Deutsche Telekom Laboratories

Technology Radar™ as technology brokering tool

Michal Dunaj (T-Labs)

André Winzer (Schaltzeit)

Knowledge Management 2007

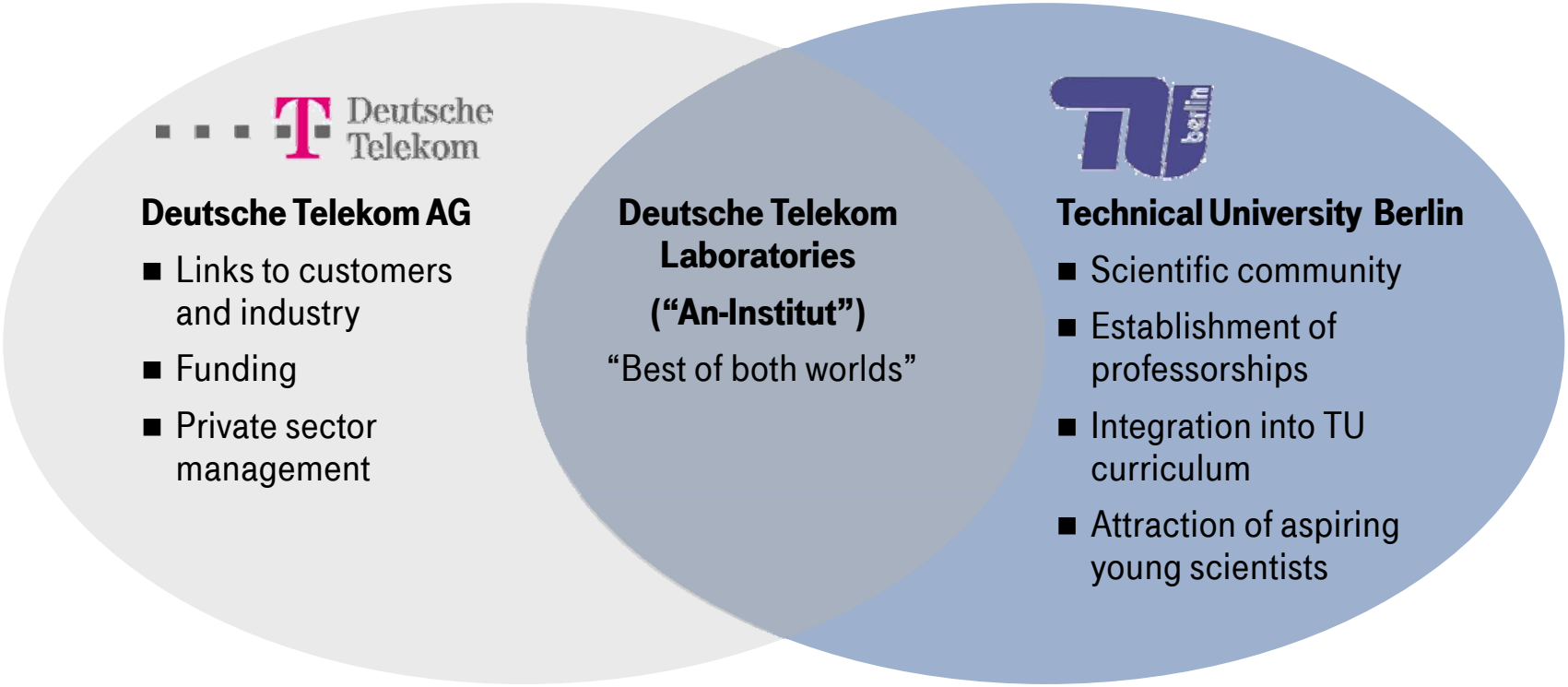
17th October 2007, Bratislava

Agenda.

- **Introduction of Deutsche Telekom Laboratories**
- Knowledge management framework
- Technology brokering as a concept
- Technology Radar as technology brokering tool (T-Labs)
- Application scenario with regard to Slovak enterprise specifics

Who we are – an introduction of DTAG Laboratories.

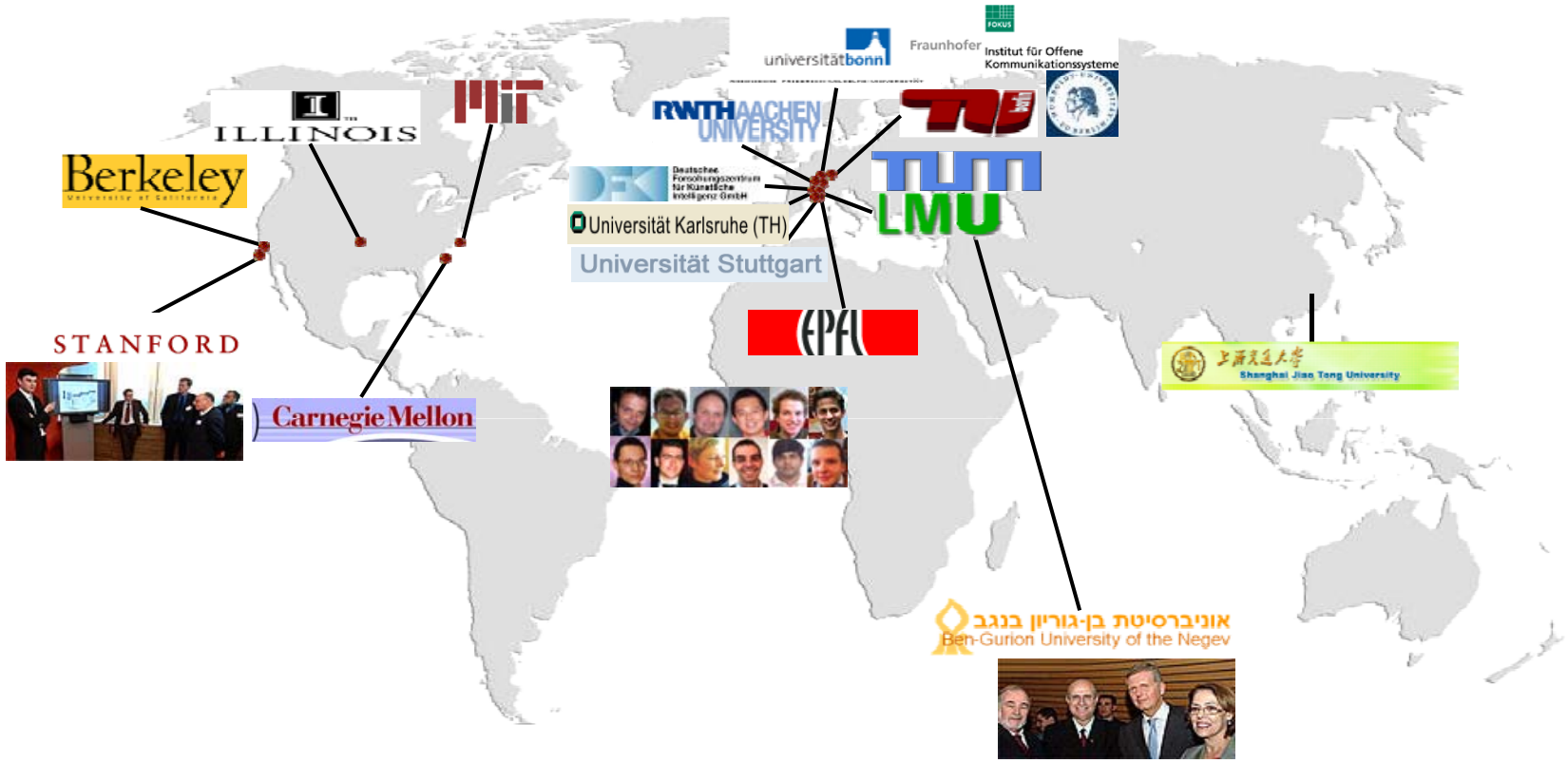
PPP with Technical University Berlin. T-Labs are a laboratory of Deutsche Telekom and an-institute of TU Berlin at the same time.



