Path-breaking Research in the Pulp and Paper Industry, the Roles of Science, Government and Industry [Case Finland]

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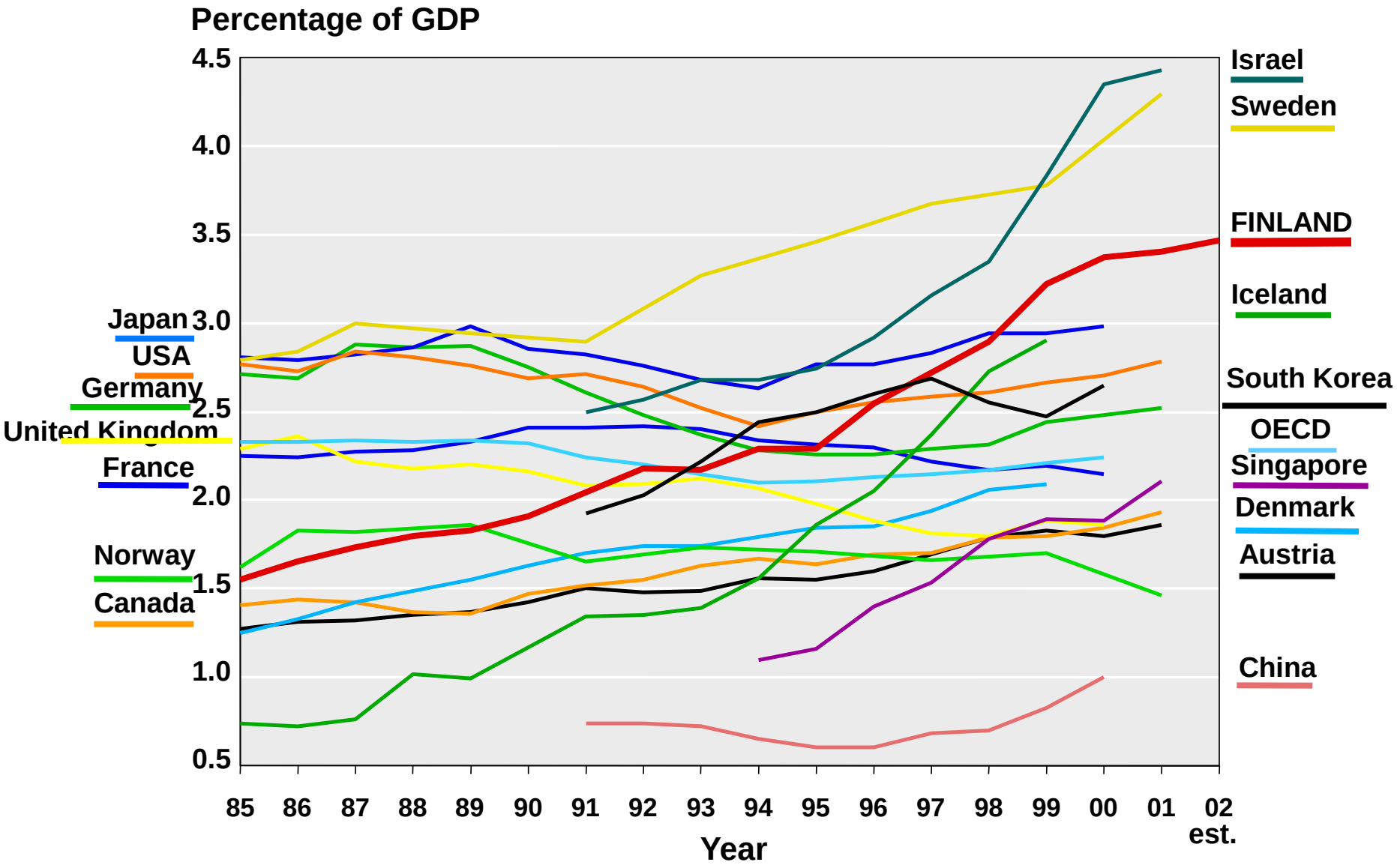
Definition of Path-breaking

Characterized by originality and innovation; pioneering.

