

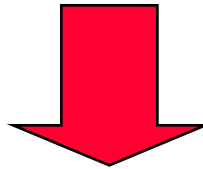
Små, høyteknologiske foretak i kunnskapsøkonomien

Olav R. Spilling
ESBRI 23.11.2004

- 1. Introduksjon: roller for små foretak**
- 2. Kunnskapsøkonomi og høyteknologi**
- 3. Case Oslonett – kommersialisering av Internett**
- 4. Små høyteknologi-foretak og evolusjonære prosesser**
- 5. utfordringer i kunnskapsøkonomien**

Roller for små foretak?

- Økende betydning i omfang siden 1970-tallet – strukturelt 'shift' i økonomien?
- Betydning for 'job generation'
- Betydning for dynamiske prosesser
- Betydning for desentralisering

































Små foretak har komplementære roller i forhold til de store

I hvilken grad representerer små foretak drivkrefter i utviklingen?

Evolution in three high-tech milieus

Relates to the early stages

-  Very important
-  Of some importance
-  Not important

Factor	Cambridge	Sophia Antipolis	Dublin
Initial conditions	University traditions Living conditions	Living condition 'Vacant space'	Cheap, qualified labour EU; English speaking popl
Triggering factors	Cambridge university Local planning	IBM and Texas Instr. Com. entrepreneur	National policy Attracting MNCs
Role of university			
R&D Institutions			
Science parks and innovation centres			
Large firms, multinationals			
Local entrepreneurs			
Small firms			
Venture capital			
Local policy			
National policy			

2. Kunnskapsøkonomi og høyteknologi

Innovation Systems - Knowledge Economy

Lundvall 1992:

Innovation system: constituted by elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge

Key focus: Knowledge

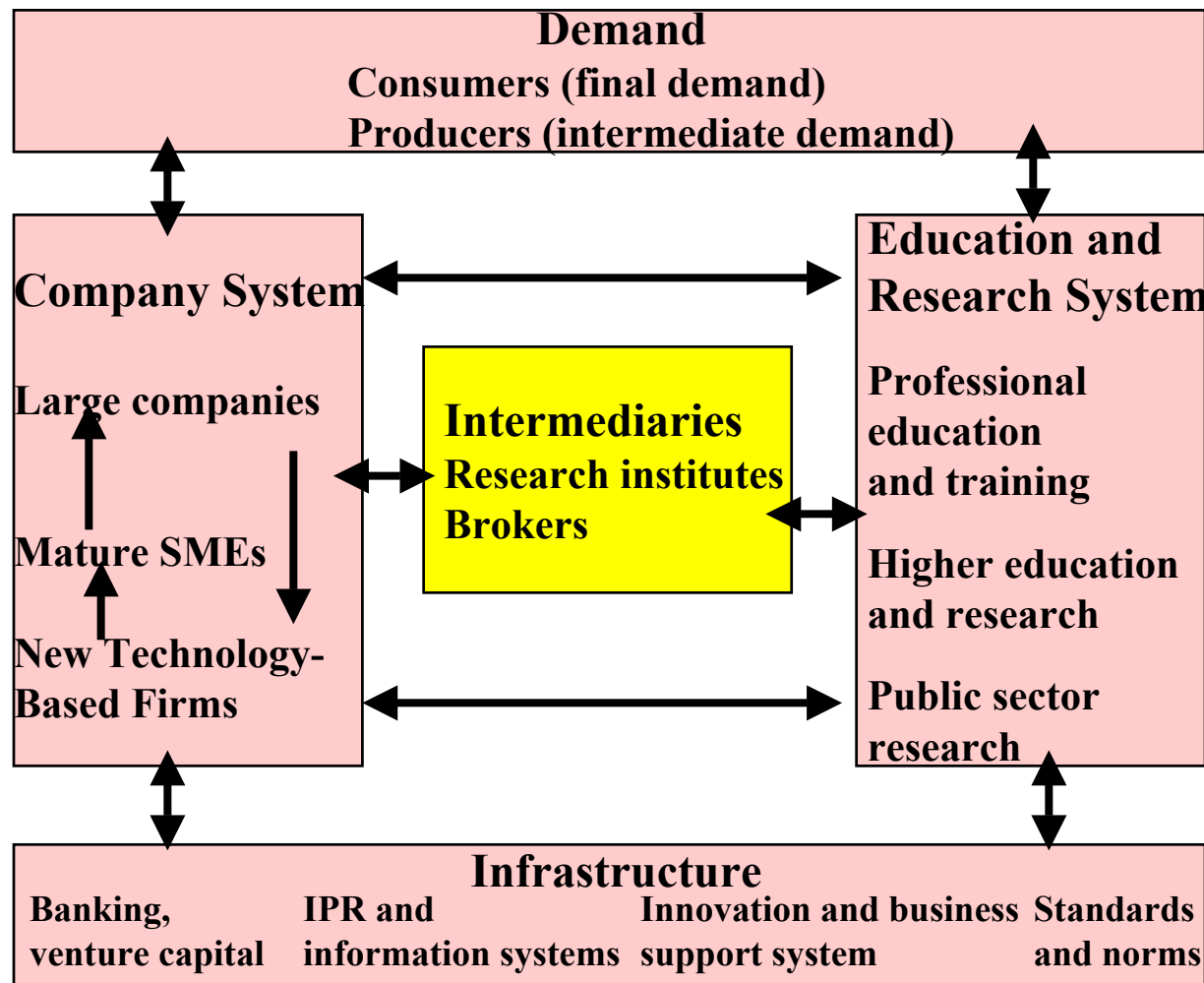
Knowledge is the most important resource in the economy

Learning is the most important process

Performance of innovation systems:

”effectiveness in producing, diffusing and exploiting economically useful knowledge”

The Innovation System – the OECD model (2002)



Framework Conditions
Financial environment

Taxation and incentives

Propensity to
innovation and
entrepreneurship

Mobility

Functions in the Knowledge Economy

**Produce
knowledge**

**Diffuse
knowledge**

**R&D
(Research &
Development)**

Education

**Exploit
knowledge
economically**

Industry

Definition of High Technology

Segal, Quince, Wicksteed (1998): A chaotic concept

Porter (1998): There is no such thing as a low tech industry, only low tech companies

Butchart (1987):

“no one doubts the significance of the high technology industries”

Indicators for high tech industries:

- **the R&D intensity**
- **proportion of scientists, professional engineers and technicians in the workforce**