Deutsche Telekom Laboratories

(Re-)activated international R&D network.

Innovation Development works closely with selected universities.

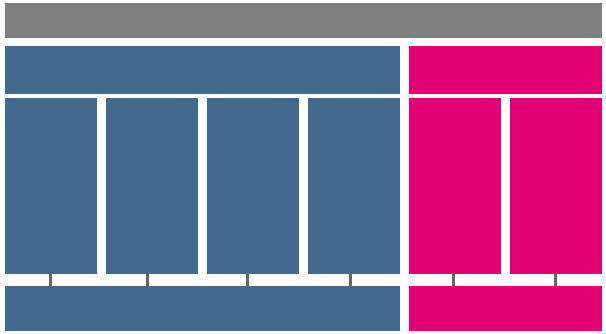


Harnessing the R&D community.
Example: T-Labs a university-industry research center.

T-Labs
one of the larges university-industry research center

University and industry
Research and development
in one entity

- 4 professorships
- 45 researchers
- 20 industry employees



Engage with R&D community

Research collaborations
with leading universities and research centers

STANFORD
Fraunhofer FOKUS Institut für Offene Kommunikationssysteme
Berkeley University of California
Universität Stuttgart
MIT
EPFL
Humboldt-Universität zu Berlin
TU berlin
universitätbonn Rheinische Friedrich-Wilhelms-Universität
LMU
אוניברסיטת בן-גוריון בנגב Ben-Gurion University of the Negev
TUM
DFKI Deutsches Forschungszentrum für Künstliche Intelligenz GmbH
RWTH AACHEN UNIVERSITY
Carnegie Mellon
上海交通大学 Shanghai Jiao Tong University
ILLINOIS

Schaltzeit.
Research environment of Deutsche Telekom Laboratories.

Foundation	▪ Founded out of the research environment of T-Labs in march 2006 . The close collaboration with the T-Laboratories has constantly improved process structures and boosted outcomes.
Core competence	▪ Technology Scouting, Early Innovation Detection, Knowledge Brokering Solutions
Approach	▪ Trace, evaluate and promote trends in technology fields. ▪ Acquire, retain and retrieve new combinations of information
Aim	▪ Support companies with the implementation of technology brokering ▪ Processes for the early detection of technologies ▪ Accelerate and ensure innovation the long-term growth of partners

Technology Radar ™

Virtual Communication

▪ Facilitate knowledge sharing and test future interaction capabilities of in new medias in early stage development

University-industry collaborations @ T-Labs.

To partner with top-universities the T-Labs use three different collaboration types.

PhD-Program

PhD-students

- work in projects of the Deutsche Telekom Laboratories
- while following PhD program at Illinois State University

Joint development projects

Ben Gurion University

- Web security
- Data warehousing
- Internet applications

Long term research

STANFORD

Stanford - Center for network research

- Next generation internet - clean slate approach

Agenda.

- Introduction of Deutsche Telekom Laboratories
- **Knowledge management framework**
- Technology brokering as a concept
- Technology Radar as technology brokering tool (T-Labs)
- Application scenario with regard to Slovak enterprise specifics

Knowledge management (KM) definitions.

KM is already an established topic, being discussed both by practitioners and academics.

Definitions of knowledge management*			
Emphasis on systems and teamwork	**An audit and protection of "intellectual assets"**	**KM as processes**	**KM as art**
▪ the management of the organization towards the continuous renewal of the organizational knowledge base - e.g. creation of supportive organizational structures, facilitation of organizational members, putting IT-instruments with emphasis on teamwork and diffusion of knowledge (as e.g. groupware) into place. **- Thomas Bertels**	▪ that highlights unique sources, critical functions and potential bottlenecks which hinder knowledge flows to the point of use. It protects intellectual assets from decay, seeks opportunities to enhance decisions, services and products through adding intelligence, increasing value and providing flexibility. **- Denham Grey**	▪ Knowledge Management is the collection of processes that govern the creation, dissemination, and utilization of knowledge **- Brian Newman** ▪ Focusing on determining, organizing, directing, facilitating, and monitoring knowledge-related practices and activities required to achieve the desired business strategies and objectives **- Karl Wiig**	▪ The art of creating value from an organization's intangible assets. **- Karl-Eric Sveiby**

And many others thoughts like:

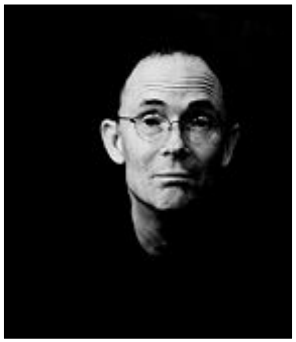
- Advanced practice and leadership of value networks and value network analysis. A body of work derivative of information theory associated with Prusak and Davenport.
- The Intellectual Capital movement ;Professor Bontis, Professor Edvinsson and Stewart
- Complexity approaches associated with David Snowden
- 'Narrative' approaches with Denning, Snowden, Boje and others.

