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RWTH AACHEN UNIVERSITY

Workshop during the 5th project-day of NoAE

EnergieRegion.NRW Cluster EnergieWirtschaft

NoAE Network of Automotive Excellence

Quo Vadis - Open Innovation, Distributed Innovation and open Source Models for Electric-Vehicle Developments

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With about 18 full time research positions plus many graduate student assistants, tutors, and research affiliates, RWTH-TIM is one of the largest groups of its kind in the German-speaking academic landscape.


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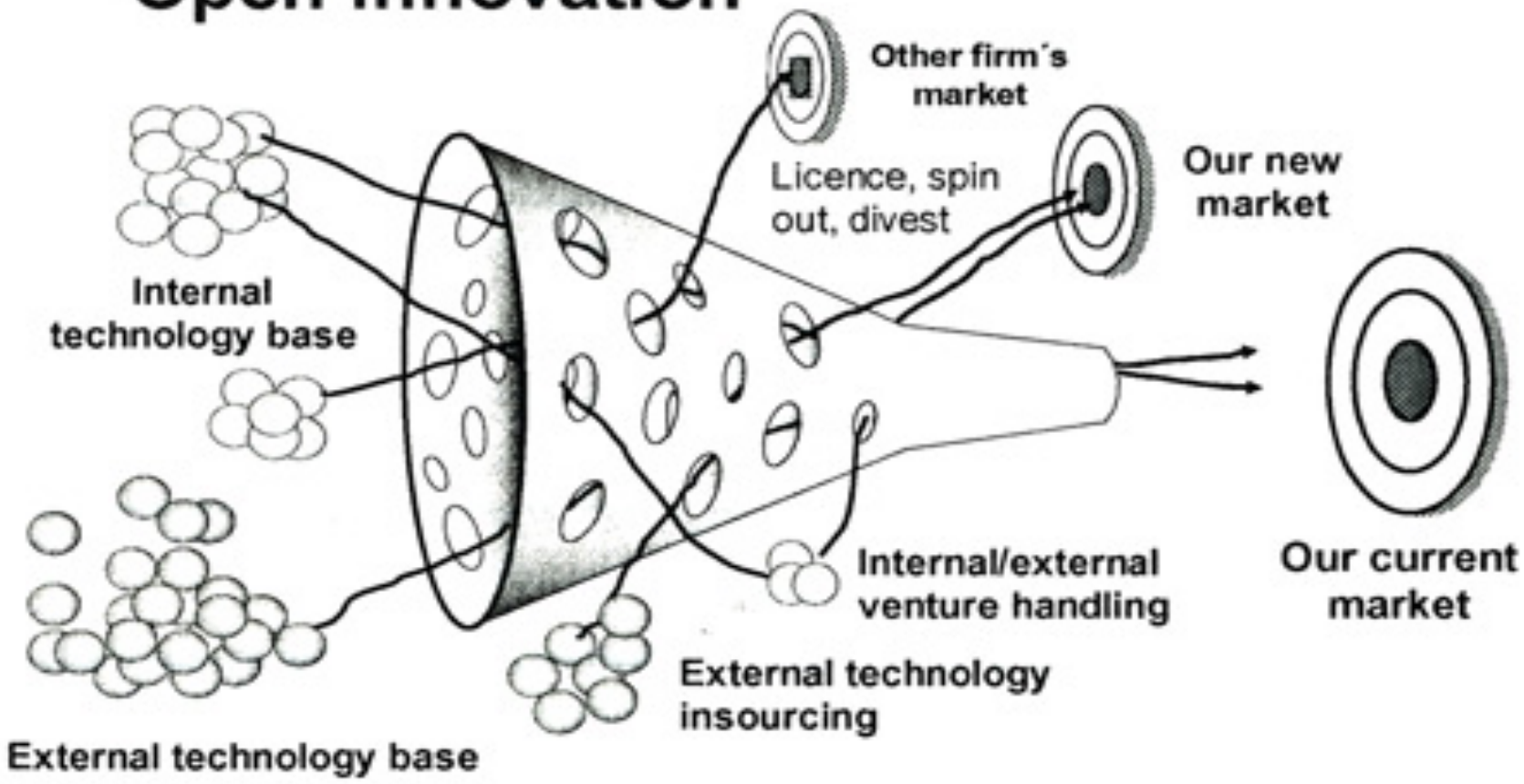
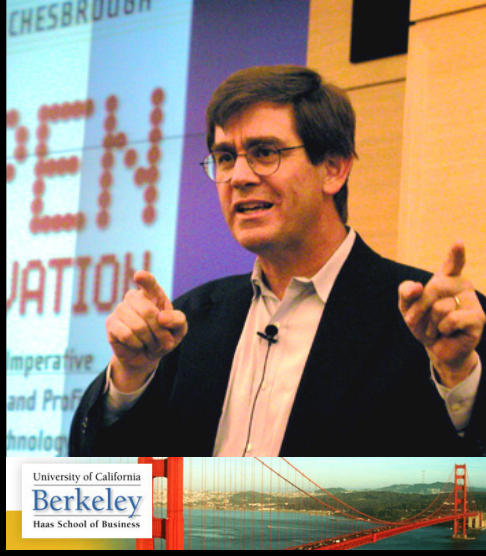
When googling "Innovation", this picture used to show up as the #1 hit.

