Parallel Database Project (CP93:6638)
András Benczúr, Eötvös Loránd University

The Proposal

The focus of the research programme lies in the area of database syetems and their implementation on parallel database machines. The project drows on the differing strengths of the collaborators with the theoretical expertise being provided, in general, by the East European partners and the more practical, engineering aspects being provided by the Western European partners.

In addition, the project will enable the transfer of technology between the collaborators and in particular the exploitation of parallel database software developed in Sheffield is proposed by a number of East European organisations.

The main focus of the research lies in the investigation of techniques to support user defined and abstract data types in highly parallel database machine. This work is also supported by research into the underlying algorithms which can be used in a parallel database machine. In addition, it is proposed to investigate the use of functional data modelling and functional languages as a basis for building a high performance database machine, which has a greater semantic richness than that which can be expressed in SQL. This work will be applied to geographic information systems. We shall also invetigate the use of attribute grammars to specify the algorithms used in such database machines.

An important aspect of the project is that of providing techniques to measure the performance of a database machine. We intend to investigate how a formal description of performance could be constructed, as well as to develop specific techniques which could be used to measure the performance of a particular implementation. To increase the effectiveness of the modified project the banchmarking work of Sheffield Hallam University has been concentrated at the and of the project period.

Partners
National Transputer Support Centre (NTSC), Sheffield
Sheffield University (SU), COORDINATOR
Sheffield Hallam Univeresity (SHU)
Laboratory PRiSM, Versailles University (PRiSM)
TELMAT , Cedex
Slovak Technical University (STU), Bratislava
Eötvös Loránd University (ELTE), Budapest
Computer and Automation Institute of the HAS (SZTAKI), Budapest
József Attila University, (JAU), Szeged, Hungary
Bulgarian Academy of Sciences, (CICT), Sofia

Meeting held on 17 October 1994 Laboratory PRiSM, Versailles
Main goal of the meeting:
Re-arrange the work plan and partner interactions for the rest of the project. Every partner knows what they are going to do with whom.
-Presentation of the individual partner background and goals.
-Revised workplan was developed and refined in small groups.The partners split up into two groups.

The first group (High Level Group) works on high level machine. Partners: PRiSM, ELTE, JAU, STU. The discussed topics are the extensions of SQL, the optimisation, the functional model and the compilation techniques.

The second gruop (Low Level Group) works on the low level machine. Partners: NTSC, SU, SZTAKI, ELTE, JAU, SHU, CICT. This group is interested in the following topics: the memory database, the performance evaluation, the recovery models, the data placement, the load balancing. The interface betweeen the two groups is the W-SQL presented by Sheffield University.

Meeting Held on 28 February, SZTAKI, Budapest.
Following the EU progress review meeting held on 27 February, the partners held a technical meeting to revise and clarify the work programme in the light of the reviewers' comments.

Present:

Project Manager,Jon Kerridge, SU/NTSC;

Project Leaders: Georges Gardarin, PRISM; Innes Jelly, SHU; Lajos Rónyai, SZTAKI; András Benczúr, ELTE; János Toczki, JAU; Vladomir Vojtek, STU.

High Level Group

Parterns: PRiSM, ELTE, SZTAKI, JAU, STU

Precise Collaborations and Deliverables of the High Level Group

1. ADT SUPPORT

Start from technical report: 'Abstract Data Type Requierements for a Parallel Database processor'.

a) Specification of ADT Responsibility : PRiSM

Extend with clear operations. See NF2 to collections in OQL/SQL3. Look at ADT specification in SQL3.

    *Structure and operations for fuzzy and geographical data type.

    * Nested relations towards collections.

OFL mapping. Specify a procedural semantics of OFL.

b) Update in nested collections Responsible : ELTE

Object oriented model is a generalization of NF2. Extension of OFL for aggregation (ex: geographical data type). No update standard is already defined.

REPORT (beginning of September) Collection and Update ADT (Fuzzy and Geographical data type) Note: this report may be divided into two reports. COMMON PAPER (beginning of November)

2. QUERY PROCESSING IN OBJECT ORIENTED AND PARALLEL DATABASES.

Start from:

i) OFL rewriting rules of PRiSM

ii) cost model of PRiSM. Responsible : STU

a) Intermediate languages. Functional expression or algebraic expression.

b) Rewriting rules.

c) Cost models.

d) Graph traversal.

e) From a prototype in Prolog for relational model to a prototype for object oriented model.

REPORT (beginning of September) Cost model Strategies: 1 or 2 COMMON PAPERS

1. Parallel cost model for the beginning of November.

2. Query optimizer architecture (integrating genetic algorithm, heuristics and parallelism) for the beginning of January.

3. SPECIFICATION AND DESIGN OF OFL COMPILER AND EXECUTOR FOR TRANSPUTER Responsible : JAU * Support for collection * OFL compiler Design an object manager with OFL support for T-node.

REPORT Version 1: End of May. version 2: Beginning of September.

Low Level Group

Present: SU/NTSC, SHU, STU, SZTAKI, CICT The meeting addressed the issue ofidentification of the focus for collaborations and the deliverables to be achieved. On the basisof the existing collaborative work, the presentations made on the previous day and the reviewers' comments, the following were listed as the areas where a successful delivery of good standard research could be achieved.

1.STU/SHEFFIELD

1. Simulation of disc processing by discrete event simulation

2. Performance modelling of the DAC

3. Performance Evaluation of the transaction processing pipeline

4. Distributed simulation, using CDB Model as example system.

Reports/papers to be prepared on these four areas. The fourth paper will involve collaboration between SZTAKI and STU, and is viewed as a possibility for the later stages for the project, rather than a fixed deliverable.