*Source: KM forum

Business drivers of a knowledge management.

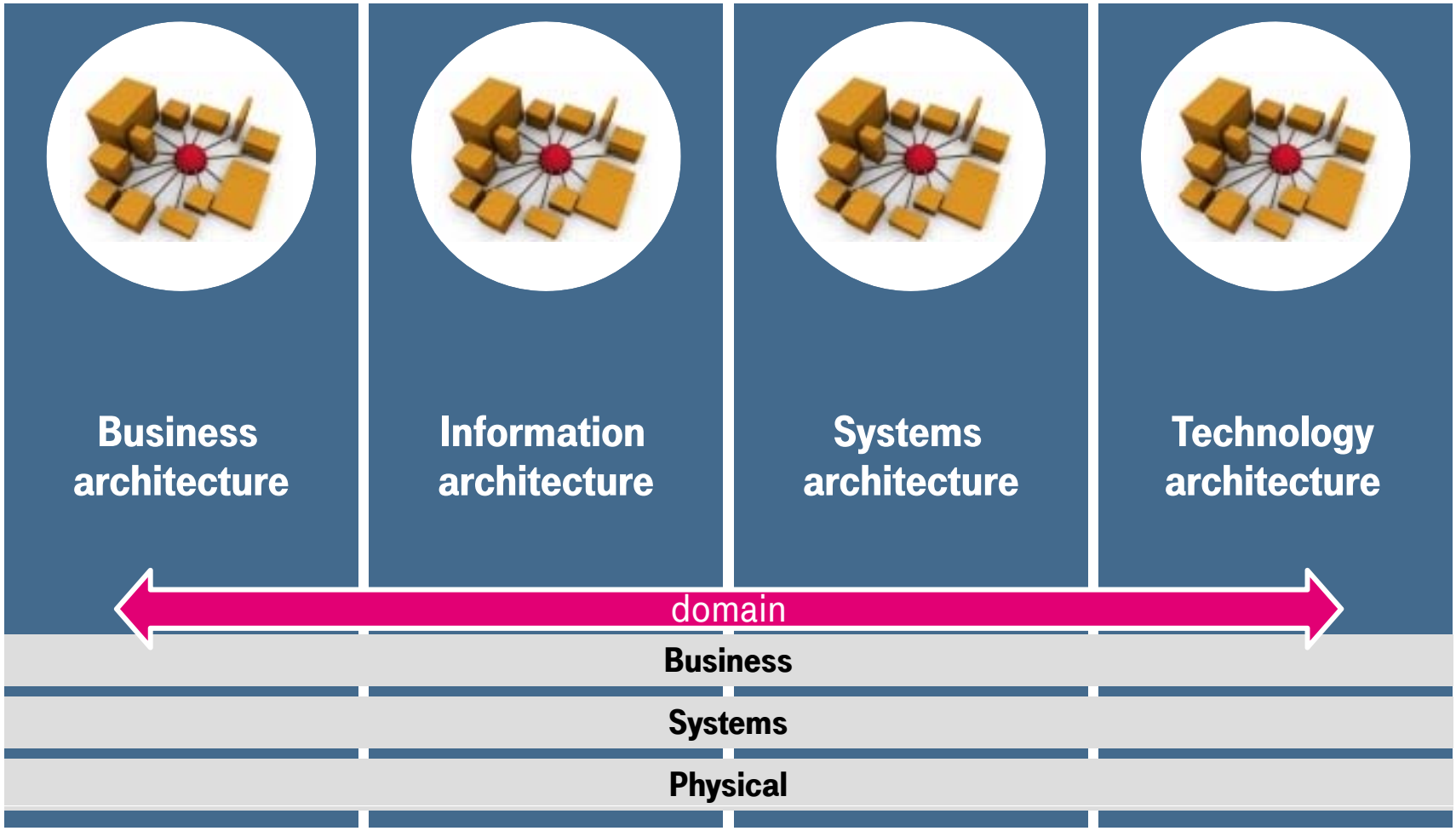
"The future is already here – it is just not evenly distributed yet."
William Gibson.

Enterprise management environment	
1	▪ Need to be constantly kept updated
2	▪ Commitment to foster innovation
3	▪ Necessity to be able to steer / be in a control/ the company
4	▪ and ROI on expert systems
5	▪ How to innovate routinely?



Enterprise – architecture dimensions. (simplified)

