Study visits on Swedish innovation systems

June 2017

Henrik Friden, Swedish National Agency for Innovation Systems (Vinnova)	National research and innovation policy
Maria Lindqvist, County Administrative Board of Stockholm	Swedish innovation strategies at national and regional levels
Emelie Johansson, KTH Business Liaison	Collaboration for innovation
Hans Westlund, Professor of Urban and Regional Studies, KTH	Entrepreneurship for regional development
Lisa Ericsson, Head of KTH Innovation	Introduction to KTH Innovation: organization and business development model
Terrence Brown, Professor of Entrepreneurship and Innovation, KTH	Technology-based entrepreneurship and entrepreneurship for engineers
Bruce Lyne, Professor in Industrial management, KTH	IPR strategy and the innovation process
	Partnering as a means to speed commercialization
Per Thulin, Program Director, KTH	KTH's master programme "Economics of innovation and growth"

www.vinnova.se

VINNOVA

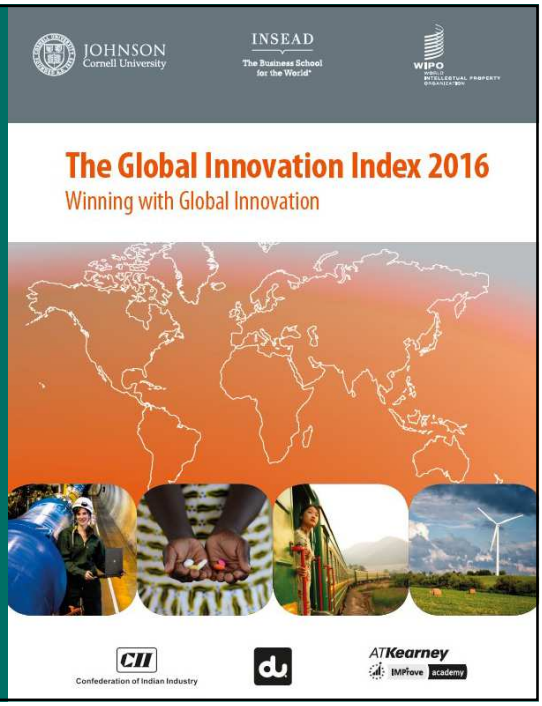
National research and innovation policy

Henrik Fridén, Ph.D.

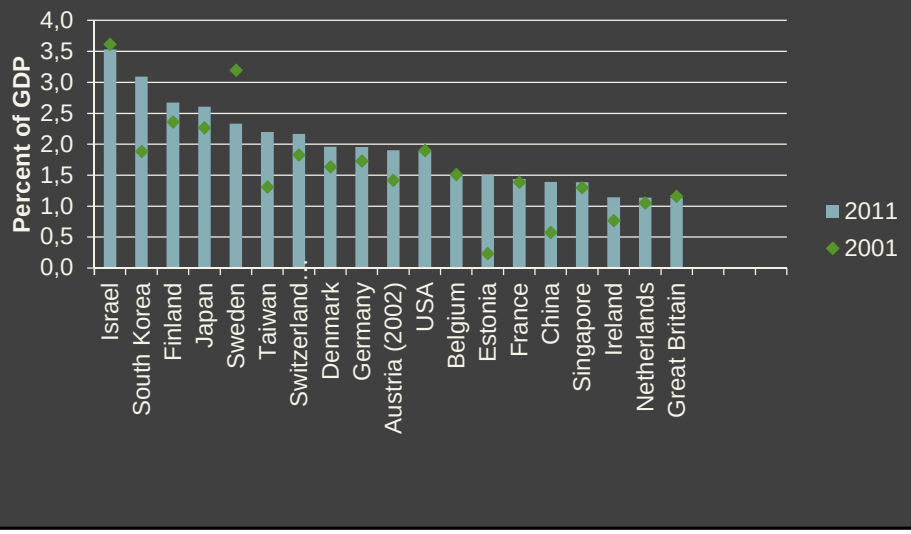
Swedish Governmental Agency for Innovation Systems (Vinnova)

The Global Innovation Index 2016

1. Switzerland
2. **Sweden**
3. United Kingdom
4. United States of America
5. Finland
6. Singapore
7. Ireland
8. Denmark
9. Netherlands
10. Germany



R&D-investments as a share of the GDP decreases among private companies



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Governance of Research and Innovation

Parliament (Riksdag)

Legislates

Decides on budget

Decide on over-all priorities for policy areas

"Research and Innovation Bill to Parliament" ~ every 4 years

Bild 6

Government (Cabinet)

Prepares and presents Bills, i.e. “Research and Innovation Bill”

Specifies budgets and goals for agencies

Issues assignments to agencies

Appoints agency heads

Bild 7

Agency characteristics

Autonomous – courts and other agencies are treated alike

One Minister cannot rule – collective decision making of the Government

No external can interfere with agencies in their handling of cases (incl. ministers, Constitutional rule)

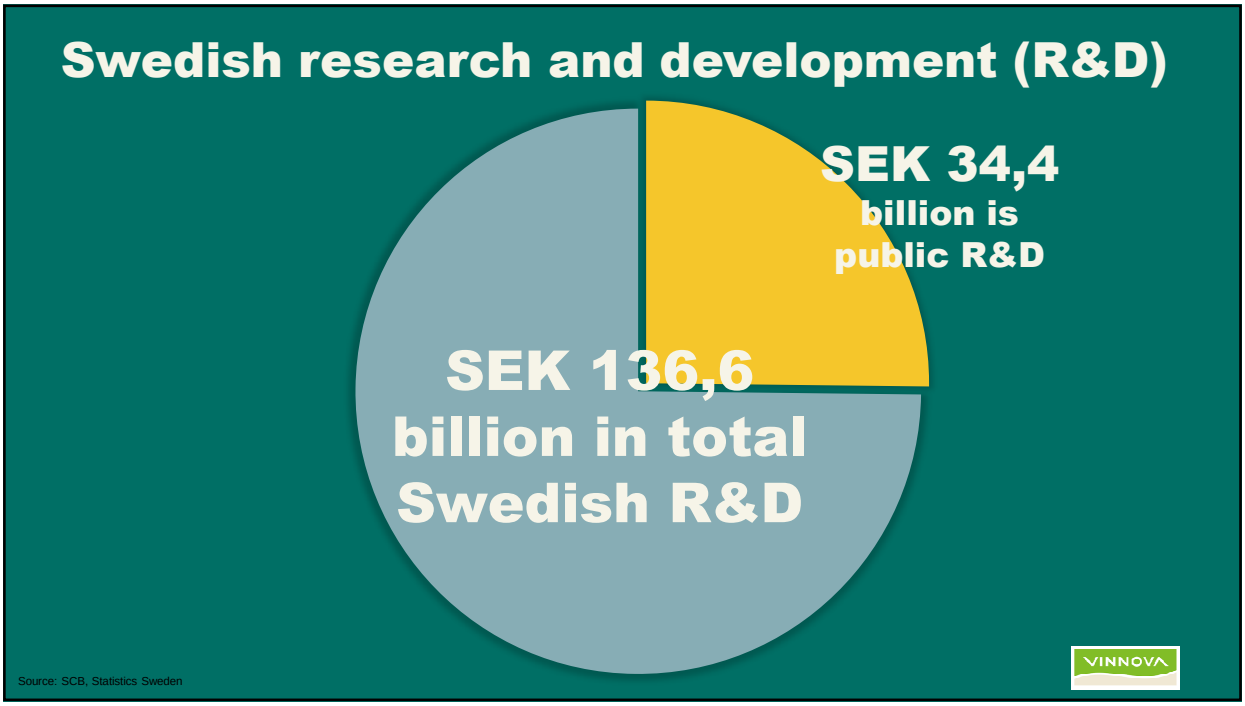
Public access to documents (Constitutional rule)

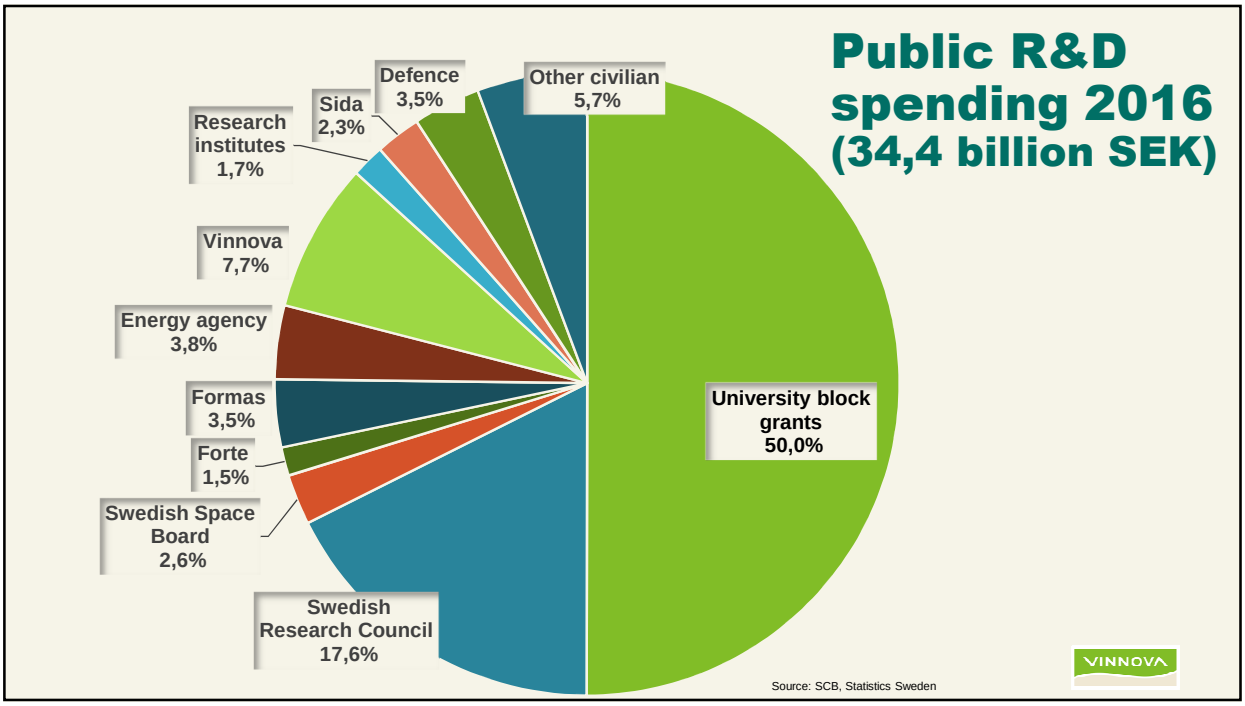
Impact analysis instead of detailed directives. (*Ex post* control – generally no *ex ante* steering)

Research and Innovation Bill to Riksdag 2016

- ”Cooperation” and ”Societal Challenges” as major policy focus
- Wider view on the mission for public universities
  - Clearer responsibility put on universities to reach the policy goals
  - Increased basic funding based on deliveries on expectations (policy related)
- New national programmes focusing on societal challenges
- Strong focus on new ”Cooperation programmes” (innovation oriented), mainly by increased funding to, and clustering of, ongoing activities/programmes

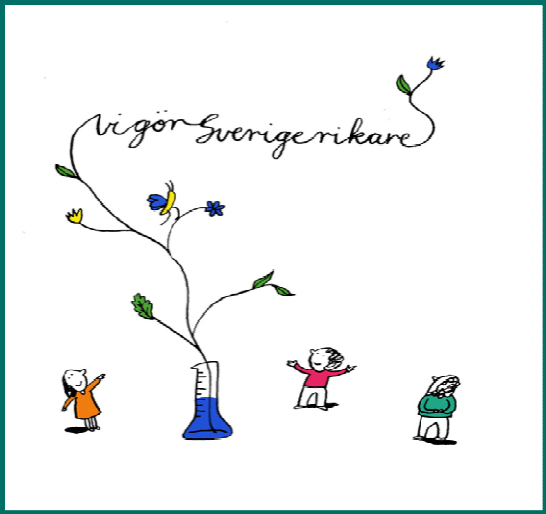
Some figures on Swedish Research and Innovation


Swedish research and development (R&D)
SEK 34,4
billion is
public R&D
SEK 136,6
billion in total
Swedish R&D
Source: SCB, Statistics Sweden
VINNOVA


Public R&D
spending 2016
(34,4 billion SEK)
Defence
3,5%
Other civilian
5,7%
Sida
2,3%
Research
institutes
1,7%
Vinnova
7,7%
Energy agency
3,8%
Formas
3,5%
Forte
1,5%
Swedish Space
Board
2,6%
Swedish
Research Council
17,6%
University block
grants
50,0%
Source: SCB, Statistics Sweden
VINNOVA

Vinnova in brief

- Swedish government agency under the Ministry of Enterprise and Innovation
- During 2016 the funding distributed for Research and Development is approx. SEK 2,6 Billion
  - Grants to universities, companies and public authorities
  - Co-operation between stakeholders is central
- About 200 people work at Vinnova´s offices in Stockholm, Brussels and Palo Alto, CA
- Charlotte Brogren is Director General



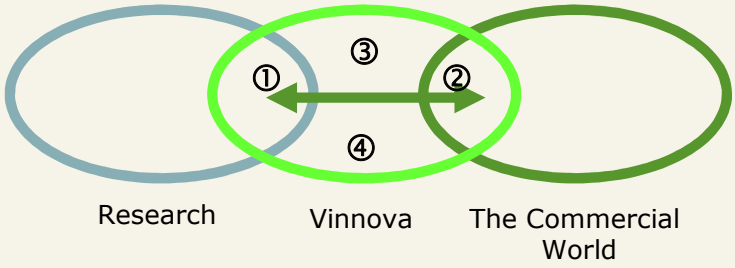
Three roles

Funding Research & Innovation

National EU Contact Agency

Expert Agency

Research and Innovation for Sustainable Growth



❶ Support the creation of new market inspired research results

❷ Support the creation of "bridge heads" on the market for research based innovations

❸ Stimulate the creation of networks between industry, finance, academia and public org.

❹ Support the adaptation of R&D results for commercial exploitation

Why is cooperation central in Vinnova's portfolio of initiatives?

- Cooperation between academia, business and public sector is a powerful tool to transfer knowledge and to exploit research findings
- Cooperation gives new important input from industry or public sector to academia, often helping to (re-) define the scientific research agenda of the field
- Cooperation helps changing the behavior of actors involved, thus paving the way for renewal and innovation

"An interesting observation about economic impacts is that the effects of collaboration – take-up and use of knowledge from the centers by the companies involved – dwarf university income from patents and licensing, suggesting that cooperation is a far more powerful means than the Technology Transfer Office function to obtain societal and economic returns for the taxpayer"

From: p. 120 in "Long Term Industrial Impacts of the Swedish Competence Centres", Peter Stern et al. – Technopolis Group; VINNOVA Analysis VA 2013:10

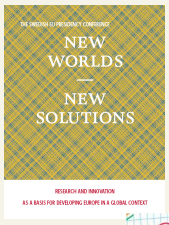
Slide 16

Societal Challenges as Drivers for Innovation and Growth

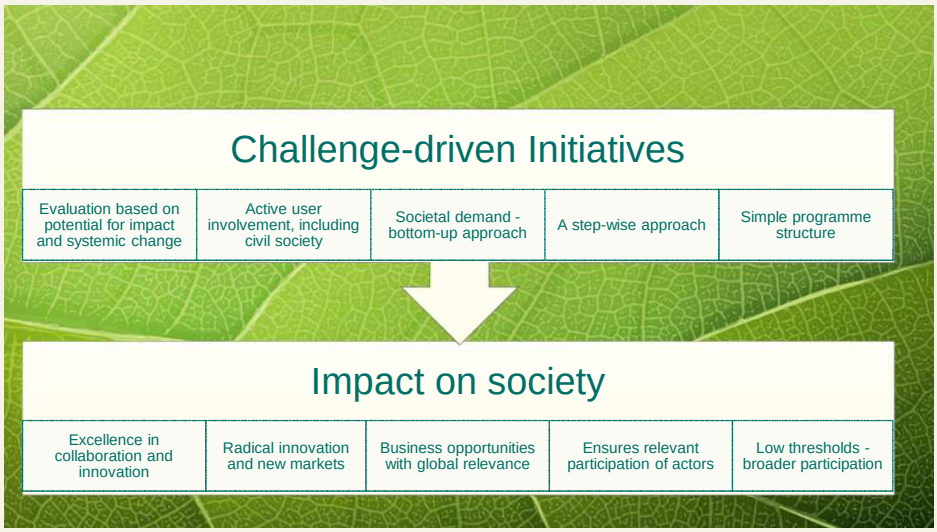
Societal Challenges

- Threats if not addressed
- Global challenges have been identified as a strong driver of demand for innovations by EU 2020, OECD…
- The Lund declaration, 2009

Demand for solutions create <u>business opportunities</u> for innovative new products, services and processes



Slide 18



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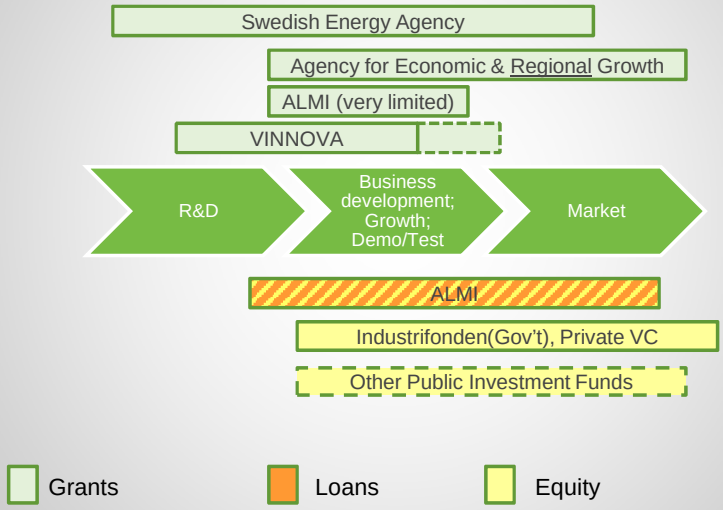
Support for Innovation in Small & Medium Sized Companies

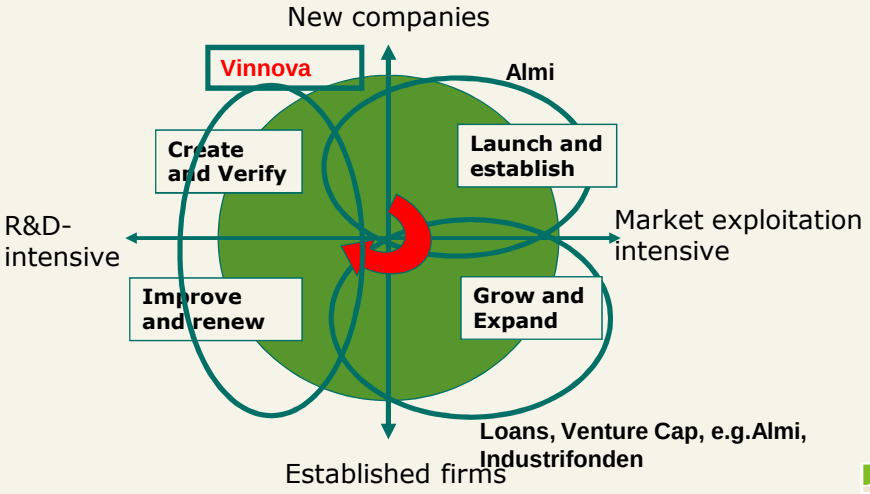
VINNOVA

Public Grants, Loans and Equity for SME:s in Sweden



Slide 21

The Support System for Commercialisation



Thank you for your attention!

Extra slides

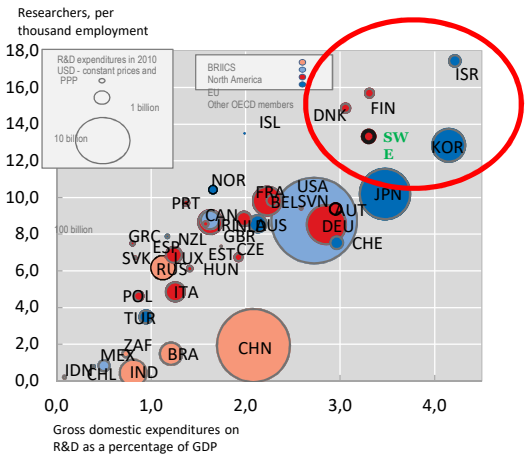
OECD REVIEW OF INNOVATION POLICY:
SWEDEN 2016
MAIN RESULTS AND RECOMMENDATIONS

Andrew Wyckoff,
Director of Science Technology and Innovation

OECD
BETTER POLICIES FOR BETTER LIVES

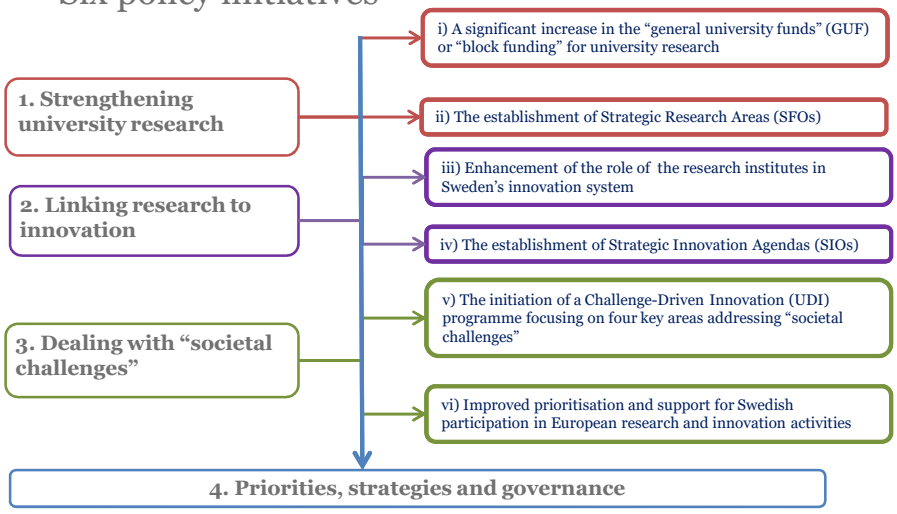
Main conclusions of the 2012 Review

- a highly successful economic and social development
- well prepared for globalisation
- a strong Swedish innovation system
- but new initiatives to tap "new sources of growth" needed



The 2016 Review

- Six policy initiatives



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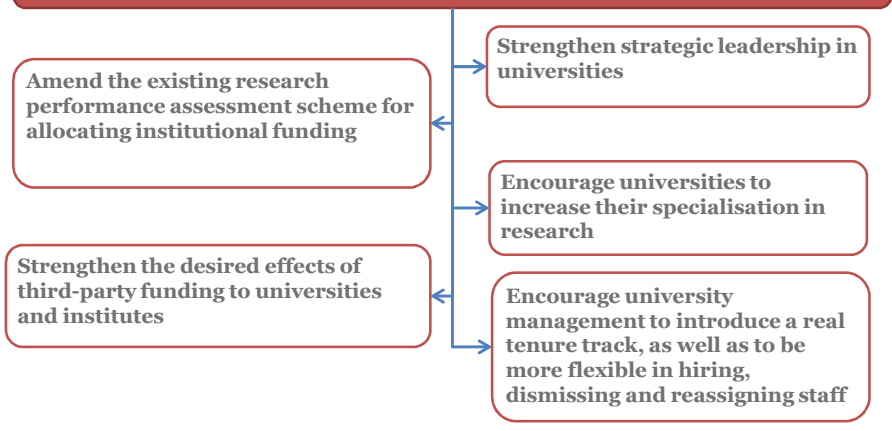
Recommendations