A successful port of W-SQL to the Telmat T-Node in Bratislava is assumed in order to achieve these deliverables. STU to take the lead in the organisation of this work.

2.SZTAKI/SU/SHU

1. Capturing the CDB as a vertical market model for performance evaluation

2. Comparison of Data and Processing Requirements between CDB and TSB Banking Model.

3. Using CDB on W-SQL Platform

Papers 1 and 2 require analytical work, 3 requires system implementation. SZTAKI to take lead on this work, documents would be exchanged and a visit to Sheffield organised. SHU representative to visit Budapest in June(?).

3.PRISM/SU

1. Mapping OFL - W-SQL.

This is to be undertaken as a paper exercise, no implementation expected. SU to take lead onthis.

4.CICT/SHEFFIELD Because it was not possible to determine what work had been already achieved at CICT, the details of possible collaboration could not be specified. In the light of the apparent lack of progress it was made clear that CICT might have to relinquish some of its resources in order to support the collaborative work that was underway and had been identified as important. The following topics were identified by CICT representatives as the primary focus of the CICT contribution:

1. Parallel database simulation

2. Data Placement and Load Balancing

Further discussion will take place between CICT and Jon Kerridge when their progress report is received.

The *BOOTSTRAP* Institute

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1. Introduction

Two fundamental production process related decisions which are not supported by product quality control are:

The customer's decision problem:

Is the supplier able to sustain the reliability of its production?

The supplier's decision problem:

How can we improve the reliability of the production?

The BOOTSTRAP Approach supports these high impact decisions.

2. The *BOOTSTRAP* Approach

Bootstrap is a method to analyse, redesign, and improve the business processes of software development, introduction and use.
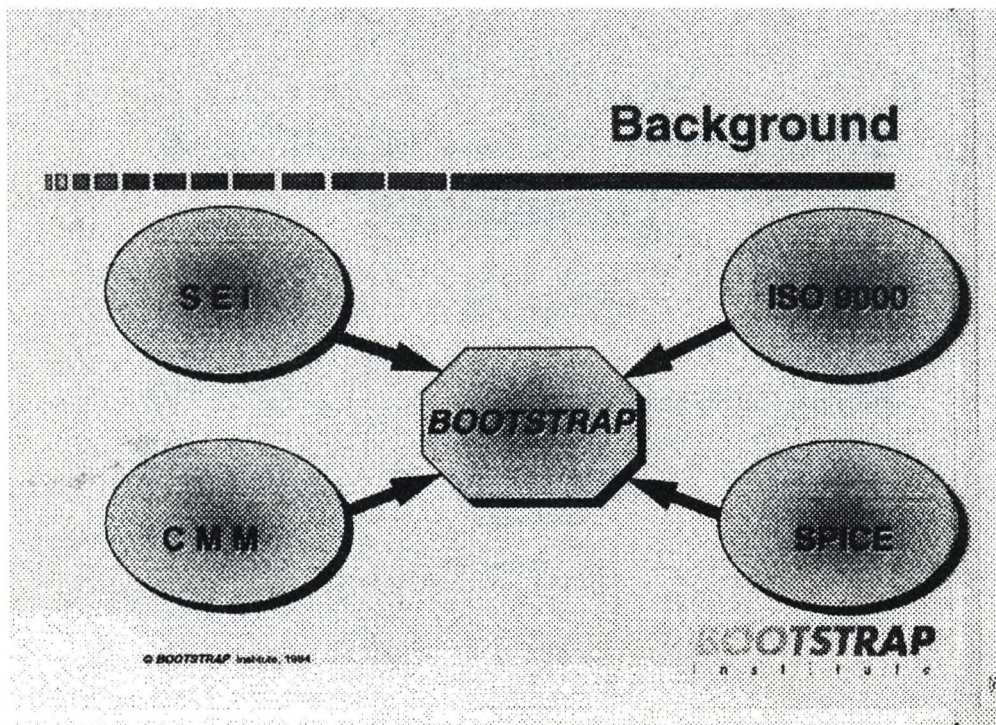
The cornerstones of Bootstrap are a state-of-the-art methodology, the quantitative evaluation of software processes, the identification of areas of improvements, and the recommendation of the EU.