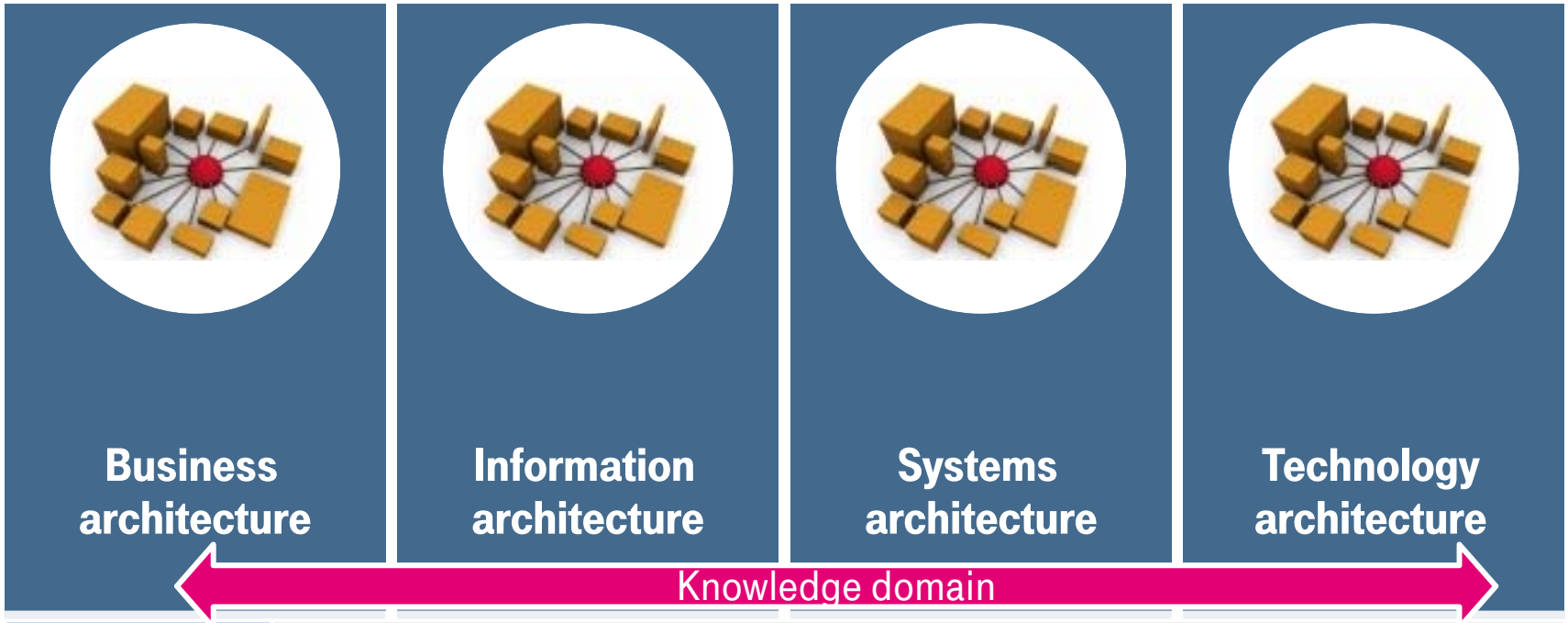
IT world originated holistic view on any enterprise or organization in general.



*Source: adopted according to Zachmann (1987, IBM) and Pulkkinen 2006

Enterprise – architecture dimensions & knowledge management.

The knowledge domains flow over enterprise through technologies and organization processes. An ecosystem is established.



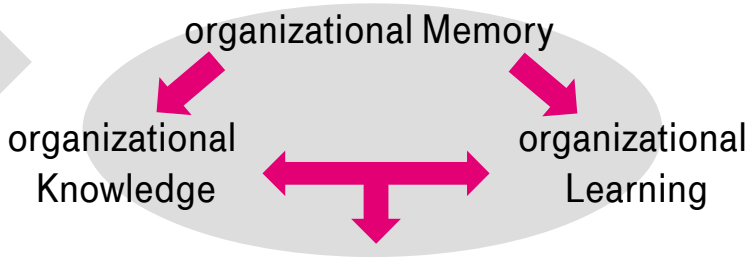
Techno-centric	▪ A focus on technology, ideally those that enhance knowledge sharing/growth.
organizational	▪ How does the organization need to be designed to facilitate knowledge processes? Which organizations work best with what processes?
Ecological	▪ Seeing the interaction of people, identity, knowledge and environmental factors as a complex adaptive system.

Organizational memory and its process.

Valuable solutions arrive seldom at the time as the problems they solve, to people that need it and in recognisable forms.