Source: *The American Heritage® Dictionary of the English Language, Fourth Edition, Copyright © 2000 by Houghton Mifflin Company.*

R&D input in some OECD countries



What do you get as a nation with your R&D?

Plenty of scientific articles

New competences that are used to build new businesses and provide better products, processes and services, i.e. one is capable of turning R&D to better decision making, and through that, to national wealth

Definition of Relative R&D Intensity

$$\text{R\&D Intensity} = \frac{\text{R\&D Expenditure}}{\text{Annual Turnover}}$$

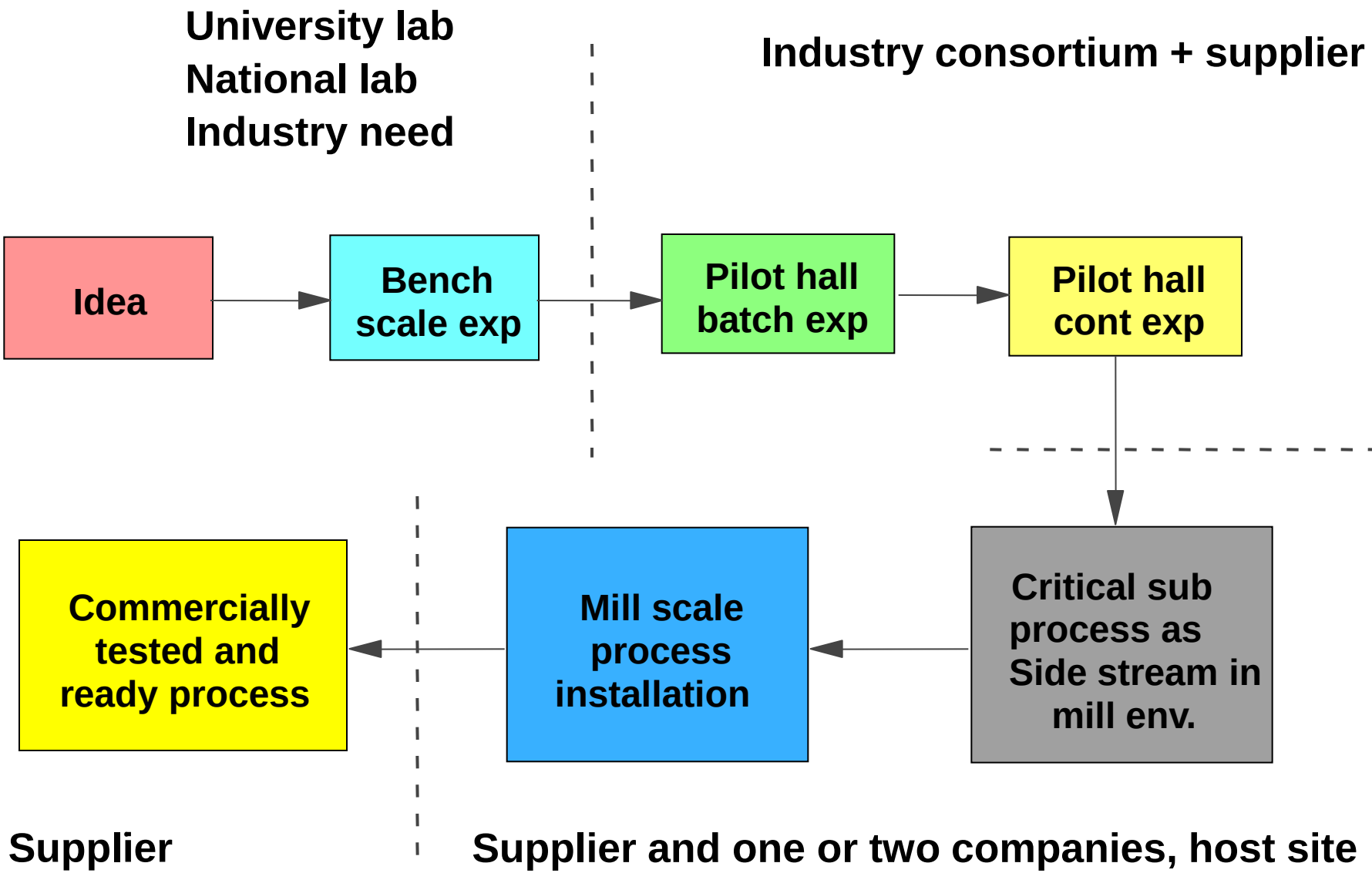
Definition of Low Tech, High Tech and In between Industries