Originally restricted to manufacturing

Recent analyses also include services

High Technology

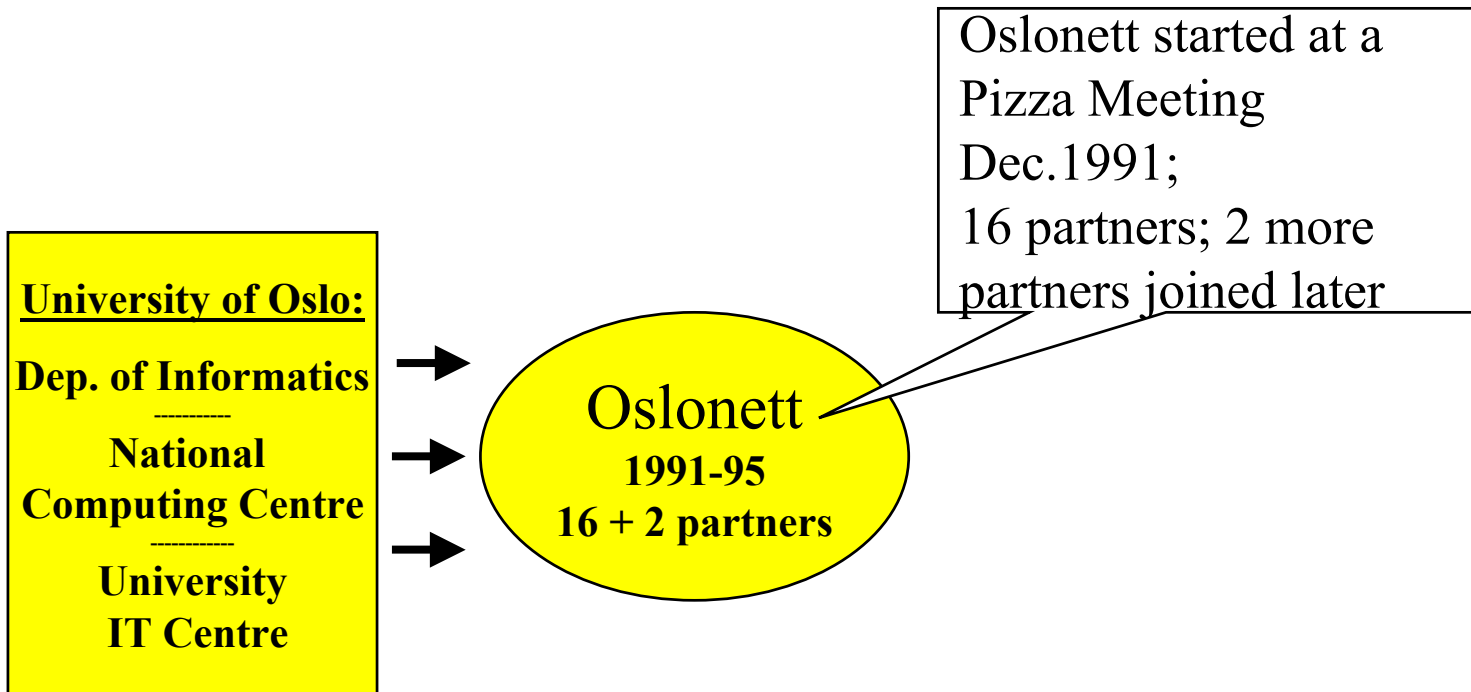
Nace 2	Detailed classification
24	24.13 Manufacture of other inorganic basic chemicals
	24.14 Manufacture of other organic basic chemicals
	24.16 Manufacture of plastics in primary forms
	24.4 Manufacture of pharmaceuticals, medicinal chemicals and botanical products
30	30 Manufacture of office machinery and computers (whole group)
31	31.2 Manufacture of electricity distribution and control apparatus
	31.6 Manufacture of electrical equipment n.e.c.
32	32 Manufacture of radio, television and communication equipment and apparatus
33	33.1 Manufacture of medical and surgical equipment and orthopaedic appliances
	33.2 Manufacture of instruments and appliances for measuring, checking etc
	33.4 Manufacture of optical instruments and photographic equipment
35	35.3 Manufacture of aircraft and spacecraft
51	51.64 Wholesale of office machinery and equipment
52	52.485 Retail sale computers, office equipment and telecommunication equipment
64	64.2 Telecommunications, except 64.201 'chat lines'
72	72 Computer and related activities (whole group)
73	73.1 Research and experimental development on natural sciences and engineering
74	74.209 Other technical consultancy work
	74.3 Technical testing and analysis

3. Oslonett

Da Oslonett ble etablert i 1991, var dette det første forsøk på kommersialisering av Internett i Norge. Her er beskrevet den prosessen som fulgte etter denne etableringen.

Eksemplet viser hvordan kommersialisering av ny teknologi skjer i et komplisert samspill mellom ulike aktører, og der små foretak har ulike roller i samspill med større foretak.

Oslonett – Norway's first Internet company



The "Pizza Gang" 1991-2001



Steinar Kjærnsrød



Yngvar Berg



Hans Petter Holen



Kjell Øystein Arisland



Otto Milvang



Erling Maartmann-Moe

Steinar Kjærnsrød
 Yngvar Berg
 Hans Petter Holen
 Arne Kinnebergbraaten
 Leif Arne Neset
 Sigbjørn Næss



Kjell Øystein Arisland
 Otto Milvang
 Erling Martmann Moe
 Tor Sverre Lande
 Gisle Hannemyr
 Tore Solvar Karlsen



