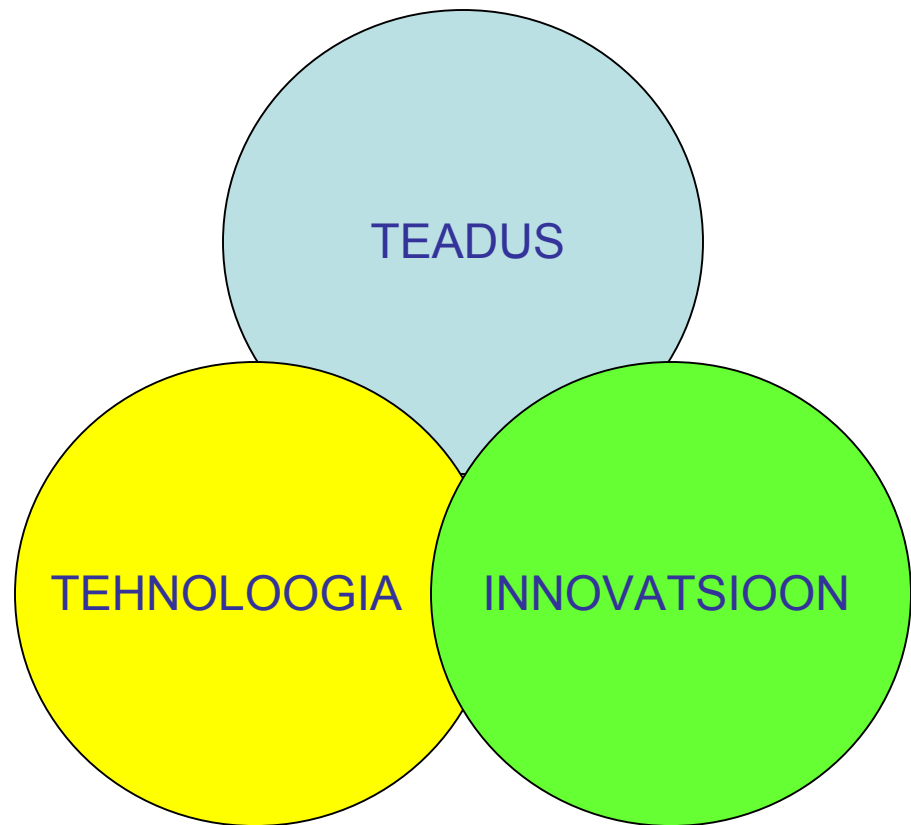


Teaduspoliitikast Eestis – kus me asume maailmas

Mati Karelson

TEADMISTEPÕHINE EESTI



TEADUS



INIMRESSURSS



INFRASTRUKTUUR

KVALITEET

TEADUSARTIKLITE ARV 1995-2006

(1000 el. kohta)



Allikas: ISI Essential Science Indicators

TEADUSARTIKLITE VIIDATUS 1995-2006

(1000 el. kohta)



Allikas: ISI Essential Science Indicators

TEADUS

Lisa 3

Teadus- ja arendustegevuse finantseerimisstrateegia aastatel 1998–2006

Teadus- ja arendustegevuse kulutused²

Näitaja	1998	1999	2000	2001	2002	2003	2004	2005	2006
Teadus- ja arendustegevuse kogukulutused, milj EEK	450,9	572,8	600,0	704,3	815,2	1004,4	1343,1	1735,5	2185,5
Teadus- ja arendustegevuse kogukulutused, % SKP-st ³	0,61	0,76	0,70	0,75	0,80	0,90	1,10	1,30	1,50
Avaliku sektori osakaal teadus- ja arendustegevuse kogukulutustes, milj EEK	360,1	433,3	444,0	549,3	652,2	803,5	1007,3	1301,6	1529,9
Avaliku sektori osakaal teadus- ja arendustegevuse kogukulutustes, %	80	76	74	78	80	80	75	75	70

Teadus- ja arendustegevuse riigieelarveline finantseerimine^{4,5}

	1998	1999	2000	2001	2002	2003	2004	2005	2006
Riigieelarvelised eraldised teadus- ja arendustegevusse, milj EEK	312,5	363,8	370,6	430,9	497,5	614,0	714,0	884,0	1014,0
sh Haridusministeerium	278,0	331,0	329,0	357,3	413,3	430,0	460,0	550,0	600,0
sh Majandusministeerium	30,0	28,0	37,0	61,4	70,0	170,0	240,0	320,0	400,0
sh teised ministeeriumid ⁶	4,5	4,8	4,6	12,2	14,2	14,0	14,0	14,0	14,0