1. Strengthening university research

Enable universities to act in more flexible and strategic ways before any new increase in block funding or extension of the Strategic Research Areas programme



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Recommendations

2. Linking research to innovation

- Further develop the RISE institute system to strengthen its contribution to Swedish research and innovation
  - Maintain RISE core funding at about 20% of the institutes' total income
  - Approve current plans to take full ownership of the RISE institutes
  - Incentivise their contribution to societal challenges
  - Strengthen their role in supporting innovation in traditional SMEs, in complementarity with regional universities
- Amend and extend the Strategic Innovation Agendas programme
  - Increase funding for initiatives such as the Strategic Innovation Agendas to facilitate both broader participation by new cross-sectoral consortia and projects of greater critical mass
  - Complement the Strategic Innovation Agendas programme with dedicated support to activities aimed at identifying new trajectories and, as necessary, disrupting existing ones

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Recommendations

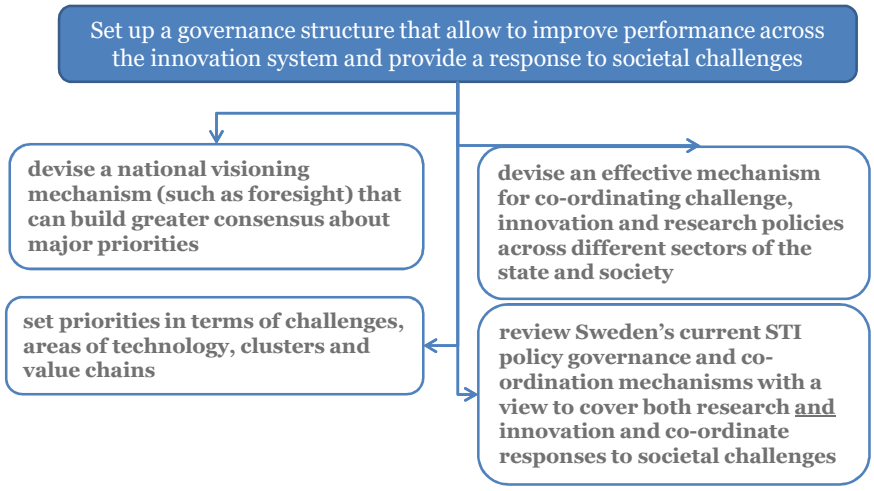
3. Dealing with "societal challenges"

- Take actions to address societal challenges at systems level , not only at programme or project levels
  - Develop a national strategy regarding societal challenges, and integrate it with the wider research and innovation strategy
  - Increase agency efforts to play a leadership role in research and innovation to addresses societal challenges at a European and even global level
- Increase the Challenge-Driven Innovation Programme potential contribution to solving specific societal challenges
  - Expand the scale of the Challenge-Driven Innovation programme
  - Refine the scope of the Challenge-Driven Innovation programme

30

Recommendations

4. Priorities, strategies and governance



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Recommendations (examples)

- 1. Strengthening university research
  - Enable universities to act in more flexible and strategic ways before any new increase in block funding or extension of the Strategic Research Areas programme
- 2. Linking research to innovation
  - Further develop the RISE institute system to strengthen its contribution to Swedish research and innovation
  - Amend and extend the Strategic Innovation Agendas programme
- 3. Dealing with "societal challenges
  - Take actions to address societal challenges at systems level, not only at programme or project levels
- 4. Priorities, strategies and governance
  - Set up a governance structure that allow to improve performance across the innovation system and provide a response to societal challenges

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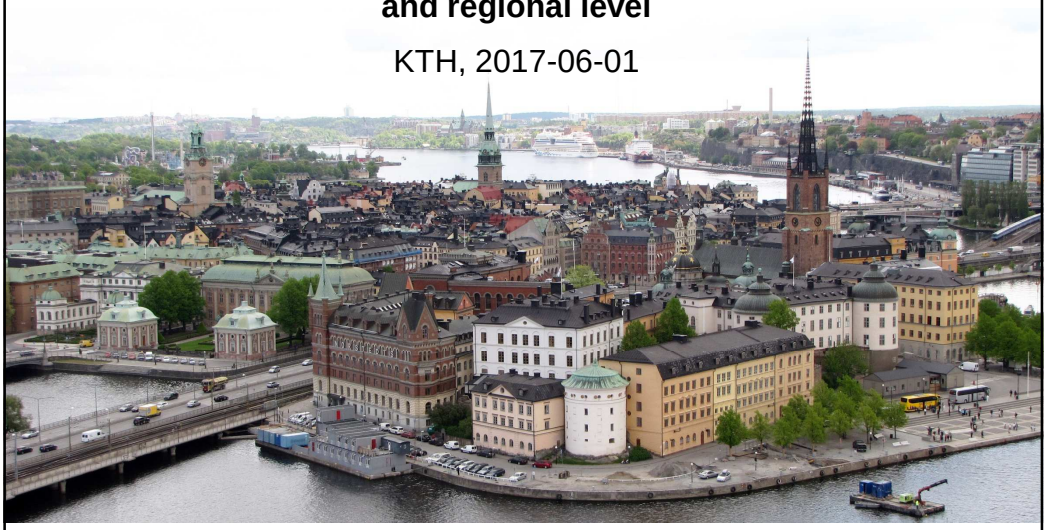
Swedish innovation strategies at national and regional level

KTH, 2017-06-01



Maria Lindqvist, County Administrative Board of Stockholm

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The governmental investigation on innovation and entrepreneurship

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Entreprenörskap i det tjugoförsta århundradet

(SOU 2016:72)

Framework conditions

- Labor market
- Social insurance
- Access to competence
- Competition and productivity
- Legal frameworks
- Housing and infrastructure
- Taxes

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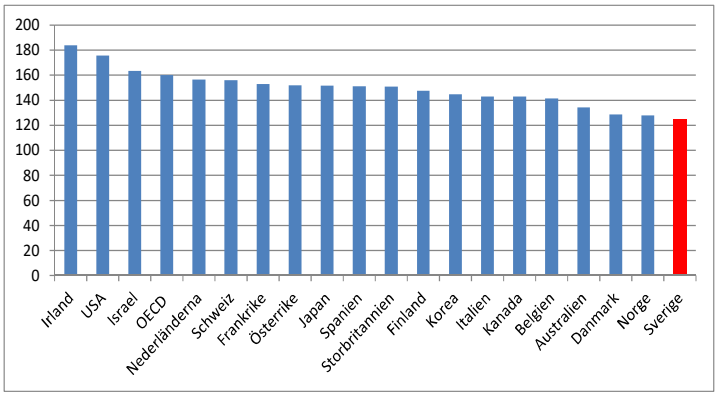
High education income in comparison to average income level



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Taxes as a share of GDP and entrepreneurship, 2001-2015 in innovation driven countires

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Meeting social challenges

- Focus on areas where Sweden has a global competitiveness
- Aging population, increased privatisation, need for research innovation and digitalisation in health and hospital care
- Global migration, flows of refugees and urbanisation
- Increasing ecological footprints, global pollution, sharing economy and circularity

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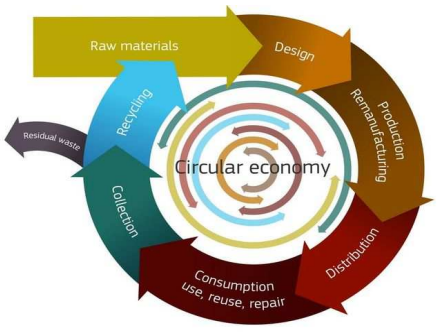
A circular economy from a broad perspective



Vs

Linear economy

Länsstyrelsen Stockholm

Need for initiatives

- Incentives for innovation in health and hospital care,
  - E.g. result based funding, evaluations and access to open data
- New ways into Swedish society
  - E.g.. fast track at universities and HEI, exchange of experience (e.g. Germany), innvaotion competitions, entrepreneur brokers, access to second hand rental apartments
- More climate friendly and resource efficient production
  - Harmoniserd frameworks, evaluation and monitoring, producer responsibility regulations, stimulate climate friendly support
  - Incentives for a more circular economy, e.g. taxes, research, testbeds, industrial symbiosis, sharing of knowledge
  - More transparent national priorities
- Public procurement, innovation competitions an crowd-sourcing

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Threats to research and innovation in Sweden

- Top-level ranking in innovation index – but more input than output (economic effects)!
- Low ranking in the PISA-study
- Lack of competence in the business sector
- Ambitious investments in the last research bills (innvoation offices, startegic research programs, strategic innvaotion programs, development of Swedish research institutes, etc) but uncertain effects on research quality and cooperation accordin to OECD
- Private investments in R&D are going down

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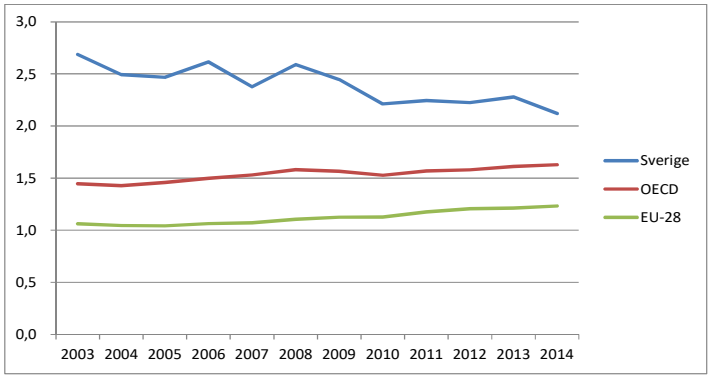
Private research as a share of GDP



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Need to focus quality in research and education

- Develop research and education in higher education (competition, leadership, research funding, international experts)
- Develop access to competence (fair judgement of national exams, more digital competence development, life-long-learning, facilitate the potential to attract global talents)
- Increased collabotaion between academia, bsiness and public sector (national programs, mobility, campus based meeting places, access to innvoation advisory services, support to use testbeds, etc)
- Other suggestions (R&D-deduction for private firms, support in patent processes)

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Public support to entrepreneurship and innovation

- Fragmented with many actors and overlapping initaitives
- Limited coordination – piplelines in agencies and ministries, uncreal division of responsibility between national and regional level
- Weaknesses in monitoring and evaluation – measuting sociatal effects, weak goal formulations
- Unclear volumes - depening on definitions!

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Business support to various policy areas (about SEK 38,2 billions)

Policy areae	MSEK	Share
Labor market policy	13 790	36 %
EU funding	10 463	27 %
Business development	5 222	1 4 %
Research and innovation policy	3 293	9 %
Farming etc	2 287	6 %
Regional business support	1 624	4 %
International policy	770	2 %
Environment and climate policy	397	1 %
Cultural policy	316	1 %
Total	38 161	

Source: Data 2014-2015

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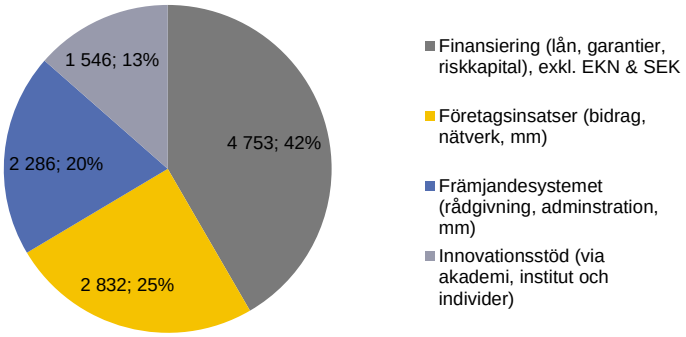
Different types of growth support initiatives (total about SEK 11,3 billions)



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More efficient public support systems

- Better national co-ordination
- More transparent regional responsibilities and access to resources
- Develop the prerequisites for better evaluations (goal setting, measuring societal effects, stronger evaluation capacity, consolidate funding)
- Develop access to digital information (verksamt.se)
- Support m innovative public procurement
- Focus early stage funding for innovation

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The County of Stockholm

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Facts about Stockholm County

- 2 percent of Sweden's area
- Most densely populated county in Sweden with over 2,1 million inhabitants
- 20 percent of Sweden's population, growing with 30,000–40,000 new inhabitants per year
- 30 percent of Sweden's gross domestic product
- 30 percent of new businesses
- Half of the county consists of forest
- Archipelago with 30,000 islands

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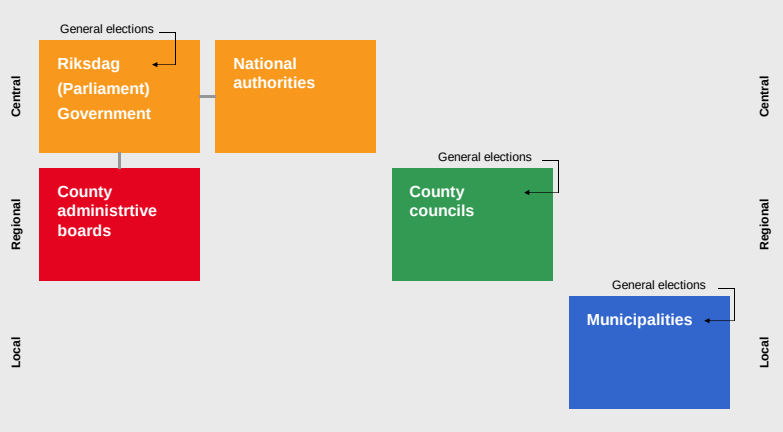
The County Administrative Board's position in the Swedish public authority system



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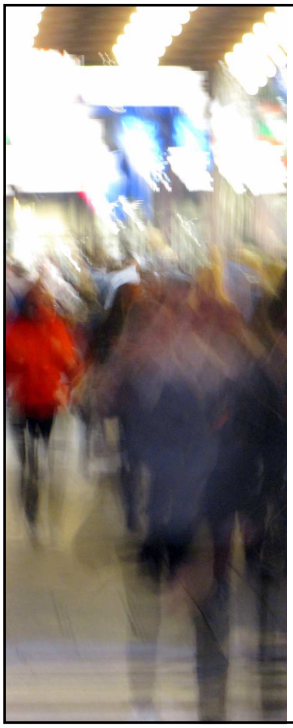

Government representatives in Stockholm County

The County Administrative Board's charge:

- ensure that national policies and national goals have a regional impact
- coordinate state activities
- follow and promote the county's development (”growth responsibility”)

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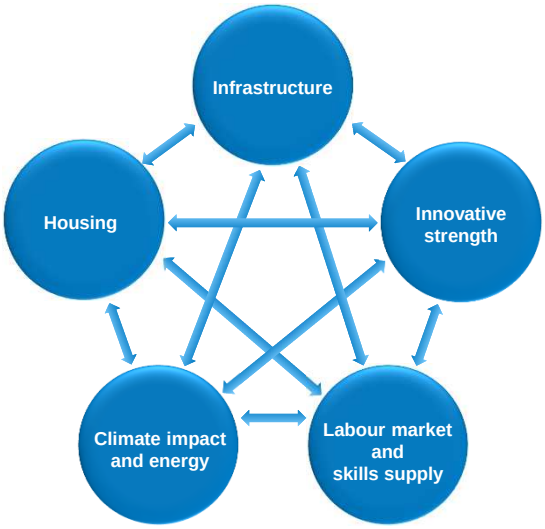
Five crucial development areas for the Stockholm region



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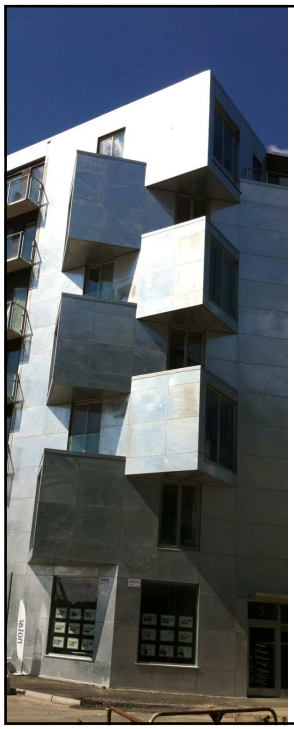

Functional housing market

- A rapid increase in the population and insufficient construction of homes have led to a housing shortage.
- Up to 20,000 new homes need to be built each year. Flexible solutions for a wider range of student accommodation are urgently required.
- This also necessitates considerable expansion and improvement of the infrastructure.

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Functional infrastructure

- The traffic and transport system has reached its maximum capacity.
- Major investments must be made in water supply, sewage systems and waste management.
- The expansion of broadband – particularly in rural areas – is important.
- Expansion must occur in parallel with the planning of new housing and workplaces, and it must take place in an eco-friendly way.

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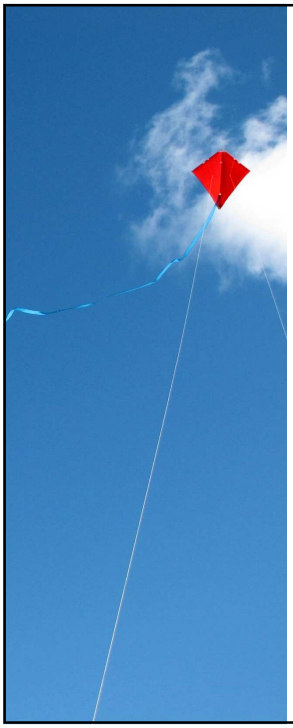

Sustainable environmental & energy development

- Key areas comprise reduced climate impact, secured supply of drinking water and stimulated development of environmental technology.
- Using the innovative ability of the region we can both develop the business sector and lead the environmental field.

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Functional labour market & skills supply

- The need for a highly qualified workforce is rising rapidly.
- A secured skills supply, better matching and faster establishment in the labour market are prioritised measures.

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Greater innovative strength

- Stockholm County is described as the most knowledge-intensive region outside the USA.
- But international competition is intense and measures to promote innovation are required – especially to secure cutting-edge expertise.

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Innovation Stockholm
Regional Innovation Strategy

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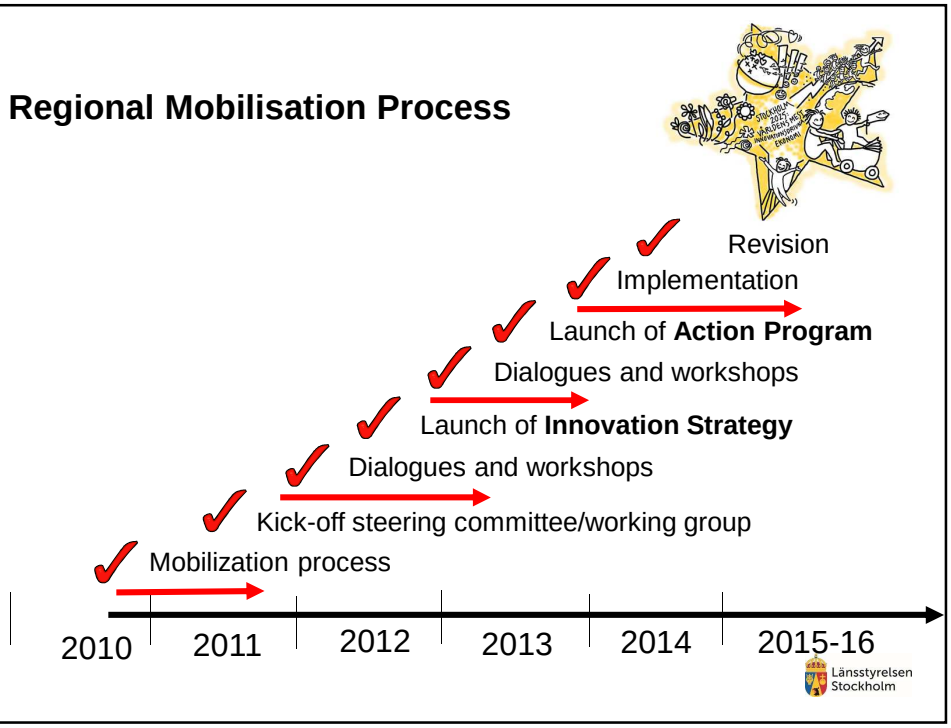
A Regional Mobilisation Process



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Strategic Triple Helix Partnership

Stockholms stad · KSL Kommunförbundet Stockholms Län · KTH · Stockholm Business Region Development · Stockholms läns landsting · Stockholms Handelskammare · Länsstyrelsen i Stockholms län · Karolinska Institutet · Stockholms universitet

INNOVATION STRATEGY FOR THE STOCKHOLM REGION

DESIRED POSITION

ATTRACTIVE

STOCKHOLM 2025

LEADERSHIP

SUSTAINABLE

THE WORLD'S MOST INNOVATION-DRIVEN ECONOMY

CREATIVE

OPEN

GUIDING OBJECTIVES

COLLABORATION MUST BE EXPANDED AND THE RESULTS OF COLLABORATIONS IMPROVED THROUGH:

- improved and expanded collaboration between researchers, businesses and the political/public sphere
- a larger number of international networks being established in research and innovation
- more collaboration between knowledge areas.

GUIDING OBJECTIVES

THE STOCKHOLM REGION MUST BE SEEN AS MORE ATTRACTIVE TO:

- students, researchers, experts and entrepreneurs
- investments and investors
- multinational companies.

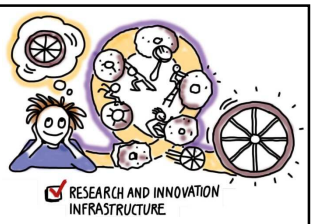
GUIDING OBJECTIVES

DELIVERY CAPABILITY IN THE RESEARCH AND INNOVATION SYSTEM MUST INCREASE THROUGH:

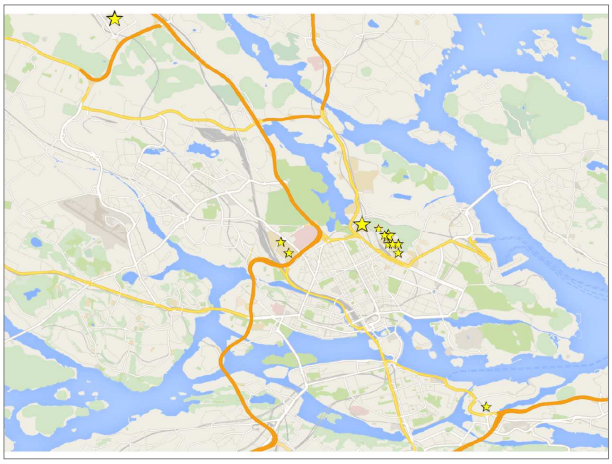
- a larger number of innovative export companies being established
- a larger number of rapidly growing companies in industries with high added value being created
- greater impact of new business models and areas.