organizational memory and it‘s process

Acquisition → **Retention** → **Retrieval**

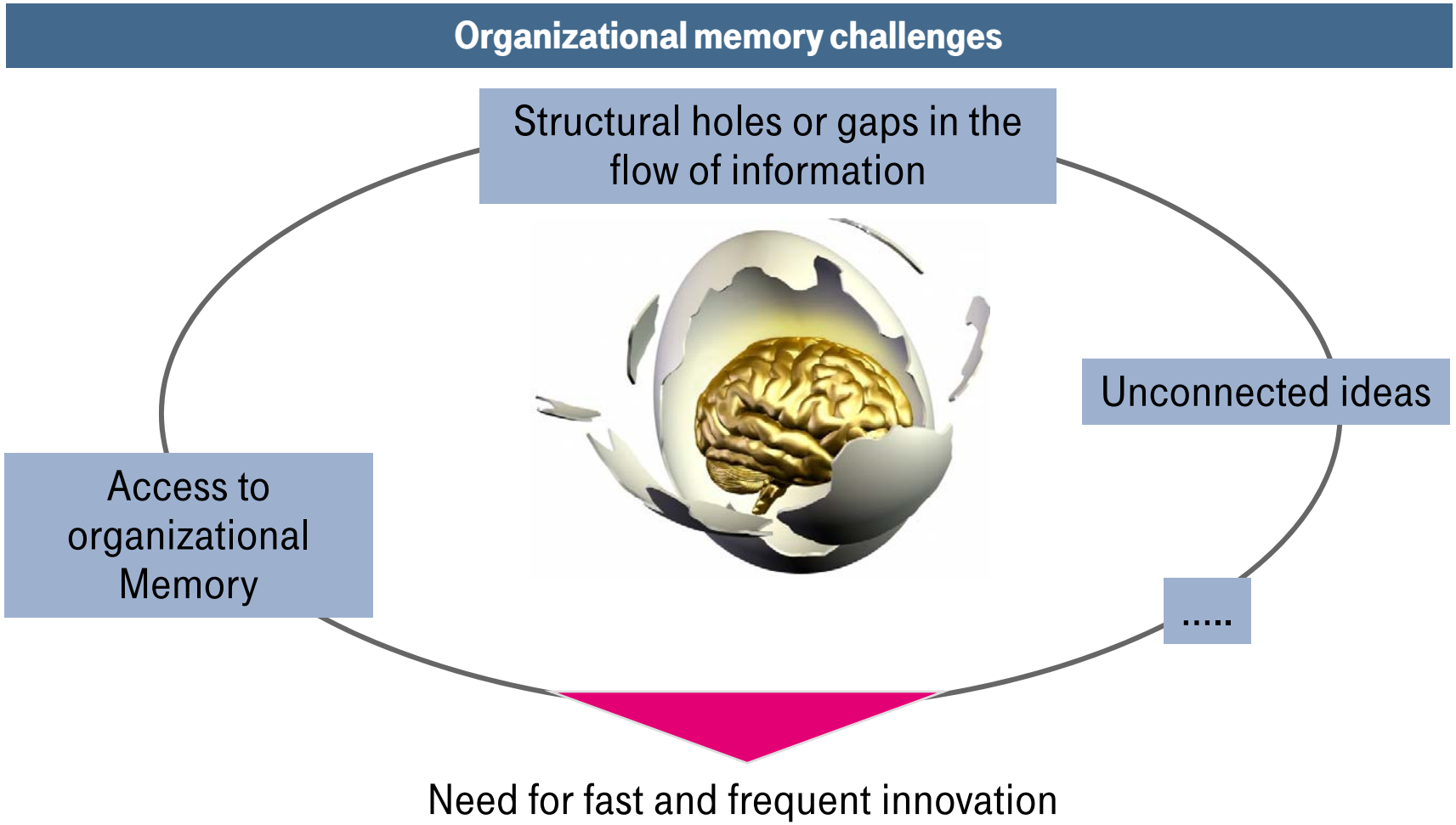


- Routines support an organization memory.
- Definition: The organizational memory is defined as stored information from an organization history that can be brought up to bear present decisions

organizational Memory Information System (OMIS)

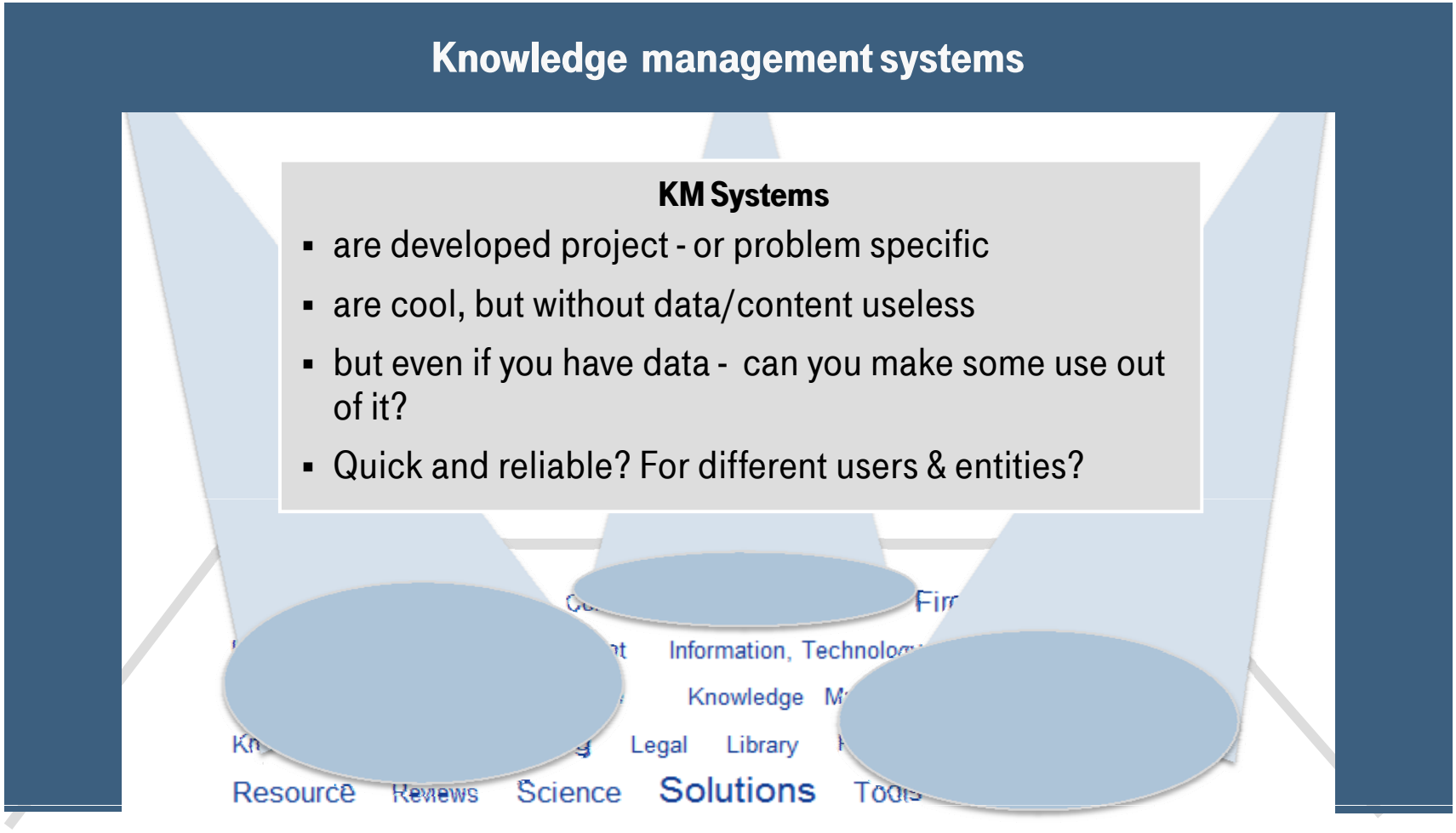
J.P. Walsh and G.R. Ungson (1991)
organizational Memory, Academy of Management Review, Vol. 16

Organizational memory challenges.
Access to the tacit knowledge.



Knowledge management systems & access via organizational memory.

Making knowledge accessible in any sense is difficult.

