Open Innovation

Prof. Dr. Hermann Requardt
Siemens AG

Frankfurt, January 15th, 2009
What is innovation?

“Eine wirklich gute Idee erkennt man daran, dass ihre Verwirklichung von vorn herein ausgeschlossen erschien.” (Albert Einstein)

„Anything that won't sell, I don't want to invent. Its sale is proof of utility, and utility is success." (Thomas A. Edison)

„Im Deutschen wird Innovation heute im Sinne von neuen Ideen und Erfindungen sowie für deren wirtschaftliche Umsetzung verwendet.“ (Wikipedia)
For Siemens, innovation is transforming knowledge into money.

"Today’s technology is tomorrow’s bread – today’s science is tomorrow’s technology."

Richard von Weizsäcker

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“Innovation is the creation of something new ... and its successful introduction into the market” (Schumpeter)

Innovations have different perspectives. It’s not all about technology!

<table>
<thead>
<tr>
<th>Market</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>iPod*</td>
<td>Easy to use</td>
</tr>
<tr>
<td>iPhone*</td>
<td>Attractive design</td>
</tr>
<tr>
<td>MRI*</td>
<td>New imaging technology</td>
</tr>
<tr>
<td></td>
<td>Other diagnostic possibilities</td>
</tr>
<tr>
<td>Light-Bulb**</td>
<td>Incremental improvement</td>
</tr>
<tr>
<td>LED*</td>
<td>Brighter</td>
</tr>
<tr>
<td></td>
<td>Lower power consumption</td>
</tr>
</tbody>
</table>

*) Classification valid at market introduction
**) Classification valid from today’s perspective
Innovation activities – Siemens follows many paths to innovation

Openness

External communities
Along the value chain
Cross-Sector
Within Sector / Division
Within BU

Innovation process

Generation of ideas
Selection & Concept
Techn. development
Market launch

Supplier / customer integration
External cooperations
IPR / Standard.
Technology e-Broker
Spin-out
Open expert networks
Venture Capital

Spin-in
Corporation Labs

Idea Generation

Idea Management

Research & Development
Sales & Marketing

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Example eCar shows innovation complexity and involvement of multiple parties.
E-car is an answer to a variety of urgent global needs

- Renewable energy
- Oil shortage
- Global warming
- Emerging countries

**Emerging countries**
- Low-cost mobility in emerging countries

**Global warming**
- Reduction of pollution and CO$_2$ emission

**Oil shortage**
- Substitute for oil

**Renewable energy**
- Storage capacity for renewables

Lower costs per km  
no dependence on oil  
decentralized storage: 300 cars equal 1 windmill with 3 MW  
zero-emission

Source: Team Cross Business Opportunities
Effects of this trend are already visible

Market studies predict strong growth of e-car market

“5.3 Mio EU e-cars + infrastructure investments in 2015”
Whole ecosystem affected by e-car: Accelerates energy trends and new needs arise for all players

Utilities
- Highly dynamic load profiles on network
  - Active power management on all network levels needed

Owners of commercial buildings
- New infrastructure components
  - Need for charging stations and billing equipment

Utilities
- Battery as storage facility and source of power
  - Need for intelligent battery management and smart metering equipment

Energy traders
- New participants on energy market
  - Decentralized management and new trading platforms needed

New service providers
- E-car mobility as business opportunity
  - Need for global technology provider

Car manufacturers
- New car architecture
  - New drive train concepts and car automation approach needed

Car manufacturers
- Different car production
  - New manufacturing methods needed

Source: Team Cross Business Opportunities

January 2009
The playing field ranges from e-cars to power supply for e-car electricity

Complete e-car playing field

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Local interface</th>
<th>Distribution of energy</th>
<th>T&amp;G of energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM</td>
<td>Local power generation</td>
<td>Car control</td>
<td>Drive</td>
</tr>
<tr>
<td>Only standards</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Determined by type of transmission  
2) Internal Combustion Engine  
3) Combined Heat and Power  

Source: Team Cross Business Opportunities  
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Page 10 January 2009
E-Car one part of evolving integrated energy system
Possible scenario: E-Car connected to low voltage system

Products needed for control of load flow and power quality
e.g.
Distribution Management Systems / Virtual Power Plants
Power Electronics
System Planning

110 kV
10 kV / 20 kV
0.4 kV

Diesel < 20 MW
Wind < 20 MW
Solar < 20 MW

E-car < 10 kWp
Solar < 200 kWp
CHP* < 50 kVA

* Combined Heat and Power

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Several players have to become part of the game ……..