Industry type	R&D as % of turnover
High Tech	> 4
Low Tech	< 1
"In between", or Medium Low or Medium High Tech	1 ↔ 4

Special characteristics of innovation in low tech and high tech industries

	Low tech industry	High tech industry
Competition criterion	price/quality	innovation
R&D intensity	low	high
Patenting	low	high
Innovation focus	process ("product")	product
Scale of innovation	incremental	fundamental
Source of innovation	Information already available in other areas	self (in co-operation) searched new information
Type of knowledge	tacit	practical, codified
Type of learning	learning by using	searching, exploring
Co-operation	customer - producer	university - producer
Skills and competencies	Practical knowledge + skills	theoretical knowledge + cognitive skills

Specifics of new process development



Key Questions?

How does one ensure that a sufficient Amount of properly focused (applied) basic research is carried out for the future of the pulp and paper industry?

Who should be doing that research?

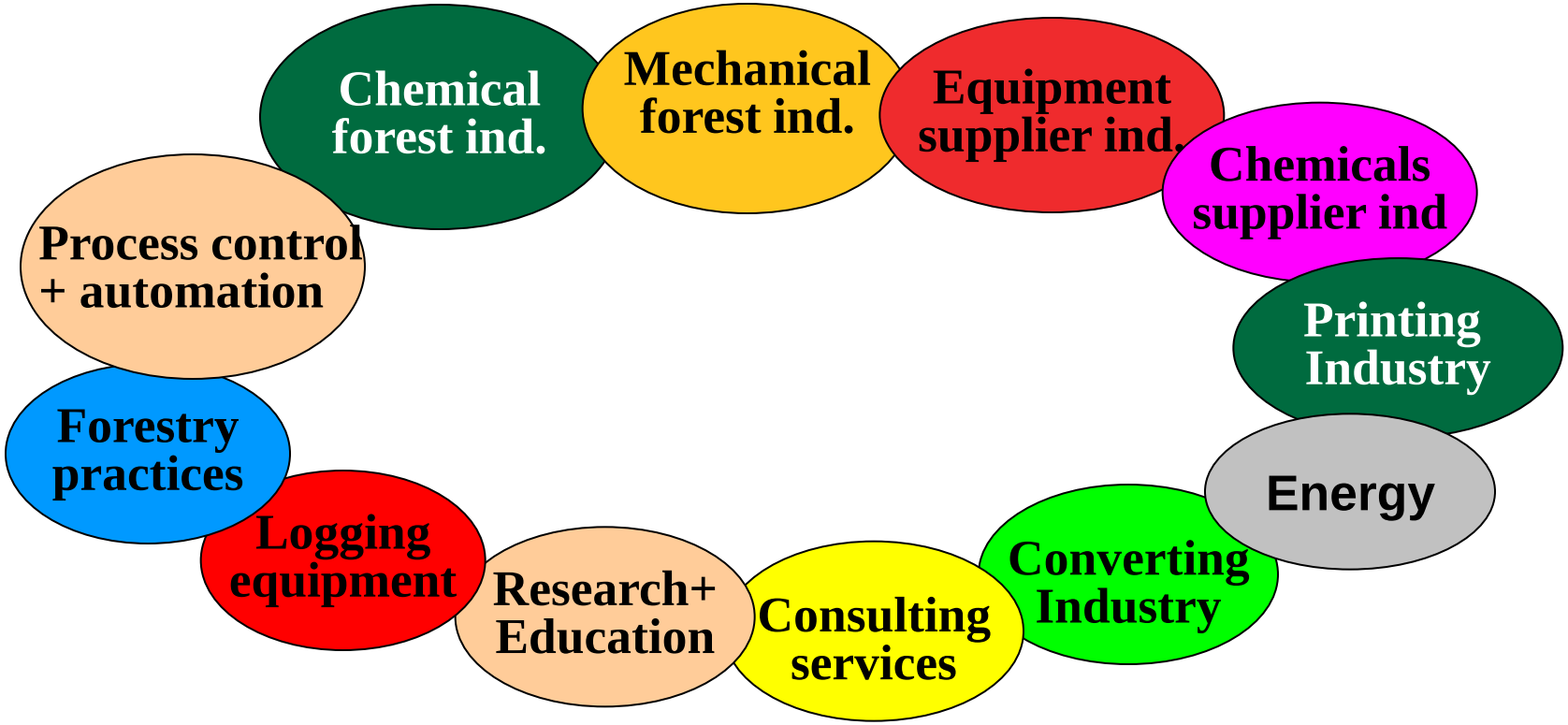
Distribution of MWP according to the role of recognition