Arne Kinnebergbraaten



Leif Arne Neset



Sigbjørn Næss



Tor Sverre Lande



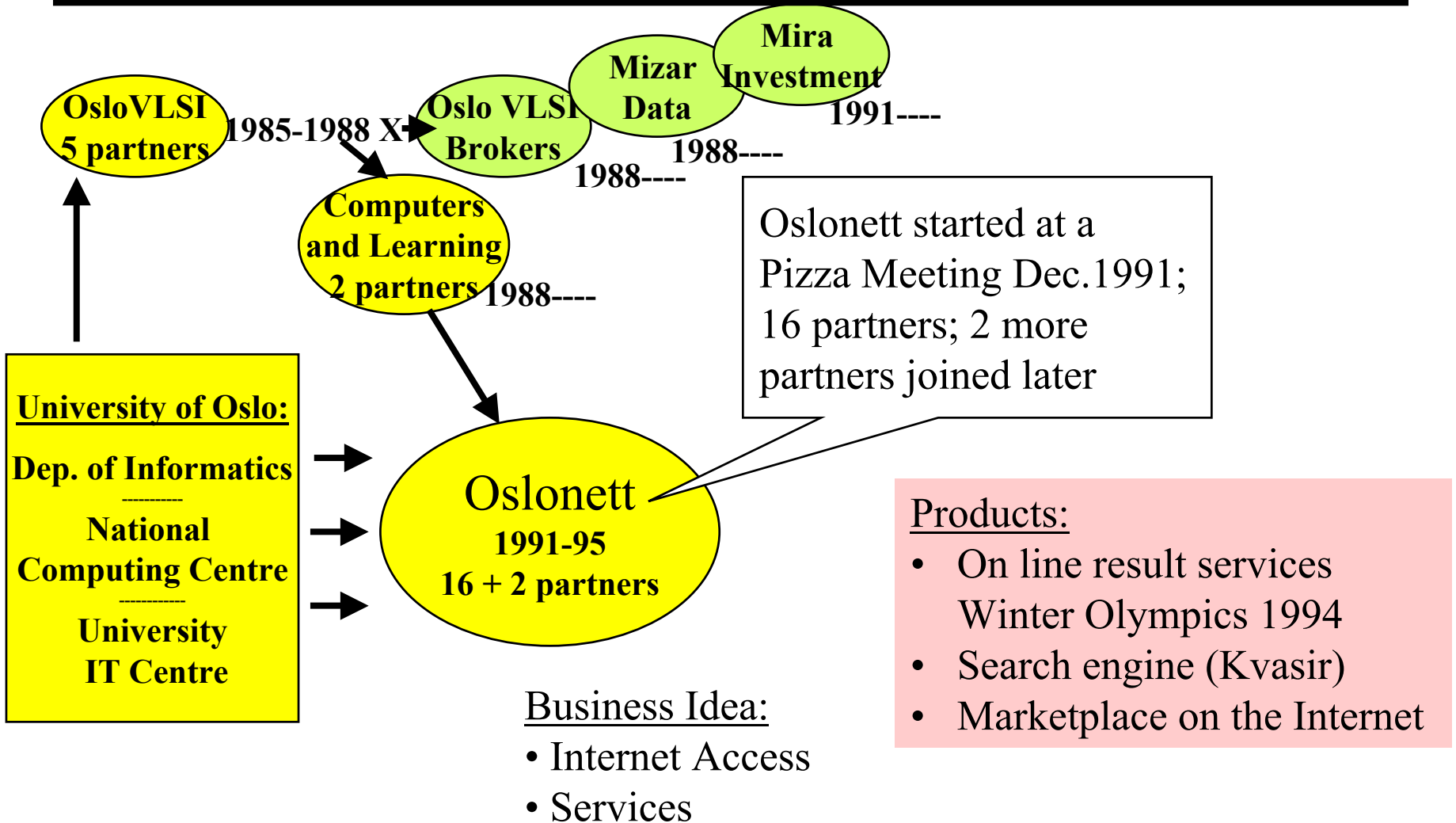
Gisle Hannemyr



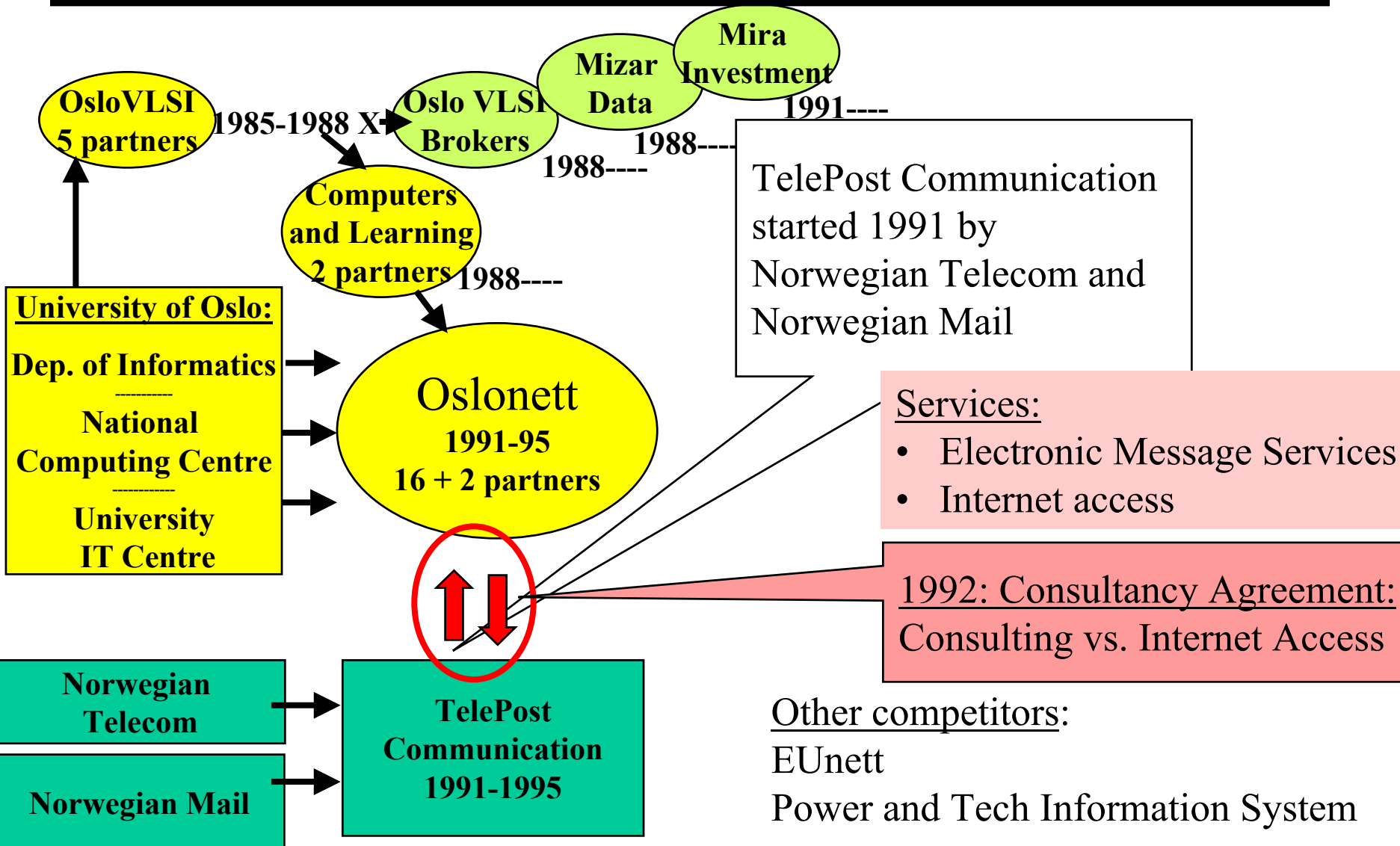
Tore Solvar Karlsen



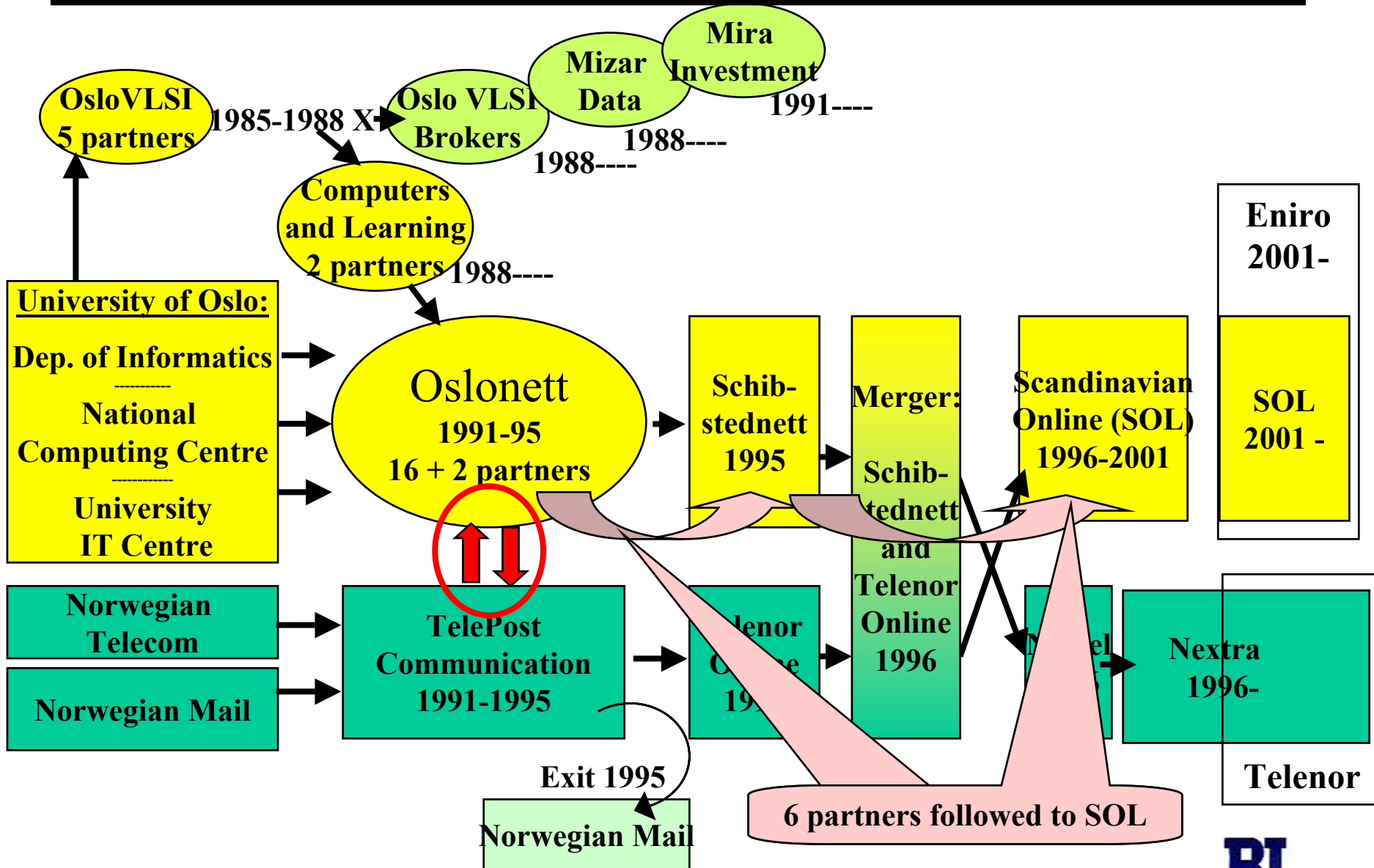
Oslo VLSI – the Start



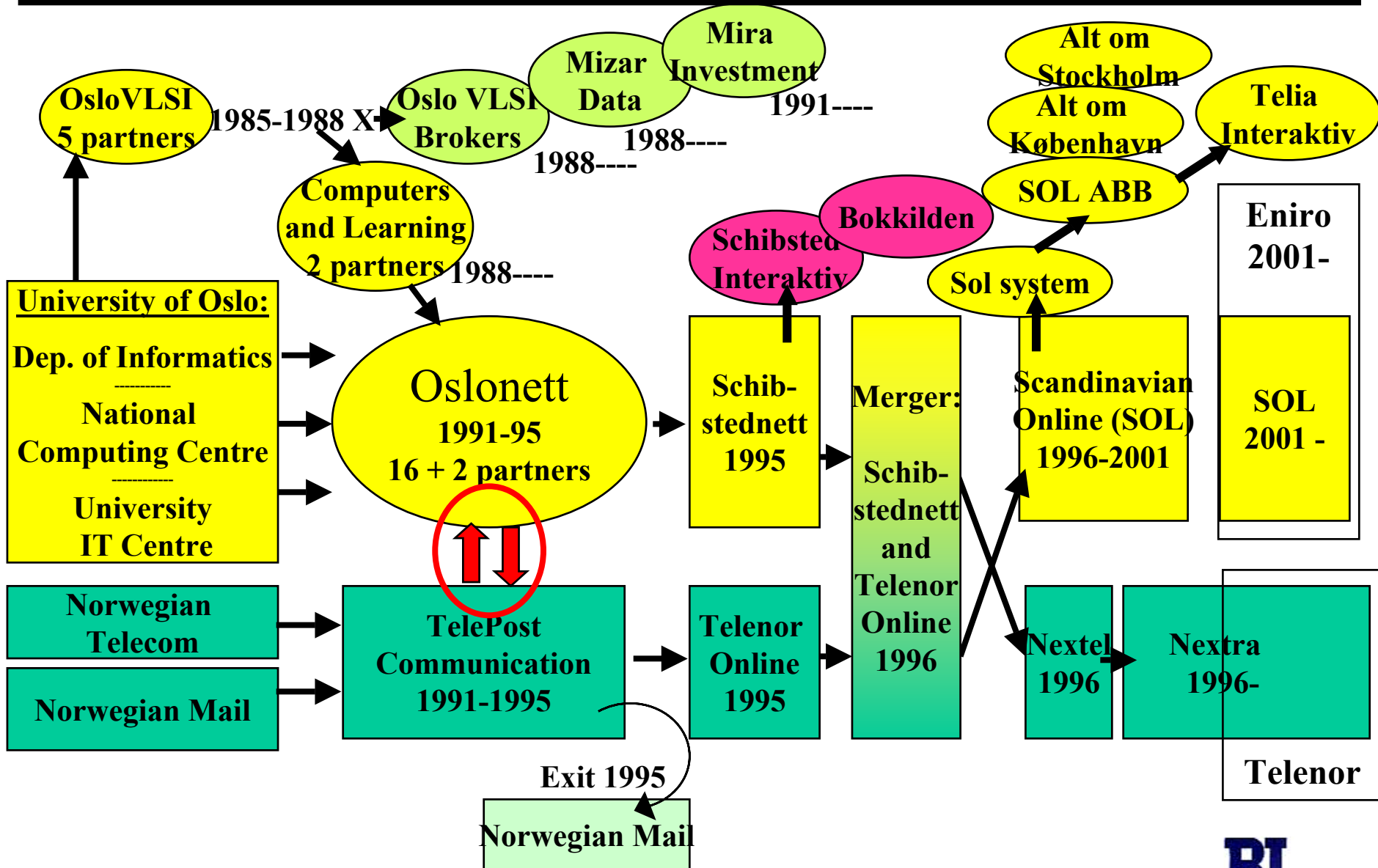
Oslonett – Competition



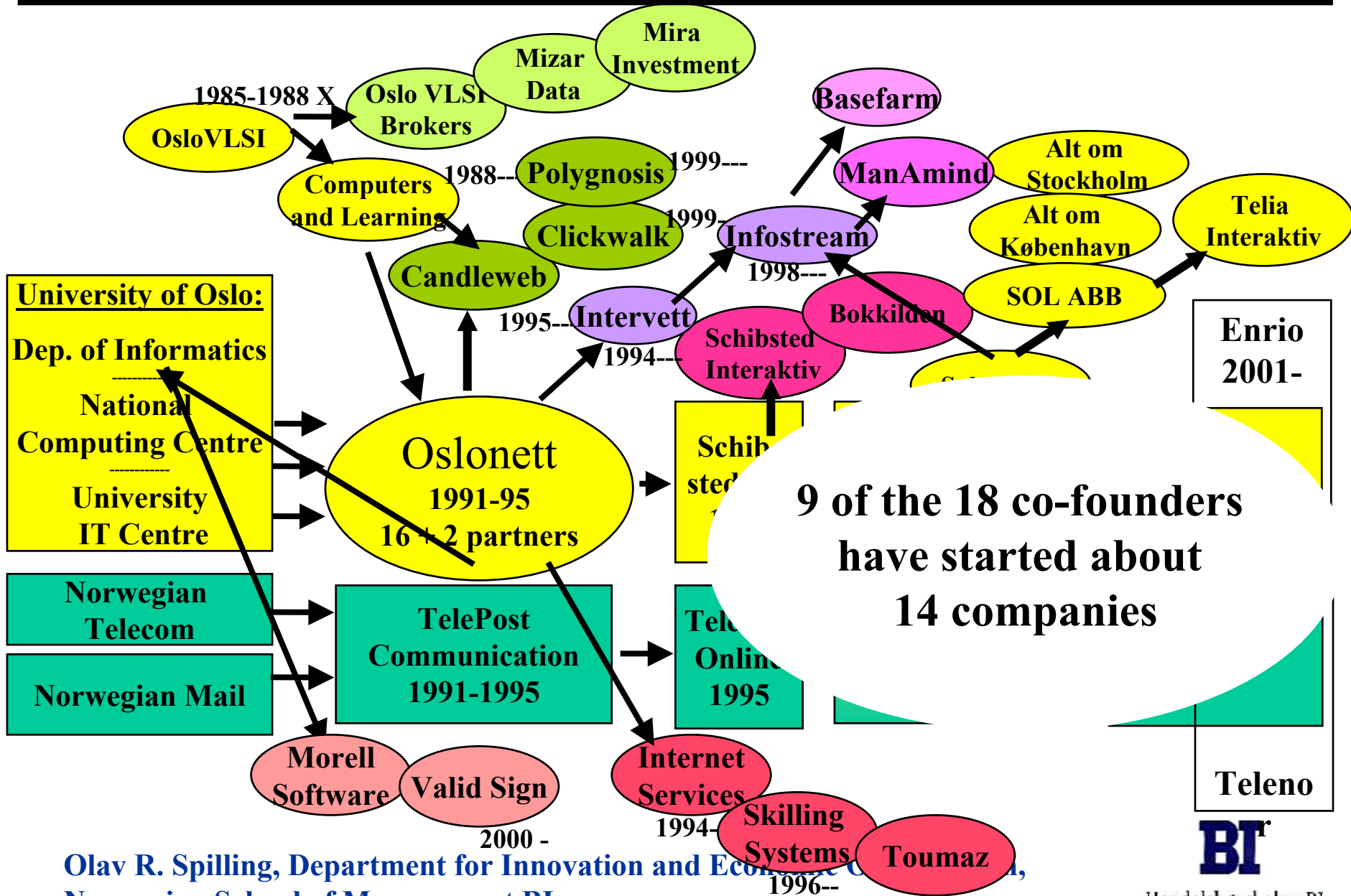
Oslo - Acquisition - Restructuring



Scandinavian Online - Spin-Offs



Spin-Offs from Oslonett Partners



Main actors over time

University/R&D-institutions

- * Important in the initial phase

Small firms

- * Important in the start phase
- * Large number of spin-offs

Large firms

- * Important for 'industrialisation'

Missing in the first stage: Risk capital

On the Role of Small Firms

Mira

Why do we need small firms?