RESEARCH AND INNOVATION | INNOVATION PROCUREMENT | SUPPLY OF CAPITAL | CROSS-SECTOR APPROACH | GLOBA ATTRACTIVE

Mapping of research and innovation infrastructure in Stockholm



90 laboratories, test & demo sites in SU, KI, KTH och RISE

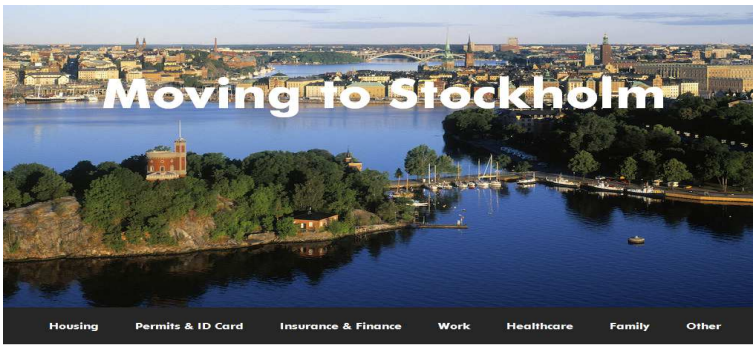


Example - KTH

1	Electrum Lab
2	SciLifeLab
3	PDC Center for
4	Odqvistlabratoriet
5	Sjöstadsverket
6	Nano Lab, AlbaNova Nanofabrication facility / Myfab
7	AlbaNova Laser Laboratory
8	AlbaNova Mesoscopic Measurements Lab
9	VIC Visualization Studio
10	SAPC - Centrum för flyg och rymdfysioloig / Swedish Aerospace Physology Center
11	XPRES Lab
12	KTH Transport Labs
13	Byggkonstruktion Mätlaboratoriet ABE
14	Highway and Railway Engineering Laboratory (Väg- och banteknikaboratoriet)
15	Greenhous Labs

Länsstyrelsen Stockholm

Home page for talent attraction

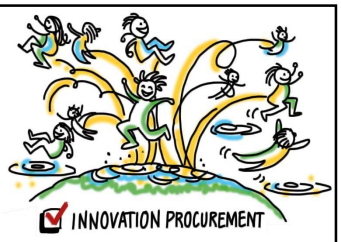


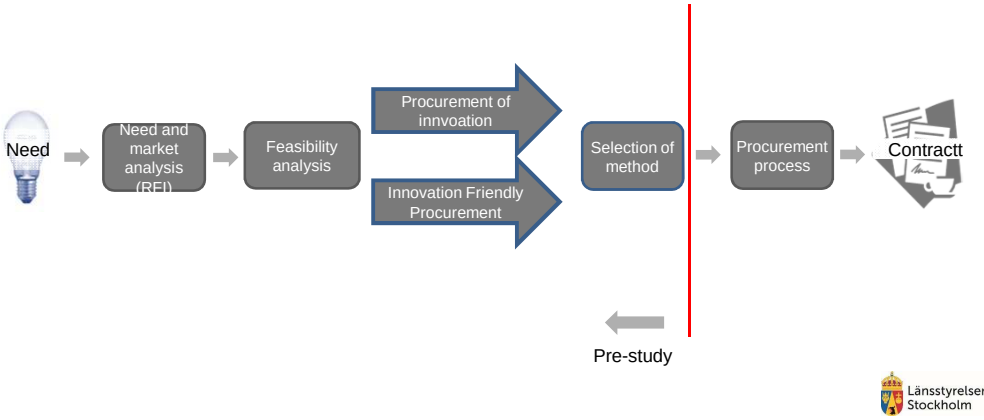
Are you thinking about moving to Stockholm? Wonderful, we'd love to have you here! And to make your relocation easier, we've gathered most of the information you need to consider before you pack your bags.

www.visitstockholm.com/movingtostockholm

Länsstyrelsen Stockholm

Handbook for innovation procurement





Länsstyrelsen Stockholm

OpenLab

- Center for students, teachers and researchers from KI, KTH, SU och SH working with challenges provided by Stockholm city, the County Council or the County Administrative Board
- Develop concepts of solutions to complex societal challenges for a growing region by inter-disciplinary collaboration

New creative locations in January 2015

- 1300 kvm creative, learning environment and meeting place, supporting innovative solutions for regional challenges
- Unique café concept
- Creative environment for students, researchers and business
- Ateljéer/studios for prototyping
- Conference area
- Exhibitions

Länsstyrelsen Stockholm

EU-funding

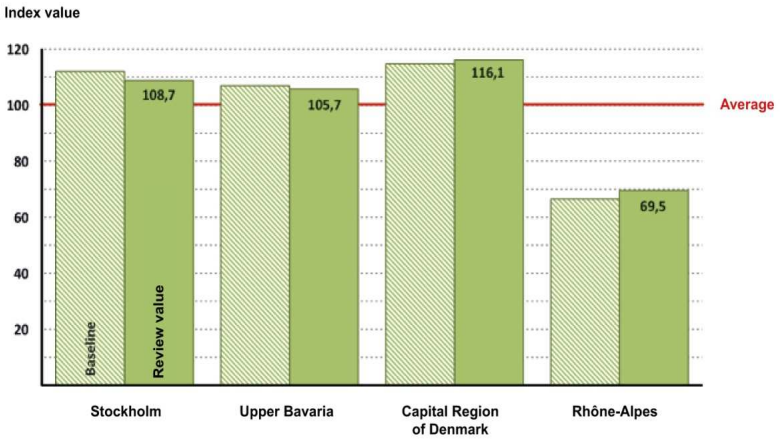
Pre-studies
2014

Structural Funds
2014-2020

Horizon
2020,
COSME,
National
Funding
(Vinnova,
Tillväxtverket,
mfl)

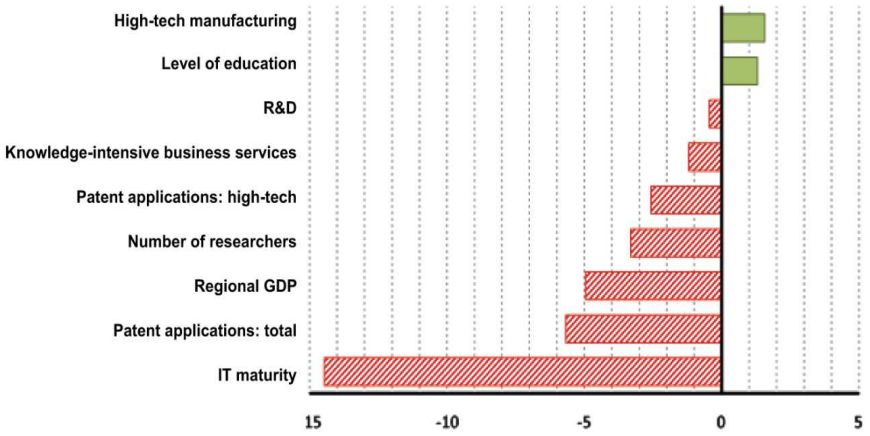
Länsstyrelsen Stockholm

Innovation index values of the four regions: baseline and review



Länsstyrelsen Stockholm

Changes in Stockholm compared to baseline



Länsstyrelsen Stockholm

Process for smart specialisation

Länsstyrelsen Stockholm

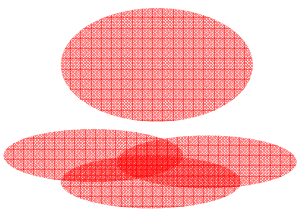
EU Structural Funds in Stockholm

- Budget European Regional Funds (ERDF
  - About 300 miljoner SEK (€30 million) 2014-2020
  - One priority area: Sustainable Urban development
    - TG 1 Research, technology and innovation (45%)
    - TG 3 Competitive SME (40%)
    - TG 4Low carbon economy (15%)
- Budget European Social Funds (ESF)
  - PA 1 (Competence) 463 miljoner SEK (about €46 millions)
  - PA 2 (Increase transfer to work) 622 miljoner SEK (about €62 millions)

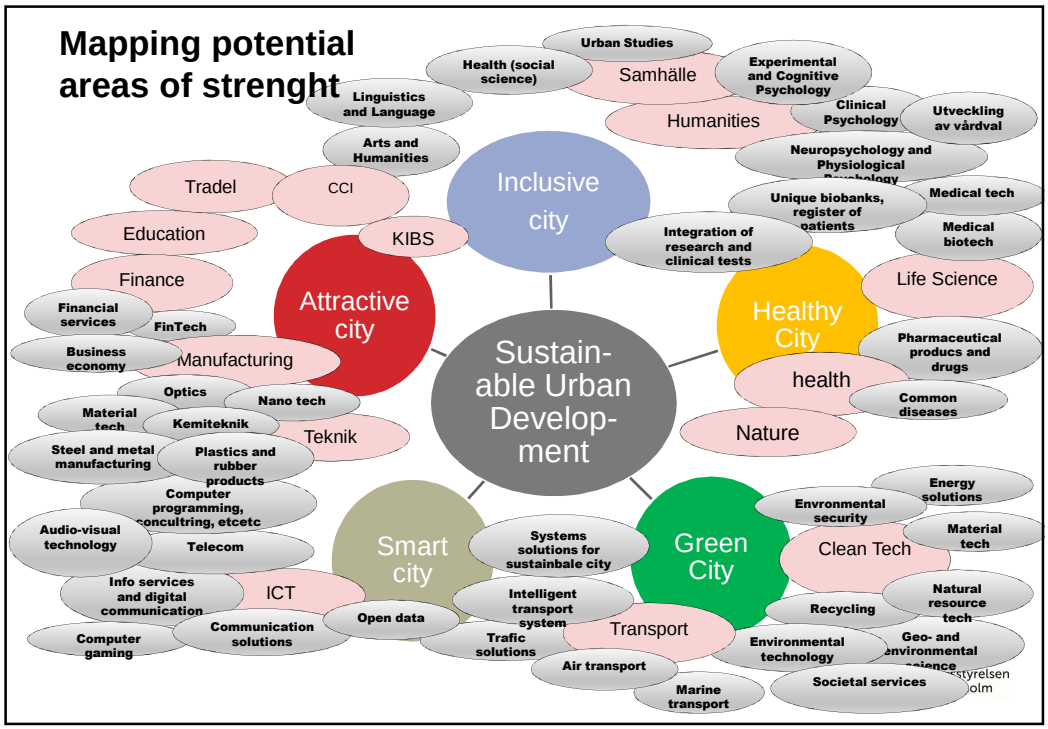
Länsstyrelsen Stockholm

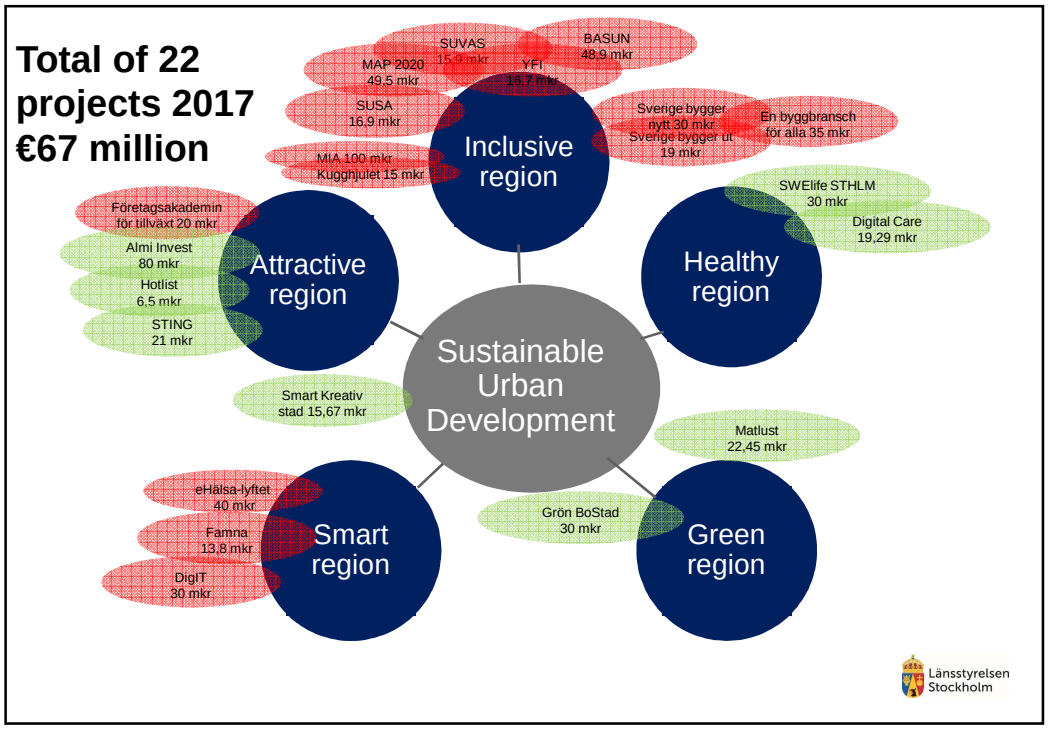
Main principles for implementation

- Concentration of resources
- Existing companies and employees in focus
- Collaboration between funds
- ”Stockholm Model”
  - Large collaborative projects between strategic partners (preferably inter-disciplinary initaitives)
  - A strategic effort with several participating projects, contributing to regional learning

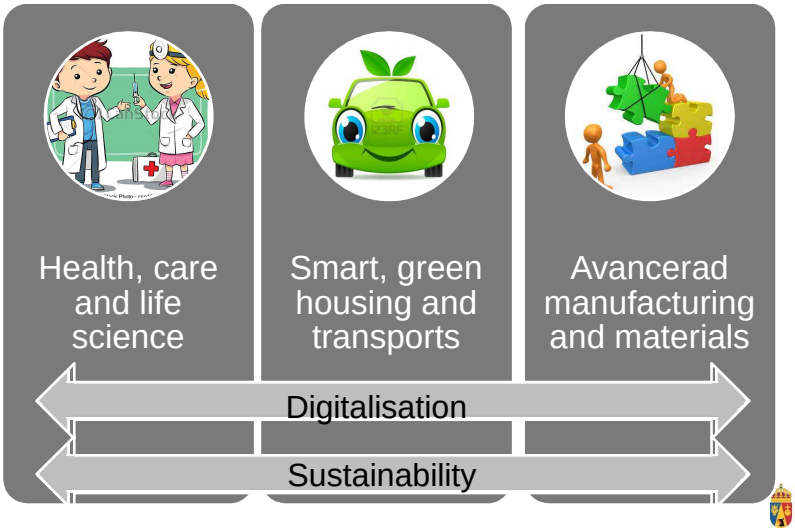


Länsstyrelsen Stockholm


Mapping potential areas of strenght
Sustain-able Urban Develop-ment
Inclusive city
Attractive city
Smart city
Green City
Healthy City
Urban Studies
Health (social science)
Samhälle
Experimental and Cognitive Psychology
Linguistics and Language
Humanities
Clinical Psychology
Utveckling av vårdval
Arts and Humanities
Neuropsychology and Physiological
Tradel
CCI
Unique biobanks, register of patients
Medical tech
Education
KIBS
Integration of research and clinical tests
Medical biotech
Finance
Life Science
Financial services
FinTech
Pharmaceutical producs and drugs
Business economy
Manufacturing
health
Optics
Nano tech
Common diseases
Material tech
Kemiteknik
Nature
Teknik
Steel and metal manufacturing
Plastics and rubber products
Energy solutions
Computer programming, concultring, etcetc
Envronmental security
Audio-visual technology
Material tech
Telecom
Systems solutions for sustainbale city
Clean Tech
Info services and digital communication
ICT
Intelligent transport system
Natural resource tech
Open data
Recycling
Transport
Computer gaming
Communication solutions
Trafic solutions
Environmental technology
Geo- and environmental
Air transport
Marine transport
Societal services


Total of 22 projects 2017 €67 million
Sustainable Urban Development
Inclusive region
Attractive region
Healthy region
Smart region
Green region
SUVAS 15,9 mkr
BASUN 48,9 mkr
MAP 2020 49.5 mkr
YFI 16,7 mkr
SUSA 16,9 mkr
Sverige bygger nytt 30 mkr
Sverige bygger ut 19 mkr
En byggbransch för alla 35 mkr
MIA 100 mkr
Kugghjulet 15 mkr
SWElife STHLM 30 mkr
Digital Care 19,29 mkr
Företagsakademin för tillväxt 20 mkr
Almi Invest 80 mkr
Hotlist 6,5 mkr
STING 21 mkr
Smart Kreativ stad 15,67 mkr
Matlust 22,45 mkr
eHälsa-lyftet 40 mkr
Famna 13,8 mkr
DigIT 30 mkr
Grön BoStad 30 mkr
Länsstyrelsen Stockholm

On-going discussion on smart specialisation



Länsstyrelsen Stockholm

Meeting several national collaboration programs

- Next generation travel and transport
- Smart cities
- Life Science
- Connected industry and new materials
- Circular and bio-based economy

Länsstyrelsen Stockholm

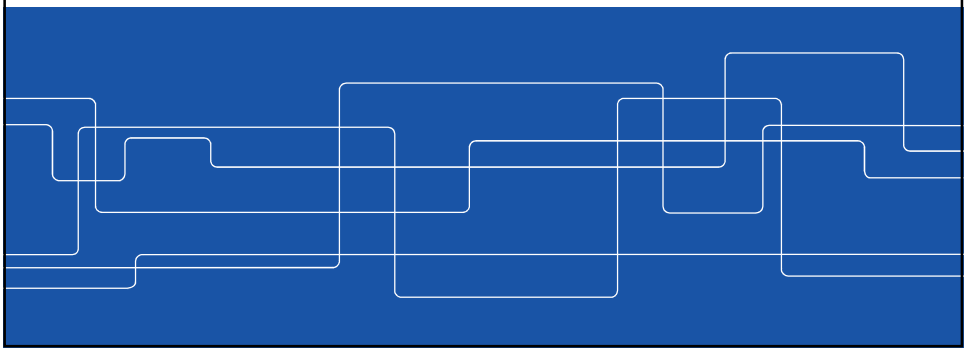
For more information contact:

maria.c.lindqvist@lansstyrelsen.se

Thank you for your attention!

Länsstyrelsen Stockholm

Collaboration for Innovation



KTH Vision 2027

KTH works for a brighter tomorrow. KTH wishes to enhance society and identify smart solutions to the grand challenges of today, and of tomorrow.

KTH works in the service of humankind for the society of tomorrow.

VISION27

IMPACT THROUGH COLLABORATION

Business Liaison Office

Tech Transfer and Innovation support

Research Office

Researchers → Idea → Proposal → Contract & Formalities → Project → External funding bodies

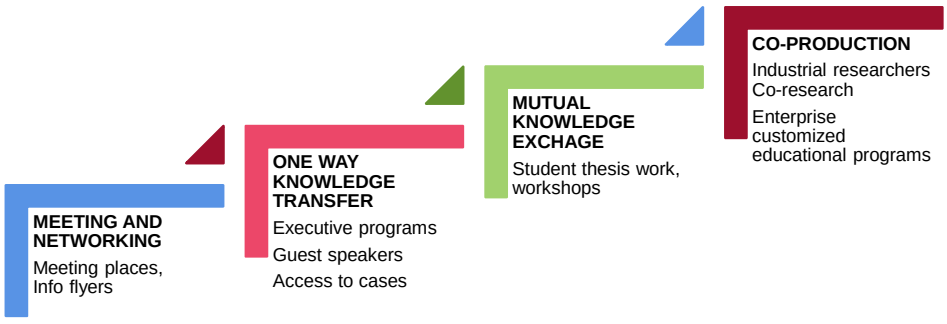
Innovation - Push

Students & researchers → Initial contact → Idea → Feasibility study → Project → Society

Business Liaison - Pull

Students & researchers ← Project or collaboration ← Idea ← Matching ← Initial contact ← Society

Collaboration development stair



Means for enhanced value creation through collaboration with society

Work process for partnerships Processes for initiation, operation, evaluation and organisation, Partnerships and Fundraising

Mobility Mobility in to KTH
Mobility out from KTH

Arenas for collaboration Network, Alumni, Forum for Adjunct Prof. KTH Innovation, Research Platforms, OpenLab, Digital Demo Sthlm

Collaboration in education and research Centres, thesis projects, Co-publ, challenge-driven education and research

Campus development Attractive environment, visibility of research, Living Labs – meeting spots, high quality research infrastructure

KTH model of collaboration

STRATEGIC PARTNERSHIP PROGRAM

PERSON MOBILITY

Goal: Adjunct Professors, Affiliated Faculty, Industial PhD

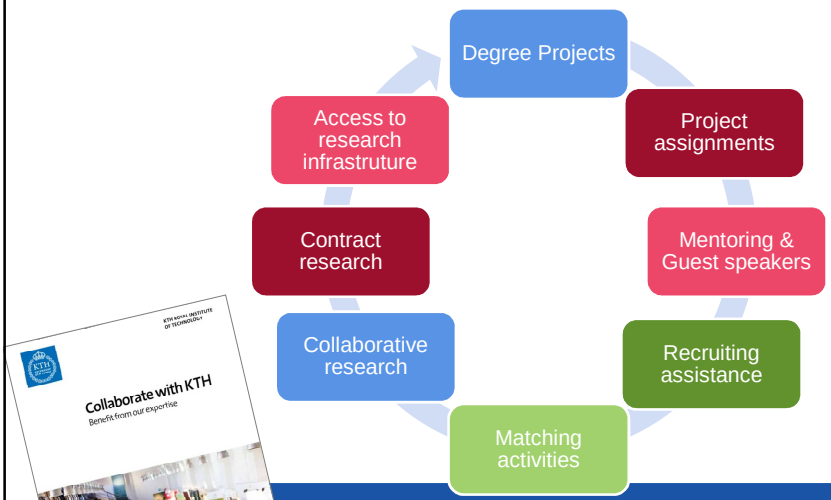
ARENAS

> OpenLab

IMPACT

Logging of indicators to measure Impact

Collaboration possibilities for SME



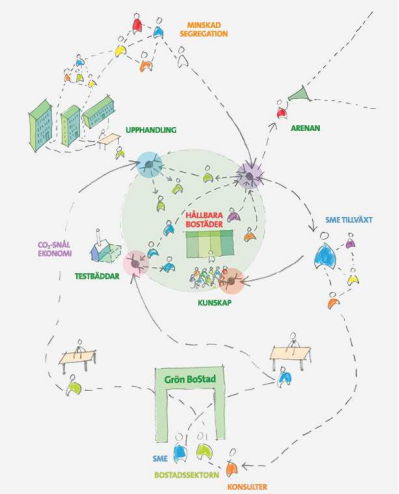
Grön BoStad Stockholm

Developments for habitations can be the driving force in making Sweden even more robust, climate neutral and socially forward looking.

To achieve that vision, Grön BoStad Stockholm operates in four interconnected subprojects: test beds, procurement, the arena and knowledge.

Grön BoStad Stockholm is funded by the European Regional Development Fund, and the project will help small and medium-sized enterprises in the housing sector to grow.

The target is growth, reduced segregation, and an economy characterized by low carbon emissions.