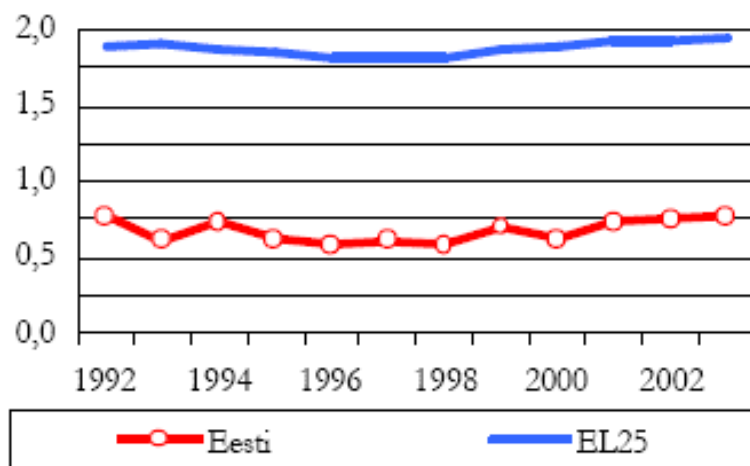
Allikas: Teadmistepõhine Eesti 2002-2006

TEGELIK RE RAHASTAMINE (TAN 14.09.2005)

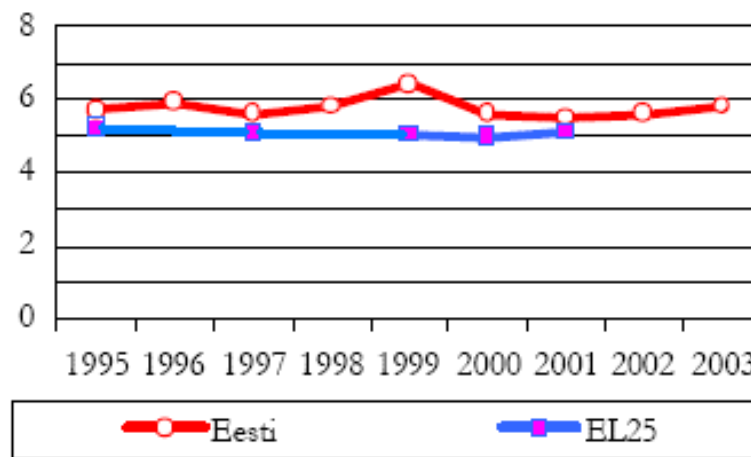
	2005	2006
HTM	582,8	633,6
strateegias	656,4	704,9
MKM	236,0	313,7
strateegias	381,9	470,0
TEISED	54,8	98,3
strateegias	16,7	16,5
KOKKU	873,6	1045,6
strateegias	1055,1	1191,3
SKP %	0,56	0,61
strateegias	0,68	0,70

EESTI JA EUROOPA LIIT

Teadus- ja arendustegevuse kulud



Avaliku sektori kulud haridusele



Allikad: Eesti Statistikaamet, Eurostat.

T&A KULUTUSED SOOMES

Research and development expenditure

	1989	1991	1993	1995	1997	1998	1999	2000	2001	2002	2003	¹⁾ 2004
	€ million											
Business enterprises	924,8	975,1	1 048,5	1 373,4	1 916,7	2 252,8	2 644	3 136	3 284	3 375	3 528	3 434
Public sector ²⁾	286,1	357,5	379,7	374,4	408,6	443,9	470	497	501	530	515	504
University sector ³⁾	290,2	378,0	367,5	424,6	579,5	657,8	765	789	834	926	962	1 017
Total	1 501,2	1 710,6	1 795,8	2 172,4	2 904,9	3 354,5	3 879	4 423	4 619	4 830	5 005	4 955
as % of GDP	1,8	2,0	2,2	2,3	2,7	2,9	3,2	3,4	3,4	3,5	*3,5	*3,3
	%											
Business enterprises	61,6	57,0	58,4	63,2	66,0	67,2	68,2	70,9	71,1	69,9	70,5	69,3
Public sector ²⁾	19,1	20,9	21,1	17,2	14,1	13,2	12,1	11,2	10,8	11,0	10,3	10,2
University sector ³⁾	19,3	22,1	20,5	19,6	20,0	19,6	19,7	17,8	18,1	19,2	19,2	20,5
Total	100	100	100	100	100	100	100	100	100	100	100	100
1) Estimate on the basis of inquiry responses and other calculations 2) Incl. private non-profit sector 3) Incl. central university hospitals and polytechnics * preliminary data												

Source: Statistics Finland, Science and technology statistics

T&A KULUTUSED USA-s

U.S. R&D expenditures, by character of work, performing sector, and source of funds: 2004						
Performing sector	Source of funds (\$ millions)					Total expenditures (% distribution)
	Total	Industry	Federal government	U&C	Other nonprofit institutions	
R&D	312,068	199,025	93,384	11,095	8,565	100.0
Industry	219,226	195,691	23,535	NA	NA	70.2
Industry-administered FFRDCs	2,584	NA	2,584	NA	NA	0.8
Federal government	24,742	NA	24,742	NA	NA	7.9
U&C	42,431	2,135	26,115	11,095	3,087	13.6
U&C-administered FFRDCs	7,500	NA	7,500	NA	NA	2.4
Other nonprofit institutions	12,750	1,199	6,072	NA	5,478	4.1
Nonprofit-administered FFRDCs	2,834	NA	2,834	NA	NA	0.9
Percent distribution by source	100.0	63.8	29.9	3.6	2.7	NA