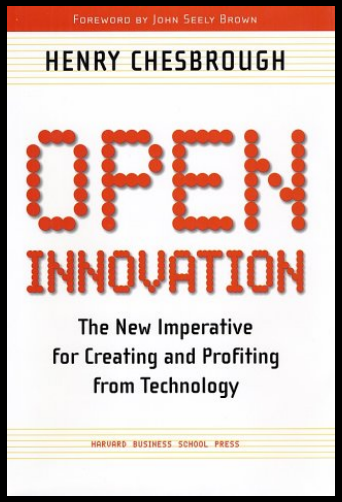
Open innovation



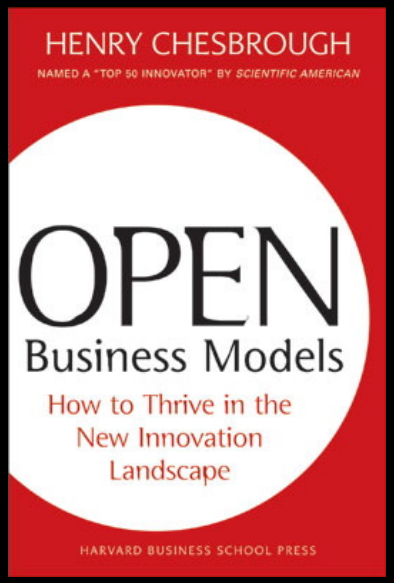
What is open innovation?

Open Innovation





2003
(200 Webpages)



2006

2011
(13 Mil. Webpages)

The idea of Open Innovation

(Chesbrough 2003)

- **New strategy / paradigm** in the entrepreneurial innovation management

- **Opening** of the innovation process **for external knowledge** in contrast to classical **closed innovation** by internal R&D departments
  (Chesbrough/Vanhaverbeke/West 2003; Gassmann/Enkel 2006; Lichtenthaler 2009, 2010, etc.)

- **Cooperation und Collaboration** of profit-actors (e.g. customers, users, supplies, competitors) and non-profit actors (e.g. universities, research labs etc.)
  (Henkel 2006; Laursen/Salter 2006; Reichwald/Piller 2009)

- **Open Call for participation**
  (Katila/Ahuja 2002; Howe 2006; Jeppesen/Lakhani 2010)

- Use of **Internet technologies**

Large corporations today have dedicated roadmaps for open innovation

	Idea Evolution	Technology Mgmt.
External	Idea contest 	E-broker NINESIGMA INNOCENTIVE yet2com
Internal	Innovation Jam Idea contest 	Open expert networks 