- * testing out business ideas
- * supplement large firms

Many possible outcomes of a start-up

- * temporary - restructuring
- * growing large
- * niche-activities
- * local service providers
- * personal business ('life-style business')

Miron
Software

Valid Sign

2000 -

Internet
Services

1994-

Skilling
Systems

1996--

Toumaz

Teleno

BI^r

Handelshøyskolen BI

3. Små høyteknologiske foretak og evolusjonære prosesser

Det følgende materialet er basert på en survey av små høyteknologiske foretak i Oslo og Trondheim gjennomført i 2002. Gjelder foretak mellom 2 og 100 sysselsatte. Antall foretak som deltok i undersøkelsen: 117.

High-tech firms in Oslo and Trondheim: **Development of Business Idea**

The business idea was developed:

- independent 56%
- in another company/institution 24%
- in collaboration with another company 17%

Very few
university-
related!!

Organisation of company:

- independent 86%
- daughter company 12%

No differences between
the companies in Oslo
and Trondheim

High-tech firms in Oslo and Trondheim:

Background of founder

Employment background of founder(s):

- manager in another company	33%
- employed by another company	42%
- employed by university/research inst	12%
- unemployed	8%
- student	3%

Functional background of founder(s):

- R&D	26%
- Production	28%
- Marketing	50%
- Management	29%

Data add up to more than 100% as many companies have more than one founder and the founder(s) have more than one type of background

High-tech firms in Oslo and Trondheim:

Mergers, Acquisitions and Spin-Offs

Have been merged with another company:	24%
Have acquired another company:	22%
Have licensed <i>in</i> production rights:	5%
Have licensed <i>out</i> production rights:	11%
Contributed to other start-ups	32%
Employees have left and started new companies	27%

(These spin-off companies are partly competitors, partly collaborators, mostly located in the same region)

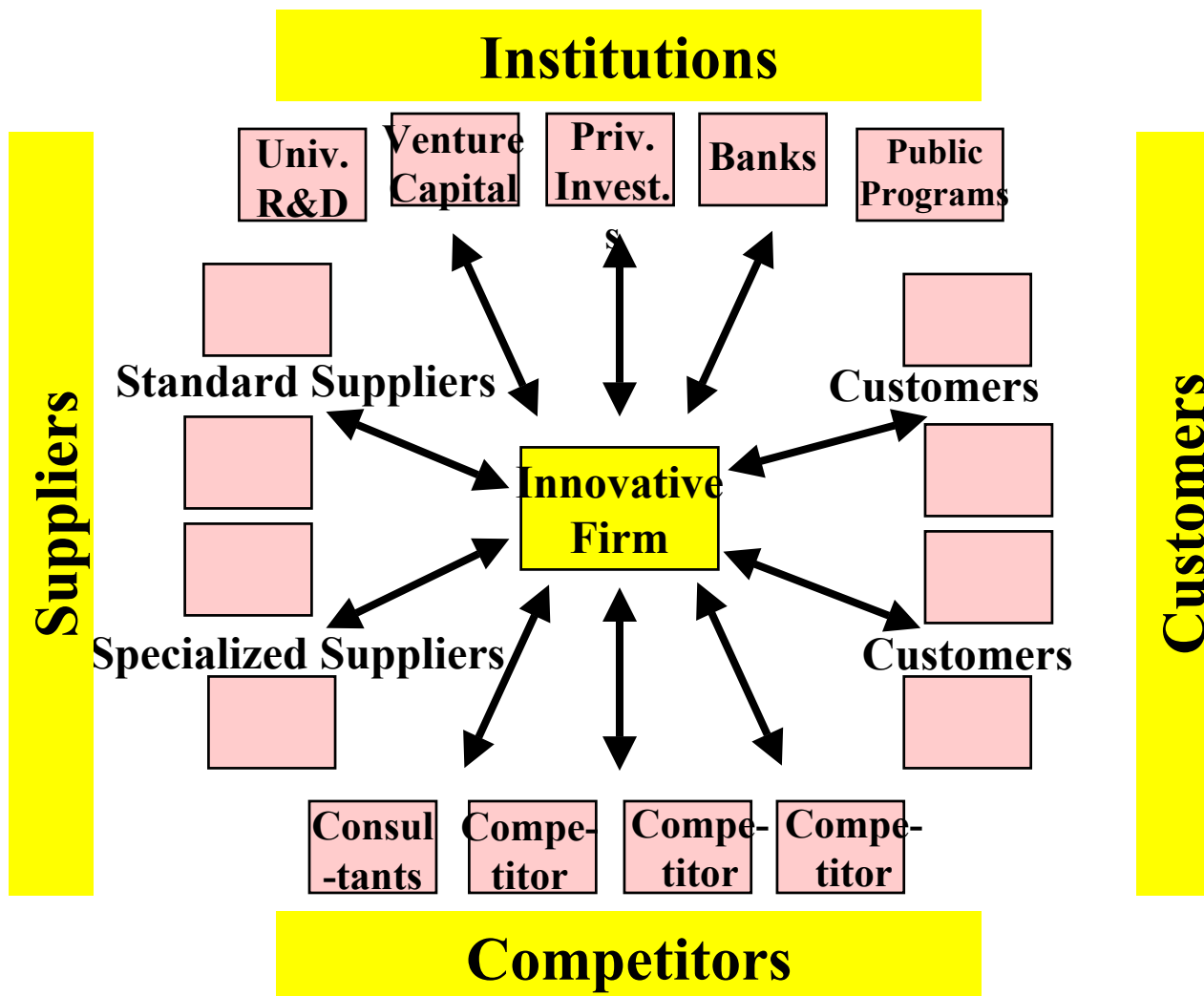
High-tech firms in Oslo and Trondheim:

High Level of Innovation Activity

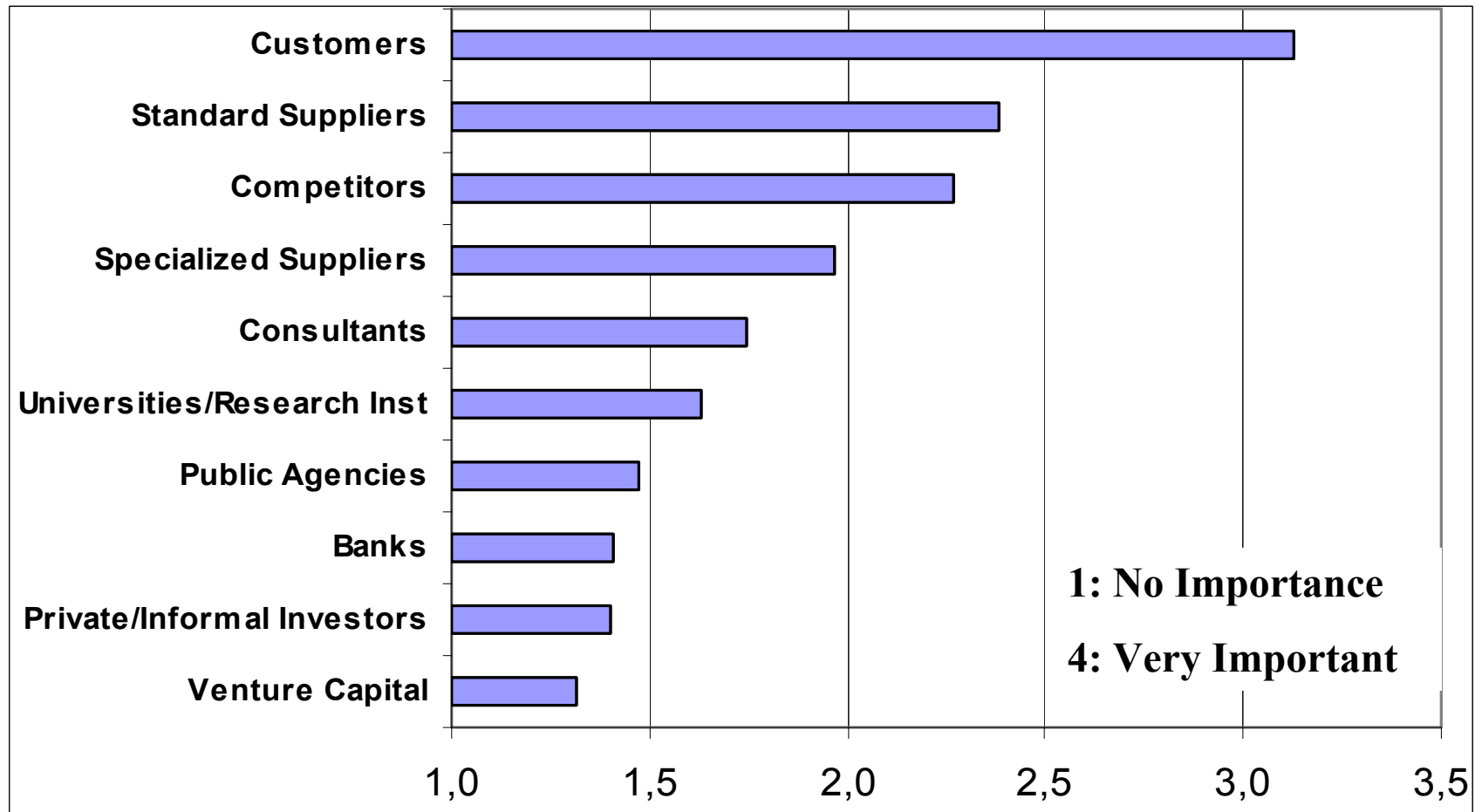
	(Last year)
Own R&D activity	58%
Acquired R&D-services	25%
(Last 3 years)	
New products/services	65%
Improved products/services	70%
Process innovation	41%
Innovation in marketing/sales	29%
New markets	45%
Applied new technology	44%
Applied new software/system solutions	67%

Companies in Oslo slightly more innovative than in Trondheim

The Innovation System – the Interactive Model



Actors Important to the Innovation Process



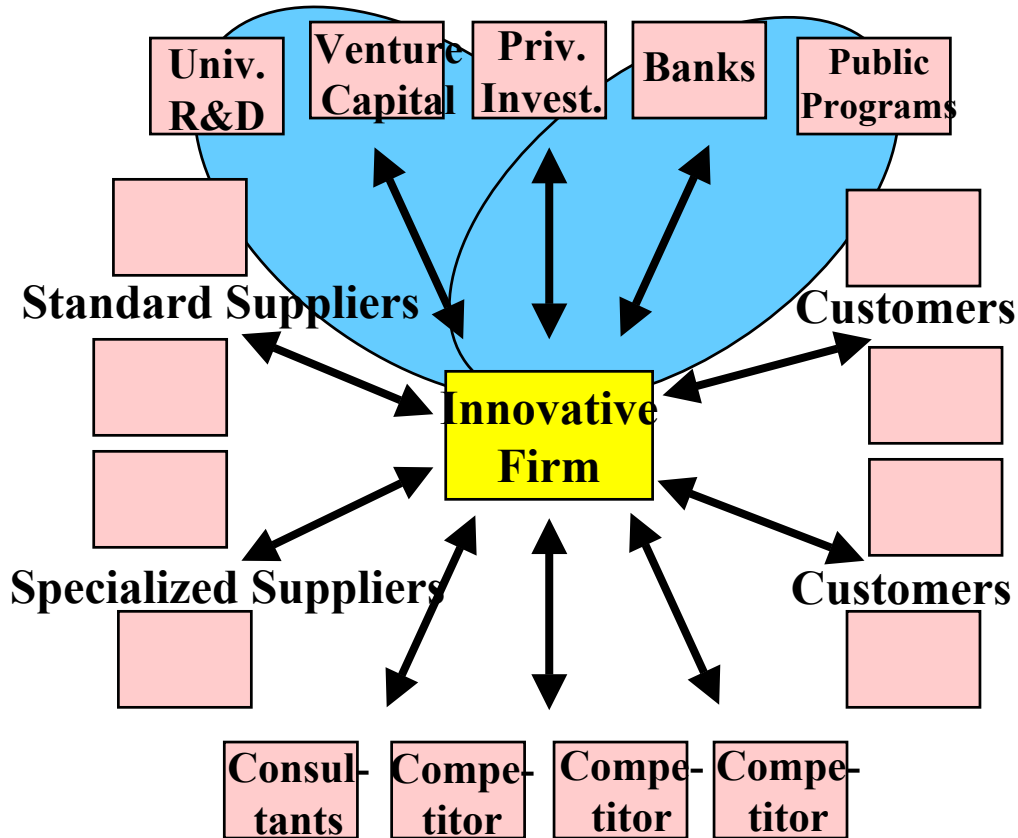
No differences between the companies in Oslo and Trondheim

Different Types of Innovators?

Factor analysis based on importance of contacts with different actors in the innovation process.

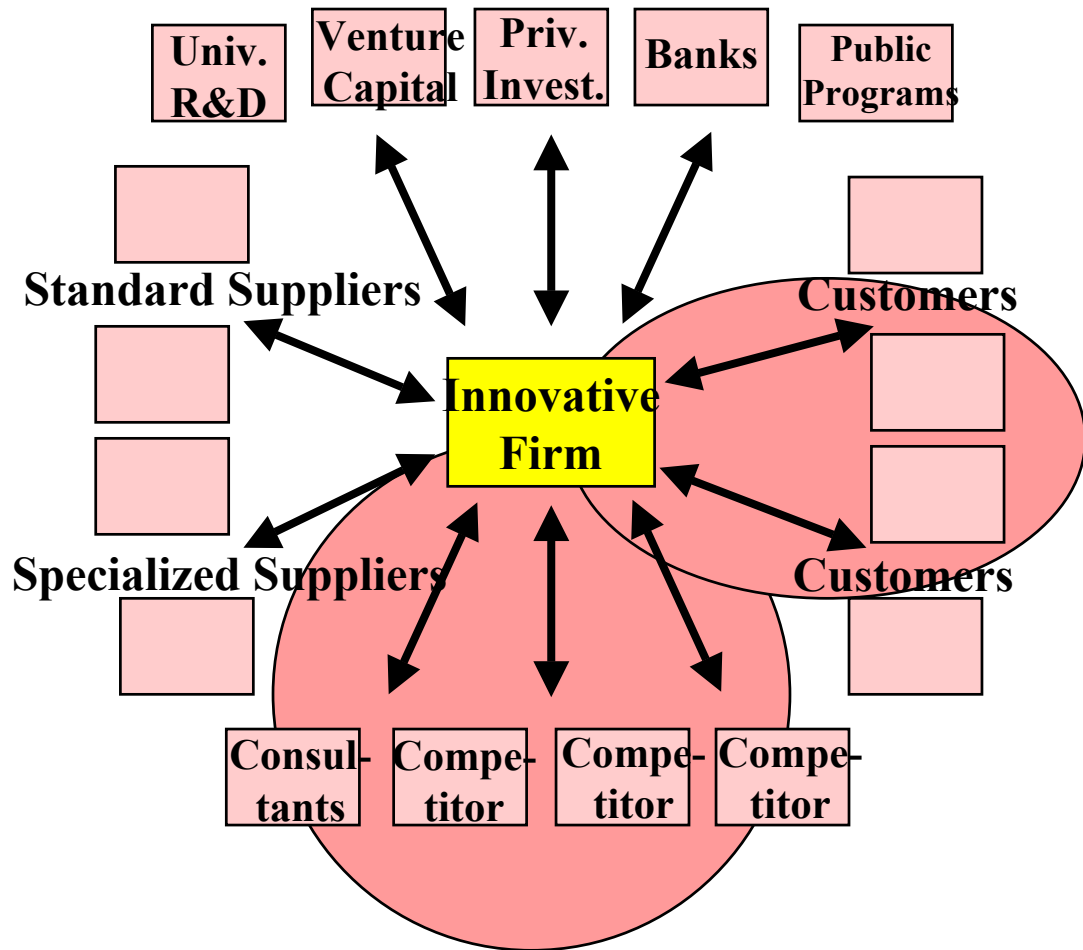
	1	2	3
Standard Suppliers			0,820
Specialized Suppliers			0,768
Customers		0,603	0,316
Consultants		0,793	
Competitors		0,769	0,241
Universities/R&D	0,658		
Venture Capital	0,803		
Private Investors	0,771		
Banks	0,389		0,346
Public Programs	0,650		