Type of recognition	Forests & Forestry	Mechanical Forest Industry	Chemical Forest Industry
New theoretical understanding	5	3	3.5
New (revolutionary) practical discovery	2	1	5.5

Comparison of Pulp & Paper Industry related developments in Finland and Sweden

	Finland		Sweden	
Category	**1970**	**2001**	**1970**	**2001**
Pulp production, Mt/a	**6.2**	**11.2**	**8.2**	**11.0**
Paper production,Mt/a	**4.3**	**12.5**	**4.4**	**10.5**
Consulting activity	Pöyry, Ekono	Pöyry, PI, CTS	ÅF. IVL, Pöyry NLK (Celpap)	Pöyry, ÅF-IVL
Machinery suppliers	**Valmet, Tampella Ahlström, Wärtsilä (P&P firms had own mach. comp.)**	**Metso, Kvaerner Andritz,Vaahto**	**KMW, Sunds Defibrator, Udde-valla verkst.** BTG	**Metso**
Chemical suppliers	**Kemira, Oulu, Raisio, others**	**Raisio, Kemira**	**KemaNord, EKA, AGA, Dow, others**	**EKA-Chem. (Akzo-Nobel), BIM**
Harvester mfrs	**Lokomo, Valmet, Farm.tractor modif.**	**Timberjack, Ponse Valmet (Kone)**	**Volvo BM, Ösa, Kockum, Farming .tractor modficat.**	**~~Timberjack,Deere~~ Valmet (Kone), Rotne**
Joint central research	KCL, VTT	**KCL,VTT, Län-nen laboratorio**	STFI, YKI,IVL Packforsk	STFI, YKI
Joint marketing	yes	no	no	no
Prod. cap. (P&P) M.+D.Sc./a	35 / 4-5	110 / 25	15/0	60/12
Globalisation in P&P	**Nordland, Star, Kitimat, Tivoli**	**3 firms are among the 12 big ones**	**Stora, SCA**	SCA

The Finnish Forest Industry Cluster



Possible reasons for fast growth of Finland based paper industry

- Education and technology resulting from it.
- Co-operation practices in marketing, research, financing arrangements and with suppliers. In other words, the efficient utilisation of home ground advantages within the forest industry cluster especially in the 1970s and 1980s.
- Understanding of the role of forest industry in the national economy by the government and the respective authorities.
- Sweden has had more important industries than the forest industry to look after.

National P&P technology programs during the past 15 years

Finland

- Functional paper 13 M€
- Pulping "package" 10 M€
- Sytyke (Environm.) 3 M€
- Carboh. & process ind. 3 M€
- Fibre (energy savings) 7 M€
- Web (energy savings) 10 M€
- Sustain. paper (energ.) 20 M€
- Electronic printing 12 M€
- Cactus (low water cons.) 16 M€
- Wood Wisdom 33 M€
- Pigments as raw material 4 M€