Bootstrap was a European ESPRIT project (5441) which was carried out and finished in February 1993 by a consortium of European software companies and universities.
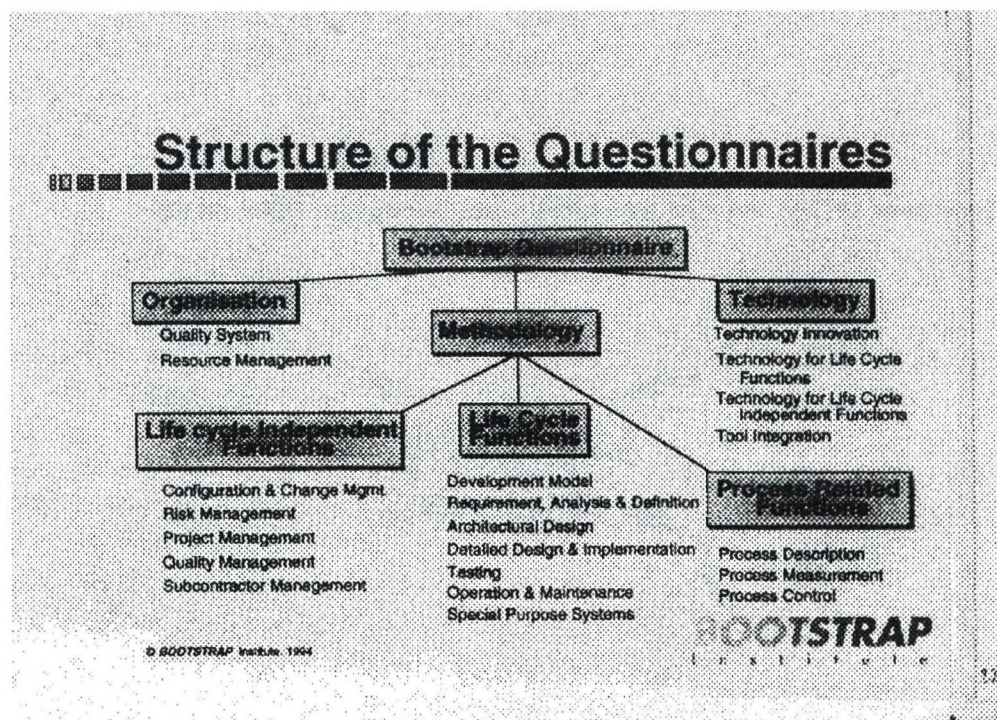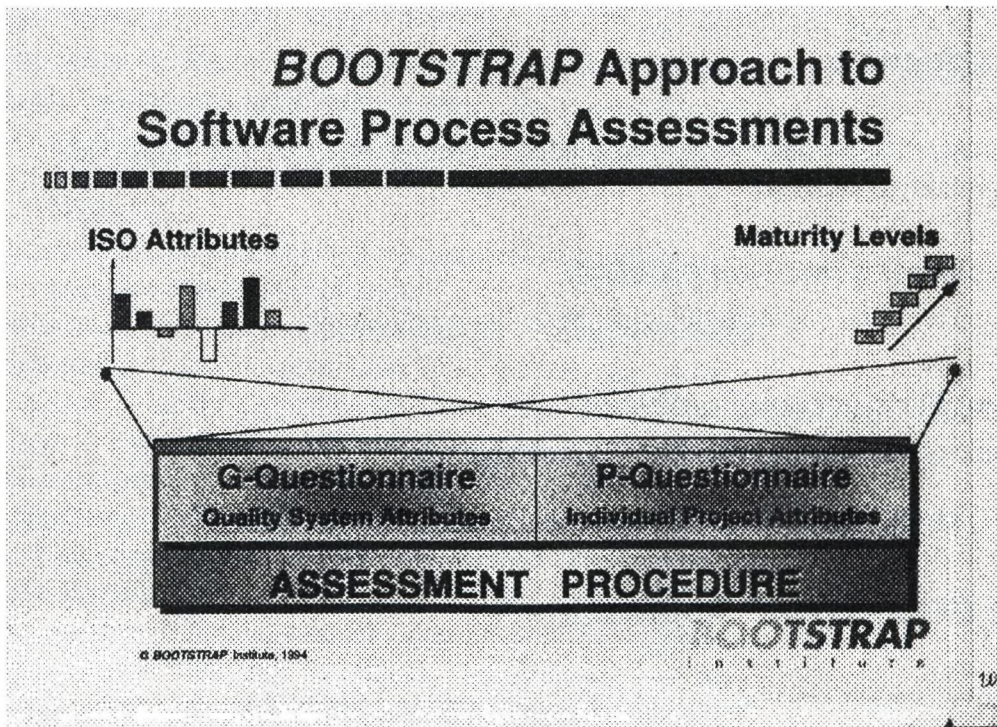
3. The *BOOTSTRAP* Institute

The principles of the BOOTSTRAP Institute:
- The Bootstrap Methodology must be accessible to all.
- The methodology must grow to encompass new thinking.
- The evolution is guided by democratic, one member, one vote process.
- Must provide service to European industry.
- The Institute operates on a not-for-profit basis.

The BOOTSTRAP Institute has members in many European countries including Hungary where MTA SZTAKI, the Computer and Automation Institute of the Hungarian Academy of Sciences is the first Central and Eastern European member.
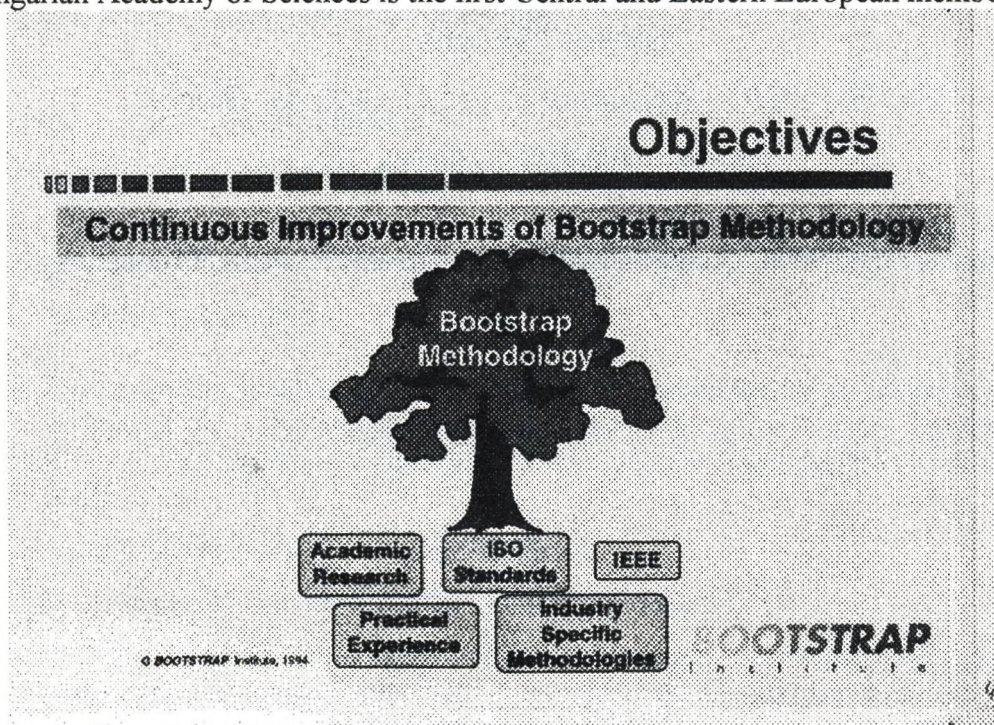
In addition to the continuous improvement of the Bootstrap methodology, the objectives of the BOOTSTRAP Institute include education on Bootstrap and process improvements, licensing the methodology on an equitable basis, accreditation of assessors, collection and management of assessment data.