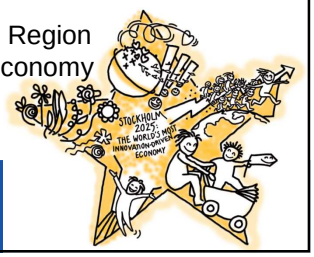
Regional collaboration for growth

Organisations

- County Administrative Board
- City of Stockholm
- Other Universities (KI, SU)
- Foundations and institutes

Present projects

- Innovation Strategy for the Stockholm Region - The worlds most innovation-driven economy



KTH's strategic partners

ABB
SKANSKA
ERICSSON
SCANIA
BOMBARDIER
the evolution of mobility
SANDVIK
SAAB
VATTENFALL
rethink.
Stockholms stad
Stockholms läns landsting
storaenso

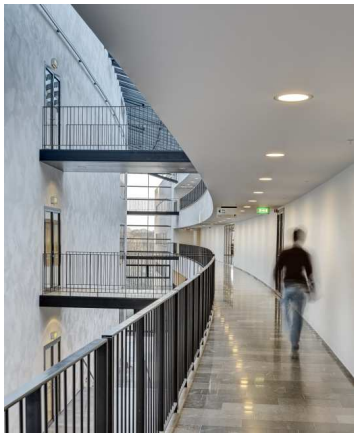
Collaboration that creates mobility between KTH and industry

From partner to KTH

- Adjunct Professor
- Affiliated Professor
- Affiliated Faculty
- Industry-employed doctoral students

From KTH to partner

- Industry-employed doctoral students
- Affiliated experts
- Degree projects and student jobs



Indicators for Collaboration

Quality measures for evaluation

- Adjunct professors
- Affiliated professors/affiliated faculty
- Industrial PhD students/Industrial Licentiate students
- Co-published papers with industrial partners
- Affiliated KTH experts
- Research funding from industry and public sector
- Commissioned Research
- Income from Contract education
- Patents, License agreements and Start-ups
- Incoming questions

Alumni – our top ambassadors

18 000 outside of Sweden
30 in your countries
25 formalised networks

Fundraising

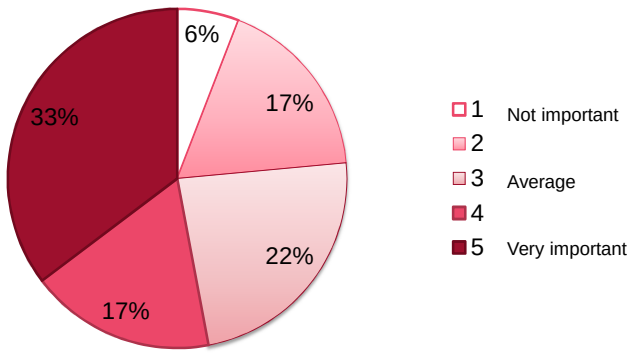
In order to compete on a global market we need to produce world leading research and education

Governmental support and research calls is not enough

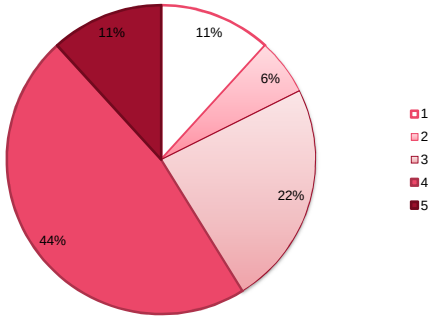
We need to intensify our research and work proactively within priority areas in order to quickly find the solution for the challenges of tomorrow

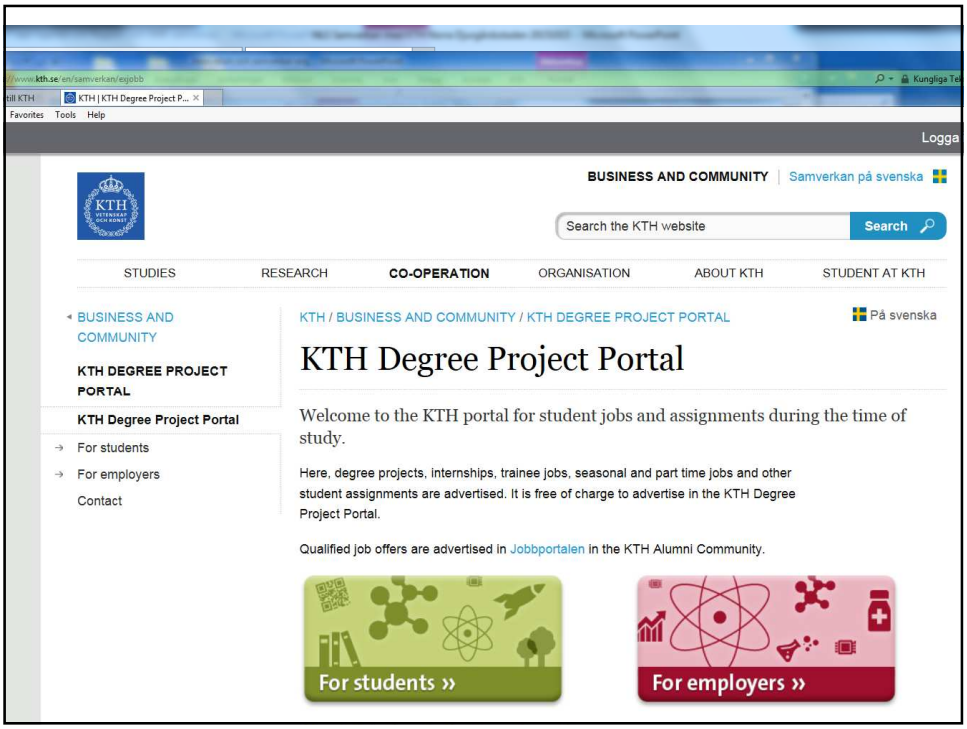
We are inviting our friends, alumni and business partners to be part of this

How important is collaboration with academia/KTH for you? 1 (not important viktig) -5 (very important)



Get access to degree thesis students





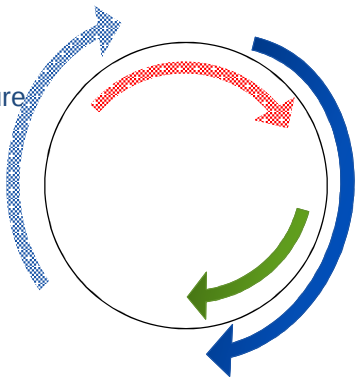
KTH Degree Project Portal

Reaches all KTH students

- Bachelor students
- Master students & Architecture

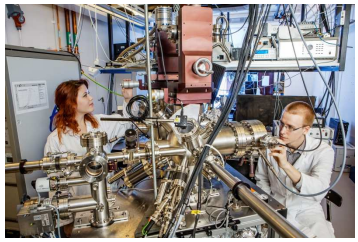
Quick and free of charge

- kth.se/exjobb
- exjobb@kth.se



Access to research infrastructure

- Lab, equipment, data bases
- Performs tests, demonstrations and verifies concepts



kth.se/samverkan/infrastruktur

Thank you!
Emelie Johansson, KT
emelij@kth.se

Entrepreneurship, social capital and rural development in Sweden

Hans Westlund

Professor of the Royal Institute of Technology (KTH), Stockholm, Sweden

The Swedish countryside

- 1945: Half the population lived on the countryside
- 2017: 12% live on the countryside
- 1945: About 70% of countryside's population were farmers or forestry workers
- 2017: 2.5% of the rural population work in agriculture and forestry

Industrial structure

- The service sector – mainly run by the municipalities – dominates both cities and countryside in Sweden
- The knowledge economy (high-tech sectors and education and research) is concentrated to metropolitan and university regions

Not one uniform countryside

- Metropolitan-close countryside experiences high growth
- Rural areas close to regional centers increase
- The peripheral countryside (most of Sweden) loses population
- The more remote from centers – the larger are the population losses (with some interesting exceptions)

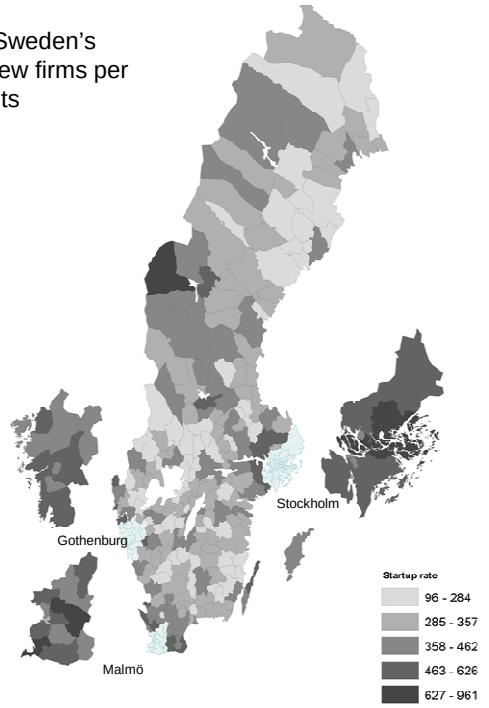
Entrepreneurship – a popular concept

- ”To discover (or create) opportunities, to evaluate them, collect resources, in order to exploit the opportunities”
- Economic e-ship (starting new firms, etc)
- Social e-ship (new solutions for society’s welfare)
- Political/policy e-ship (new methods in government, governance, planning, etc)

Entrepreneurship in the form of startups

- Strong entrepreneurship in metropolitan regions – not least among immigrants
- Low level of entrepreneurship in former manufacturing industry regions
- Strong entrepreneurship in rural tourism regions and certain other rural regions
- E-ship is highest in new, knowledge intense industries (metro regions) and low in traditional manufacturing (small urban places and rural areas)

Startup rates in Sweden's municipalities. New firms per 10,000 inhabitants



Regional Policies in Sweden

- Established 1965
- Mainly directed towards firms for job creation
- The great expansion of the public sector in the 1970s created much more jobs in rural areas
- Today, most jobs in the cities. Rural dwellers commute to the jobs

Sweden member of European Union 1995

- Partly new systems for regional and rural policies:
- New possibilities to apply for support
- More resources for active villages that make applications, no extra resources to passive areas.

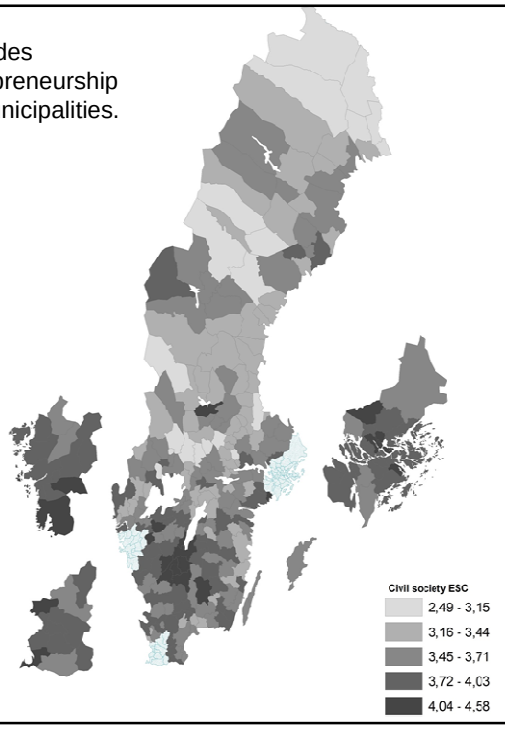
Social Capital

- Social Capital: Relations and norms necessary to collaborate and accomplish things
- Trust and membership of voluntary associations? (civil society)
- Social capital of companies and government
- The relationships between companies, municipalities and associations

Important measures of social capital that promote e-ship

- Citizens' *attitudes* towards local entrepreneurship (startups)
- The share of small firms of the total number of firms in the municipality – reflects small firm traditions, a long-term business-related social capital
- These two factors are strongly correlated with startup rates in Sweden

Citizens' attitudes towards entrepreneurship in Swedish municipalities. Scale: 1-5



Three Swedish Examples 1/3

- Gnosjö – a legendary entrepreneurial village
- Unique informal collaboration among small manufacturing companies
- Entrepreneurship is encouraged by existing companies – lending of capital and equipment

Three Swedish examples 2/3

- Åre: Not only a ski resort

- A great example of tourism as base for local development
- Enterpreneurship: Top ranking in new companies per inhabitant
- Substantial regional policy support – and successful
- Many entrepreneurs from Stockholm being active in Åre

Three Swedish examples 3/3

- Trångsviken: The most companies per inhabitant in Sweden
- EU membership gave new opportunities
- The Village House: the village's node
- The Development Company
- Important indigenous actors with extensive networks

Common features of the three examples

1. Cooperating enterprises
2. Cooperation between firms, municipality and local associations
3. Firms' good customer relations and high quality products
4. Contacts and relations to regional and national politicians and officials, and to big companies

Why are the good examples just a few?

- Former industry might have counteracted entrepreneurship
- Most people lack knowledge on how to run a company
- The often necessary cooperation between firms, public sector and third sector is missing
- The important external contacts for getting capital, ideas, know-how etc, are missing

Are enterprises the crucial power in rural development? 1/2

- Yes, but local policy can have an impact too!
- Survey to municipal directors about:
- Cooperation with local industry
- Measures for strengthening local business climate
- Co-financing of development projects with local industry
- Cooperation with other municipalities
- Development projects (co-financed by EU and state)
- Benchmarking, learning and competence development
- Marketing

Results

- In the metropolitan regions and regional centers, local policy had no impact. Growth is market-led
- In rural municipalities, those that scored high in benchmarking, learning and competence development had better population and employment development
- Entrepreneurial policy seems to have an impact in rural municipalities!

Are enterprises the crucial power in rural development? 2/2

Yes, but successful development demands cooperation between three actors:

- The enterprises
- Local associations
- The Municipalities

All experiences point in the direction that the three actors must help each other to achieve local development!

The traditional view

	Actor		
	Ec. E-ship	Pol. E-ship	Soc. E-ship
Activity	Company	Municipality	Associations
Production and sales	O		
Administra-tion and service		O	
Culture and leisure activities			O

The necessary cooperation

	Actor		
	Ec. E-ship	Pol. E-ship	Soc. E-ship
Activity	Company	Municipality	Associations
Production and sales	O	(o)	(o)
Administra-tion and service	(o)	O	(o)
Culture and leisure activities	(o)	(o)	O

The countryside is changing…

- New knowledge and a new way of thinking is necessary
- Those villages where noboby dares to take initiatives will fade away
- The villages that form a new social capital for cooperation, entrepreneurship and renewal will prosper

Are these results of any relevance for other countries?

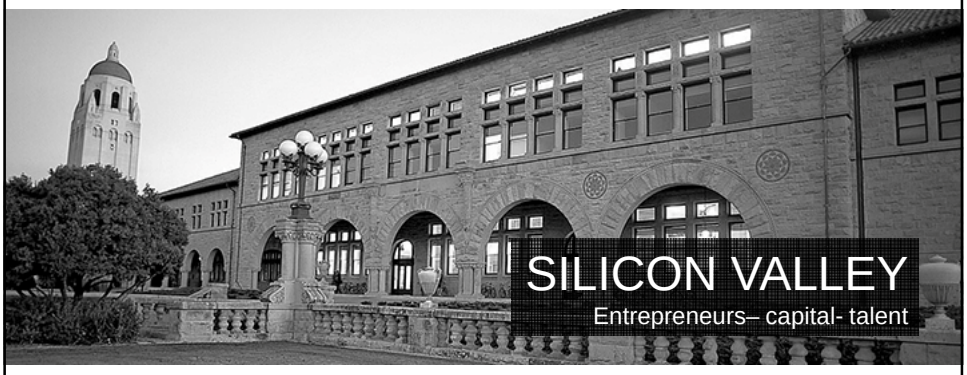
- Sweden East European are far from each other and have different histories, but have also much in common – both opportunities and problems
- In all countries, the countryside needs new strategies to survive
- In all countries, collaboration between the leading local actors is decisive for successful entrepreneurship and local development

Finally…

I hope that at least something of what I said has been of some interest for you

Thank you for your attention!

WORLD CLASS INNOVATIVE ECO-SYSTEM



SILICON VALLEY

Entrepreneurs– capital- talent


EUROPA
The battle for second place

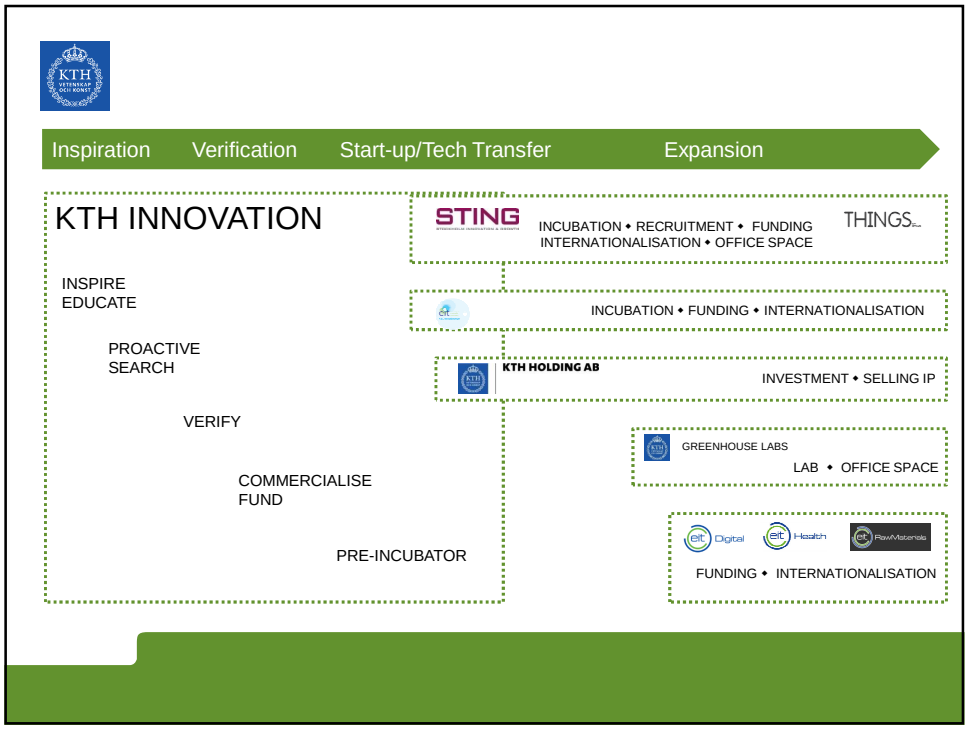

SVERIGE
Investment increasing 150 %

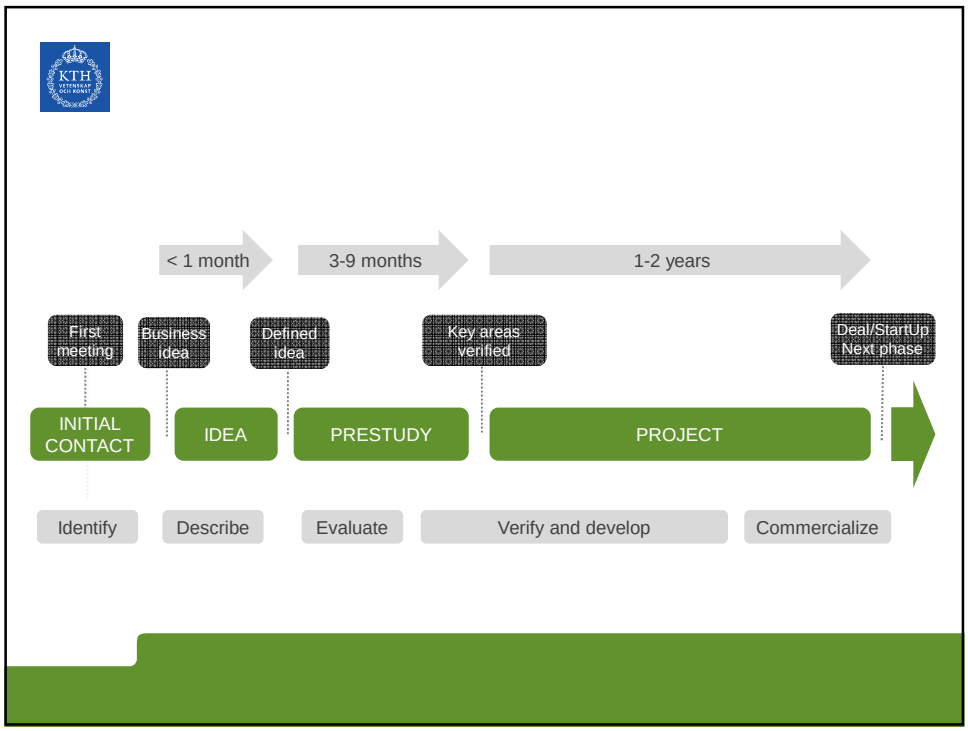

STOCKHOLM
Why do we succeed?


KTH – IT ALL STARTS HERE!

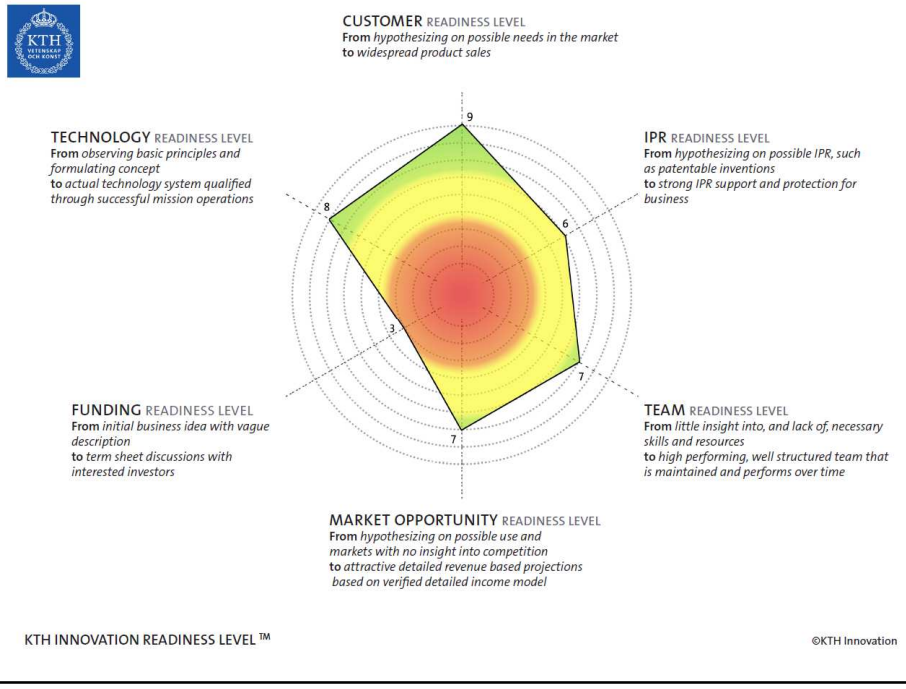

More Ideas
Effective support process
World Class Eco System


INNOVATION SUPPORT FOR EARLY TECH IDEAS

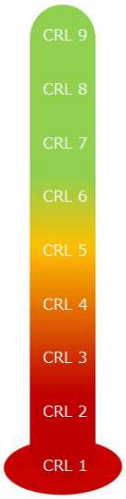

Inspiration
Verification
Start-up/Tech Transfer
Expansion
KTH INNOVATION
INSPIRE
EDUCATE
PROACTIVE
SEARCH
VERIFY
COMMERCIALISE
FUND
PRE-INCUBATOR
STING
INCUBATION • RECRUITMENT • FUNDING
INTERNATIONALISATION • OFFICE SPACE
THINGS
INCUBATION • FUNDING • INTERNATIONALISATION
KTH HOLDING AB
INVESTMENT • SELLING IP
GREENHOUSE LABS
LAB • OFFICE SPACE
FUNDING • INTERNATIONALISATION


< 1 month
3-9 months
1-2 years
First meeting
Business idea
Defined idea
Key areas verified
Deal/StartUp Next phase
INITIAL CONTACT
IDEA
PRESTUDY
PROJECT
Identify
Describe
Evaluate
Verify and develop
Commercialize


313
ideas
30
startups
41 M
SEK


CUSTOMER READINESS LEVEL
From hypothesizing on possible needs in the market
to widespread product sales
TECHNOLOGY READINESS LEVEL
From observing basic principles and formulating concept
to actual technology system qualified through successful mission operations
IPR READINESS LEVEL
From hypothesizing on possible IPR, such as patentable inventions
to strong IPR support and protection for business
FUNDING READINESS LEVEL
From initial business idea with vague description
to term sheet discussions with interested investors
TEAM READINESS LEVEL
From little insight into, and lack of, necessary skills and resources
to high performing, well structured team that is maintained and performs over time
MARKET OPPORTUNITY READINESS LEVEL
From hypothesizing on possible use and markets with no insight into competition
to attractive detailed revenue based projections based on verified detailed income model
9
8
6
3
7
7
KTH INNOVATION READINESS LEVEL ™
©KTH Innovation

Customer Readiness Level - CRL



CRL 9	Widespread product sales
CRL 8	First product sold
CRL 7	Customers in extended product testing and/or first test sales
CRL 6	Benefits of the product confirmed through partnerships and/or first customer testing
CRL 5	Established relations with target customers/users
CRL 4	Confirmed needs from several customers and/or users
CRL 3	First market feedback established
CRL 2	Identified specific needs in market
CRL 1	Hypothesizing on possible needs in market

KTH INNOVATION READINESS LEVEL™

IPR Readiness Level - IPRL

IPRL 9	Patent granted in relevant countries and maintained in force Strong IPR support and protection for business
IPRL 8	First patent granted IPR strategy fully implemented More complete assessment of freedom-to-operate
IPRL 7	Patent entry into national/regional phase Possibly other formal IPR registered or additional patent applications filed
IPRL 6	Positive response to patent application IPR/patent strategy in place supporting business Initial assessment of freedom-to-operate
IPRL 5	First complete patent application filed Draft of IPR/patent strategy in place
IPRL 4	Confirmed novelty and patentability Decided on alternative IP protection if not patenting
IPRL 3	Detailed description of possible patentable inventions or other possible IPR Initial search of the technical field and prior art
IPRL 2	Identified specific possible patentable inventions or other forms of possible IPR that you own/control
IPRL 1	Hypothesizing on possible IPR (such as patentable inventions)

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EVALUATION

KTH NETWORKS

2017 AND BEYOND …

Technology-based Entrepreneurship

Terrence E. Brown

June 2, 2017

Who am I?