Total 141 M€

Out of this TEKES has paid about 60 – 70 %

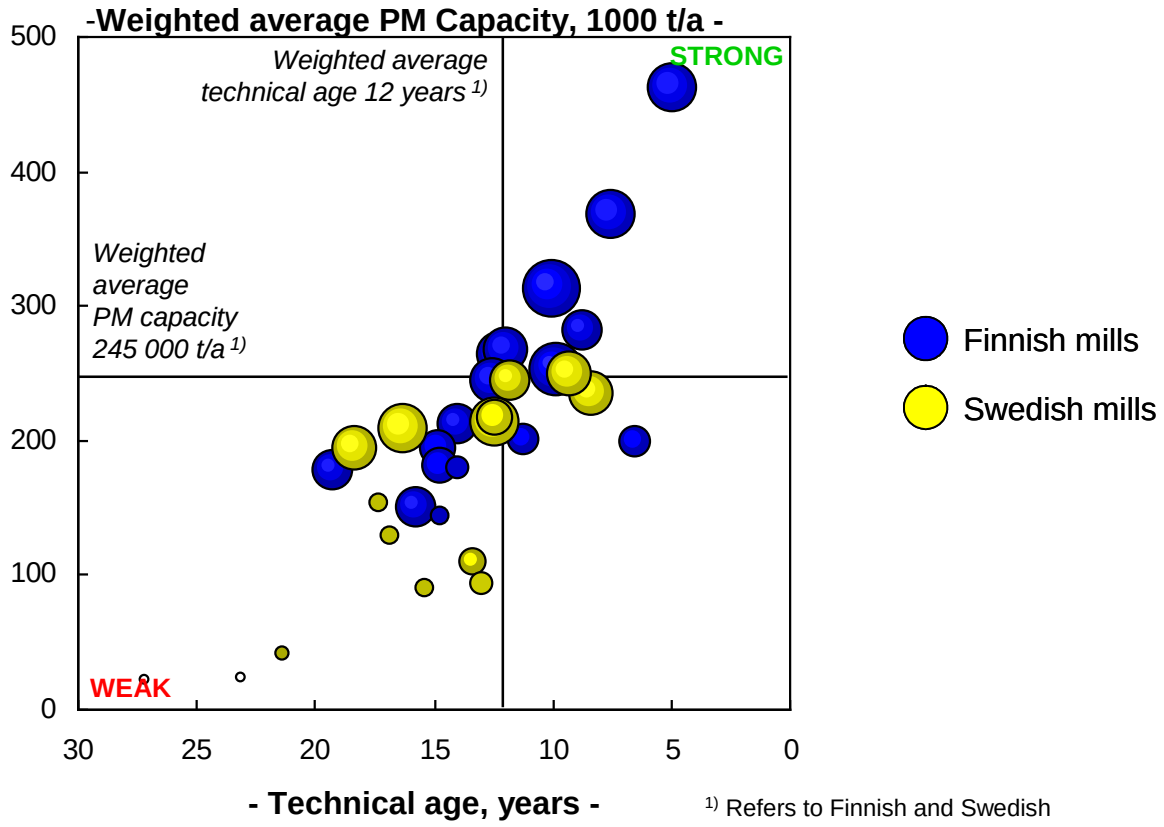
Sweden

- NSP ??
- KAM I 11 M€
- FRAM 5.5 M€
- WURC 1 M€/a
- BiMaC (2002 – 2007) 8 M€
- Black Liquor Gasific. >5 M€
- Faxen hydrodynamics
- Start up support to Karl-stadt and MidHögskola
- SSVL (environment)