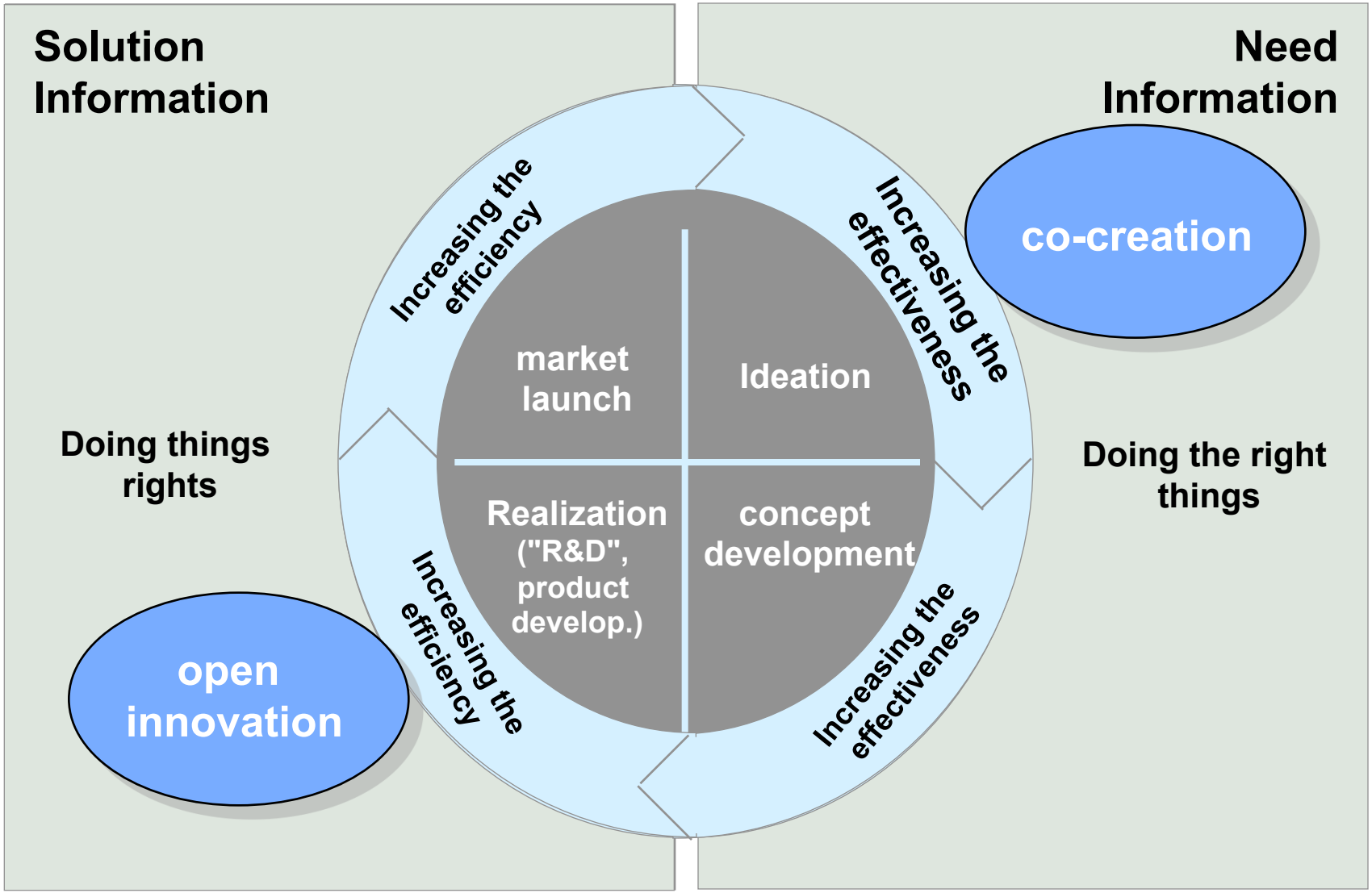
Source: Lackner 2009: Open Innovation at Siemens

Open Innovation

The formal discipline and practice of leveraging the discoveries of *unobvious* others as input for the innovation process through formal and informal relationships*.

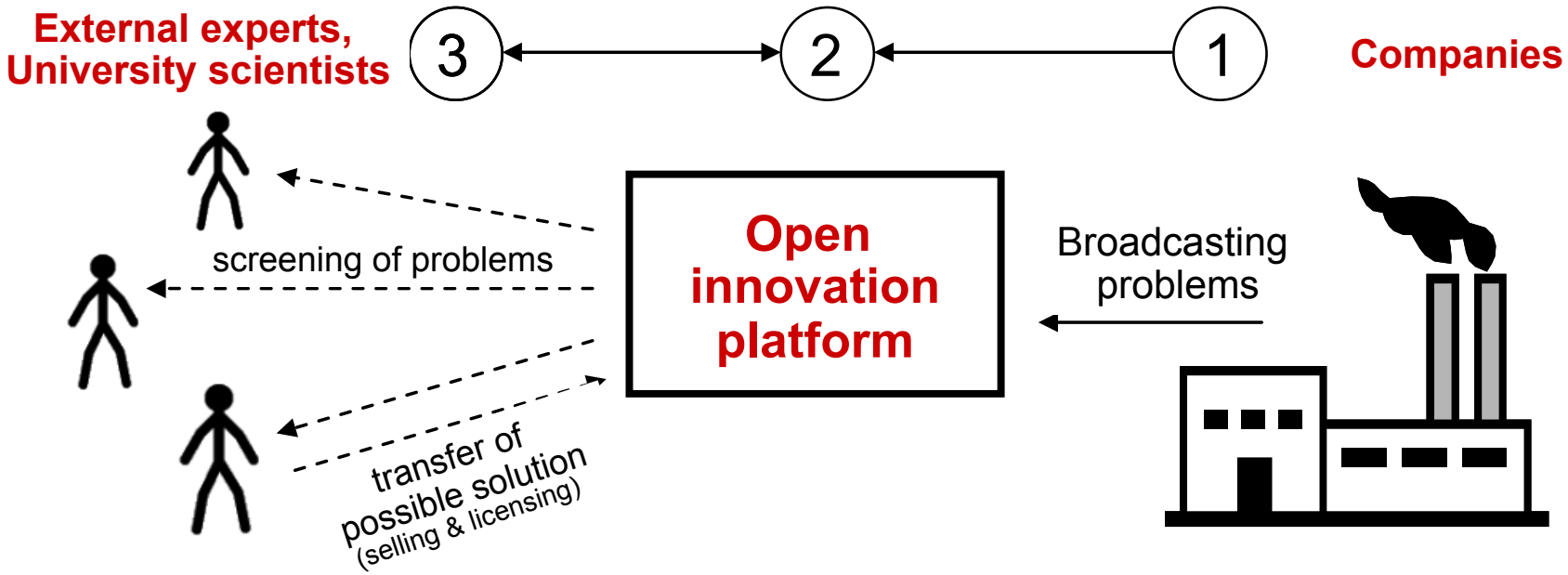
*Note: It are the informal relationships that constitute the "innovativeness" of open innovation!