- Terrence E. Brown is Associate Professor of Entrepreneurship and Innovation. My research area is – **Value creation through the formation, management, rapid growth and rejuvenation of business enterprises**. Currently his main research interests are:
- Business Model Innovation
- Opportunity Development Process
- Open and User Driven Innovation
- Translating theory into action techniques for managers and entrepreneurs
- Former Daen, Stockholm School of Entrepreneurship
- I am the founding Editor-in-Chief of the international, double-blind, peer-reviewed journal, International Journal of Entrepreneurial Venturing (IJEV).
- I have been published in academic journals such as the *Strategic Management Journal, Journal of Business Venturing and Journal of Small Business Strategy.*
- I am on the editorial boards of journals such as *Journal of Small Business Management, International Journal of Internet and Enterprise Management, International Journal of Industrial Ecology.*

Our course

- 7.5 ECTS
- Approx. 7 weeks
- 50 students
- Projects
- Teams
- Business simulation (Marketplace LIVE)

How is tech-based entrepreneurship different?

- Level of technology risk
- Time to market
- Resource requirements
- Scalability
- Leadership requirement

Characteristics that may give high tech ventures high potential

- Create new value for customers
- Have some type of tech IP that is hard to replicate
- First mover advantage
- Scalable
- Barriers to entry
- High level of initial risk

The Technology Innovation Life Cycle

- Stages in the technology innovation lifecycle:
  - **Diagnose:** identify and evaluate new ideas for products and processes
  - **Develop:** the idea is transformed through planning and developing into a viable product or process
  - **Deploy:** planning the migration and roll-out.
- **Roll out:** the process of introducing the new product to the market or employing the new or improved process in particular areas of the business.

What is Innovation?

- **Innovation:** the whole process from the inception of an idea through developing and testing to successfully putting the innovation in use – whether commercially in a market or as part of improving a business.
- **Innovation vs Invention**

Defining Innovation

- ***Creative destruction*** (Shumpeter, 1942): when innovative solutions are introduced by entrepreneurs, undermining the current practice in the economy, and thereby moving existing products, production methods and even companies of business.
- Entrepreneurial practices of **supporting innovation** serve as catalyst for **building the economy**.
- Frequency or infrequency of **innovative ideas** – **ups and downs of economic waves** and cyclical nature of economic development.

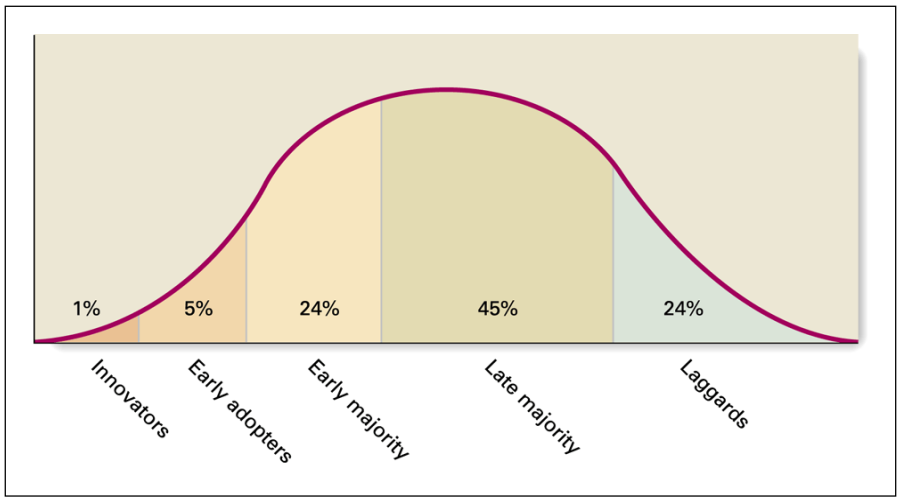
Disruptive Technology

- A new technology that gets its start away from the mainstream of a market and then, as its functionality improves over time, invades the main market
- Revolutionizes the industry structure and competition, often causing the decline of established companies because they listen to customers who say they do not want it
- Causes a technological paradigm shift

Diffusion of Innovations

- The Roger's Diffusion of Innovation Paradigm
  - **The Individual Innovativeness Theory:** the rate of adoption depends on the degree of innovativeness of an individual or other unit.
  - **The Theory of Perceived Attributes:** there are five attributes of the innovation that determine the rate of adoption and success: relative advantage; compatibility; complexity; trialability; observability.

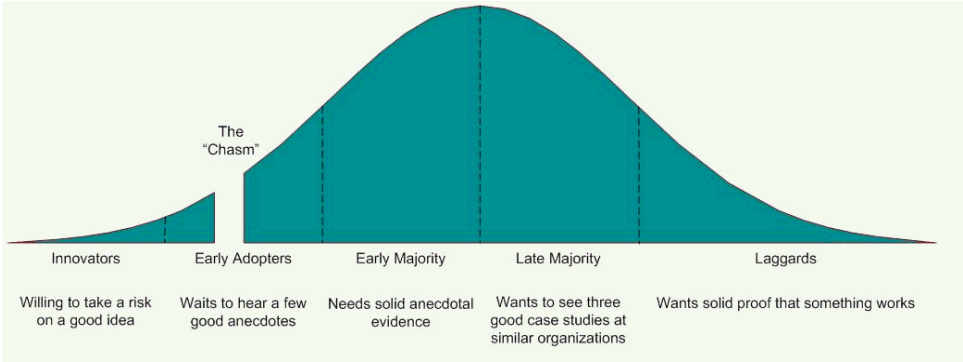
Diffusion of Innovations and the Technology Adoption Life Cycle



Geoffrey Moore

Diffusion of Innovations

The Revised Technology Adoption Life Cycle.



Geoffrey Moore

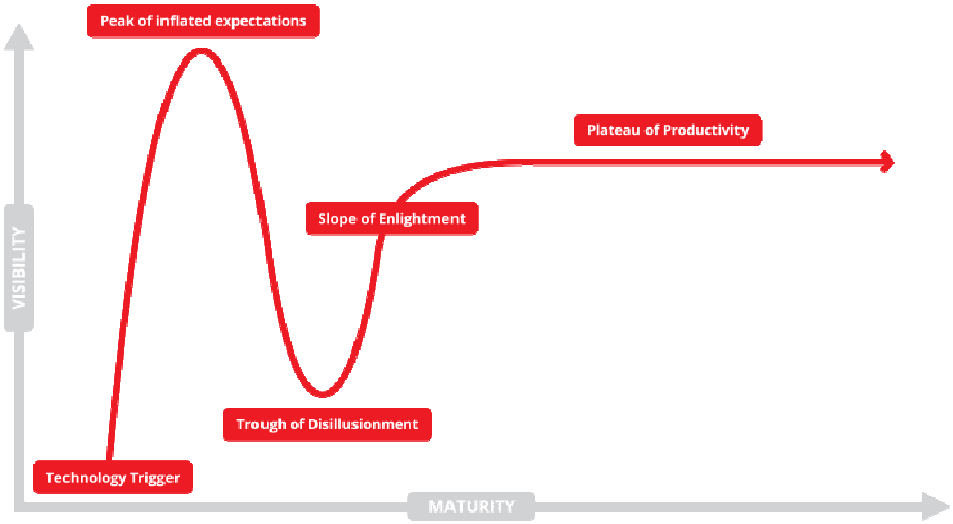
Crossing the Chasm

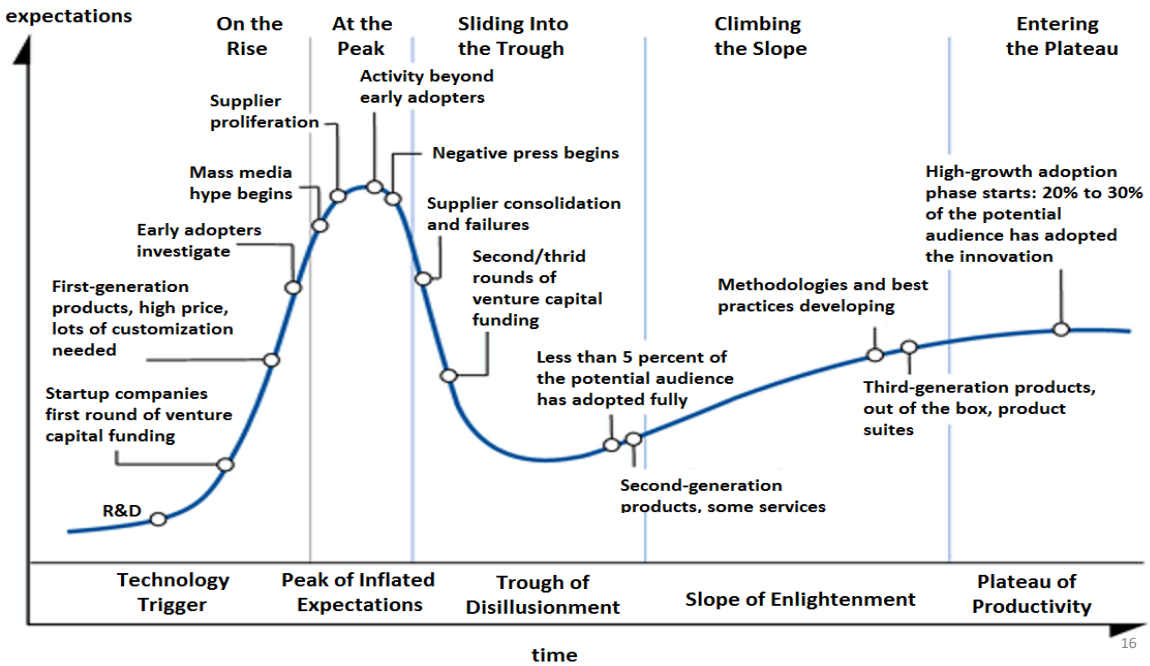
- Correctly identify the needs of the first wave of early majority users
- Alter the business model in response
- Alter the value chain and distribution channels to reach the early majority
- Design the product to meet the needs of the early majority and so that it can be modified and produced or provided at low cost
- Anticipate the moves of competitors

Strategic Implications: Crossing the Chasm

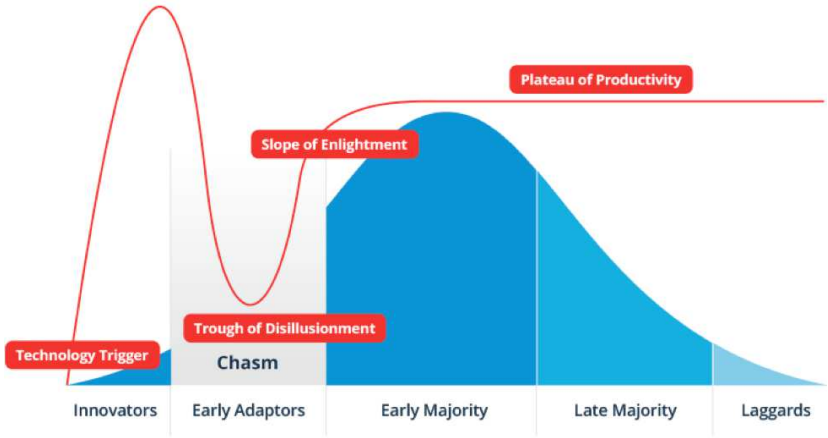
- Crossing the chasm between early adopters and early majority
  - Innovators and early adopters are technologically sophisticated and will tolerate engineering imperfections - the early majority are not
  - Innovators and early adopters are typically reached through specialized distribution channels - the early majority are not
  - Innovators and early adopters are relatively few in number and not particularly price sensitive - the early majority are not

Gartner's Technology Hype Cycle

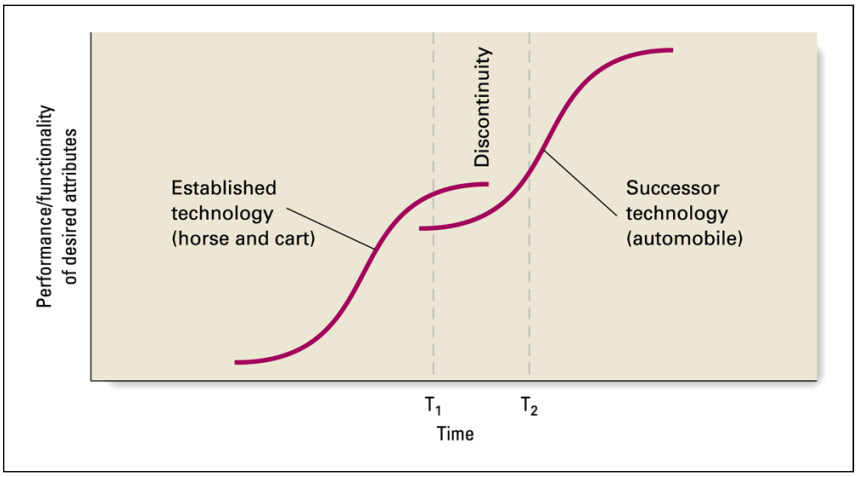




Tech Hype Cycle & Crossing the Chasm



Established and Successor Technologies



Sources of Innovation

Innovation management methodology

(O'Sullivan and Dooley, 2009):

1. Understand requirements and define goals
2. Engage users and model processes
3. Create actions and empower teams
4. Develop migration plan
5. Implement actions and monitor results

Introduction to Technology Transfer

- **Universities** play a significant role in the development, support and shaping of **technology entrepreneurship**.
- Universities as catalysts of new venture formation and regional development (Markman et al., 2005).
- **Technology entrepreneurs** are key actors both in the creation of new knowledge and its exploitation within and outside university boundaries.
- Nations with strong research systems and capacity to leverage the commercial opportunities will prosper economically and socially.

Third-mission Activities

- Third-level institutions – drivers of knowledge that impact the economy and society through technology and knowledge transfer.
- Technology Transfer Offices - protect IP and support innovation and entrepreneurship
  - Student internships – Roundtables
  - Jointly sponsored symposia – Joint curricula development
  - Joint research projects – Alumni associations
  - Guest speakers – Research commercialisation
  - Executive development workshops

Technology Transfer and Mechanisms

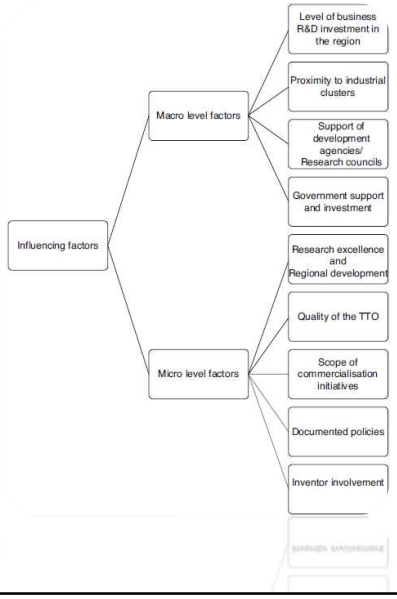
- **Technology transfer:** the process whereby invention or intellectual property from academic research is licensed or conveyed through use rights to a for-profit entity and eventually commercialised (Friedman and Silberman, 2003, p. 18)
- **Commercialization** of university-discovered technologies is a driver of economic growth.
  - University-industry Technology Transfer Process
  - Specific Mechanisms for Technology Transfer in Third-level Institutions

Third-mission Activities

- **Technology Transfer Offices (TTOs)** serve to protect the IP of the university and seek the best uses for research; transfer knowledge and technology from the research labs to Technology Entrepreneurs:
  - University research sponsored by companies
  - Academic consulting
  - Licencing of university-owned IP to companies
  - University support for start-up companies
  - "Mega agreements"
  - Research centres
  - Industry consortia to support university research.

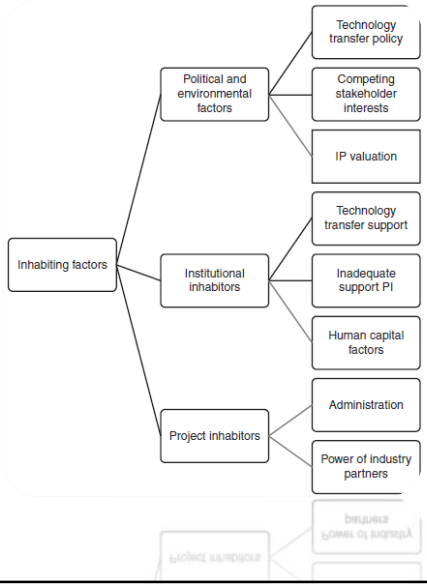
Stimulants and Barriers to Technology Transfer

Figure 2.2 Influencing factors: macro and micro factors, p. 46

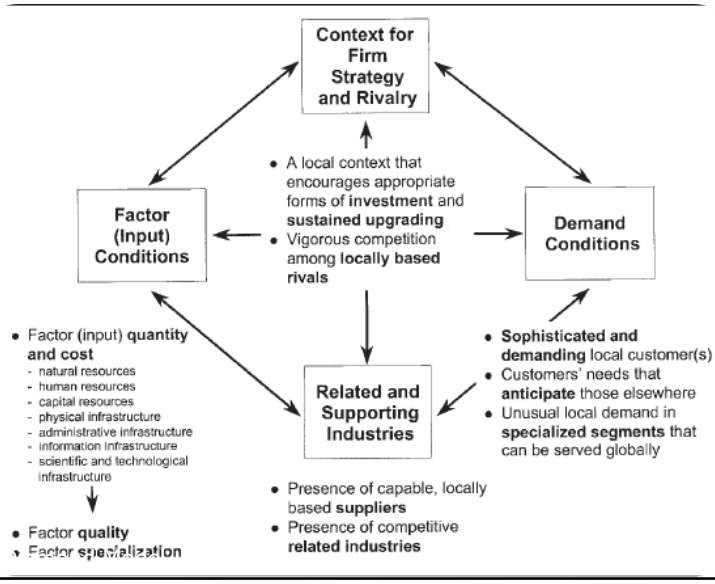


Inhibitors to commercialisation

Figure 2.4 Inhibitors to commercialisation, p. 51



Clusters/Regional Innovation Systems



Questions & Discussion?

Entrepreneurship for Engineers

Our course

- 6 ETCS
- Approx. 16 weeks
- Designed for (currently) EIT Digital
- First part of two part sequence
- 75 students

Concept, Theory and Practice

- Management
- Business
- Entrepreneurship focusing on Ideation

Flipped classroom

- Learning Management System (LMS)
- Videos
- Interactivity
- Content creation
- Diagnostic exam

Are engineers different?

- Yes
- Hard vs soft
- Solution vs problem
- Technical skills

Context

Questions & Discussion?

CREATING VALUE FROM IPR

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Bruce Lyne
Royal Institute of Technology

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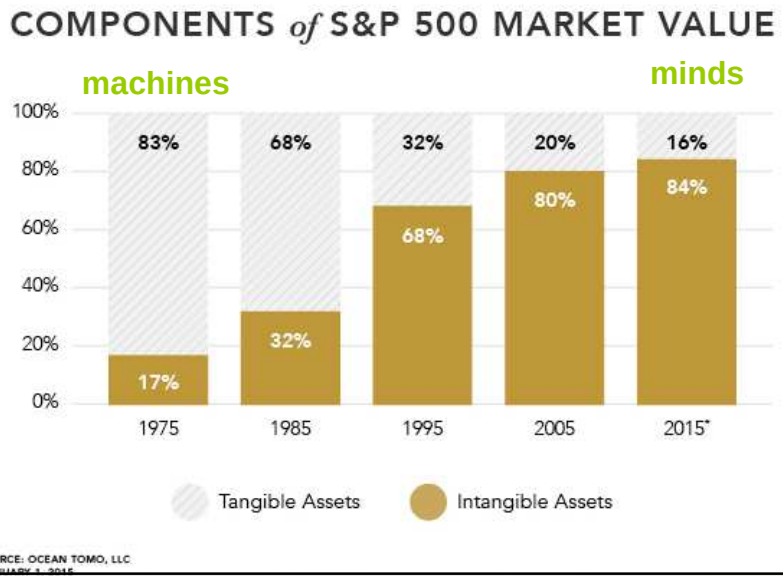
business has changed



Challenge:

How to identify, capture, grow and sustain these intangible assets that make up over 80 % of the value in a company?