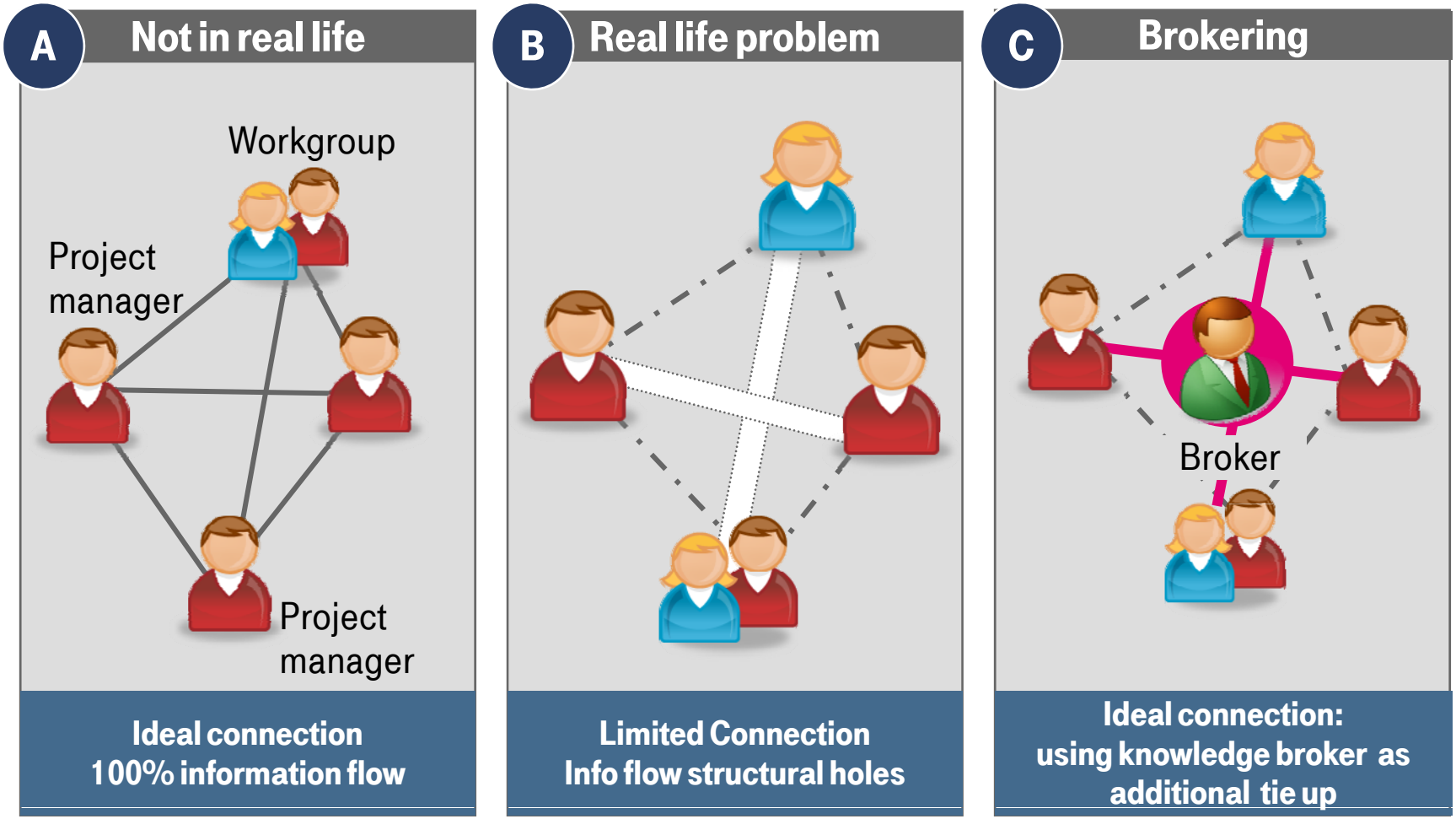


Agenda.

- Introduction of Deutsche Telekom Laboratories
- Knowledge management framework
- **Technology brokering as a concept**
- Technology Radar as technology brokering tool (T-Labs)
- Application scenario with regard to Slovak enterprise specifics

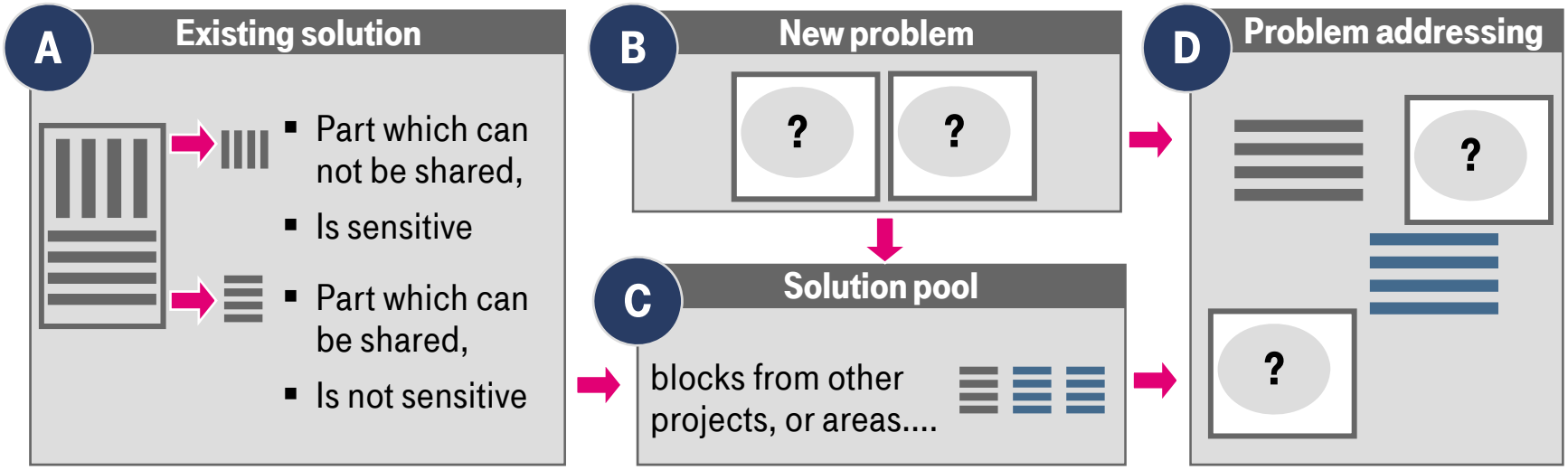
Technology brokering as a concept - introduction.