Open innovation (and **co-creation** = open innovation with customers) **extends** *(not: substitutes)* **the toolbox of your innovation management to address these problems**



One core method of OI:
Broadcast Search
("Crowdsourcing")

Adopting Open Innovation *(beyond local search)*



Activities on research site:

- **Screening of problems**
- Reaction only when problems seems to be known and cost to answer affordable
- Transfer of solution idea
- Transfer of suggestion for contract research

Activities on company site:

- **Transfer of problems**
- Screening and evaluation of problems
- Transfer of "best" solution
- Contracting of further research

"This will never work
in our industry."

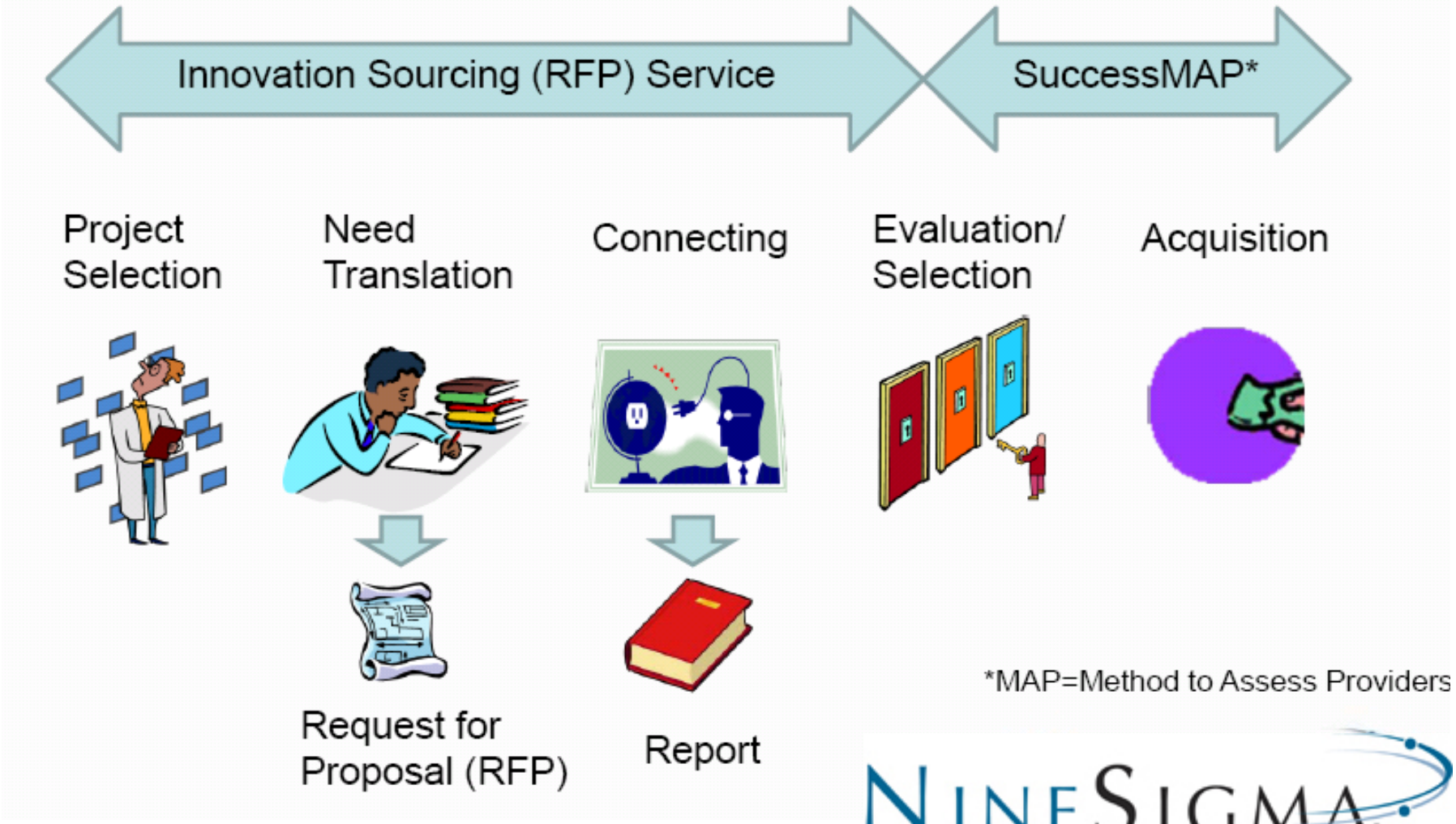
Project: Piloting open innovation in the German industry