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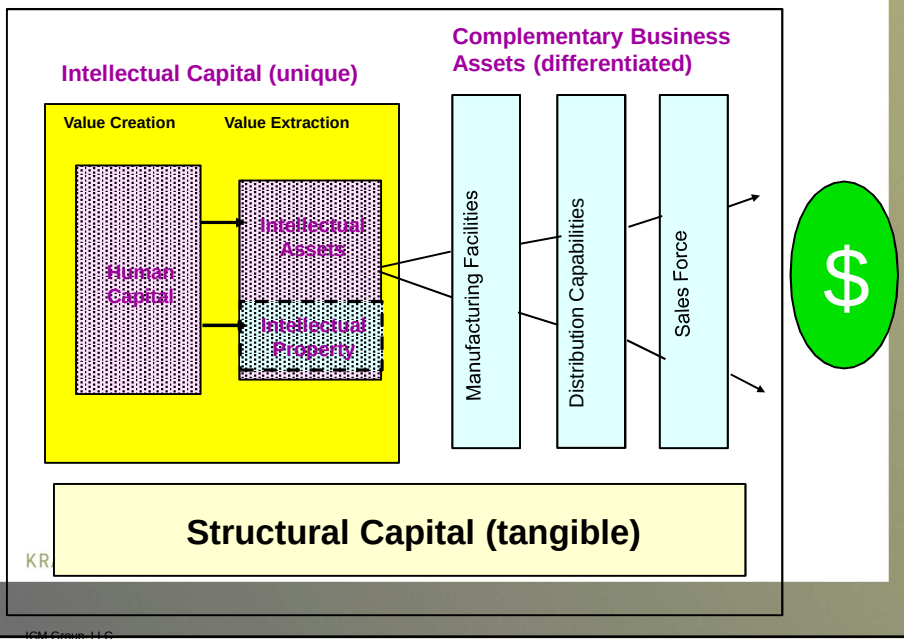
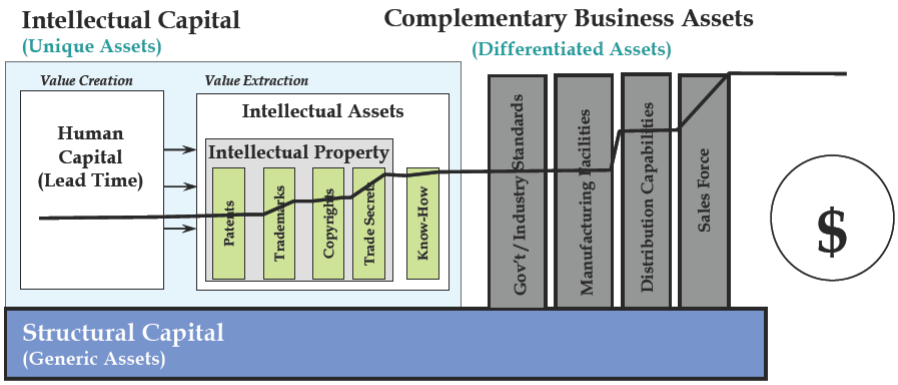


Knowledge Based Company Model

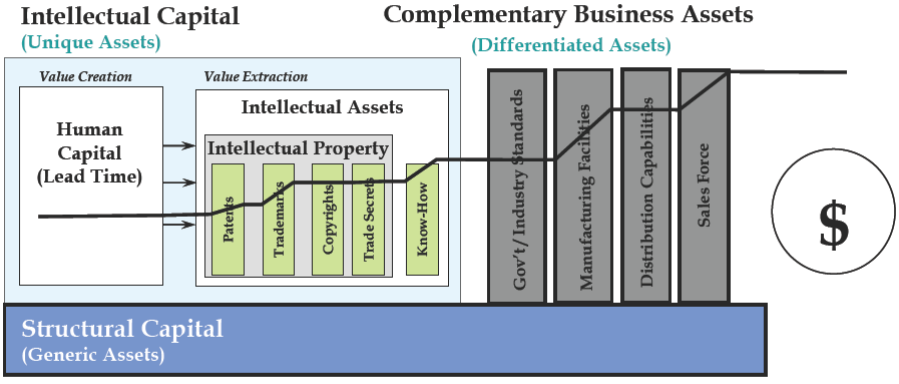
Beverage Companies



- Lines Show the Percentage of Company Value (Market Capitalization) That is Protected By This Asset
- Most value is in Trademark, Trade Secret, Distribution and Sales

Knowledge Based Company Model

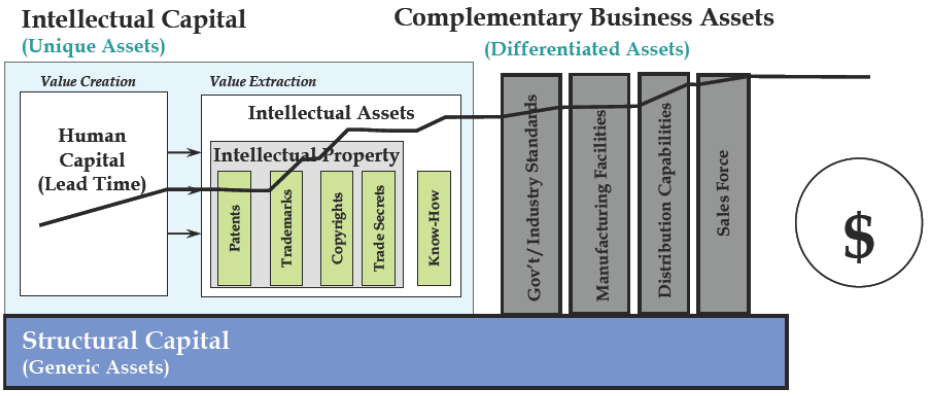
Paper Companies



- Most value is in Trademark, Know-How, Manufacturing and Sales
- Some value in Patents

Knowledge Based Company Model

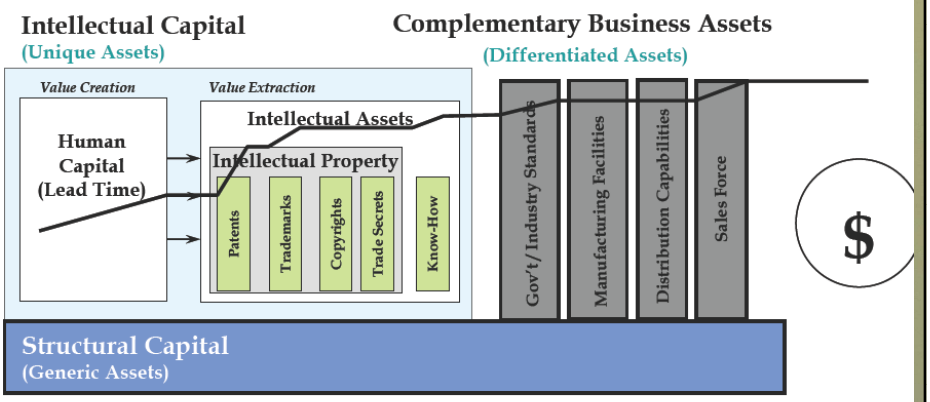
Software Companies



- Most value is in Human Creativity, Trademark, Copyright, and Distribution

Knowledge Based Company Model

Pharmaceutical Companies



- Most value is in Human Creativity, Patents, and Trademarks
- Some value in Know-How, and Sales

Basic concepts

• An invention is a solution to a technical problem

• Patents are granted for inventions that are novel, inventive and industrially applicable

• National/regional scope

• Valid for 20 years from filing

• A patent is a negative legal right

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A granted patent…

…only gives you the right to prevent others from commercializing your patented invention.

You may stop them from:
- manufacturing
- selling
- importing
- using
- renting…

You may of course grant them a license to use your patented invention.

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Why apply for a patent?

Patents create exclusivity:
- preventing competitors from introducing a similar product
- blocking competitors from patenting

Patents:
- are assets with legal rights associated
- build substance in a company
- encourages inventiveness and builds the company image internally and externally

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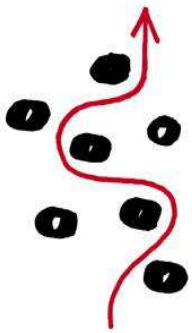
Safety



- Analyze “freedom to operate”
- Create “freedom to operate”
  - Design around
  - Invalidate
  - Negotiate
    - Cross licenses

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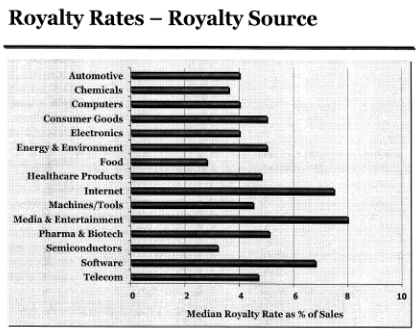
Royalty rates



- A typical royalty is 25 % of the gross net margin
  - Example:
    A gross net margin of 20 % results in a royalty of 5 % of the sales value
- Minimum (and maximum) levels are common

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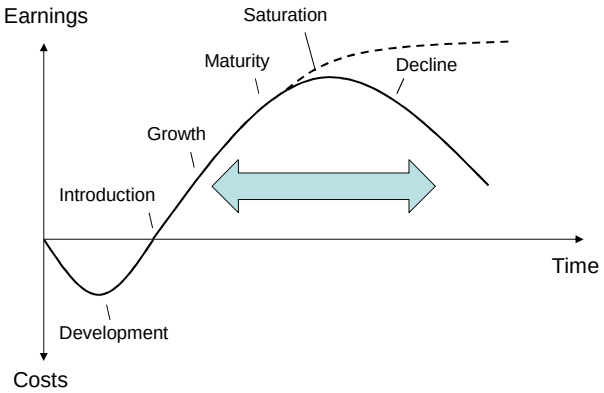
Product Life-Cycle



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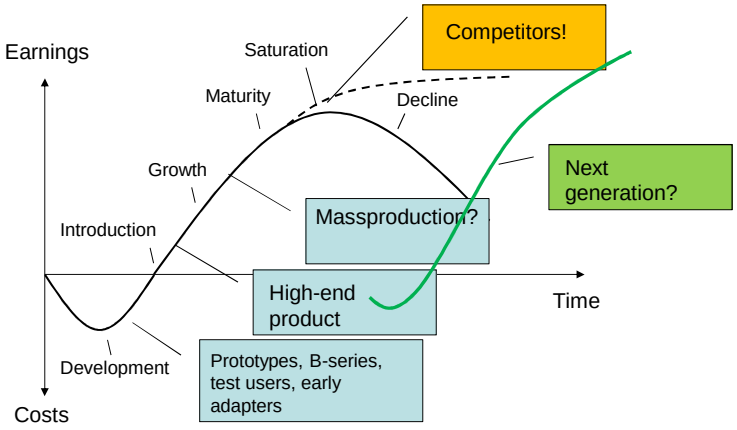
Timing is everything!



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Strategic models

”Revenue”

Increase revenues by licensing
or selling IPR

”Assets”

IPR as an asset in the company
Boost company value
Attract investment

”Safety”

Use the system
Stay informed
Freedom to operate
Possibility for cross licensing

”Exclusivity”

Create an exclusive market position
Maintain high margins

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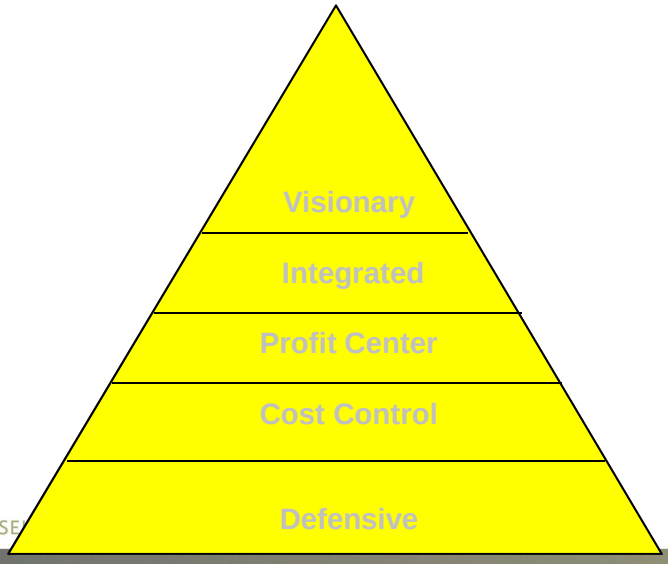
IP Value Hierarchy



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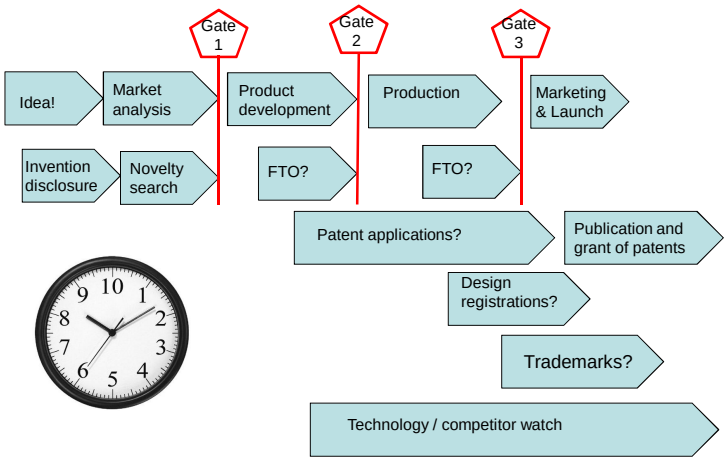
Managing Intellectual Assets



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Managing Intellectual Assets

When should you file your patent application? Well, as early as possible since…

- The risk of being blocked by others is reduced
- Earlier revenues are possible
- The chance of obtaining a granted patent increases
- The chance of obtaining broad scope of protection increases
- An obstacle for others to patent is created earlier

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Managing Intellectual Assets

Where should you file?

- Where are the customers?
- Future markets?
- Where are the competitors?
- Where is the product manufactured? Where could it be manufactured?
- Where can IPRs be enforced?

N.B. ”Global” coverage is neither possible nor financially defendable, make strategic choices!

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Managing Intellectual Assets

Different routes to a patent

- Swedish patent applications – fast, cheap
- European patent applications – high quality search, greater coverage
- International patent applications (PCT) – slow, global coverage
- Priority year enables further filing within 12 months

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Competitor / Technology Watch

- Input: competitor names/ fields of technology / keywords / inventors
- Keep track of your competitors!
- Oppose and invalidate disturbing patents
- Identify copy-cats and possible infringers
- Business intelligence, share data within the company

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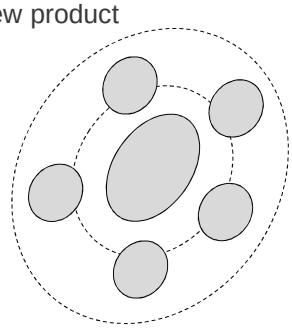
Managing Intellectual Assets

- Supplementary filing for highly ranked ideas
- Create patent fence around the new product
- Different forms of protection
  - patents
  - trademarks
  - designs
  - utility models
  - trade secrets



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Managing Intellectual Assets

- Patent landscapes – a strategic planning tool

Source: ThomsonReuters

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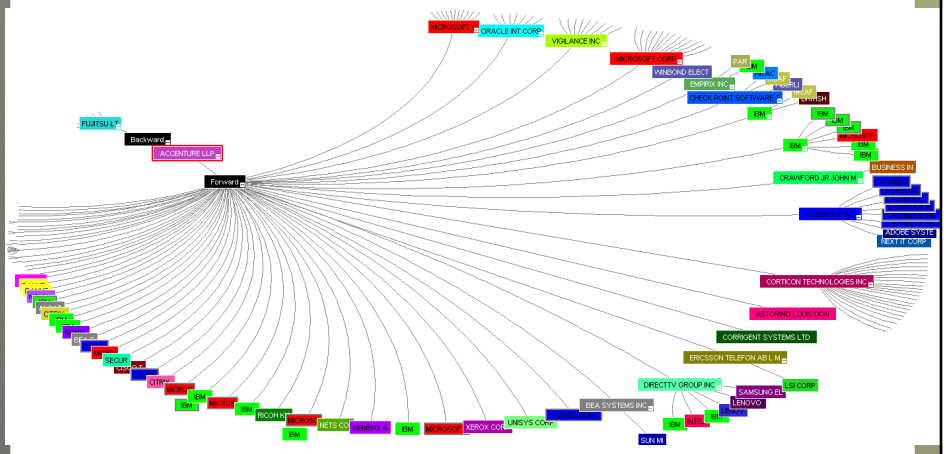
CITATION TREE



Question: Who are citing this specific patent, and why? What are they developing and how close are they?

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Managing Intellectual Assets

Alternatives to patenting?

- Prophylactic publication
- Trade secrets, in case of

  - substantial technology lead

  - reverse engineering difficult or impossible

  - infringement monitoring difficult

  - numerous possibilities to work-around

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Licensing

- Highly established in some fields
- Requires considerable administrative capacity
- Can be very profitable

- An alternative / shortcut to acquire IP
- A possibility to monetize non-core assets
- Applicable to patents, trademarks and designs

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Examples

- In 2016, ERICSSON had license earnings of 10 000 MSEK (14 400 MSEK in 2015, 9 900 MSEK in 2014)
- Ericsson holds > 42,000 granted patents according to their Annual report 2016 (compared to 39,000 in 2015)
- Quote: “As IPR licensing margins are above the Company average, they have an accretive impact on profitability.”

- NASA offers non-exclusive licences to start-up companies wth no up-front payment , and on May 5, 2016 NASA released 56 formerly-patented technologies into the public domain

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You are accused of infringement – what to do?

- Invalidate patent
- Work-around
- License in
- Negotiate
- Ignore – continue infringement
- Wait until patent expires
- Stop R&D (and/or commercial activities)

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Infringement by competitor

- Intellectual Property rights are business tools, and tools must be used to give maximum benefits
- A slow escalation:
  - Initial contacts / Warning letter
  - Offer to license
  - Infringement action
  - Settlement?
  - Judgement
  - Damages

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Damages awarded 1995 - 2014

Figure 4. Top ten largest initial adjudicated damages awards: 1995–2014

Year	Plaintiff	Defendant	Technology	Award (in $M)
2009	Centocor Ortho Biotech Inc.	Abbott Laboratories	Arthritis drugs	$1,673
2007	Lucent Technologies Inc.	Microsoft Corp.	MP3 technology	$1,538
2012	Carnegie Mellon University	Marvell Technology Group	Noise reduction on circuits for disk drives	$1,169
2012	Apple Inc.	Samsung Electronics Co.	Smartphone software	$1,049
2012	Monsanto Company	E. I. du Pont de Nemours and Co.	Genetically modified soybean seeds	$1,000
2010	Mirror Worlds LLC	Apple Inc.	Operating system	$626
2005	Cordis Corp.	Medtronic Vascular, Inc.	Vascular stents	$595
2004	Eolas Technologies Inc.	Microsoft Corp.	Internet browser	$521
2011	Bruce N. Saffran, M.D.	Johnson & Johnson	Drug-eluting stents	$482
2014	Masimo Corporation	Philips Electronics N. America Corp.	Device measuring blood oxygen levels	$467

Source: 2015 Patent Litigation Study, PWC

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THANK YOU!
Please feel free to ask questions!

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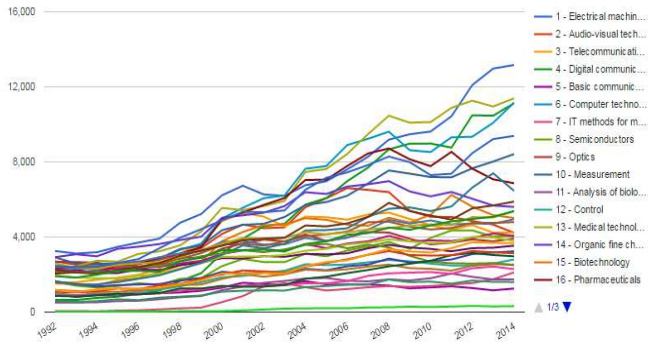
Trends in patenting



Source: WIPO IP Statistics Database, http://www.wipo.int/ipstats/en/

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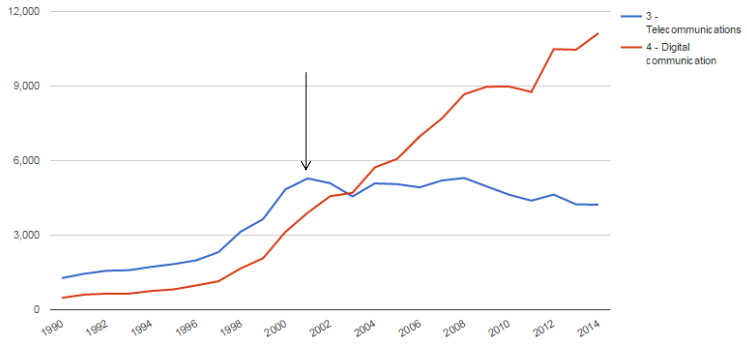
Trends in patenting



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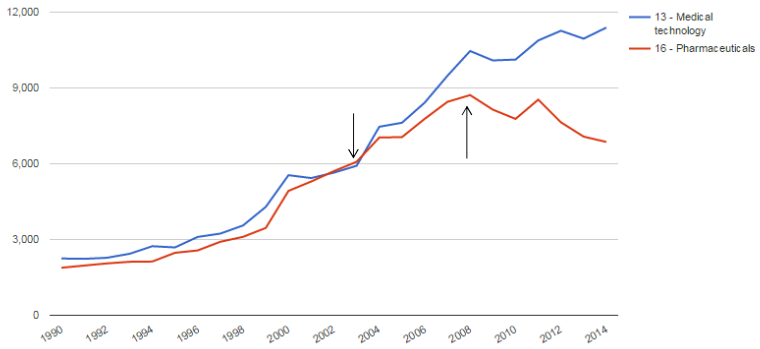
Trends in patenting



Source: WIPO IP Statistics Database, http://www.wipo.int/ipstats/en/

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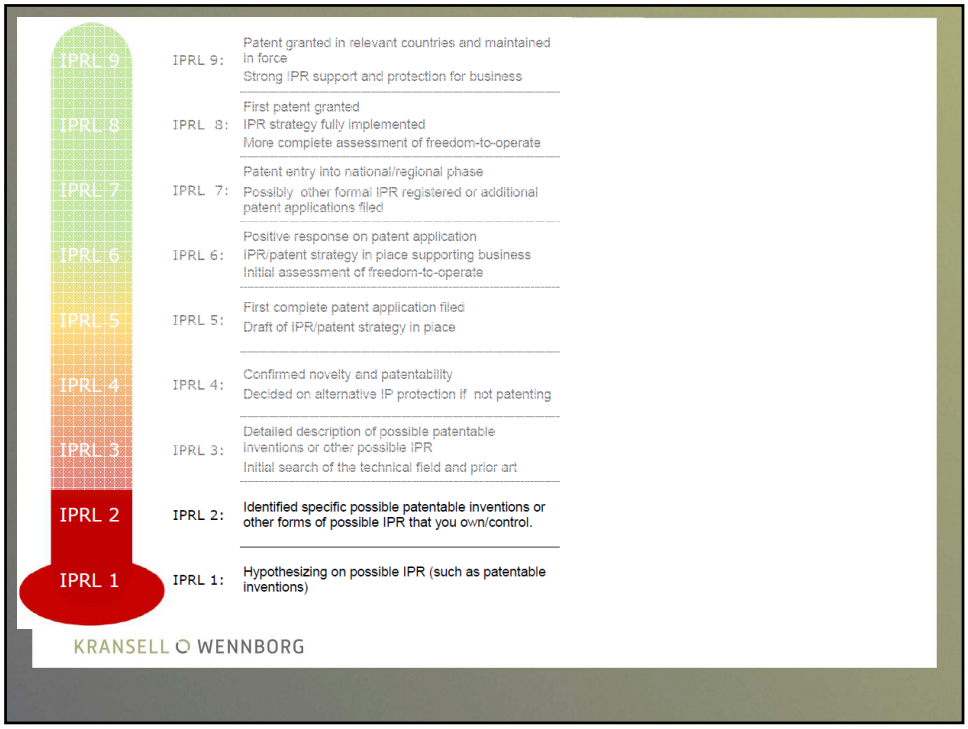
Patent strategies

Model	Description	Suitable for
"Exclusivity model"	Creates an exclusive market position. Enables high margins for innovative products.	R&D-intensive companies selling innovative products and aiming for high gross margins.
"Revenue model"	Revenues from licensing or selling of IPR.	Companies unable to capitalize on their innovations in all possible fields of technology.
"Asset model"	IPR regarded as an asset in the company. Boosts company value.	Companies facing an exit or a major investment.
"Safety model"	Enables freedom-to-operate.	Companies fearing or experiencing problems commercializing products due to competitor's patents.