FFRDC federally funded research and development center

U&C universities and colleges

Allikas: U.S. NSF Science and Engineering Indicators 2006

RIIKLIKUD T&A KULUTUSED USA-s

TABLE 2. Budget authority for research and development, by Federal agency and character of work, proposed levels: FY 2004

Agency	Character of work (millions of dollars)			Discretionary budget authority	Percent R&D as share of discretionary budget
	R&D total	Basic research	Applied research and development		
All Federal Government	118,014	26,862	91,152	782,219	15.1
Department of Defense	62,672	1,309	61,363	379,898	16.5
Health and Human Services	28,108	14,804	13,304	66,195	42.5
National Institutes of Health	26,866	14,801	12,065	27,742	96.8
National Aeronautics and Space Administration	8,543	2,535	6,008	15,469	55.2
Department of Energy	7,559	2,593	4,966	23,376	32.3
National Science Foundation	3,690	3,486	204	5,481	67.3
Department of Agriculture	1,803	819	984	19,503	9.2
Department of Commerce	1,006	391	615	5,406	18.6
National Oceanic and Atmospheric Administration	675	312	363	3,325	20.3
National Institute for Standards and Technology	318	79	239	498	63.9
Department of the Interior	633	38	595	10,587	6.0
Department of Transportation	674	37	637	13,673	4.9
Environmental Protection Agency	607	90	517	7,627	8.0
Department of Veterans Affairs	822	495	327	28,057	2.9
Department of Education	275	1	274	53,137	0.5
Department of Homeland Security	836	47	789	26,697	3.1
International assistance programs	306	58	248	17,039	1.8
Smithsonian Institution	121	121	0	567	21.3
Tennessee Valley Authority	25	NA	25	NA	NA
Department of Labor	10	2	8	11,535	0.1
Nuclear Regulatory Commission	60	NA	60	626	9.6
Corps of Engineers	27	3	24	4,049	0.7
Department of Housing and Urban Development	51	NA	51	31,301	0.2
Department of Justice	106	33	73	17,697	0.6
Social Security Administration	30	NA	30	3,084	1.0
Postal Service	47	NA	47	NA	NA
Department of the Treasury	3	NA	3	11,397	0.0

ALLIKAS: National Science Foundation, Division of Science Resources Statistics, National Patterns of R&D Resources (annual series)

T&A KULUTUSED SINGAPURIS

Year	Total R&D Expenditure (\$m)	Private Sector R&D Expenditure (\$m)	Private Sector R&D Expenditure as % of Total R&D Expenditure	Total R&D Expenditure as % of GDP	Private Sector R&D Expenditure as % of GDP
1990	571.70	309.50	54.14%	0.85%	0.46%
1991	756.80	442.00	58.40%	1.01%	0.59%
1992	949.54	577.62	60.83%	1.17%	0.71%
1993	997.93	618.58	61.99%	1.06%	0.66%
1994	1,174.98	736.23	62.66%	1.09%	0.68%
1995	1,366.56	881.37	64.50%	1.15%	0.74%
1996	1,792.14	1,133.42	63.24%	1.38%	0.87%
1997	2,104.56	1,314.52	62.46%	1.49%	0.93%
1998	2,492.26	1,536.10	61.63%	1.82%	1.12%
1999	2,656.30	1,670.86	62.90%	1.90%	1.20%
2000	3,009.52	1,866.05	62.00%	1.88%	1.17%
2001	3,232.68	2,045.02	63.26%	2.10%	1.33%
2002	3,404.66	2,091.33	61.43%	2.15%	1.32%
2003	3,424.47	2,081.19	60.77%	2.15%	1.31%

ERANDLIK EESTI ?

Nii meie kui Tartu ühine siht on avaldada Eesti otsustajatele survet, et **riigieelarvest** teadus- ja arendustööle eraldatav raha oleks praeguse 0,89 protsendi asemel lähemal Lissaboni strateegias ettenähtud kolmele protsendile.

Allikas: R. Raud, Postimees, 16. mai 2006.

T&A 9% SKP-st !

Kui see saavutada, muutub tekk piisavalt laiaks, et kõik saaksid tegeleda sellega, milles ollakse tugevad, ilma et peaks pisikest pirukat omavahel jagama.

ibid.