- Group of German engineering companies in the automotive industry: Suppliers and users of driving systems (gear boxes, power train , etc.), organized in industry association (called "FVA")

- **Many of them are world market leaders in their sector**
- Very engineering driven, successful, very "German" engineers. Typical example of "local search" !
- **Problem:** For some technical problems, they did not find sufficient solution
- Project with our research group in Aachen: **Pilot co-creation for technical problem solving**

Open Innovation Accelerators

In the project, we selected five problems from companies and the FVA research consortium to be "broadcasted" by NineSigma.



RFP Review

REQUEST # 66198

Durable, Non-Lubricated Gear Materials

Request For Proposal Description

NineSigma, representing **a Central European Academic/Industrial Development Consortium** invites proposals for **strong, durable gear materials that don't require lubrication.**

The successful material will:

- Be compatible with one or more methods of contemporary gear manufacturing
- Convert into gearboxes that can run without lubrication
- Create gearboxes that meet the following specifications
  - Ambient temperature range from 0 to 40 °C
  - Hertzian stress (at gear contact points) up to 1600 N/mm²
  - Nominal drive torque >100 Nm
  - Typical operating input speed>2000 RPM (up to approx. 8000 RPM); output ratio 1/3 – 1/10
  - Support tooth design permitting Efficiency at full load of >90%
  - Operating life >10000 hour
  - Gear thickness about comparable to same performance metal gears

Possible Approaches

Possible approaches might include, but are not limited to:

- Stronger plastic materials
- Composite Materials
- Durable one-time surface treatments for metal gears
- New Alloys for metal gears
- Ceramic materials
- Porous, oil-soaked gears and pre-lubricated gears
  - oil losses must be safely inhibited
  - bulk oil cannot leave gearbox under any circumstances
  - No additional lubrication for the operating life of the gearbox

Opportunity

Licensing, product acquisition, contract research, proof of concept leading to scale-up to manufacturing, joint development, supplier agreement

Timeline

Phase 1 – Material Feasibility and Proof of Principle
Phase 2 – Manufacturing and Commercial Development

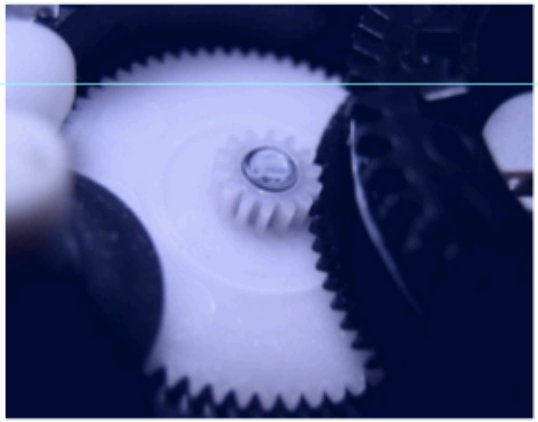
Financials

Phase 1 funding to demonstrate proof of principle is supported by the Academic/Industrial consortium up to the amount needed to contract one year of research in an academic environment. Alternative pathways and options for development will be funded by one or more industrial partners at levels appropriate to the opportunity.

Approaches Not of Interest

The following approaches are not of interest:

- Materials that cannot be fabricated into gears by existing manufacturing methods
- Alternative power trains as substitutes for gears



NineSigma®
Accelerating the Innovation Cycle

RFP Review

REQUEST # 66204
Extraordinary Fine Particle Removal from Lubricated Mechanisms

Request For Proposal Description

NineSigma, representing **A Central European Academic/Industrial Development Consortium**, invites proposals for **Extraordinary particulate removal additives** to conventional lubrication systems.

The successful additives will:

- Reliably bind to metal particles in the 0.001 to 5 micron range
- Peacefully co-exist with conventional lubricants and additives
- Render the small particles capturable by a convention filtration system.