KRANSELL ○ WENNBORG


IPRL 9
IPRL 8
IPRL 7
IPRL 6
IPRL 5
IPRL 4
IPRL 3
IPRL 2
IPRL 1
IPRL 9: Patent granted in relevant countries and maintained in force
Strong IPR support and protection for business
IPRL 8: First patent granted
IPR strategy fully implemented
More complete assessment of freedom-to-operate
IPRL 7: Patent entry into national/regional phase
Possibly other formal IPR registered or additional patent applications filed
IPRL 6: Positive response on patent application
IPR/patent strategy in place supporting business
Initial assessment of freedom-to-operate
IPRL 5: First complete patent application filed
Draft of IPR/patent strategy in place
IPRL 4: Confirmed novelty and patentability
Decided on alternative IP protection if not patenting
IPRL 3: Detailed description of possible patentable inventions or other possible IPR
Initial search of the technical field and prior art
IPRL 2: Identified specific possible patentable inventions or other forms of possible IPR that you own/control.
IPRL 1: Hypothesizing on possible IPR (such as patentable inventions)
KRANSELL WENNBORG

Partnering Opportunities

Bruce Lyne, KTH

Options in technology exploitation:

- √ Build a business internally or externally
- √ Partner (JV, alliance, other)
- √ License
- √ Discard

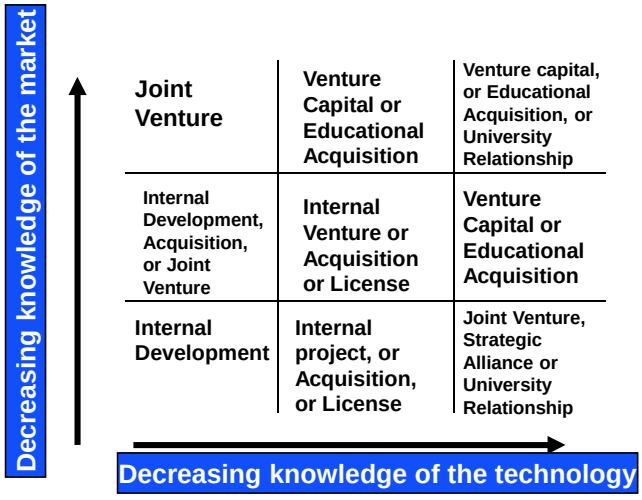
Trends into the 21st century…for many emerging technical companies:

- Cost of technology development and product introduction is growing
- Capital is more difficult to raise, particularly "early stage"
- Market success requires global strategy perspective
- Product development and life cycles are becoming increasingly shorter
- Market credibility is greatly enhanced with endorsement of large corporation alliance
- Larger share of market leads to greater efficiency and better price stability

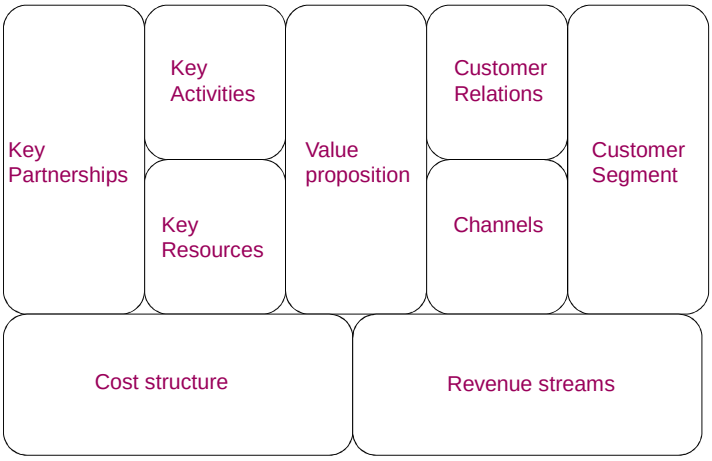
Motivations for partnering

- Access to complementary technology, technology synergy, cross fertilization of fields of technology
- Capturing partner's tacit knowledge of technology, market experience, thereby leapfrogging competitors
- Minimizing and sharing of costs and uncertainty in R&D
- Reducing time to market to keep up with shorter product life cycles
- Globalization, entry into foreign markets, knowledge of international environment and opportunities

Finding others who know more about the markets or the technology (Berry and Roberts)

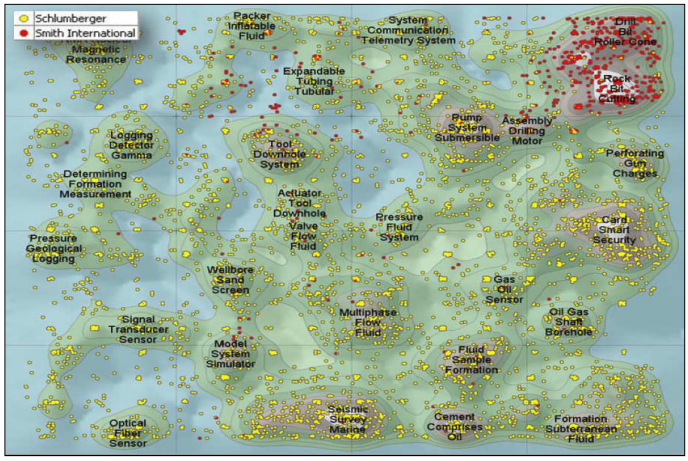


Business model Canvas



After Alexander Osterwalder

How Can you Find Them?

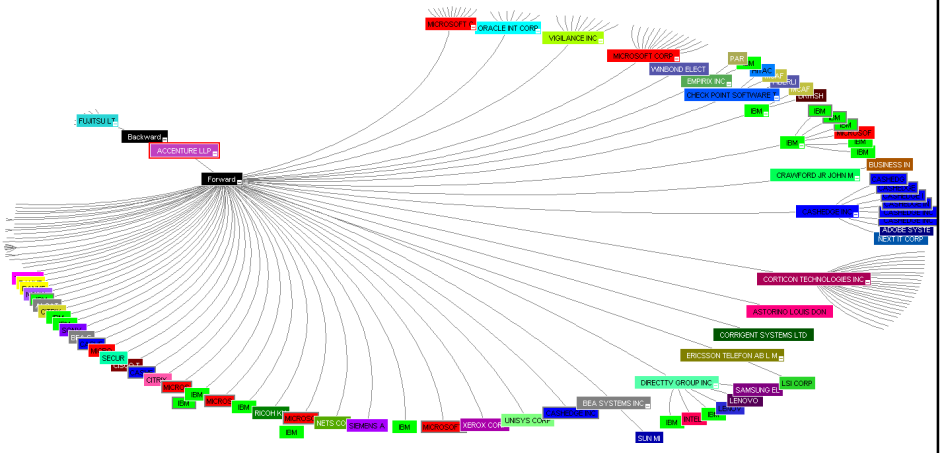


Use a Patent Themescape

Question: Why may Schlumberger have decided to acquire Smith International?

7

CITATION TREE



Question: Who are citing this specific patent, and why? What are they developing and how close are they?

8

Ethics and Sources of Information

Academia
- Literature publications
- Academic consultants
- Professional meetings

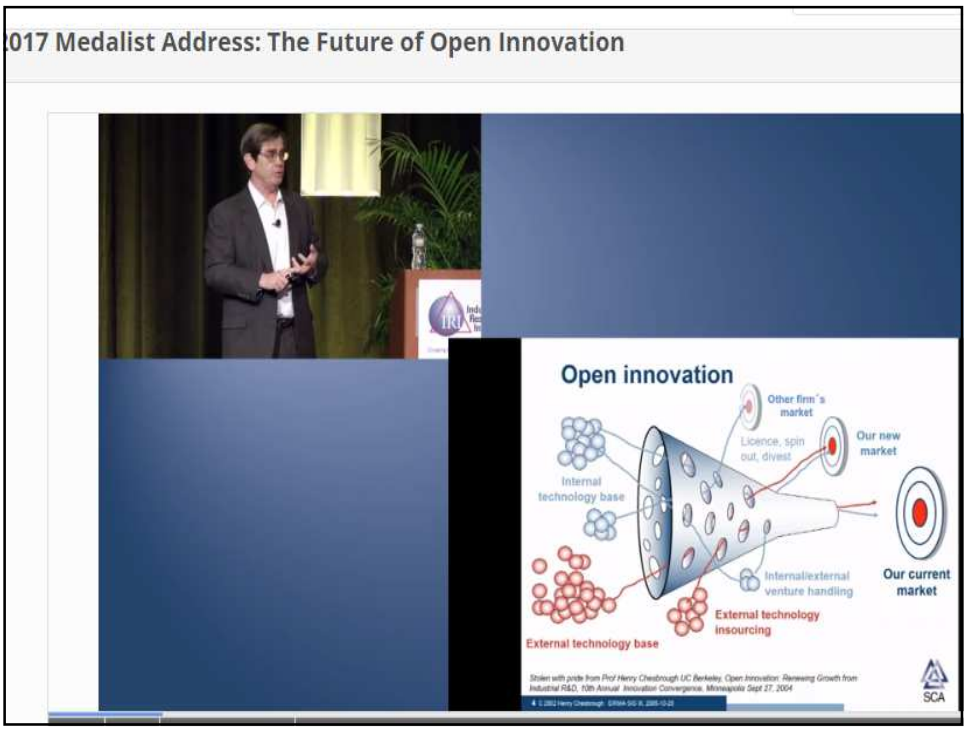
Government
- Patents
- FDA – applications for clinical trials and approvals
- SEC filings
- EPA filings
- OSHA filings
- Department of Commerce
- Federal and state court cases
- Zoning boards

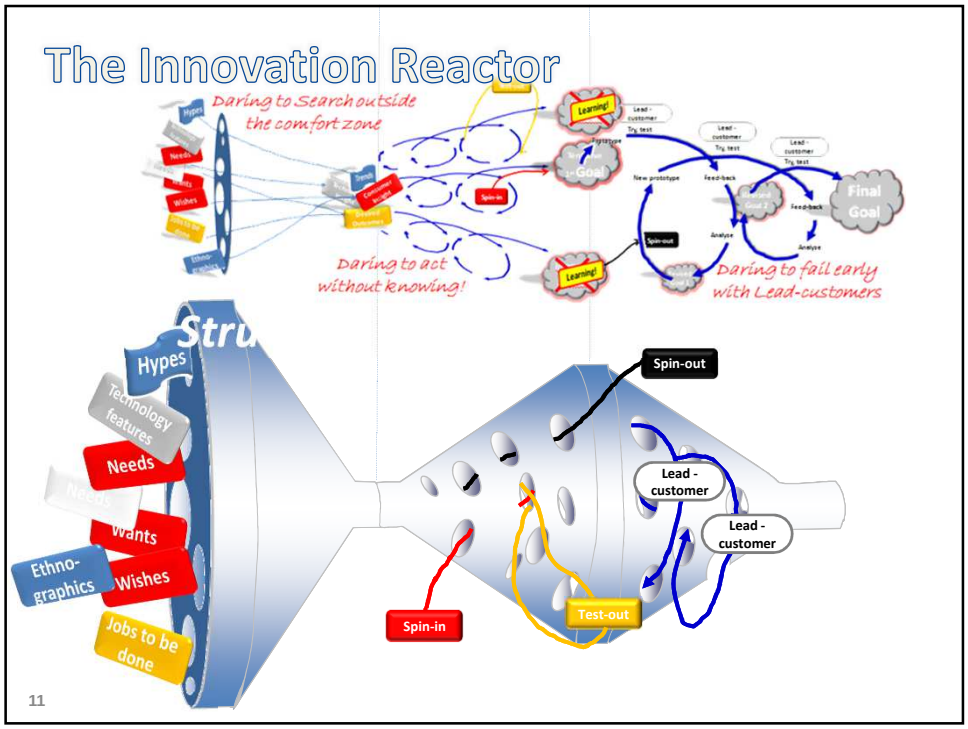
Sources of technology information

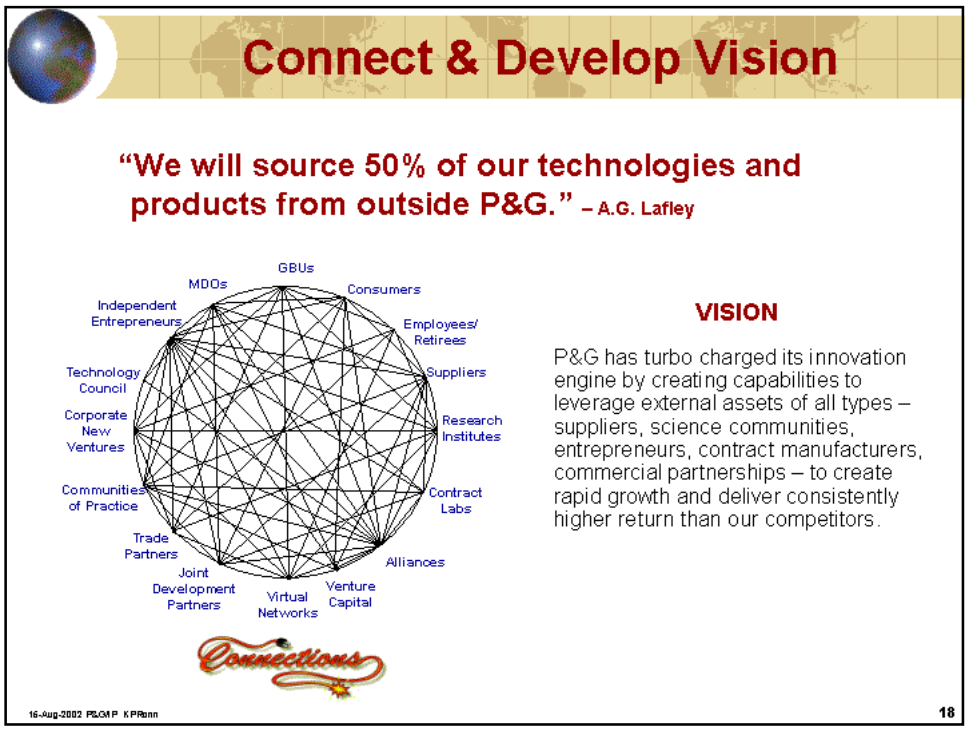
Competitor Sources
- Competitor publications
- Product brochures
- Annual reports
- Press releases
- Help wanted ads
- Current employees

Internal Sources
- Reverse engineering
- Marketing
- Sales
- Purchasing
- Planning
- Engineering

External Commercial Sources
- Trade associations
- Trade shows
- Consultants
- Stock analysts
- Public interest groups
- Executive recruiters
- Partners
- Licensees
- Consortia
- Offshore labs
- Customers
- Suppliers
- Directories
- Databases




The Innovation Reactor
Daring to Search outside the comfort zone
Daring to act without knowing!
Daring to fail early with Lead-customers
Learning!
Goal
Final Goal
Spin-out
Spin-in
Test-out
Lead - customer
Lead - customer
Hypes
Technology features
Needs
Wants
Wishes
Ethno-graphics
Jobs to be done
11


Connect & Develop Vision
"We will source 50% of our technologies and products from outside P&G." – A.G. Lafley
GBUs
MDOs
Consumers
Independent Entrepreneurs
Employees/ Retirees
Technology Council
Suppliers
Corporate New Ventures
Research Institutes
Communities of Practice
Contract Labs
Trade Partners
Alliances
Joint Development Partners
Virtual Networks
Venture Capital
Connections
VISION
P&G has turbo charged its innovation engine by creating capabilities to leverage external assets of all types – suppliers, science communities, entrepreneurs, contract manufacturers, commercial partnerships – to create rapid growth and deliver consistently higher return than our competitors.
16-Aug-2002 P&G/IP KPRonn
18

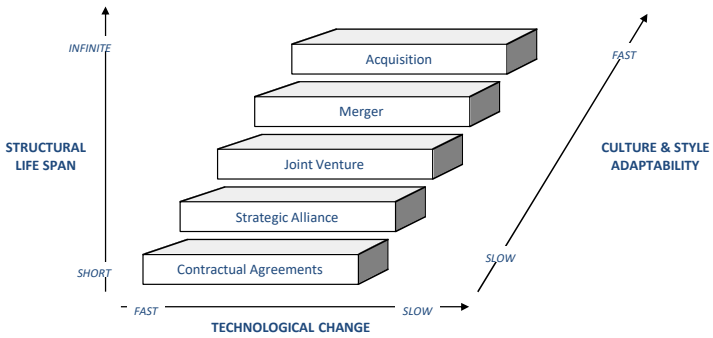
How can they Find You?

RfP OI Service Suppliers

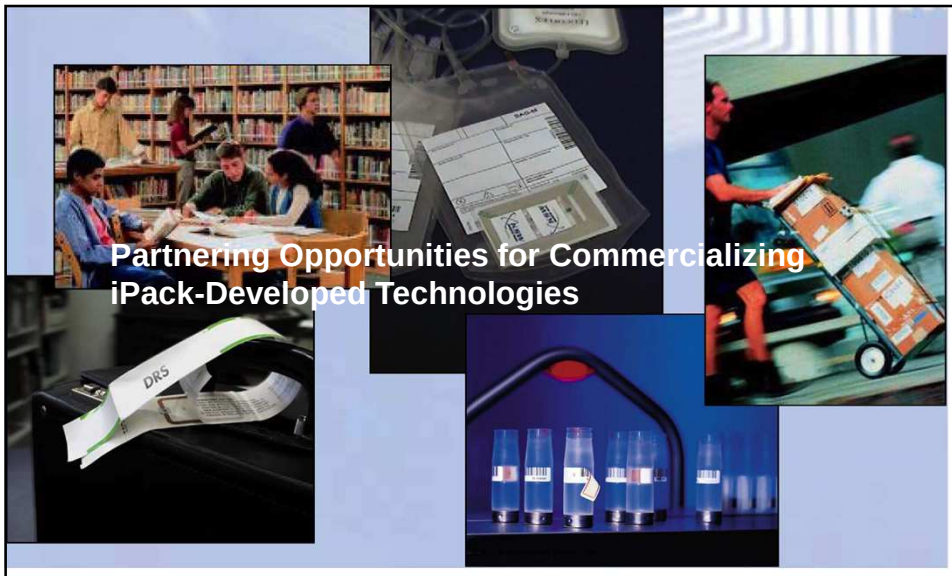
- NineSigma
- Fellowforce
- IdeaConnection
- TechScout
- Sqore
- Inpama.com
- IXL Center
- Innocentive
- SpecialChem
- Nottingham Spirk
- Harryson Know Who
- Yet2.com
- YourEncore

SP Technical Research Institute of Sweden
Erik Ronne, Head of Open Innovation

Several forms of cooperative linkage can be adopted by a corporation for executing its globalization strategy.



The choice will not only depend on evaluating the current situation but on management's view of the future.



Prof. Bruce Lyne

iPack project
TC1.3 Business Innovation in Printed Electronics

Conclusions from Market Report:

- **The probability of successful commercialization increases with the use of existing, well-proven technologies and decreases with the number of new components introduced into the system. Trying to build an entire system from scratch and get it to market is virtually impossible, as each new component introduces uncertainty in manufacturability and performance.**
- **Partnership with companies that have proven track records in RFID and who work closely with customers in designing RFID solutions would also bring easy acceptance…**
- **Several interviewed companies who are in the market with RFID solutions see value-added applications of their RFID technology base in printing sensors for smart packages and tags.**

Partner in printing inks

- **BASF** for the development of polymeric inks for printed electronics by virtue of strong financial commitment to research in this area.
  - dedicated lab in Singapore
  - membership in three important academic/industrial partnerships devoted to printed electronics:
- MaDriX - PolyIC, BASF, Evonik Industries, ELANTAS Beck and Siemens, with matched financing from German Federal Ministry of Education and Research
- Forum Organic Electronics excellence cluster - PolyIC, BASF, SAP, University of Heidelberg, Robert Bosch, Roche Diagnostics, Karlsruher Institut für Technologie, and the University of Stuttgart, Philips, Merck, Max Planck Institute for Polymer and Solid State Research….
- Holst Center -(open-innovation R&D centre that develops generic technologies for Wireless Autonomous Sensor Technologies and for Flexible Electronics, located at the University of Eindhoven)

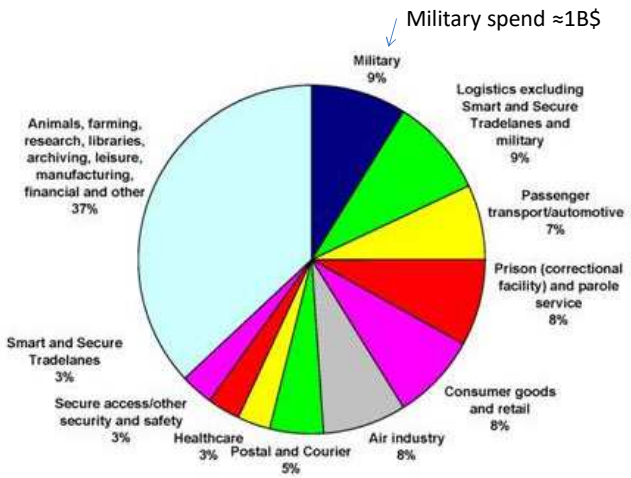
Partner in chip and sensor technology

- **Impinj** for the joint development of RFID/sensor chips and circuits.
  - This is the most trusted supplier of UHF Gen 2 RFID solutions with applications across numerous vertical markets, including apparel, inventory management, asset tracking, authentication, and serialization
  - they would like to expand into more complex RFID/sensor systems like those being developed at iPack.