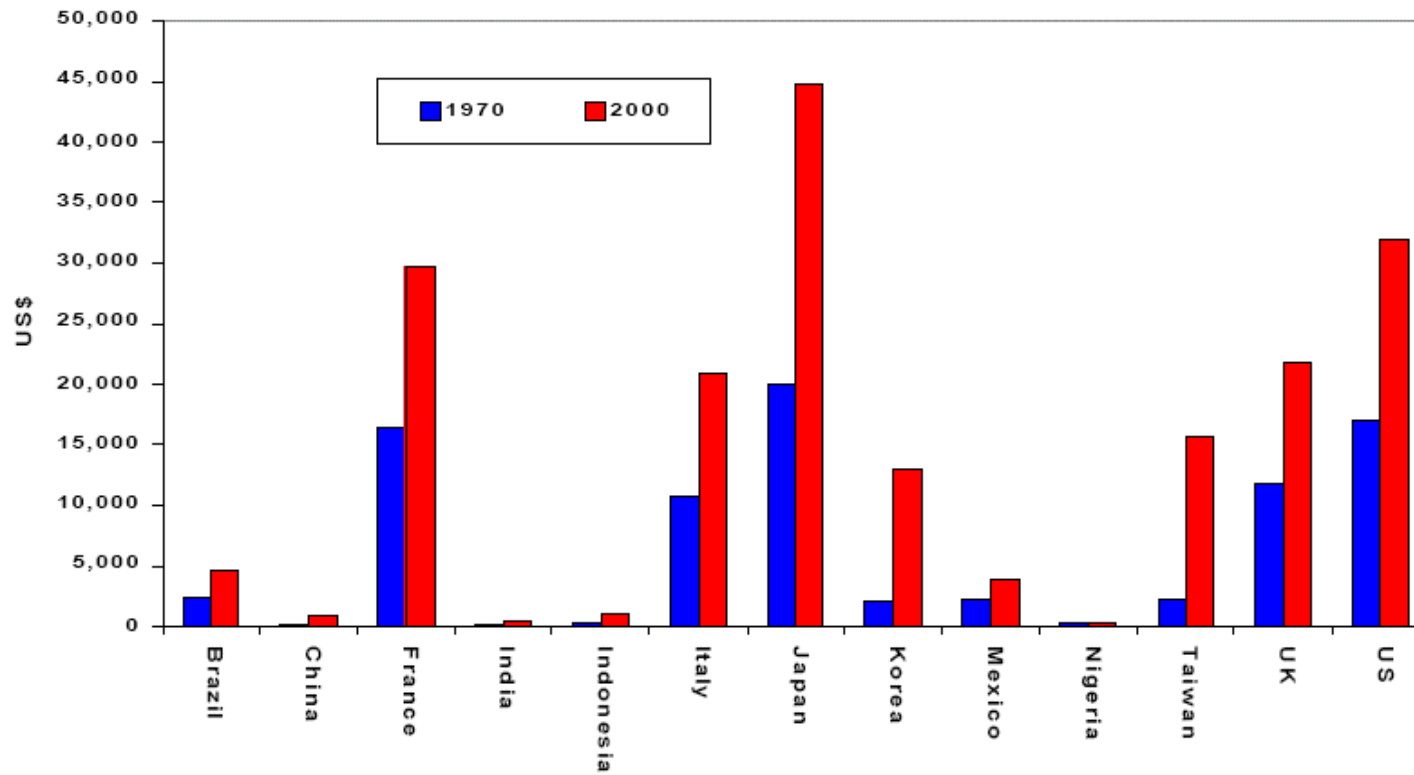
SKP 1 ELANIKU KOHTA (\$1000)