The confidentiality of individual assessment data is contractually guaranteed. Licensees can see other assessments only at aggregate level. Selective queries cannot be performed to derive individual data.

Other activities of the BOOTSTRAP Institute include:
- Representation at Standards bodies.
- Co-operation with the European Software Institute.
- Provision of instructors/speakers.
- Coordination of multi-national assessments.
- Forum for licensees and independent assessors.

Quality : A Critical Success Factor for Information Systems Development

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Quality : A Critical Success Factor for Information Systems Development

1   Software Company Success Factors

Capers Jones, in his monumental book entitled "Applied Software Measurement" and after surveying more than 4000 projects executed within the years 1950-1990 concluded that the following factors are common amongst successful software companies.

- Accurate measurement of software productivity and quality

- Accurate planning and estimation of software projects

- Capable management and technical staffs

- Good organizational structures

- Effective software methods and tools

- Adequate staff office environments

An analysis of the above factors can offer insight to any software organization seeking to play a leading role in industry.

2   Software Quality

Software quality is the totality of software characteristics that determine the degree to which the software product meets the expectations of the customer. For software development, quality can be decomposed in the following constituents :

- Full understanding of the customer's needs;

- Efficient design of the products that meet these needs;

- Effective implementation coupled with extensive and systematic testing so as to ensure that the implementation is as bug free as possible and that the constructed systems operate faultlessly;

- Reliability of all bought-in components;

- Comprehensive and clear user documentation;

- Punctual delivery based on reliable cost estimates;

- Efficient servicing and maintenance;

- Constant improvement of processes and products based on measurements.

High software quality is the result of good software engineering practices and commitment to produce in compliance to a well-defined software development process. The complexity of today's systems, the increased competition, and the customer demand for higher quality systems offered at lower cost, has resulted into forcing the IT industry to adopt better software engineering practices and to improve the software development process.

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3   ISO 9000

ISO 9000 provides guidelines for the establishment, documentation and maintenance of an effective quality management system (QMS). The proper interpretation of the ISO 9000 standard will enable the organization to establish a QMS which fits it's needs. It will demonstrate a commitment to quality and the capacity to supply quality products and services to the organization's customers.

ISO 9000 is an internationally accepted standard. It is simple, concise and it enables all software development firms an easy implementation of it's articles. Upon establishment of a QMS, any organization can seek certification from any accredited certification body. Certification is simply an assurance that a supplier meets all the requirements of ISO 9000.

4   Quality Management Systems

Quality Management Systems (QMSs) define the quality environment within a business. It is important to stress that no magic cook book exists which will allow one to "purchase" an off-the-shelf QMS. This means that any organization seeking to establish a QMS must first and most importantly understand it's own business. What really needs to be done is for the organization to be in a position to extract the true customer requirements and to provide the proper technology so as to meet such requirements. All such considerations must be reflected in the QMS to be established.

The establishment of a QMS requires diligent effort on the part of the entire organization and not simply some middle managers or quality assurance staff. The key to achieving this goal is for the quest for higher software quality to originate from executive management. This does not mean simple lip-service, but, a commitment for process and product excellence on the part of upper management. Furthermore, the emphasis in the design of the QMS must be in the prevention of errors and not simply detection and correction. This translates into detecting defects in early software development life-cycle phases. The organization will witness both direct and indirect monetary profits, if defect prevention is achieved.

The QMS will disintegrate, if it is left unattended. Engineers will recognize this as the second law of thermodynamics. Constant reviewing of current technologies and practices as well as continuous monitoring of the effectiveness of the QMS will allow for the establishment of new QMS requirements. Besides, one of the fundamental principles of TQM is that of constant improvement which means that the QMS must be constantly assessed and perfected so that the corresponding software development process is upgraded accordingly.

5 Productivity

Productivity, using the Oxford Dictionary definition is, "the ratio of useful work performed to the total energy expended". The very nature of this definition is technically oriented which allows one to evaluate productivity from an efficiency perspective. The metric which allows for the quantification of productivity using the efficiency perspective is source lines of code (SLOC) per unit of expended time.

There are some problems when adopting a SLOC metric exclusively. Such problems include language dependence and lack of historical data from previous similar projects. This is the reasoning for taking an alternative view of productivity. One measuring the user's benefit from the code; an effectiveness perspective. Function Points, the selected metric using this approach, allow for the quantification of user benefit obtained to user cost incurred. Function Points are now evolving as a world-wide standard being that they :

- Measure what the user requested and received

- Measure independently of technology used for implementation

- Provide a sizing metric to support quality and productivity analysis

- Provide a vehicle for software estimation

- Provide a normalization factor for software comparison

A value perspective for productivity is also very useful for business managers. Using this third alternative, various "value for money" type measurements are extracted and their interpretation allow for drawing conclusions for productivity.