Commercialization of RFID/Sensor Systems

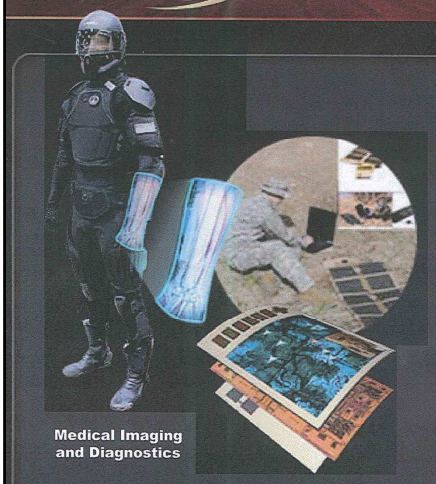
- Avery Dennison as the best established and equipped manufacturer of intelligent tags who is interested in extending their reach with sensors for gases, temperature, sugar content in blood, etc.
- offers a wide variety of RFID products covering asset tracking in the HF and UHF RFID spectrum
- Four RFID tag manufacturing plants USA, Europe and Mexico
- AD work with an array of industry leaders in tag converting, printer and reader hardware, software and systems integration
- RFID design center is in Baddow, just East of London (formerly Marconi's RFID center which AD acquired)

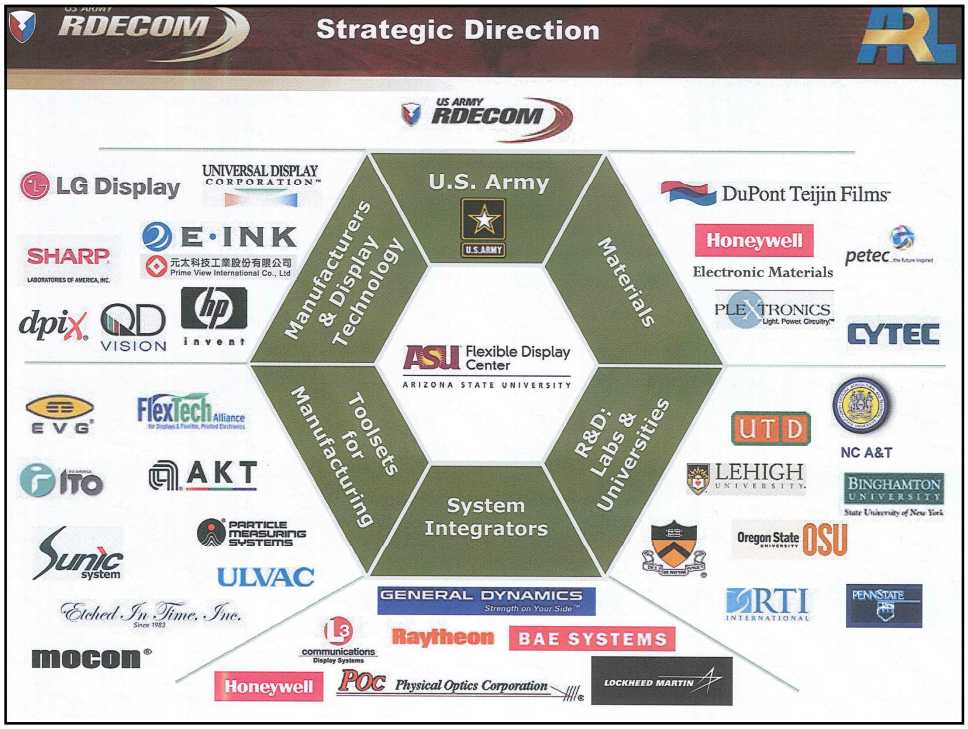
Military are biggest single user of RFID



Application of iPack low-energy solutions to RFID communications and positioning

- The US Army Research Laboratory
  - Research, Development and Engineering Command (RDECOM) is centrally responsible for developing and integrating technology-enabled solutions for soldiers
  - World's biggest user of RFID - inventory is meant to be visible all of the time (including during transport in aircraft) via RFID tags
  - pursuing flexible displays to be worn by soldiers and used in mobile outposts
  - want to couple their RFID network to sensors to monitor soldiers' physiological vital signs as well as detection of pathogens, explosives, etc
  - want to reduce weight and make electronics more robust
  - interested in iPack low-energy RFID/sensors, and in food tracking system





Cautions in Partnering

- Studies show 50% of all strategic alliances fail within three years
- Mismatched expectations are the principal cause of failures
- There are no "merger of equals"
- Successful alliances MUST make good business sense
- Successful alliances MUST meet individual needs
- Weak + weak = weaker !

Note: An Industrial Research Institute survey of 2010 reports that 47% of companies expect increases in alliances and joint ventures tied to R&D.

Partnering is a people process: Implementation

- Carefully organize teams
- Prepare for trauma
- Define success
- Move swiftly & decisively

  –Maintain morale

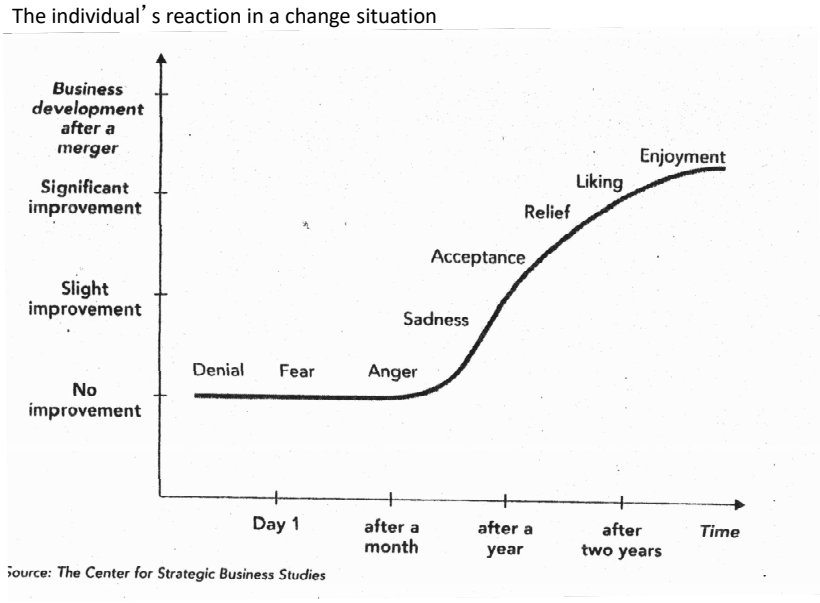
  –Minimize rumors

  –Minimize loss of key personnel

  –Eliminate uncertainty

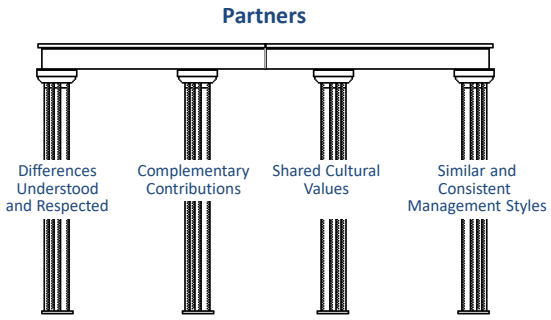
Strategic Alliances - Partnering is a people process

The individual's reaction in a change situation



Source: The Center for Strategic Business Studies

Successful joint ventures and strategic alliances exhibit similar characteristics.



Partners understand differences:

- Definition of "Success"
- Goals and Objectives
- Management Reward Systems
- Management Decision-Making Process
- Employee Relations and Environmental Responsibility
- Risk Tolerance

Transferring Rights: Intellectual Capital Components

- Human Capital
  - Know-how
  - Creativity
  - Skills
- Intellectual Property
  - Patents
  - Copyrights
  - Trademarks
  - Trade secrets
- Intellectual Assets
  - Programs
  - Inventions
  - Documents
  - Processes
  - Drawings
  - Designs

Intellectual Capital Risks in Strategic Alliances

- Shared Facility:
  - –Exposed Trade Secrets and Sensitive Technologies
  - –Access to Confidential Information
  - –Unintended Transfer of Technologies
  - –Inconsistent Judicial Decisions or Enforcement Favoring a Country
- Conflict of Interest for Personnel
  - –Question of Employee Loyalty (e.g. to JV or partner)
  - –Potential Future Competitor
  - –Information Shared with JV, Partnerships, or Suppliers
  - –Individual risk Issues
  - –Mobility of personnel

Some of the top reasons TO partner:

- Hands: Extra R&D capacity – hands
- Brains: Expertise
- Access to key technology/market
- Localized products for local markets
- Lets you focus on your competencies
- Speed to market
- Reduce costs

Some of the top reasons NOT TO partner:

- Loss of strategic control of your business
- Loss of in-house expertise
- Confidentiality of Intellectual Property
- Loss of project control
- Stability of partner

Three Phases of Open Innovation

	Exploration		Joint (Co-)development			Commercial
			Incubation		Development	
	OPTIONAL STEPS*					
Contracts	**Initial Contact** Non-confidential Letter	**Detailed Discussion** Mutual, One-way or Two-way Confidentiality Agreements	**Develop Relationship** Material Transfer Agreement	**Exploratory Co-Development** Exploratory Research Agreement	**Co-Development** Detailed JDA or Alliance Agreement	**Commercial** License, Buy or Commercial Supply Agreement
Activity	Identification of Interest Areas, Business and Cultural Fit	Clear Understanding of What Each Party Brings, Technology Expertise & Areas of Interest	Initial Testing to Develop Joint Technical Statement of Work	Successful Laboratory Test & Proof of Concept	Successful Field Test & Valuation Model	Market Success for Both Firms
Deliverable	**Open Discussion**	**Agreement on Vision For Success**	**Joint Technical Plan**	**Understand Value Chain**	**Understand Valuation Thoroughly**	**Equitable Division of Profits**

*Depending on complexity & technology development stage

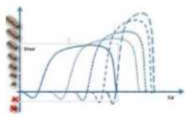
Better Practices for Managing Intellectual Assets in Collaborations
Research and Technology Management , Feb 2010

Trends into the 21st century…for the larger companies

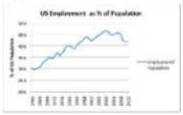
- Lack flexibility to respond rapidly to technological and market changes
- Need to look outside for innovation
- Rapid market shifts and fragmentation motivate selection of small companies
- Partnering allows large company to respond to emerging technology risks

Some numbers on startups…

- 1958 the average life span of the companies in S&P 500 was 61 years. 2012 it was only 18 years. (70 % less)



- Between 2009-2014 70% of all new employments in the US were created in startups.



- Startups are 16 times more productive than large companies regarding number of patents per employee

- The patents from startups are cited 2,5 times more often than the ones of the large companies, indicating a higher degree of originality and inventiveness

Collective Disruption, Michael Docherty, 2015

12

Asymmetric Collaboration – What can we get?

- Credibility
- Branding & PR
- Distribution & Market access
- Supplier Network
- Funding

⟺

- Speed of innovation
- Innovative image
- Innovations
- Culture

Insead & #500Corporations, How do the worlds biggest companies deal with the startup revolution, 2016

Combining the DNA of dinosaurs and fruit flies

- Fruit flies are tech start-up companies that react at lightning speed to changes in the technology or business environment
- Dinosaurs are the large well-established companies that are bureaucratic, risk-averse, rife with internecine politics, hobbled by government regulations and stockholders' concerns
- Dinosaurs are very robust and have been around for a long time, but lack the agility to adapt to major shifts in climate like that associated with a comet impact
- The fruit flies create Internets, killer-app software, and breakthroughs in fields like biotech, semiconductors, and nanoscience
- While dinosaurs can easily squish fruit flies, they need to somehow combine their DNA in order to be responsive and adaptable
- The result is that companies like Intel and Pfizer are forever monitoring small companies as potential fast-paced suppliers or as acquisition targets so they can remain competitive

Inspired by ***Clockspeed : Winning Industry Control in the Age of Temporary Advantage*** by Charles H. Fine

Why great companies fail

1. Corporate arrogance and hubris
2. Leadership fails to anticipate a reality different than what they are prepared to see
3. Insufficient attention to weak signals
4. Biases of internal decision-making processes
5. Lack of vision and risk taking
6. Wrong incentives: short-term & risk adverse
7. Trapped in yesterday's business models
8. No large-scale technology company does partnering especially well. (Business Week)

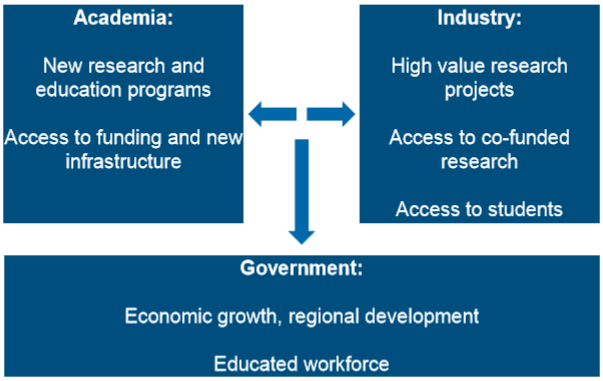
Triple helix model can drive transitions

umicore

The triple helix

- consists of **3 components**:
  1. industry
  2. academia
  3. government
- stimulates **innovation in innovation** through institutions taking non-traditional roles
- requires a **prominent role for university** in innovation

Results of academia – industry – government partnerships



Economics of innovation and growth
Motivation for the program

Innovation and entrepreneurship are prime factors behind value creation, economic prosperity and employment growth. The growing awareness of the importance of innovation among knowledge-based firms, financial markets and policymakers has created a demand for a program which integrates aspects of technology, economics, financing and other related areas.

Economics of innovation and growth

Started in 2005, one intake a year

2-year master's program (120 ECTS)

Economics with a focus on innovation and growth

Highly attractive for both students and employers

- ~ 10 qualified applicants per available seat
- Swedish and international students
- Many are offered employment before graduation

Entrance requirements and selection criteria

Special admission requirements

- ≥ 30 ECTS in economics/statistics/mathematics
- Bachelor degree in economics/engineering/mathematics

Selection criteria

- Motivation
- University ranking
- Quantity of relevant courses
- Quality in relevant courses

Top ten countries of origin in 2017 (65.4 %)

Country	Percent of qualified applicants 2017
Sweden	38.4
Germany	5.7
China	3.4
Greece	3.2
Indonesia	3.2
Pakistan	2.9
Azerbaijan	2.3
Bangladesh	2.3
Russia	2.0
USA	2.0

Program structure

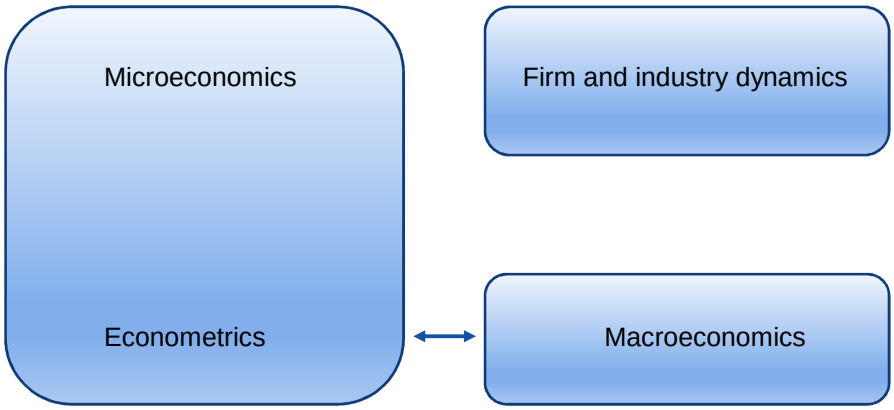
Each study year comprises 40 weeks (60 ECTS) divided into four periods

Two 7.5 ECTS courses per period except last term which is entirely devoted to the degree project 30 ECTS

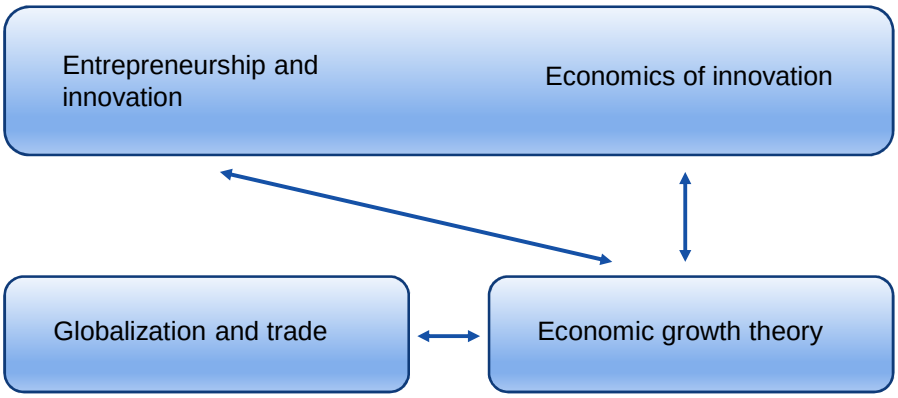
First year all courses compulsory

Second year mainly elective courses

Courses year 1, period 1 and 2



Courses year 1, period 3 and 4



Courses year 2, period 1 and 2

Theory and methodology of science

Possibility for exchange term

Conditionally elective
- Advanced econometrics
- Management and strategy
- Corporate finance
- Green economics
- …
- …

Courses year 2, period 3 and 4

Degree project

Exchange term 2017

- Iowa State University, **USA**
- Queensland University of Technology, **Australia**
- Singapore Management University, **Singapore**
- Nanyang Technological University, **Singapore**
- Korea Advanced Institute of Science and Technology (KAIST), **Korea**
- Technische Universität Berlin, **Germany**
- Keio University, **Japan**
- Tokyo University, **Japan**

Alumni

The program allows for a broad spectrum of career opportunities within the private and public sector. Previous students can be found in banking, large multinational corporations, governmental agencies, consultancy companies, academia and entrepreneurial ventures

Alumni

- Business Analyst at a Russian subsidiary of **Air Liquide**
- Associate Account Strategist at **Google**
- Sales Manager Financial Services at **Tieto**
- Business developer at the Department for Household Strategy and Development (HSD) at **Nordea**
- Project Manager at **Nordicstation**, an IT consultant company
- Capital and Risk Analyst at **Nordea**
- IT specialist in the IT department at **Aviva**
- Manager at the market intelligence and research department at **ALB-telecom**
- Research team leader at **Nepa**, a research company
- Analyst within the Global Marketing team at **Oriflame**
- Analyst at the Swedish branch of **The Royal Bank of Scotland**

Microeconomics
Intended learning outcomes

- Be able to use and derive advanced microeconomics theory to analyze market competition, technological change and productivity growth, with mathematically formalized models.
- Be able to describe and apply formal mathematical models to prognosticate how supply and demand for specific goods will develop.
- Have knowledge of duality and optimization for modern applied economical analysis.
- Have knowledge and tool to analyze welfare economics effects of technical and commercial development.
- Be able to use game theory for the analysis of strategic decisions.
- Be able to use advanced microeconomics theories and models
- Have knowledge how these can be applied for decision making in company, for example by engineers in managerial positions.

Microeconomics
Main content

- Consumer and producer theory
- Competition
- Theory of general equilibrium
- Welfare analysis
- Strategic behavior and game theory
- Information asymmetries

Firm and industry dynamics
Intended learning outcomes

- Be able to explain and analyze the importance of firm and industry dynamics for economic development.
- Be able to explain, compare and analyze the importance of firm and industry dynamics according to different economic theories.
- Have knowledge about and discuss critically empirical research results about firm and industry dynamics.
- Be able to explain the importance of institutions and industrial policy for firm and industry dynamics.
- Be able to compile, analyze critically and present an empirical case study of the development of an industry sector.

Firm and industry dynamics
Main content

- Innovation and economic development
- Firm and industry dynamics in economic theories
- Start-up and close-down of companies
- High-growth companies
- Institutional aspects of industry dynamics
- Company localization and industry clusters
- Business policy

Macroeconomics for business
Intended learning outcomes

- Relate theoretical macroeconomic models to policy issues
- Show a broad expertise in macroeconomics
- Use macroeconomic theory and empirical data to generate decision support
- Independently and in groups analyse, reason and communicate on issues related to macroeconomic variables, both in writing and verbally
- Select relevant macroeconomic models and empirical methods for analysing macroeconomic phenomena
- Reflect over how economic shocks influence the aggregate economic development in a short and long perspective

Macroeconomics for business
Main content

- How the different components of the macroeconomics stick together
- Exchange rates, deflation, inflation and prices
- Focus on empirical macroeconomics
- Technical development, innovation, competitiveness and growth
- Monetary and fiscal policy
- Financial markets, labour and product market
- Compile, analyse and report on macroeconomic data, verbally and in writing

Basic econometrics
Intended learning outcomes

On completion of the course, the student should:

- have understanding of why econometrics is necessary and which tools that can be used for an empirical analysis
- apply econometric tools for modelling, estimation, conclusion and forecasts in connection with real problems from different parts of the society
- critically evaluate results and conclusions from others that use basic tools for quantitative analysis
- have a basis and an understanding of further studies of econometrics/quantitative analysis
- have an understanding the range of more advanced technologies that are available and that can be covered in later econometric courses/courses in quantitative analysis

Basic econometrics
Main content

- Statistical probability theory and mathematics
- Simple and multivariable models for linear regression analysis
- Models for simultaneous equations
- Estimations with time series data
- Models for panel data
- Models for quantitative variables
- Hypothesis testing, prediction and model adaptation

Economics of innovation
Intended learning outcomes

- Understand the meaning of concepts such as R&D, technology, technology dispersion, markets for technology, invention, innovation, productivity.
- Understand the importance of the innovation processes of the companies and the leverage effect that can be created by utilizing industrial, regional and national innovation systems.
- Show ability to understand the often complex nature of the innovative activities
- Understand why funding of innovative activities can be a problem
- Understand why the private return on investment on innovative activities is often lower than the social return on investment
- Understand how innovative activities can be converted to new knowledge, technical changes and economical growth.
- Understand the importance of the globalization for innovative activities.

Economics of innovation
Main content

- Creation and dispersion of technology and knowledge
- Risk and funding of innovative activities
- Innovation and technology policy

Entrepreneurship and innovation
Intended learning outcomes

- Be able to explain and analyze the role of entrepreneurs for economic development.
- Be able to explain, compare and analyze the importance of entrepreneurship and innovation according to different economical theories.
- Have knowledge of the empirical results within entrepreneurship research.
- Have knowledge of the process of turning an innovation into a business.
- Have knowledge of different financing options for entrepreneurs.
- Be able to explain the importance of institutions and entrepreneurship policy for innovation and entrepreneurship.
- Be able to compile, present and critically analyze empirical research within entrepreneurship and innovation.

Entrepreneurship and innovation
Main content

- The process from innovation to business; entrepreneurship in economic theories; measuring entrepreneurship; determinants of entrepreneurial activities and success; financing entrepreneurship; institutions and entrepreneurship policy.

Globalization and trade
Intended learning outcomes

- Describe the processes of globalization and demonstrate knowledge of the political, social and economic impacts
- Describe the development of international trade and the relevant trade policy institutions
- Describe and assess the relevance of various trade theories
- Analyze the effects of various forms of trade
- Apply fundamental macro-, micro-, and international economic theory to analyze globalization
- Describe and analyze multinationals importance to globalization and localization of economic activity
- Identify factors that promote or hinder globalization
- Assess the implications of globalization for economic growth
- Critically review and reflect on the ideas in the academic literature dealing with globalization

Globalization and trade
Main content

- Static and dynamic comparative advantages
- Spatial preferences and specialization
- One-and two-way trade
- Spatial price equilibrium
- Barriers
- Specialization, agglomeration and regional/national growth
- International and regional migration patterns
- FDI

Economic growth
Intended learning outcomes

- Understand the relationship between technological development and economic growth
- Use basic theoretical and mathematical tools to analyze long-term economic growth
- Understand and reflect on the four main growth paradigms' implications for economic policy
- Use mathematical models to analyze the role of physical capital, human capital, R&D, institutions, entrepreneurship and innovation for economic growth
- Analyze the role of natural resources in sustainable economic growth
- Read, interpret and assess both basic and highly technical theoretical and empirical research on economic growth

Economic growth
Main content

- The aim of the course is to give students both broad and deep knowledge of the facts and the theories of economic growth. A special emphasis is placed on the relationship between technological development and economic growth.
- The course starts with presenting facts about economic growth and then the four main growth paradigms are introduced: the neoclassical model, the Romer product variety model, the Schumpeterian model and the AK model.
- The study of economic growth requires highly theoretical models in order to understand how different factors affect the development of the economy and a large part of the course is devoted to develop students' ability to use mathematics in solving these models. Group work and seminars are essential parts of the course, where students will develop good working skills in using relevant mathematical tools for analyzing economic growth and designing growth policies.