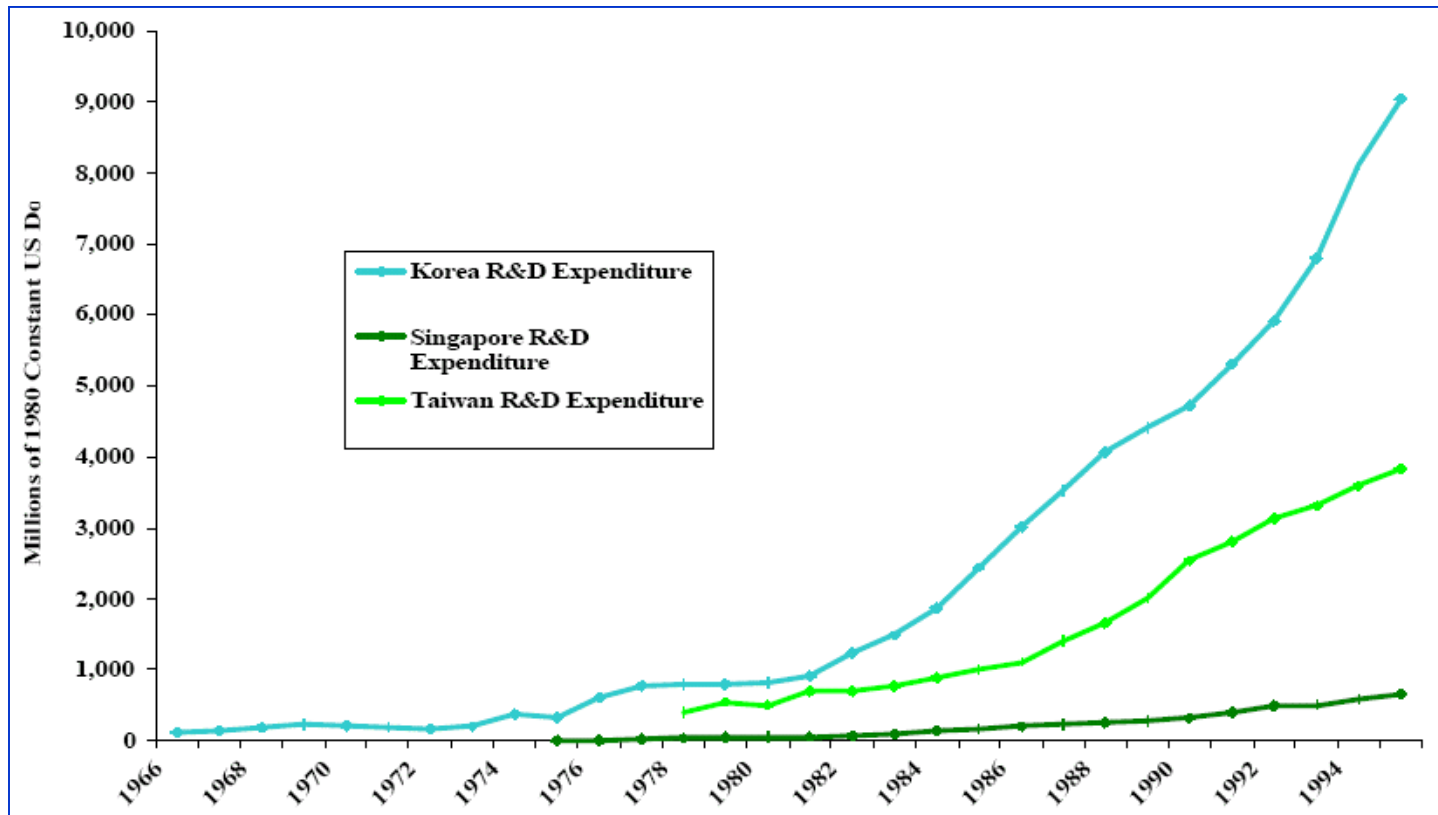
Allikas: CIA - The World Factbook 2004

INNOVATIOON

Real GDP per Capita of Selected Countries and Regions, 1970 and 2000
(1995 US\$)



INNOVATSIOON JA T&A TEGEVUS



INNOVATSIOONIAKTIIVSUS, T&A INTENSIIVSUS JA KONKURENRSIVÕIME (Euroopa Liit, 2000)

Matrix of correlation coefficients for indicators of innovation activity, R&D intensity and competitiveness

R&D expenditure as a percentage of GDP	1					
Patents per head of the population	0.67*	1				
Government R&D expenditure as a percentage of GDP	[n.a.]	0.17*	1			
Business R&D expenditure as a percentage of GDP	[n.a.]	0.75*	0.44*	1		
R&D expenditure in education as a percentage of GDP	[n.a.]	0.25*	0.41*	0.29*	1	
Gross domestic product per capita (ppp)	0.52*	0.54*	0.18**	0.63*	0.27*	1
	R&D expenditure as a percentage of GDP	Patents per head of the population	Government R&D expenditure as a percentage of GDP	Business R&D expenditure as a percentage of GDP	R&D expenditure in education as a percentage of GDP	Gross domestic product per capita (ppp)

* Denotes significance at the 1% level.

** Denotes significance at the 5% level.

Note: [n.a.] denotes not applicable. These correlations are not included because the shares of government, business and education R&D expenditure in GDP are components of the total share of R&D expenditure in GDP. By construction the component shares would be positively correlated with the total share.

Source: Data for 178 regions from 12 European Union member states using all the available regional data from *Regions Statistical Yearbook 1999 CD ROM*, Eurostat, Commission, April 2000.