- Power generation
- Smart grid
- Private smart grid
- Bi-directional plug in
- Parking area
- Smart metering & billing

The car with its battery becomes an intelligent and mobile capacitor.
„Better Place“ changes the established business

Buy energy kWh  „Better Place“ - business  Sell mobility service

Needed in Better Place
An ever increasing inter-dependability ... ... reaching the limits of integration ... and organisation
Perceive, Analyze and Act with optimized data flow

- Lane Detection sensor
- Distance sensor
- US sensors
- E-horizon data base

- Situation Recognition (sensor fusion)

- Information Presentation (ergonomy)

- Driver’s Decisions
- Steering Wheel
- Pedal

- Strategy Generation

- Cinematic Execution Level

- Hybrid Actuator
- Thermal Engine Actuator
- Transmission Actuator
- Power Steering Actuator
- Suspension Actuator

- DC / DC

- WU
- WU
- WU
- WU
The E-Car levered new solutions for all Siemens sectors and protects from disruptions.

Siemens AG business

- **Energy**
  - Smart Grid
    - Internet of power
    - Island mode etc.
- **Industry**
  - Automation
  - Drive Technologies
  - Building Technologies
- **Healthcare**
  - Service (HS)
  - Mobile Diagnostic Devices

**Business Enabler**

- Fuelprice
- CO2
- Environment care

**E-Car**

- Battery + Mgmt.
- Control power flow
- E-Motor & Inverter
- Drive Control

**Smart E-Car**

- Safe driving ADAS
- Advanced comfort
- Health monitoring

**Reduce Complexity:**
- Reduce costs
- Reduce maintenance

**Supports diffusion**

- Storage solution & Power routing
- Business opportunities and new technologies.

- Simatic / Sinumerik / system architecture

- Intelligent Building Solutions Agent technology
- Scale effects sensors + R&D cost sharing

**New system architecture**

- Reduce Complexity: Reduce costs, Reduce maintenance
One additional example: Venturi Vantage
E-Car Test Lab to make topic tangible

- Providing a test lab to train engineers from utilities and automotive OEMs
- Communication instrument to make topic internally and externally tangible (e.g. for politicians, decision makers from car manufactures and utilities)
- Culmination point to bundle the different Siemens competencies
The new mobility concept eCar.....
..... may be a trojanian horse?
Paradigm shift of Open Innovation

<table>
<thead>
<tr>
<th>Closed Innovation principles</th>
<th>Open Innovation principles</th>
</tr>
</thead>
<tbody>
<tr>
<td>The smart people in our field work for us.</td>
<td>We need to work with smart people inside and outside our company.</td>
</tr>
<tr>
<td>Home made food is good food.</td>
<td>External R&amp;D can create significant value.</td>
</tr>
<tr>
<td>If we discover it ourselves, we will get it to market first.</td>
<td>Smart copying is a core competency.</td>
</tr>
<tr>
<td>Early adoption of technology is key to success.</td>
<td>Innovation based business models are key to success.</td>
</tr>
<tr>
<td>If we create the most and the best ideas in the industry, we will win.</td>
<td>If we make the best use of internal and external ideas, we will win.</td>
</tr>
<tr>
<td>Protection of innovation is key success enabler.</td>
<td>Time is of the essence. Leakage risks need to be accepted, but managed.</td>
</tr>
</tbody>
</table>

The lab is our world

The world is our lab

2) Within Siemens or external
Source: Team Open Innovation

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Opening innovation up has proven high business impact in different cases.

### Initial situation
- Underperforming goldmine company in Ontario
- Provision of top secret mining data
- 1400 geologists, 50 countries
- $150,000 award to find next 6 Mio. Ounces of gold

### Measures
- Short list of 110 drilling targets (50% were new!)
- Gold found in all top 4 targets (8 Mio ounces of gold)

### Business Impact
- Financial success of innovation (35%)
- Organic growth
- CEO top down goal (A.G. Lafley)
- 50% of innovations outside P&G
- From R&D to C&D \(^1\) (7500 + 1,5 Mio researchers)
- R&D invest down from 4.8% (2000) to 3.4% (today)
- Innovation success rate doubled, ext. ideas (15% \(\rightarrow\) 35%)

1) C&D = Connect and Develop

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\(^1\) BCG innovation ranking 2008

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1) C&D = Connect and Develop
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January 2009

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2) BCG innovation ranking 2008

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Sector-sponsored pilots are set to test Open Innovation approaches