Different Types of Innovators?



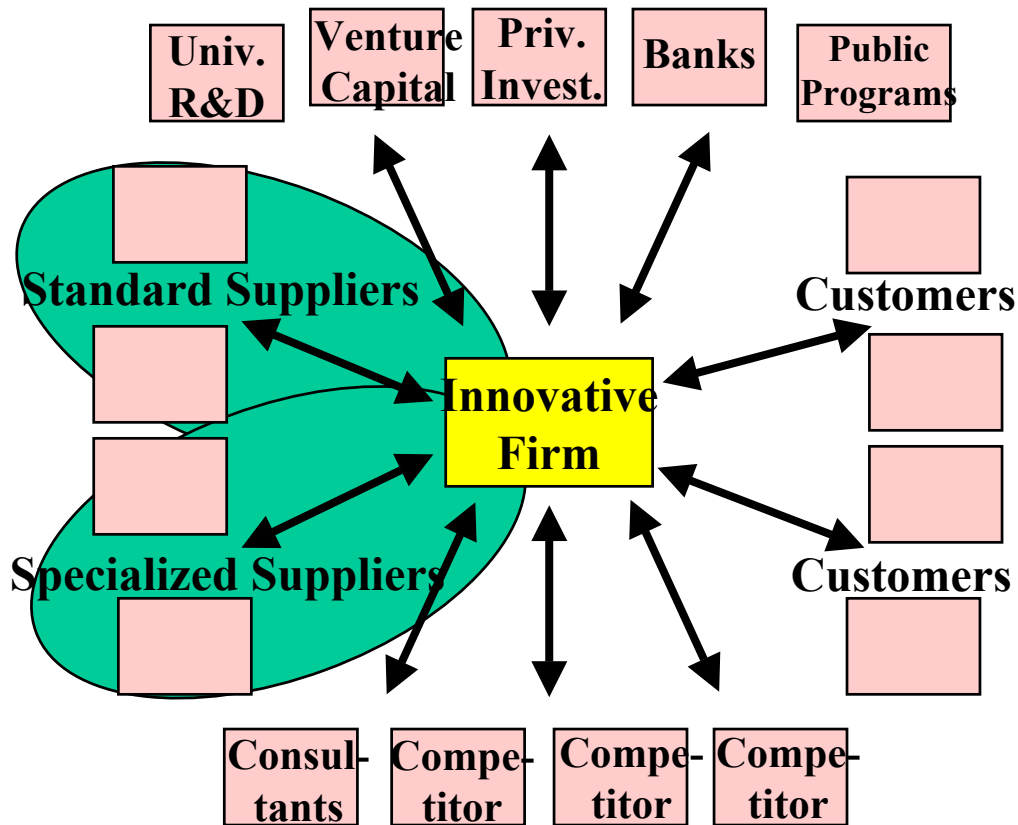
1. The R&D and Capital Based Innovator

Different Types of Innovators?



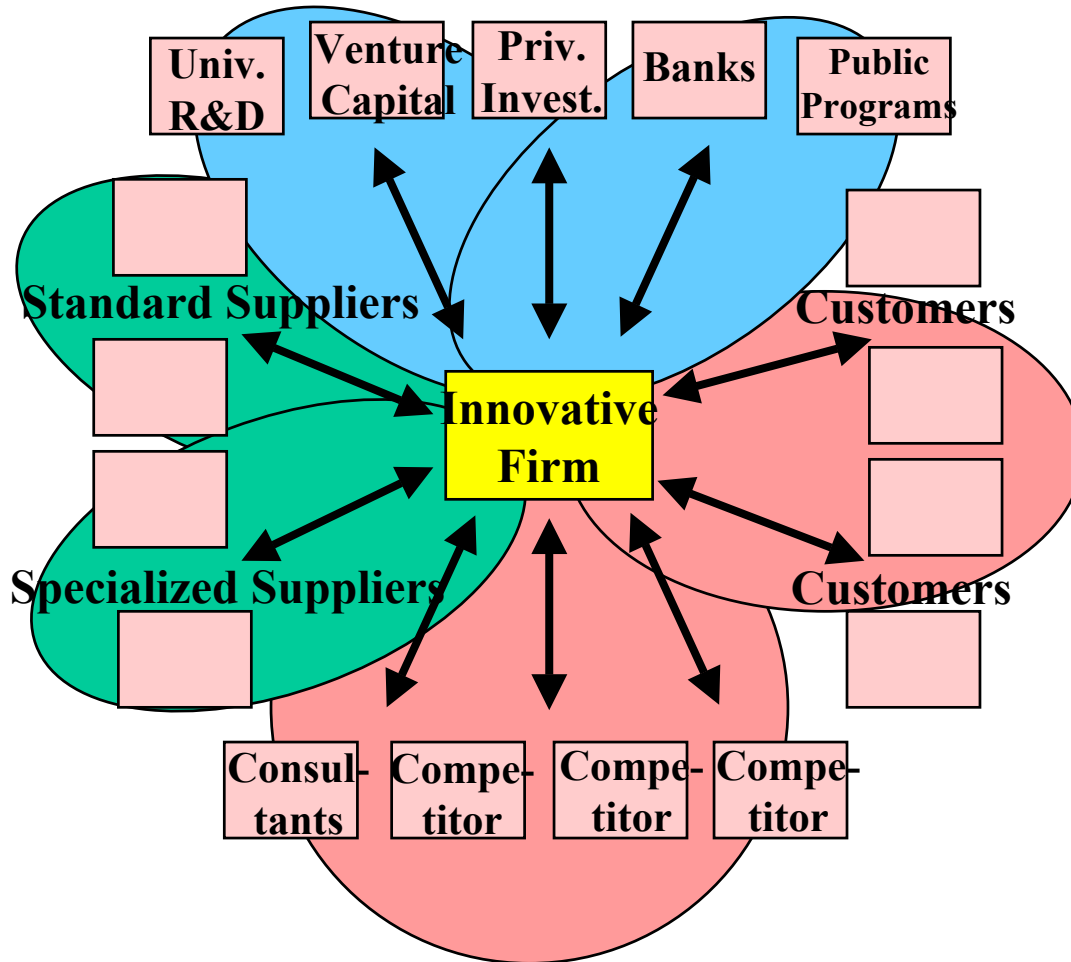
2. The Competition-Oriented Innovator

Different Types of Innovators?



3. The Supplier-Oriented Innovator

Different Types of Innovators?