Opportunity

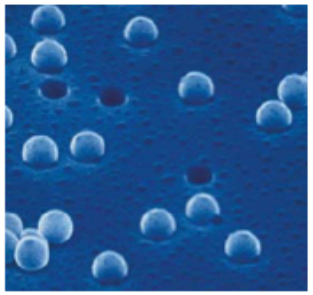
Licensing, product acquisition, contract research, proof of concept leading to scale-up to manufacturing, joint development, supplier agreement

Timeline

Contract Research phase to begin Fall 2010

Financials

Funding of research by the Development Consortium is possible for up to two graduate students for a 2-3 year program. Funding of other options by individual members of the consortium to be determined as appropriate to the state of technology development



Possible Approaches

Possible approaches might include, but are not limited to:

- Development of surface treatment of nano particles
- Long chain-multi-functional group polymers
- Sticky nanospheres
- Permeable microcapsules
- Coagulation, precipitation, sequestration

Approaches Not of Interest

The following approaches are not of interest:

- Approaches requiring new lubrication media
- Approaches that use highly toxic materials
- Approaches that decrease the lubrication performance of existing media
- Approaches that only remove soot from lubricants

RFP Review

REQUEST # 66210

Rapid nondestructive inspection of surface and subsurface microstructure properties of machined steel

Request For Proposal Description

NineSigma, representing **a Central European Academic/Industrial Development Consortium** invites proposals for the non-destructive **determination of surface microstructure properties of machined steel**.

The successful technology or device will:

- Detect and report changes in surface and subsurface microstructure properties of steels in relation to a reference state
  - Sensitive to crystal structure and transformation, for example martensite
  - Detect and assess residual stresses
  - Detect structural changes up to a maximum of 5 μm (micrometers) below the surface of the machined part as designated by the operator
- Be insensitive to the shape of the machined part being studied
- Be applicable to parts of 25 to 4000 mm diameter
- Be general or customizable to a specific part shape
- Provide a clear signal (for example a green or red light) when it encounters an out-of-specification region
- Sample and report at a rate of at least one spot per 0.1 s or scan at a rate of 1 m/sec

Possible Approaches

Possible approaches might include, but are not limited to:

- Improved Barkhausen Noise instruments
- Improved Eddy Current measurements
- Improved Speckle Interferometry imaging
- Ultrasound methods
- Ultrahigh frequency radio imaging
- Tomographic methods
- Appropriate fluids to detect changes in the stress state
- Data processing methods that improve the usability of information reported by otherwise unsuitable methods

Approaches Not of Interest

The following approaches are not of interest:

- Destructive Testing
- Surface Preparation
- Microscopic preparation such as etching

Opportunity

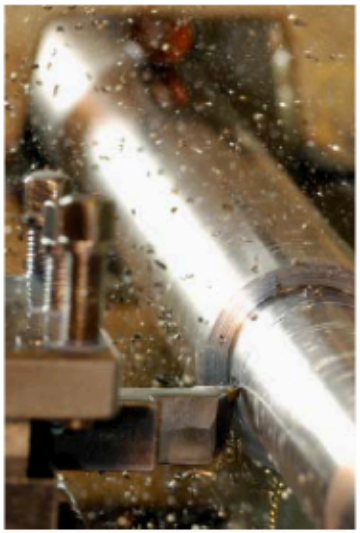
Licensing, product acquisition, contract research, proof of concept leading to scale-up to manufacturing, joint development, supplier agreement, etc.

Timeline

Phase 1 – Proof of Principle complete by August 2010

Financials

Phase 1 funding to demonstrate proof of principle is supported by the Academic/Industrial consortium up to the amount needed to support one year of research in an academic environment. Alternative pathways and options for development will be funded by one or more industrial partners at levels appropriate to the opportunity.



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Open Call of 4 RFPs *("Requests for Proposals")* lead to 96 solutions

Origin of Solution:

- 42 Industry
- 32 University
- 21 Other (z.B Non-Profit- and Public Resea

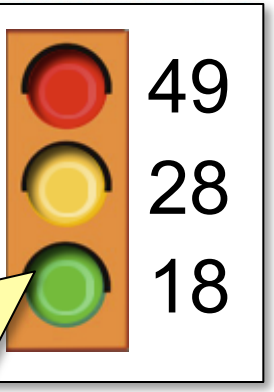
NINES
Accelerating the

Evaluation of the solution contribution

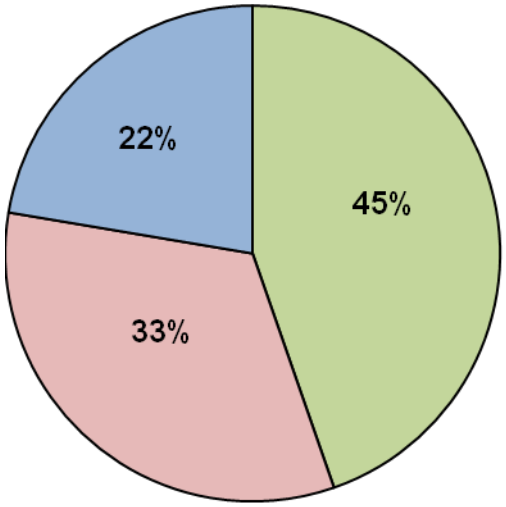
Red: **not interesting**

Yellow: interesting, but **more clarification**

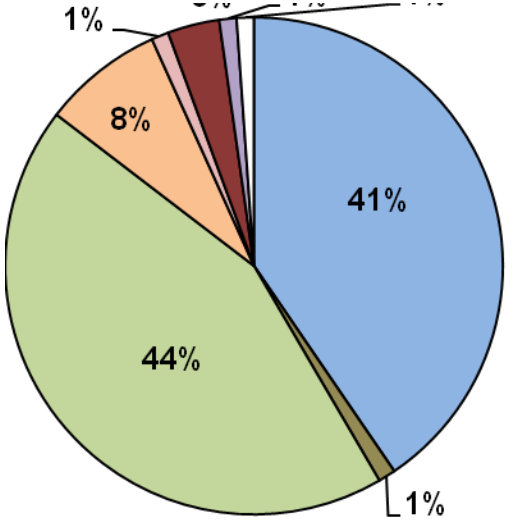
Green: very interesting/ adequate solution / follow up



Institution



Origin



The contributions (solutions) come from unknown Institutions and are new from a technical perspective

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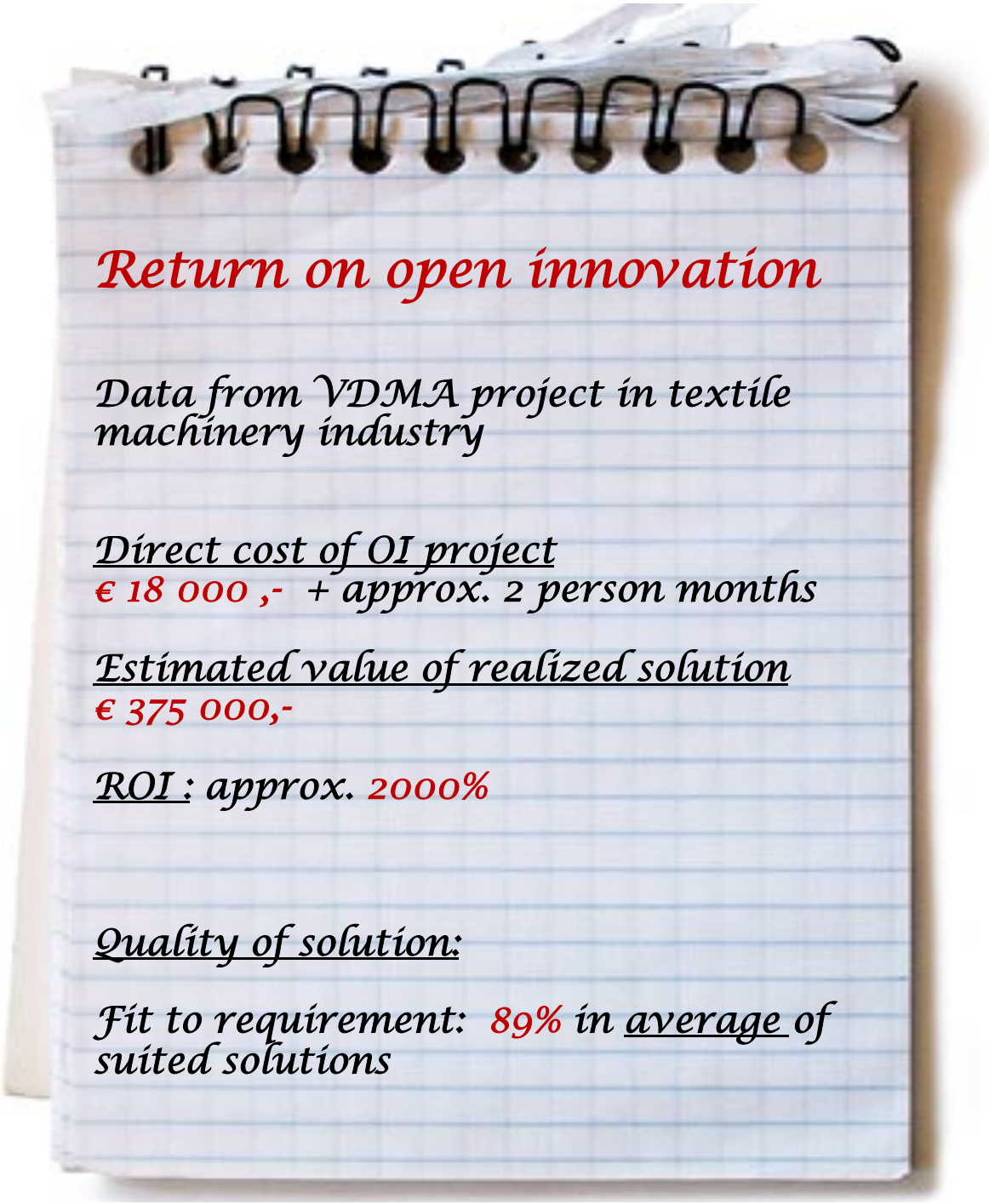
Evaluation of solution proposals by project steering committees