Exemplary topics

<table>
<thead>
<tr>
<th>Unit</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>E D EA</td>
<td>Grid integration of renewables (Virtual power plant, energy storage)</td>
</tr>
<tr>
<td>Osram</td>
<td>&quot;Customer-designed mood lighting products&quot;</td>
</tr>
<tr>
<td></td>
<td>&quot;Affordable and accurate color sensor technology&quot;</td>
</tr>
</tbody>
</table>

Source: Team Open Innovation
Pilot 1: Idea Contest –
Social network technology taps crowd intelligence

- 100s to 100,000s of people participate online
- Different disciplines bring unique creativity

- Create sense of community and shared purpose
- Provide community with opportunity for actual impact

- Community members bring forth new ideas
- Community rewards and develops good ideas
- Good ideas inspire community members

Source: Team Open Innovation
# Pilot 1: Idea Contest –
Industry generates ideas with social network technology

<table>
<thead>
<tr>
<th>Focus / Description</th>
<th>Impact</th>
<th>Int./Ext.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual Innovation Agency</td>
<td>1000 posted ideas – 3 realized</td>
<td>✓</td>
</tr>
<tr>
<td>Cisco online collaboration tools</td>
<td>Start new business (power usage control)</td>
<td>✓</td>
</tr>
<tr>
<td>Generate business ideas &amp; hire talent</td>
<td>$250,000 main prize</td>
<td>✓</td>
</tr>
<tr>
<td>Imagination Breakthroughs</td>
<td>$mn. 50 -100 from incremental improvement</td>
<td>✓</td>
</tr>
<tr>
<td>ADC: Develop applications for Android mobile phone</td>
<td>50 finalist applications – 20 win awards</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>$mn. 10 in prizes</td>
<td></td>
</tr>
<tr>
<td>Innovation LAB</td>
<td>150 smaller-scale projects per year</td>
<td>✓</td>
</tr>
<tr>
<td>InnovationJam 2006</td>
<td>Start 10 new businesses</td>
<td>✓</td>
</tr>
<tr>
<td>IT services for tomorrow's data center</td>
<td>Innovation talent hired, €5,000 cash prize</td>
<td>✓</td>
</tr>
<tr>
<td>Intranet brainstorm in preparation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-Flash internal idea pool</td>
<td>8 new high-impact ideas per week</td>
<td>✓</td>
</tr>
<tr>
<td>Design community &quot;create your style&quot;</td>
<td>Prized designs</td>
<td>✓</td>
</tr>
</tbody>
</table>

Source: Team Open Innovation
Pilot 1: Idea Contest – Includes evaluation of end-customer acceptance

**Why host an idea contest?**

**Main impact**
- Evaluate business ideas by engaged customer communities
- Get end-customer ideas incl. idea evaluation and selling potential
- Identify new market trends early
- Align product development with market requirements

**Side impact**
- Strengthen external innovation network
- Improve corporate image
- Recruit innovation talents and/or find design partners

**How does it work?**

- Large number of external end-customers and designers generate and evaluate ideas
- Address targeted invitation to potential contributors on Web
- Offer reward to attract external innovation community
- Winner's intellectual property rights are conceded to host

**Best Practice**
- Google awarded $10'000 for new Android mobile applications
- Cisco awarded $250,000 for controlling devices via net
- FSC awarded cash, product prizes for new service ideas

**What will be the topic?**

- European market ~1"0 in 2015

**Possible future contests**
- "What are new lighting applications for cars?"
- "What lighting products can use visible light communication?"

Source: Osram / Team Open Innovation
Pilot 1: Idea Contest –
Attract end-customers and designers

Osram Mood Light Idea and Design Contest 2009

Your Ideas and Designs

Your Vote

Win great prizes
3000€ & more

Get Inspired

Source: Hyve AG
Page 26 January 2009
Pilot 1: Idea Contest – Mood Light is a diverse search field

- Innovative accessories for fun and decoration purpose with impulse purchase character for home & hospitality applications
- Design objects, furniture or traditional luminaires for home, office & hospitality applications with plug and play solutions
- Future oriented applications with new materials through OLED technologies
- Intelligent illumination concepts for interior decoration and easy upgrade of homes