1. The R&D and Capital Based Innovator

2. The Competition-Oriented Innovator

3. The Supplier-Oriented Innovator

4. utfordringer i kunnskapsøkonomien

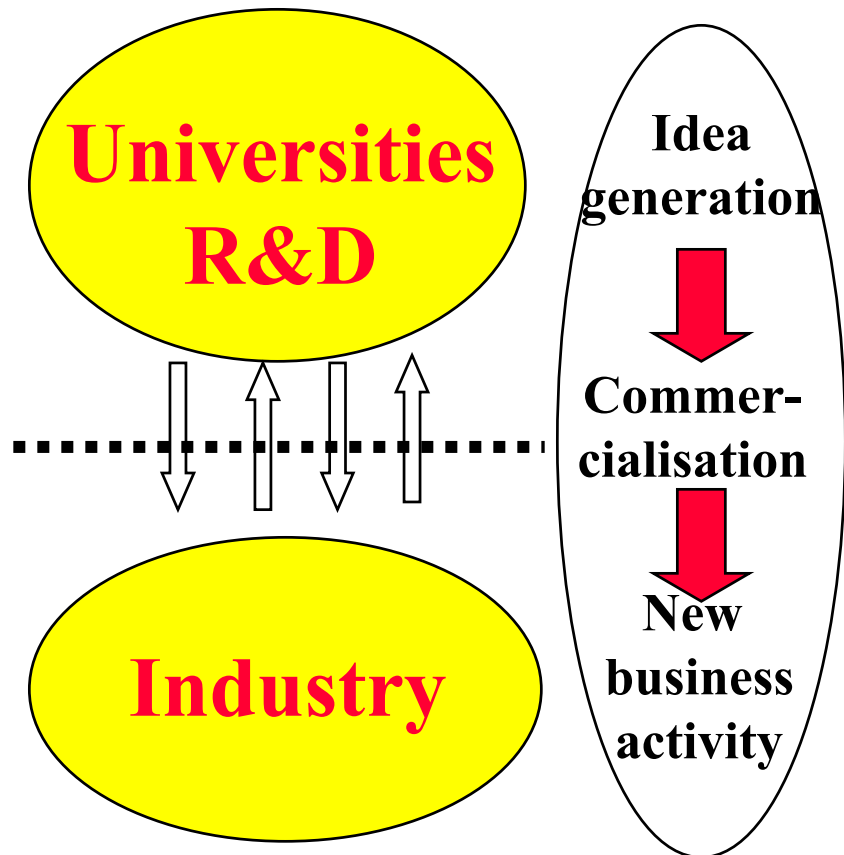
Utfordringen er å kommersialisere forskningsbasert kunnskap, dvs. å omsette akademisk kunnskap til kommersiell og vekstkraftig virksomhet.

Her følger noen indikasjoner på at dette ikke er så lett å få til i praksis.

Knowledge-based entrepreneurship

Organise new business activity based on 'advanced knowledge'

- 'new' knowledge
- research-based knowledge



Commercialisation:
Transform academic knowledge into business activity

- in an existing firm, or
- by starting a new firm

Actors and roles in spin-off processes

Actor	Examples	Primary role
Parent organisation	University department, Research laboratory	Host and organise R&D activities, create innovations. Facilitator for spin-off processes
Technology originator	Individual or group of engineers or scientists	Bring innovation through the innovation-development process; bring the process to the point where technology transfer is possible
Entrepreneur	Engineers, scientists; 'external' persons with business knowledge	Identify business idea; develop the new business venture; take the technology to create a new venture from it
The venture investor	Venture capital organization, business angles, informal investors	Provide financial resources to develop the new venture, may also provide management expertise

Based on Roberts and Malone 1996, Carayannis et al 1998

The Businesses of Recently Graduated University and College Entrepreneurs

Peter Rosa 2003:

Recent graduates starting business:

- small and unimaginative businesses
- often professionally and traditionally orientated.

Data from survey:

10% started business within 5 years after leaving university

Among these:

- 55% sole traders
- 50% with no employees; 8% with more than 10 empl.
- 32% closed (within 5 years?)
- Most common category: 'freelance' services
- No high growth manufacturing or technology
- Few high tech services, nearly all of this software

'Hardly Likely to Make the Japanese Tremble'

Teknikbaserade företag från högskolan

Studie av 500 högskoleföretag startat under 1980-talet:

- **Merparten små utvecklings- og konsultföretag**
- **Medianföretaget sysselsatte 2 personer**
- **25-50% var bisyssleföretag**
- **Bara vart femte företag med mer enn 5 anställda**

Bara 10 företag totalt var snabbt växande og internationellt inriktade (omsättning > 20 mSEK, export > 20%)

Kilde: Olofsson & Wahlbin 1993, referert i “Teknikparkens roll i det svenska innovasjonssystemet”, Vinnova 2002

New establishments with researcher participation (2001)

Data from a Nordic study on high-tech spin offs (Nås et al 2003):

	<u>Norway</u>	<u>Sweden</u>	<u>Finland</u>
Establishments	87	528	111
Researchers	113	637	145
average researcher per establ.	1.3	1.2	1.3
Employees	1855	4328	2724
average employees per establ.	21.3	8.0	24.5

OBS: skewed distributions

Parts of new establishments may be due to reorganisation of existing firm or institution

Source: Nås, SO; T. Sandven, T. Eriksson, J. Andersson, B. Tegsjö, O. Lehtoranta and M. Virtaharju: “High-Tech Spin-Offs in the Nordic Countries”. STEP Report 23-2003

Start-ups in Oslo:

Environments for Idea Generation

Applies to wholly new businesses, started 1998-2000 (N=464)
(Businesses in manufacturing and knowledge-based services)

Environment for idea generation	Yes	Partly	Total
Existing firm	39,9	8,4	48,3
Research insitute	1,1	6,3	7,4
University/Higher education	1,1	4,7	5,8
Individuals	53,7	8,4	62,1
Others	4,1	3,4	7,5

"Based on this investigation, institutions for R&D and higher education cannot be regarded as particularly important idea generators for starting new businesses." (Bolkesjø, 2001, p. 70)

The Norwegian FORNY-programme

Budget 2003: 92,6 mill NOK

Objective: Commercialisation of R&D based knowledge

Services/fields of activity:

- **Develop entrepreneurial attitudes and behaviour in R&D institutions**
- **Professional assistanse in all stages of the commmercialisation process**
- **Verification of advanced technology projects**
- **Recruitment of efficient entrepeneur teams and increase women's share**
- **Develop and diffuse knowledge on innovation and commercialisation processes**
- **Develop policy instruments for all stages from idea creation up to the venture/market take-over**

The Norwegian FORNY-programme 1995-2003

Results 1995-2003 (from 6 commercialisation units):

- Ideas generated appr. 2500
- Approved commercialisations 335
 - Among these: - new establishments 211
 - - licenses 124
- Employment in the new establishments 500-700
- Investments in the new establishments 1,2 billion NOK
- Total FORNY-funding 390 million NOK

FORNY cont.

Start-ups 1995-2003:

Special cases	4	Opera Software Open World Distribution Icesoft Technologies Maskot Interactive
Potential growth firms	16	
"New" firms	113	
<u>Marginal (no value, dying, life style)</u>	<u>30</u>	
Total	163	

Our analyses clearly demonstrates that the vast majority of start-ups may be regarded as failures in economic terms after six years. Few firms have succeeded in expanding their turnover, and most of the firms are having significant deficits. Among those which are profitable, the majority is of consultancy type business with limited potential for growth.

Source: Bolkesjø and Vareide 2004: Evaluering av kommersialiseringsenhetene i FORNY-programmet

FORNY- Recommendations

Evaluators recommendations:

- More careful selection of ideas for commercialisation
- Earlier termination of low potential projects
- Improve market competence and industry contacts
- More contacts with investors
- More use of external expertise

Other recommendations:

- Provide more risk capital for
 - large projects; - seed projects
- Develop a more entrepreneurial culture
- Develop more culture for commercialisation
- etc.

Source: Bolkesjø og Vareide 2004: Evaluering av kommersialiseringsenhetene i

FORNY-programmet

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BI

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