6 Conclusion

Project and quality management can only be accomplished by the establishment of a QMS which reflects the nature of the business. Furthermore, measurements must be extracted, recorded and interpreted during all production phases so that management decisions are based on hard data.

The concept of constant improvement is one which must be fully understood by all organizational staff, and especially management. The organization has to constantly assess it's current position and strive for further improvement. Only then can the organization become or remain competitive.

Distributed Programming Toolset for Object-oriented Multiprocessing and Intelligent Networking

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INTRODUCTION

The HPCC/SEA (High Performance Parallel Computing Software Engineering and Application) project proposal was accepted as an EUREKA project at the meeting of ministers in Paris June 1993.

HPPC/SEA is a four year project with twelve participants from four countries (Denmark , Italy, Hungary, United Kingdom) and with an estimated total cost of 52 M ECU.

Within the frame of a preliminary PHARE/ACCORD project ML Consulting and Computing Ltd (ML Consulting in short) -after several multilateral discussions with its partners- defined the HPPC/SEA DOMAIN (Distributed Programming Toolset for Object-oriented Multiprocessing and Intelligent Networking) which will be it's basic software development contribution to the HPPC/SEA project.

THE PARTICIPANTS

Denmark:	Math-Tech, Gentofte
Hungary:	ML Consulting and Computing Ltd, Budapest
Italy:	Olivetti Information Services Ricerca S.c.p.A., Bari
	Centre for Advanced Studies Research and
	Development in Sardinia, Cagliari
	Syntax Sistemi Software S.p.A. (Olivetti), Milano
	Gisettanta S.p.A., Milano
	Techso S.p.A., Cagliari
UK:	Bristol Transputer Centre, Bristol
	London Parallel Application Centre, London
	National Transputer Support Centre, Sheffield
	Strand Software Technologies Ltd, Markyate
	TSB Bank, London

OBJECTIVES OF THE HPCC/SEA-DOMAIN PROJECT

The major target of the HPPC/SEA Eureka project is to provide support for the development of system software and applications on future High Performance Parallel Computing (HPPC in short) systems. The aim is to replace today's expensive mainframe computers by lower-cost machines without any loss in computing power. Instead of a conventional architecture an innovative hardware/software solution is planned: multiple workstations connected by LAN (or even faster communication channels) and partially equipped with MIMD processors. A multiprocessor on-line transaction processing server

with the appropriate software system will be also developed within the frame of the project.

This hardware substitution is unthinkable without solid support of system software for application development, and the HPPC/SEA-DOMAIN is part of these efforts.

To check the concept, several pilot applications requiring intensive computation, selected from the medical and banking area will be implemented.

THE HPPC/SEA DOMAIN SUBSYSTEM

General Overview

The HPPC/SEA-DOMAIN shall be considered as a partial contribution to a future full-term environment. The HPPC/SEA-DOMAIN will become actually a toolset supporting divers aspects of the development of distributed programs on multi-processor machines and network connected low-cost computers on the hard- and software background at hand (see below).

On the other hand, the HPPC/SEA-DOMAIN is itself a set of distributed programs. It is perfectly the same kind of software as the one it supports. Thus, as soon as a tool gets usable, the HPPC/SEA-DOMAIN development will take advantage of the new tool's functionality.

Main Tools

The Distributed Programming Toolset for Object-oriented Multiprocessing and Intelligent networking (DOMAIN) shall cover the following main tools (as can be expected now):

Communication Design and Control System (CDCS)

The first main tool of HPPC/SEA-DOMAIN is the **Communication Design And Control System (CDCS)**. This system provides computer-assistance for the communication aspects of a distributed program. The CDCS supports the static definition of kind and structure of exchanged messages, shared objects, remotely called procedure and the like. Generation of appropriate program skeletons accompanies the graphical design phase as half-automatic help text and documentation generation. All data produced by CDCS is stored in the DPDB and is used not only for coding but also for dynamic analysis and testing.

Resource Compiler for Distributed Systems (RCDS)

Aside CDCS, the **Resource Compiler for Distributed Systems (RCDS)** plays an important role in the computer-assisted design and implementation as provided by HPPC/SEA-DOMAIN: RCDS offers extensive support for the design of high-level graphical user interfaces as appearing in the heterogeneous and distributed framework of the backing hard- and software. Again, generation of appropriate program skeletons accompanies the graphical design phase as well as half-automatic help text and documentation generation. And again, all data produced by RCDS is stored in the DPDB and is used not only for coding but also for dynamic analysis and testing.

Distributed Program Management System (DPMS)

The management of the development of a distributed program is the task of the HPPC/SEA-DOMAIN's **Distributed Project Management System (DPMS)**. This system takes care of the consistency of related program parts and their different incarnations. Source code version control, automatic object module generation and the like are similar to well-known systems like SCCS or MAKE. The DPMS, however, is able to manage more types of objects and may check much more dependencies as traditional tools can. With the help of the information stored in the DPDB sophisticated analysis becomes possible, ranging from specification and source code through object modules and code libraries to test data and documentation and help. Furthermore, the DPMS keeps track on all parts of a distributed program, on what host ever it resides. It follows the distribution of the DPDB and the distributed layout of the program itself.

Distributed Trace and Debug Facilities

The DTDF consists of high and low level tracers and debuggers. Their implementation is based on the services provided by the elements of DPPL.