RIIKLIKUD T&A KULUTUSED USA-s

TABLE 2. Budget authority for research and development, by Federal agency and character of work, proposed levels: FY 2004

Agency	Character of work (millions of dollars)			Discretionary budget authority	Percent R&D as share of discretionary budget
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Social Security Administration	30	NA	30	3,084	1.0
Postal Service	47	NA	47	NA	NA
Department of the Treasury	3	NA	3	11,397	0.0

USA PATENTIDE ARV 1995-2006

(1,000,000 el. kohta)



BRAZIL – 4
MEXICO – 4

Allikas: U.S. Patent and Trademark Office

KAGU-AASIA PATENDID USA-s (elektroonika- ja elektriseadmed)

Top 15 most-emphasized U.S. patent classes for corporations from South Korea and Taiwan: 2003

Rank	South Korea	Taiwan
1	Liquid crystal cells, elements, and systems	Semiconductor device manufacturing process
2	Electric lamp and discharge devices	Electrical connectors
3	Semiconductor device manufacturing process	Electrical systems and devices
4	Dynamic magnetic information storage or retrieval	Circuit makers and breakers
5	Electric lamp and discharge systems	Electric power conversion systems
6	Static information storage and retrieval	Active solid-state devices
7	Brushing, scrubbing, and general cleaning	Typewriting machines
8	Television	Substrate etching process
9	Refrigeration	Sheet-feeding machines
10	Active solid-state devices	Illumination
11	Pumps	Heat exchange
12	Power delivery controls, engines	Cleaning
13	Electrical audio signal systems	Optical image projector
14	Television recording systems	Communication radio wave antennas
15	Electrical nonlinear devices	Facsimile

NOTES: Rank based on patenting activity index for nongovernmental organizations, which are primarily corporations. Patenting by individuals and governments excluded.

SOURCE: U.S. Patent and Trademark Office, Office of Electronic Information Products, Patent Technology Monitoring Division (2004).

Science and Engineering Indicators 2006

SUURIMAD PATENTEERIJAD USA-s (2003.a. andmed)

Company	Patents
2003	
International Business Machines	3,415
Canon	1,992
Hitachi	1,893
Matsushita Electric Industrial	1,774
Micron Technology	1,707
Intel Corporation	1,592
Koninklijke Philips Electronics	1,353
Samsung Electronics	1,313
Sony	1,311
Fujitsu	1,302

SOURCE: U.S. Patent and Trademark Office, Office of Electronic Information Products, Patent Technology Monitoring Division, special tabulations (November 2004).

Science and Engineering Indicators 2006

JÄRELDUS 1

Eestis puudub kõrge T&A mahukusega ettevõtlus

T&A KULUTUSED EUROOPA LIIDUS

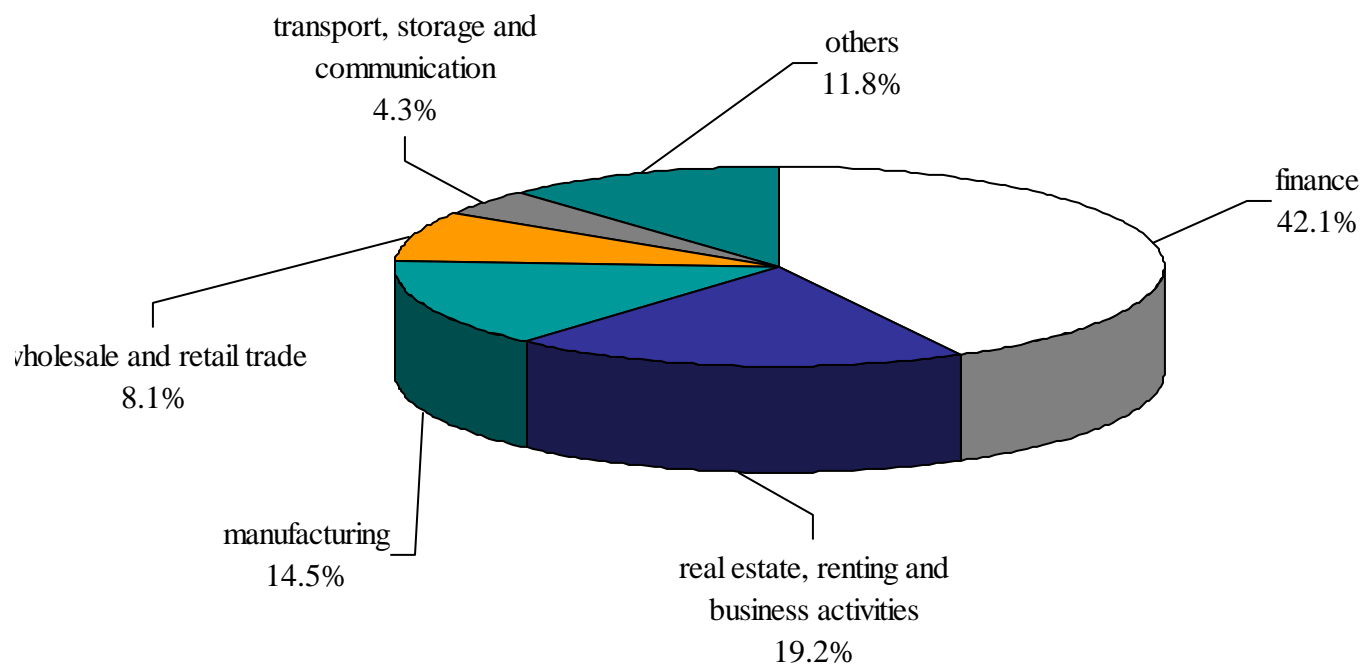
(sektorid)