RFP	Institution		Solution Technology		
	new	known	new	known	unsure
66198	23	3	16	6	4
66204	10	0	3	7	0
66207	7	0	6	0	1
66201	33	2	22	8	5



Return on open innovation

Data from VDMA project in textile machinery industry

Direct cost of OI project
€ 18 000 ,- + approx. 2 person months

Estimated value of realized solution
€ 375 000,-

ROI : approx. 2000%

Quality of solution:

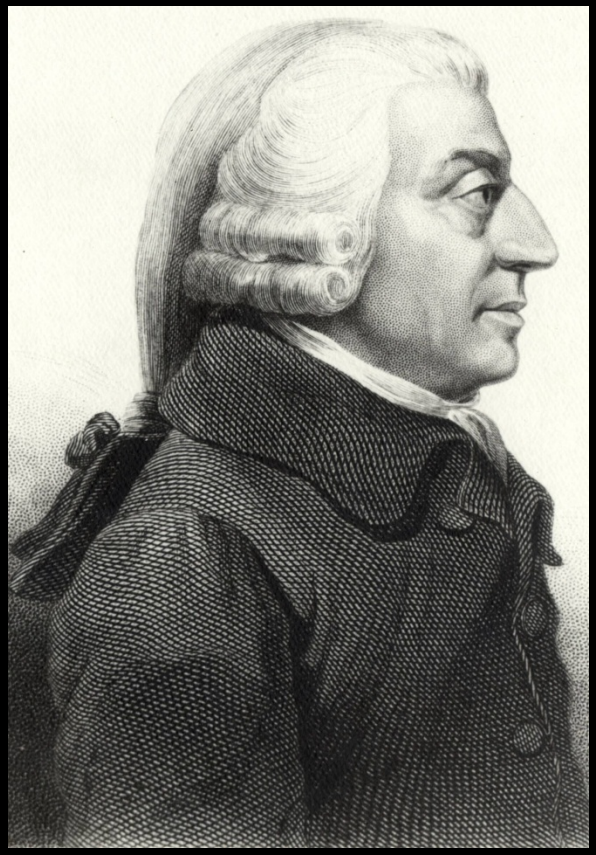
Fit to requirement: 89% in average of suited solutions

“The lab is our world”

CEO large German car manufacuturer

“The world is our lab”

CEO Open Innovation Accelerator company



„Growth and Innovation are rooted in the division of labor“

Adam Smith

Two statements of project managers from our company partners

*„**During the project, we have learned a lot about new players and the positions of other companies in the technology space**, and this in a very short time. **The real "Aha" however was that we did learn so much about ourselves**. We got a much better understanding where we are and what we know.“*

*„**During the project, our culture shifted dramatically**. My colleagues are all bumping at my door, and want to have their own RFP. We are changing from a notion of privacy and being closed (for better) **to become more open**. Participating at this project was clearly the driver of this change.“*

Profiting from these opportunities

Success Factors of "Problem Broadcasting"

- **A Good Open Innovation Environment**
  - **OI-Champion Structure** ("Process Promotor")
  - Clearly defined **problem ownership** – *and starting with the problem, not the method!*
  - **Buy-in** for the implementation of returned solutions (overcoming "**NOT INVENTED HERE**")
- **Focus on Adherence to the Timeline**
  - **Realistic time planning** (RFPs will get to competitors sooner or later)
  - Rapid, well-defined internal **RFP review** process
  - Cooperating with intermediary and **alignment of organization** for processing and scheduling

Executing open innovation demands **specific capabilities** of your organization – which are not easy to acquire or to build, but which can provide **competitive advantage**

What could our company (organizational unit) do to hand s.th. out to the periphery and still make money?

What can we share with external participants (or competitors)?

What is the real core of our company?

How can we build competences required for successful collaboration with external co-creators?

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Thank you for your attention!