Distributed Programming Primitives Library

Last but not least, there is the HPPC/SEA-DOMAIN **Distributed Programming Primitives Library (DPPL),** which is in fact a collection of generic functions, classes, controls, dialogues, and resources supplied for convenient design and implementation of high-level graphical user interfaces. Whenever possible, the objects of the DPPL are accompanied by their graphic counterparts (icons, button, and other graphic representations). All primitives contained in the DPPL achieve high-level support from the HPPC/SEA-DOMAIN CDCS and the HPPC/SEA-DOMAIN RCDS. And of course they are stored in the HPPC/SEA-DOMAIN DPDB for use in program analysis and test.

APPLICATIONS

Beside of the development of basic software tools, ML Consulting participates in the banking pilot applications based on Neural Network and Expert System technology .

- Marketing application: what kind of banking services to propose for potential clients depending on different information.
- Insurance application: what kind of insurance to propose for clients.
- Credit rating application: credit application scoring on available information
- Risk assessment application
- Fraud detection: on-line fraud detection of credit card use.

The above applications are to be developed together with TSB Bank UK.

International Projects

HPPC/SEA High Performance Parallel Computing/Software Engineering and Application EU-1063 EUREKA project

- 55.000.000 ECU 1993–1996
- 12 participants from Denmark, Hungary, Italy, United Kingdom
- Consortium leader: OLIVETTI Italy
- Goals
    - Realisation of distributed software development tools
    - Development of a multiprocessor transaction server
    - Banking applications
    - Medical applications

International Projects

MOPPS Modelling and Prototyping of a Clinical Support System Copernicus IC-1020 project

- Direct links to the EDITH European Distributed Information Technology for Healthcare ESPRIT project

- Participants
- - LISPA, GESI Italy
- - ÁSSZ, Jósa András Hospital (Nyiregyháza), ML Ltd. Hungary

International Projects

HyNet Hypermedia Networking Copernicus Cop 1249 project

- Development of tools supporting the creation of multi-lingual multimedia databases on Internet

- Participants

    - Ars-Edizioni Informatiche, IT-Software (Italy)

    - Camera di Commercio Italo Romena (Romania)

    - ML Consulting and Computing LTD (Hungary)

HYBRID AI APPROACHES TO
INTELLIGENT MANUFACTURING

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1. INTRODUCTION

In recent years, *artificial networks (ANNs)* were successfully applied for monitoring and modelling of manufacturing processes [2]. The main results of these investigations are the following:
- multisensor integration through ANNs,
- classification of wear states of cutting tools,
- estimation of lank wear,
- incorporation of cutting parameters into the learning and classification phases,
- inverse modelling of the cutting process through neural networks, and
- application of inverse models for tool monitoring.

Investigations confirmed [1] that - similarly to our present conception of biological systems - ANN techniques seem to be a viable solution for the lower level of intelligent, hierarchical control and monitoring systems. Since the higher levels of the control/ monitoring hierarchy require mostly symbolic knowledge representation and processing, the *integration* of symbolic and subsymbolic methods was predicted [1].

Several techniques for integrating expert systems and neural networks have emerged over the past two-three years: *stand-alone models, transformations, loose-coupling, tight coupling* and *full integration* [6]. In the paper a *hierarchically structured hybrid solution* through tight coupling developed mainly for manufacturing applications is described.

2. A HIERARCHICALLY COUPLED HYBRID AI SYSTEM

In the referred project supplied by the European Union, besides the development of neuro monitoring and diagnostic systems on different hardware basis, the *combined use of subsymbolical and symbolical knowledge representing and processing techniques* is attempted. In these hybrid systems, networks' outputs are conveyed to an expert system which provides process control information On the base of accumulated knowledge the hybrid systems influence the functioning of the subsymbolic levels, generate optimal process parameters and inform the user about the actual state of the process.

This *tight coupling* approach has some clear advantages:
- it fits to the monitoring-control hierarchy of manufacturing cells regarding both the form and speed of information processing,
- modular structure enabling and facilitating the use of commercial tools,
- faster development,
- clear interfaces,
- easier integration into existing manufacturing environment.

In the realisation developed in the Computer and Automation Research Institute, Budapest, the *NEURECA* artificial neural network simulator constitutes the lower, subsymbolic level [4]. The higher level is based on the commercially available *GoldWorks III* expert system shell [5]. *GoldWorks* provides frame-level and Lisp-level access to Dynamic Data Exchange files, so *GoldWorks* applications can directly access data in other applications through Microsoft's DDE interface.

Figure 1 illustrates the coupling and functioning of different submodules of the developed hybrid system. This hybrid solution incorporates the *NEURECA* neural network simulator (A) at the lower level and the symbolic part (B) at the higher level which was written using the *GoldWorks III* shell.

These two levels commu-nicate which each other through the Microsoft´s DDE interface (I). Both the symbolic and neural subsystems are connected to the machine tool (the machine tool controller is incorporated). The symbolic part forwards (II) process parameter information (feed rate, depth of cut, cutting speed) to the machine tool (C). The generated indirect signals (e.g. force components, vibration) are measured and conveyed (III) to the subsymbolic part (A) of the hybrid system.