R&D expenditures in the EU per sector, 2003

Sector	R&D intensity (% of sectoral value added)	Share of total R&D expenditures
Agriculture	0.9	1.1
Energy	1.8	1.8
Low tech manufacturing	0.7	2.7
Medium-low tech manufacturing	1.9	3.5
<u>Medium-high tech manufacturing</u>	<u>12.9</u>	<u>60.0</u>
<u>High tech manufacturing</u>	<u>21.1</u>	<u>21.3</u>
Transport services	0.2	0.5
Other commercial services	0.3	5.9
Other services	0.3	3.2
R&D	0.0	0.0
Total	2.0	166.5 (billion)

Sources: Eurostat Cronos database, and OECD ANBERD database

OTSESED VÄLISINVESTEERINGUD EESTISSE (FDI) (seisuga 31.03.2005)



Allikas: Eesti Pank

JÄRELDUS 2

Eestis puuduvad vajaliku tasemega (PhD)
spetsialistid ettevõtluses

MIKS ?

“VÄIKESTE ARVUDE SEADUS”

EESTI TEADLASTE TÖÖDE VIIDATUS 1995-2005

TOP teadlased	Viiteid	Osakaal (%)
25	19,359	44 %
50	27,374	63 %
75	32,510	74 %
100	35,468	81 %
KOKKU	43,848	100 %

Allikas: R. Villems

TEADMISTEPÕHINE EESTI PRIORITEEDID

- kasutajasõbralikud infotehnoloogiad ja infoühiskonna areng
- biomeditsiin
- materjalitehnoloogiad

PRIORITEEDID ?

EESTI
TEADUSFOND

EELARVE 2005 - 91 175 000 krooni

673 GRANTI

KESKMINE GRANT (P/A) – 7827 €

TEADUSKOMPETENTSI
NÕUKOGU

EELARVE 2005 - 230 450 000 krooni

244 TEEMAT

KESKMINE TEEMA (P/A) – 60350 €

TEADUSE BAASFINANTSEERIMINE 2005

64 406 000 krooni

RIIKLIKUD PROGRAMMID 2005

63 440 000 krooni

FOOKUS ?

T&A kulutuste valdkondlik jagunemine aastatel 1996 ja 2003 (mln kr ja %)

	Loodus- teadused	Tehnika- teadused	Arsti- teadus	Põllumajandus- teadused	Sotsiaal- teadused	Humanitaar- teadused
1996	111,0 (37,2%)	76,3 25,5%	32,7 11,0%	24,4 8,2%	26,0 8,7%	28,1 9,4%
2003	234,3 33,9%	144,5 20,9%	77,8 11,2%	62,8 9,1%	82,0 11,9%	90,7 13,1%



IIRI TEADUSFOND

RAHASTAB VALDKONDI: 1. Biotehnoloogia
2. Info- ja kommunikatsioonitehnoloogia

RAHASTAMISE MAHT: 646,000,000 € (2000-2006)