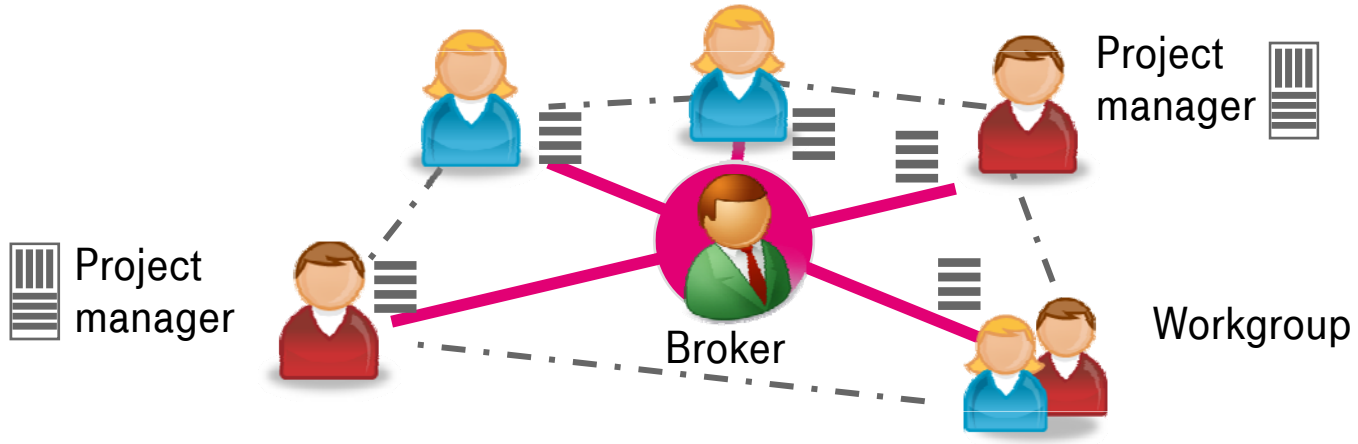
Knowledge broker in any social network (office) .



Technology brokering as a concept - explanation.

Knowledge brokering and transfer of solutions to new problems.





Knowledge brokering needs & examples.

Brokering enhances organizational memory with access.

Brokering prerequisites

- Knowledge is imperfectly shared over time, across people organizations, and industries
- Ideas from one group may solve the problems of another, only if connections made over boundaries

Technology brokering needs

- Structural holes or gaps in flow of information
- Unconnected ideas
- Need for fast and frequent innovation

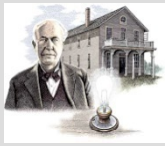
Access → Acquisition → Retention → Retrieval

- Transfer of resources where they are plenti-ful to groups where they are rare
- Non-redundant contacts are linked only via central player, so brokers are assured of being the first to see new opportunities, created by skills of another group

Examples of technology brokers

Consulting industry

Autonomous business units



Thomas Edison Labs

Deutsche Telekom Laboratories

accenture

IDEO

McKinsey&Company

Source: Hargadon & Sutton Stanford University, in Technology brokering and innovation in a product development firm, Administrative science quarterly, 1997

Future technology brokering focus.
Solving fragmentation of a knowledge.

Future technology brokering

When ideas exist within one domain, that are potentially valuable in others, individuals and organizations can create new concepts by acquiring, storing and retrieving these ideas in new combinations and by transferring these combinations to new audiences

A division operating in one industry may broker potentially valuable technologies to other industries by sharing knowledge between divisions or even among it's collaboration network

Future research focuses on:

- Fragmentation in technology knowledge
- Communication between technological domains

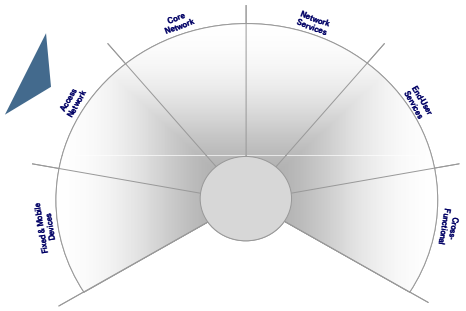
Agenda.

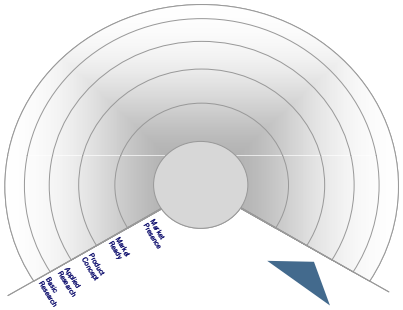
- Introduction of Deutsche Telekom Laboratories
- Knowledge management framework
- Technology brokering as a concept
- **Technology Radar as technology brokering tool (T-Labs)**
- Application scenario with regard to Slovak enterprise specifics

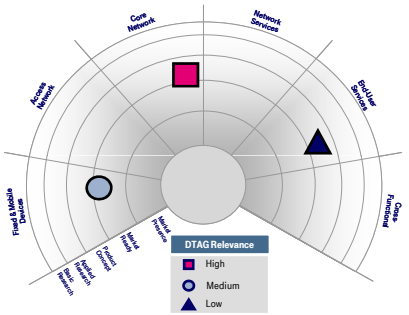
Methodology of Technology Brokering Tool.

Objectives & Structure of Technology Radar ™ Screen.

Segments	Development Phase	DTAG Relevance
▪ **Fixed & Mobile** … Terminal Devices ▪ **Access Network** … technology connecting terminal devices to the core network ▪ **Core Network** … provides transport, interconnection and management ▪ **Network Services** … basis for user services provided by network or servers in the network ▪ **End User Services** … recognized by the user, delivered via terminal devices ▪ **Cross Functional** … concepts and architectures spanning any of the above	▪ **Basic Research:** Extends fundamental knowledge without focus on specific applications ▪ **Applied Research:** Research to produce specific inventions or modifications of existing technologies ▪ **Product Concept:** Includes prototyping, testing and research to modify technology ▪ **Market Ready:** Refers to market exposure, e.g. friendly user test or soft launch ▪ **Market Presence:** Technology has already reached significant penetration in the mass market or target segment	High Medium Low ▪ **Market criteria:** Potential volume of market segment, growth of market segment, intensity of competition, sustain-ability of idea, implementation obstacles (market) ▪ **Technological realization complexity:** Research and development costs, complexity, implementation costs