In the figure the machine tool is substituted by a *simulator* of the manufacturing process (called *SIMURECA*), enlightening the test and demonstration of the system.
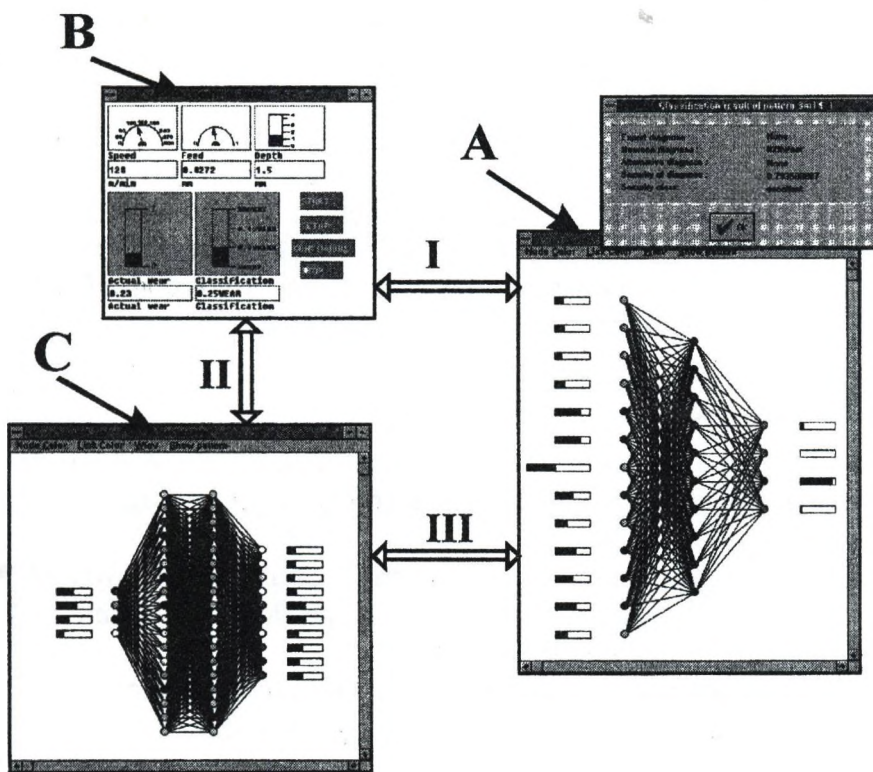

Figure 1
Components of the realised hierarchically structured hybrid AI system

Configuration of the SIMURECA and NEURECA subsystems can be initiated from the symbolic level. Type of manufac-turing (e.g. turning, milling), the signals to be measured (e.g. force, vibration), the number of considered features, and the type of task (classification or estimation) to be fulfilled by NEURECA can be defined. All of the

other tasks (e.g. activation of corresponding signal processing routines, neural networks, communi-cation between the subsystems) proceed automatically. Behind this configuration process there are rules which govern this process.

3. CONCLUSIONS

The paper described the here outlined hybrid AI system, and summarised the first experiences gained by its application in control and monitoring of manufacturing processes. It is expected, the outlined approach, can provide the sufficient framework for the solution of numerous problems in manufacturing, and can contribute to the future realisation of intelligent manufacturing systems.

4. ACKNOWLEDGEMENTS

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MorphoLogic's Linguistic Software Technology and the European Linguistic Infrastructure

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MORPHOLOGIC (established in 1991)
Staff: 7 persons + part-time

Research and development:

☞ morpho-syntactic description system with analyzer and generator
☞ spelling checker and corrector
☞ grammar checker
☞ hyphenator
☞ lemmatiser
☞ inflectional thesaurus
☞ intelligent bi-lingual dictionaries
☞ software tools supporting traslators
☞ syntactic analyser

MORPHOLOGIC's technology supports:

☞ potentially new EU languages (Hungarian, Polish; Rumanian, Bulgarian, Czech, Slovak, Slovenian, Estonian, etc.)
☞ new "Western" languages, like Turkish
☞ new methodology for the computational description of traditionally elaborated languages (English, German, French, etc.)

MORPHOLOGIC's two faces: basic research and profit-orientation

---

Research institution:

☞ doing basic research

☞ scientific publications, talks in scientific conferences

☞ undergraduate and Ph.D. students

☞ participation in Copernicus projects:

3 Joint Research Projects:
GLOSSER (1995-1996)
GRAMLEX (1995-1997)
MULTEXT-EAST (1995-1996)
Concerted Action:
ELSnet goes East (1995-1996)

Language industry:

☞ Customers of MORPHOLOGIC software technology: Microsoft, Lotus, Aldus, InfoSoft, etc.

☞ stand-alone products on the market

☞ industrial partner of ELSnet (European Network in Language and Speech)

MORPHOLOGIC's partners in the areas of the European Linguistic Infrastructure

Application areas

☞ *Multilingual computer services*
Microsoft, Lotus, etc.

☞ *Telematic translation services*
(in prep.)

☞ *Computer-aided language learning*
GLOSSER

Supporting areas

☞ *Linguistic resources*
MULTEXT-EAST

☞ *General linguistic researches*
Linguistics Institute of HAS

☞ *Standards & quality metrics*
GRAMLEX, ELSnet goes East

International Research & Development Activities at IQSOFT

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March 1995

Introduction

IQSOFT is a software house specialising in the area of intelligent systems, database management, office automation and document imaging, The company is actively engaged in international R&D projects, providing a fertile environment for the interaction of research and industrial projects.

IQSOFT was formed in 1990 from the Theoretical Laboratory of SZKI (Computer Research and Innovation Center). Key research staff of IQSOFT have a long tradition of international collaboration. The **logic programming** group has about 15 years of experience in development and application of logic programming languages. This group developed the **MProlog** modular logic programming system, one of the earliest commercial Prolog systems, as well as several applications of Prolog. The MProlog development activities were carried out in close cooperation with several West European and North American companies.

Currently there are three main research directions within logic programming actively pursued by IQSOFT: parallel implementations, knowledge based systems and extensions of logic programming languages.