Source: Osram LUM
Pilot 2: eBroker – Connect seekers with many problem solvers

E-broker – a hub for innovation

Priced-based problem solving via online R&D marketplace

Source: InnoCentive
Pilot 2: eBroker – Reduce cost and improve time2market

<table>
<thead>
<tr>
<th>Idea</th>
<th>E-brokers</th>
<th>Why does it work?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online broker to connect innovation seekers with solution providers</td>
<td>Scientific technology matchmaker (INNOCENTIVE)</td>
<td>Low-hanging fruit for solver who already knows solution</td>
</tr>
<tr>
<td>Precisely defined problems can be solved in an effective way by external technology experts</td>
<td>Business and technology connector (NINE SIGMA)</td>
<td>Community of more than 150,000 solvers</td>
</tr>
<tr>
<td></td>
<td>Technology M&amp;A agent (yet2com)</td>
<td>Intrinsic motivation to participate Cross-domain knowledge transfer</td>
</tr>
</tbody>
</table>

### Scientific technology matchmaker
- Theoretical concepts to solve technical problems
- Confidential information exchange

### Business and technology connector
- 60% industry connection to commercially available solutions
- Only non-confidential information exchange

### Technology M&A agent
- 80%-ready technologies from VC- Companies and R&D organizations
- Only non-confidential information exchange

**Performance:**
- 30% of problems solved within less than 6 months

*Source: Team Open Innovation*
Achieved benefits of leading e-brokers

**Improve R&D Efficiency**
- Reduction of development time: 75% ¹
- Improvement of ROI for R&D: 2175% ¹

**Access to a worldwide network of experts**
- Tailored target group from network of 1 Mio. experts: 60% industry, 40% academics ²
- Average community of 8,000 solvers per problem ²
- Access to ~100,000 PhDs ¹
- Network of more than 200 Venture Capital Companies ³

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¹ Figures from InnoCentive ² Figures from NineSigma ³ Figures from Yet2.com

Source: Karim Lakhani (HBS), Interview NineSigma (A. Zynga), Interview Innocentive (T. Venable), Prof. Piller (RWTH Aachen / MIT)
Pilot 2: eBroker – Often solve problems by creating unobvious connections

Source: NineSigma
Pilot 3: Open Expert Networks – Why do we need communities?

Actual situation and trends
- globalization, dynamic change
- increasing product requirements
- knowledge-intensive businesses → Knowledge as key resource
- product-/customer-oriented structures
- virtual enterprise: joint ventures, partnerships, customer integration

Deficits in handling knowledge
- double work, repetition of errors
- unused synergies / effects of scale
- sub-optimal usage of organizational available knowledge
- not efficient knowledge flows
- knowledge loss
Pilot 3: Open Expert Networks – Knowledge exchange increases efficiency

From: Exchangeable workforce

To: Individual knowledge workers

Exchanging and connecting knowledge becomes a success factor
Pilot 3: Open Expert Networks –
Communities are networks of employees

Characteristics of a Community

- common interests
- distributed across organizational boundaries
- knowledge exchange & knowledge creation
- virtual & face-to-face
- individual & business goals
- undetermined timeframe
### Pilot 3: Open Expert Networks – Cross-link experts from different sectors

#### Definition
- Topic-based **cross-linking** of experts from different SAG sectors
- **Siemens experience:**
  - First **positive experiences** within
    - **BT network**\(^1\) (ca. 6,000 members, 75 countries, reference projects)
    - **SIS Security network** (60 members, technology)
    - **BSH** (Product-technology matrix, various communities, high management attention)
- **Success factors:**
  - Clear targets and roles
  - Management commitment

#### Suggested pilot
- **Grid integration of renewables**
- **Material** (e.g., conductors)
- **Innovation in manufacturing** (sMET)
- **Lead units:**
  - Energy D EA (Pilot)
  - Industry Osram (t.b.d)
  - CT (t.b.d.)
- **Pilot driven by e.g. CT as "broker"**
- **Topics and concept to be detailed** till SCI
- **Network to be completed** with participants from additional divisions

#### Benefits
- **Use of synergies and know-how across sectors**: Avoid parallel activities across sectors
- **Overcome "Silo" thinking**
- **Increase quality and speed of innovations**
- **Shorten response time to urgent requests**
- **Identify new internal and external sales channels**

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\(^1\) I BT could provide its open references@BT platform for support of future networks

Source: Team Open Innovation

Page 35 January 2009
Siemens – Being networked, being different

- Think creatively or “outside of the box”
- Think in networks, not in organizations
- Create open doors with well-defined access controls
- Foster open market innovations
- Connect the best with the best
- Re-think competitors
- Benchmark yourself continuously

Create competitive advantage by managing complexity of internal and external know-how and flow of information