Total < 50 M€

Industry structure by mill

Graphic papers – Finland and Sweden



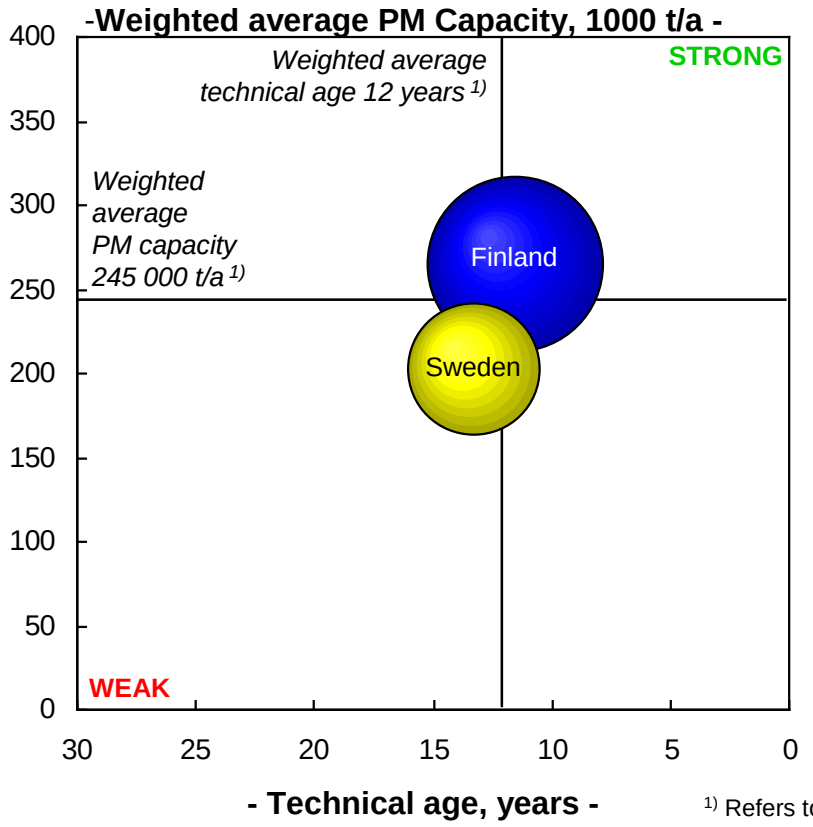
[1] Refers to Finnish and Swedish graphic paper industry

Size of the bubble reflects the mill's relative graphic paper capacity

JAAKKO PÖYRY
Jaakko Pöyry Consulting

Industry structure by country

Graphic papers – Finland and Sweden



[1] Refers to Finnish and Swedish graphic paper industry

Size of the bubble reflects the country's relative graphic paper capacity

JAAKKO PÖYRY
Jaakko Pöyry Consulting

Quotations from an enterprise seminar at Helsinki University of Technology in Febr. 10, 1994.

Tekniikka ja Talous newspaper in Febr. 17, 1994

"With the present R&D input of the Finnish forest industry we should be the best! Why are we not"? Chairman of Kymmene's Board, Mr. Casimir Ehrnrooth in Otaniemi