IQSOFT is also active in R&D in the area of databases and object oriented tools. The company is one of the main providers of relational database technology in Hungary, and is now embarking on a research project exploring the **object oriented** approach to **databases**.

Parallel Logic Programming

The basic research goals within the topic of parallel logic programming include issues of design, implementation and application of logic programming languages for multiprocessor computers. Logic programming offers a unique approach to exploiting parallelism transparently, i.e. without requiring to program the parallelism explicitly.

In 1990 IQSOFT joined the international **Gigalips** collaboration, the main partners of which are the **Argonne National Laboratory** (USA), **University of Bristol** (UK) and the **Swedish Institute of Computer Science**. The initial aim of this project was the development of a prototype parallel implementation of the full Prolog language exploiting or-parallelism. This implementation, called Aurora, has reached a fairly mature stage by now. A more recent direction of research pursued by this project

1

is the development of a new control model for logic programs, the Andorra model, suitable for exploiting both and- and or-parallelism.

Recent work at IQSOFT in this area is focused on Aurora: investigating the extra-logical features of Prolog (such as dynamic database update predicates) in the parallel environment of Aurora, designing higher order extensions to Prolog with the view to parallel execution, and working on making it a full-fledged Prolog implementation. Work is also done in exploring applications of parallel logic programming, for example in the area of computational molecular biology.

Work on the Aurora or-parallel Prolog system and its application is in part supported by the **US-Hungarian Science and Technology Research Fund** (project JP 031/90) as well as by the European Commission through the CUBIQ project (see below). IQSOFT is also active in the "Parallelism and Implementation Technologies" area of the **Compulog Net**, a Network of Excellence sponsored by the ESPRIT Project of the European Commission.

Knowledge Based Systems

IQSOFT has recently completed the development of the **ZEXPERT** expert system shell, in co-operation with **Z-Landerbank Bank Austria AG**, the largest bank in Austria. ZEXPERT contains special features for the support of financial applications, allows a semi-natural language knowledge base description, including both rule-based and procedural formats. A pilot application of ZEXPERT, an advisory system for building loan selection, is to be put to use in the branch offices of Bank Austria later this year.

In 1992 IQSOFT has been awarded one of the first European Commission grants for joint East-West projects. This project, with **City University** (London, UK) and **University of Bristol** (UK), is entitled "**CUBIQ**: Development and Application of Logic Programming Tools for Knowledge Based Systems" (**PECO 92** Project 10979).

The CUBIQ project aims at the development of Prolog tools for knowledge-based systems and at the implementation of prototype applications using these tools. The tool-set helps the creation of knowledge-based systems by providing an integrated environment, featuring frame-based knowledge representation, rule-based reasoning techniques, and facilities for explanation and dependency analysis. New primitives are introduced for handling uncertain knowledge and checking the correctness of their usage. The tool-set includes a novel graphical interface for interaction with the knowledge engineer and the end user. It runs on the Aurora parallel implementation as well as on traditional sequential implementations such as SICStus Prolog.

Extensions of Logic Programming Languages

The logic programming group at IQSOFT has been active in this area for the last decade. In addition to various pioneering extensions within the Prolog implementations developed, work in this area included LDM, a VDM-like language implemented on top of MProlog.

IQSOFT has recently been awarded a European grant to work on extensions of Prolog in a joint project **EXEMPLARY** (Extensions Emphasising Prolog Applications and Reusability, **Copernicus** project CP 94 1025). Partners of IQSOFT in the EXEMPLARY project are **BIM—Belgian Institute of Management**, the **Masaryk**

University of Brno and the **Josef Stefan Institute** of Ljubljana. Work in this project will start in April 1995 and will include research on various language extensions (such as extended DCGs and non-local variables), methodology support and prototype applications.

Object Oriented Technologies

Object oriented technologies have been present in several aspects of IQSOFT activities. IQSOFT developed a class library in SQLWindows and used it in several software projects such as the various information systems for the Hungarian State Holding Company. The ZEXPERT shell includes object oriented elements, and the object oriented approach was in part used in the implementation of the ZEXPERT system itself. In the CUBIQ project attempts are made to integrate some aspects of the logic programming and object oriented paradigms.

With this background IQSOFT recently started the joint project **ADOORE** (Application specific Depositories of Object Oriented Environment, **Copernicus** project CP 94 764), together with the French software firm **Objectif Technologie, Charles University** of Prague and the Czech software company **DCIT**. The aim of the project is to explore the use of object oriented methods and tools in the field of business applications built on the top of a relational database. An important goal of the project is to use object oriented techniques for the whole software life cycle, from analysis through design to implementation itself. The project will develop domain specific class libraries and prototype applications in the field of intelligent business applications.

Conclusions

IQSOFT is involved in several international research projects, with partners from both Western and Eastern Europe as well as from North America. We see significant benefits for IQSOFT received from these collaborative projects, such as:

- new advanced technologies and skills are acquired,
- new tools and libraries are developed with the potential for commercial utilisation,
- prototype applications can form the basis of future products,
- the transfer of research infrastructure (e.g. in networking, software tools, project management) advances the whole company.

On the other hand we believe that such projects are of benefit to the Western partners as well, through e.g.

- valuable feedback from adaptation of tools and products in a new environment,
- experience of using the new technologies in applications,
- (westwards) transfer of scientific results, in areas where the Eastern partner has significant past experience (e.g. logic programming in case of IQSOFT).

Finally we would like to emphasise the importance of electronic communication in all phases and all aspects of such international projects, including the conception of the projects, proposal writing, contract finalisation, joint work, project management, reporting and reviewing. We believe that our research projects would have been almost impossible to set up and maintain without an electronic communication infrastructure.