SFI Projects approved by year to end January 2004

Year Approved	Award	Area	Title	Forenames	Surname	Research Body	Original Institution	Research programme title	Duration (months)	Amount approved
2004	Investigator	ICT	Prof.	Kevin	Ryan	University of Limerick	University of Limerick	Foundations, Technologies and Context for Global Software Development	48	€3,969,968
2004	Investigator	BioT	Prof.	Robert	O'Neill	University College Dublin	University College Dublin	New Technologies for Monitoring Cell Signalling in the Living Brain: Design, Characterisation and In-vivo Application to Study Extracellular Glutamate, Energy Metabolism & Their Relationship	48	€510,047
2004	Investigator	BioT	Prof.	Brian	MacCrath	Dublin City University	Dublin City University	Biomedical Diagnostics Group	48	€5,626,390
2004	Investigator	BioT	Dr	Amir	Khan	Trinity College Dublin	Trinity College Dublin	Structural Basis for the Specificity & Function of RAB Effector Proteins	48	€780,892
2004	Investigator	BioT	Dr	Max	Dow	University College Cork	UCD as ETB Walton visitor from John Innes Centre, Norwich, UK	Cyclic-GMP Signalling and the Environmental Regulation of Virulence Factor Production in Bacterial Pathogens of Humans and Plants	48	€955,424
2004	Investigator	BioT	Dr	Paul V.	Murphy	University College Dublin	University College Dublin	Towards Novel Glycoconjugate Based Therapeutics for Angiogenesis	48	€824,752
2003	Investigator	ICT	Dr	Christof	Wunderlich	NUI Maynooth	University of Hamburg	Development of Quantum Memory Using Microwave Manipulated Quantum Bits in Ion Traps	48	€3,295,900
2003	CGET	ICT - Multi	Prof.	John B.	Fetlica	Trinity College Dublin	University of Oxford, UK	Centre for Research on Adaptive Nanostructures and Nanodevices (CRANN)	60	€9,999,600
2003	Co-Investigator 10.1	ICT	Prof.	Douglas J.	Leith	NUI Maynooth	University of Bath/olyde UK	National Communications Network Research Centre	48	€4,669,571
2003	Co-Investigators 10.3	ICT	Prof.	John	Nelson	University of Limerick	University of Limerick			€0
2003	Research Infrastructure	ICT-Multi	Nanotechnology Research Facility			Trinity College Dublin	N/A	Construction of Specialised Laboratory for Nanoscience Research - CRANN	12	€11,000,000
2003	Co-Investigator 9.1	BioT	Prof.	Claran	Regan	University College Dublin	University College Dublin	Irish Centre for Applied Neurotherapeutics	48	€7,674,274
	Co-Investigators 9.2	BioT	Prof.	Peter	Humphries	Trinity College Dublin	Trinity College Dublin		48	€0
	Co-Investigators 9.3	BioT	Dr.	Keith	Murphy	University College Dublin	University College Dublin		48	€0
	Co-Investigators 9.4	BioT	Dr.	William	O'Connor	University College Dublin	University College Dublin		48	€0
2003	CGET	BioT	Prof.	Timothy	O'Brien	NUI Galway	NUI Galway (prev. Mayo Clinic, USA)	Regenerative Medicine Institute (REMEDI)	60	€14,998,960
2003	Research Infrastructure	ICT	Photonics Research Facility			University College Cork	N/A	Construction of specialised laboratory for Photonic Systems Research	48	€4,484,066
2003	Investigator	BioT	Prof.	Timothy J.	Foster	Trinity College Dublin	Trinity College Dublin	Functional analysis of novel surface proteins of <i>Staphylococcus aureus</i>	48	€905,619
2003	Investigator	BioT	Prof.	Gregory	Atkins	Trinity College Dublin	Trinity College Dublin	Construction and development of a new prototype measles-mumps-rubella vaccine based on recombinant RNA	48	€694,073
2003	Investigator	BioT	Prof.	Martin	Olynes	Dublin City University	Dublin City University	Understanding & Exploiting Gene Expression Profiles of Cultured Animal Cells in Order to Develop Improved Biopharmaceutical Production Processes	48	€3,990,000

EESTI RIIKLIKUD PRIORITEEDID 2005-2007.a.

TEADUSE TIPPKESKUSED (10) – 34,200,000 krooni 2005.a

TEADUSE TK INFRASTRUKTUUR – 100,000,000 krooni (2005-2007)

DOKTORIKOOLID () - ... krooni 2006.a

TEADUSE INFRASTRUKTUURI PROGRAMM – 230,000,000 krooni 2006.a

TEHNOLOOGIA ARENDUSKESKUSED (5) – 59,297,156 krooni 2005.a

KRITEERIUM : TEADUSLIK TASE
OSALEJAD: \approx 100% EESTI TEADLASED

EESTI T&A JA RAHVUSVAHELISTUMINE

(mõtiskluseks)

25 MAAILMA TOP 2000 TEADLAST OMA ERIALAL (2...3)
5-AASTANE LEPING

AKTIVA: 10.a. VIIDATUS á +1500 (1548) KOKKU ca 40,000 (2x)

á 10 UUT DOKTORIT ANTUD ERIALAL (7) - KOKKU 250 (3 ... 5x)

IGALT UUELT DOKTORILT 1 U.S. PATENT – KOKKU 250 (30 x)

PASSIVA: 100,000 € TÖÖJÕUKULUD P/P P/A

100,000 € PÜSIKULUD P/P P/A

KOKKU: 25 x 200,000 € = 5,000,000 € P/A (7% 2006.a RE T&A)

EESTI T&A PRIORITEEDID

(mõtiskluseks)

- RESSURSI (KESKKONNA) SÄÄSTLIKKUS
- TERVED INIMESED = TERVE RAHVAS
- RIIGI JA RAHVUSE KESTMINE

Index of Economic Freedom Rankings 2005

- | | |
|-------------------|---------------------|
| 1. Hong Kong | 23. Lithuania |
| 2. Singapore | 28. Latvia |
| 3. Luxembourg | 30. Norway |
| 4. ESTONIA | 33. Czech Republic |
| 5. Ireland | 35. Hungary |
| 7. UK | 36. Slovak Republic |
| 8. Denmark | 39. Japan |
| 12. USA | 41. Poland |
| 14. Sweden | 112. China |
| 15. Finland | 124. Russia |
| 18. Germany | |

Source: Wall Street Journal; The Heritage Foundation

TÄNAN !