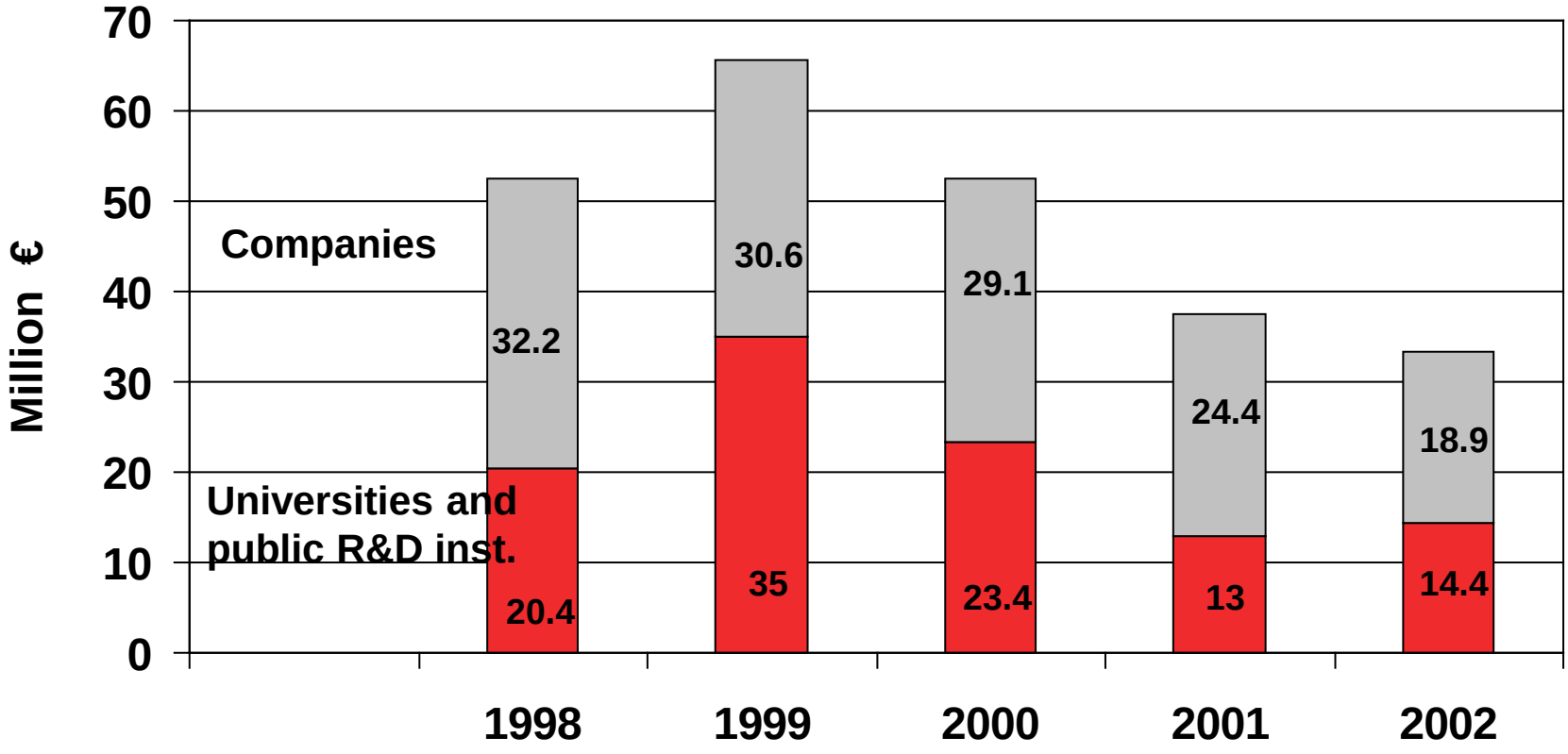
Suomen metsäteollisuuden nykyisellä tutkimuspanoksella meidän pitäisi olla parhaita. Miksi emme kuitenkaan pärjää paremmin?"

Kymmenen hallituksen puheenjohtaja Casimir Ehrnrooth Otaniemessä 10.2.

Estimated R&D Input by the Finnish Forest Industry Cluster in 2001

	R&D budget M€	Contri-bution by TEKES, M€	No. of projects
Pulp and paper industry companies	**100**	**4.0**	**11**
Wood products companies	**15**	**3.0**	**37**
Equipment supply companies	**100**	**11.0**	**35**
Automation, instrument.+ process control	**10**	**1.4**	**10**
Chemical supplier companies	**10**	**2.0**	**8**
Industry dedicated research labs + others	**Included al-ready in ind.**	**2.9**	**4**
VTT and other public labs + universities	**17**	**13.4**	**21**
TOTAL	**252**	**38.7**	**116**

TEKES funding to the Finnish forest industry cluster in 1998 - 2002



Conclusions

- Governments seem to have forgotten the important role that the traditional basic industries – including pulp and paper industry – provide to the national wealth. There is not sufficient seed money for path-breaking research.
- Universities are expected to carry out much of the basic research. Thus they are responsible for contributing seeds to new products and/or new processes in the pulp and paper industry. In order to do that better they need reinforcement to their scientific personnel.
- The pulp and paper companies need to integrate long term strategic research into their strategic and scenario planning. The technology strategy and the business strategy must be clearly linked together. All strategic R&D does not have to be done by the company itself; it can be outsourced or carried out with suitable partners.

Proposal

- Marcus Wallenberg Foundation establishes another prize.
- Marcus Wallenberg Research Recognition Award
- It would be awarded to such a CEO, COO, or Executive VP who has fostered, supported and effectively utilized results of long term (applied) basic research during the past 3 to 5 years period.
- A selection committee will evaluate the applications and make the recommendation to the Foundation.
- The purpose of this award is to activate strategic long term research in the minds of the top management of the pulp and paper companies.