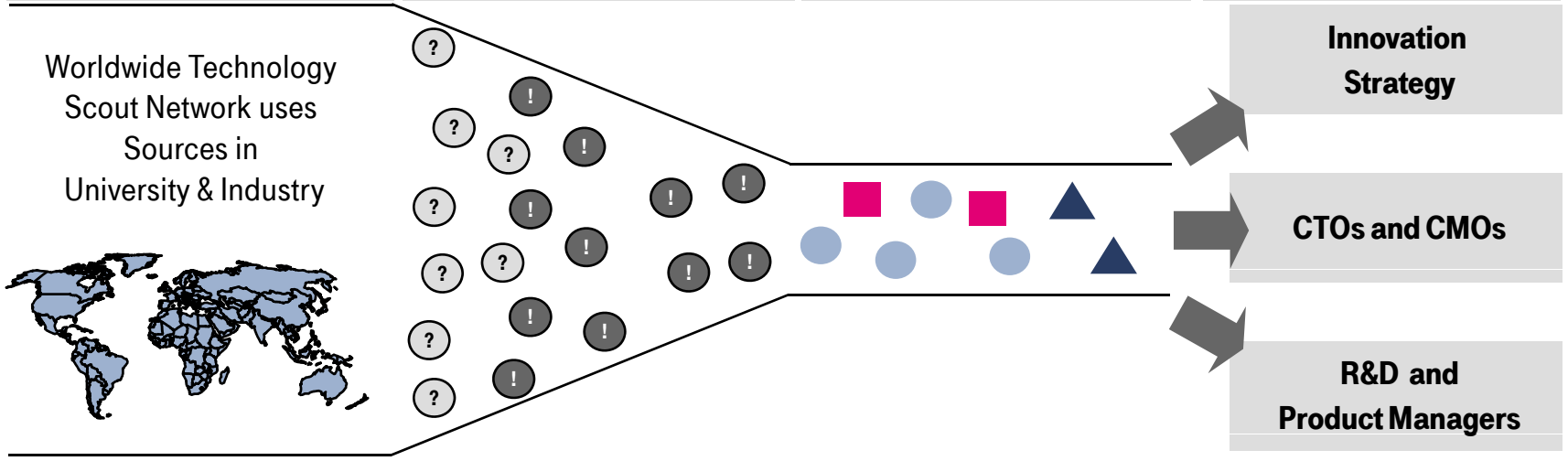




Technology Radar ™ – Radar Process.

The Radar Cycle itself Consists of Four Process Steps. The Technology Radar™ is used as a technology brokering tool.

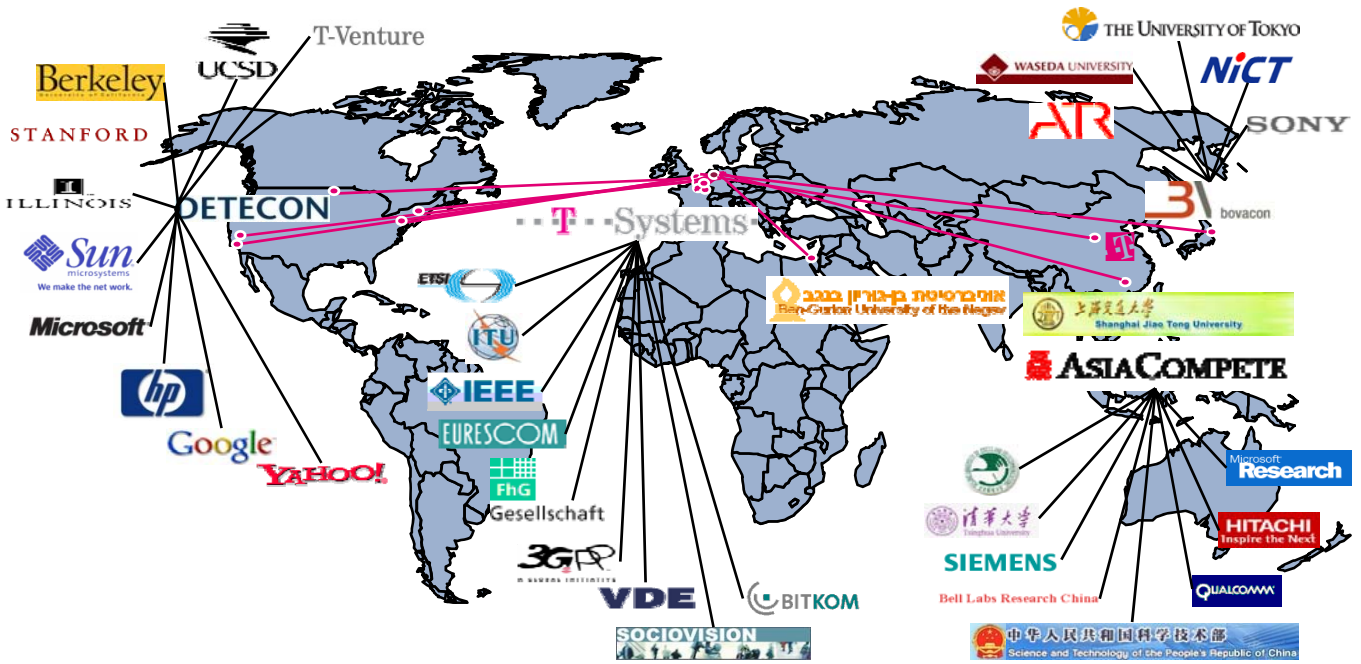
Identification	Selection	Assessment	Dissemination
Technology topics are identified through in-house experts and an international scouting network	A long list of topics is reduced into a short list according to the degree of novelty for DTAG. Preference is given to broad coverage, rather than conceptual accuracy or mutual exclusiveness.	The selected topics are described in technology profiles and ranked on their relevance for DTAG based on two criteria: 'market impact' and 'technological realization complexity'.	The findings are disseminated to the innovation strategy, to the CTOs and CMOs and as an electronic versions to interested managers of the SBUs



Methodology of Technology Brokering Tool.

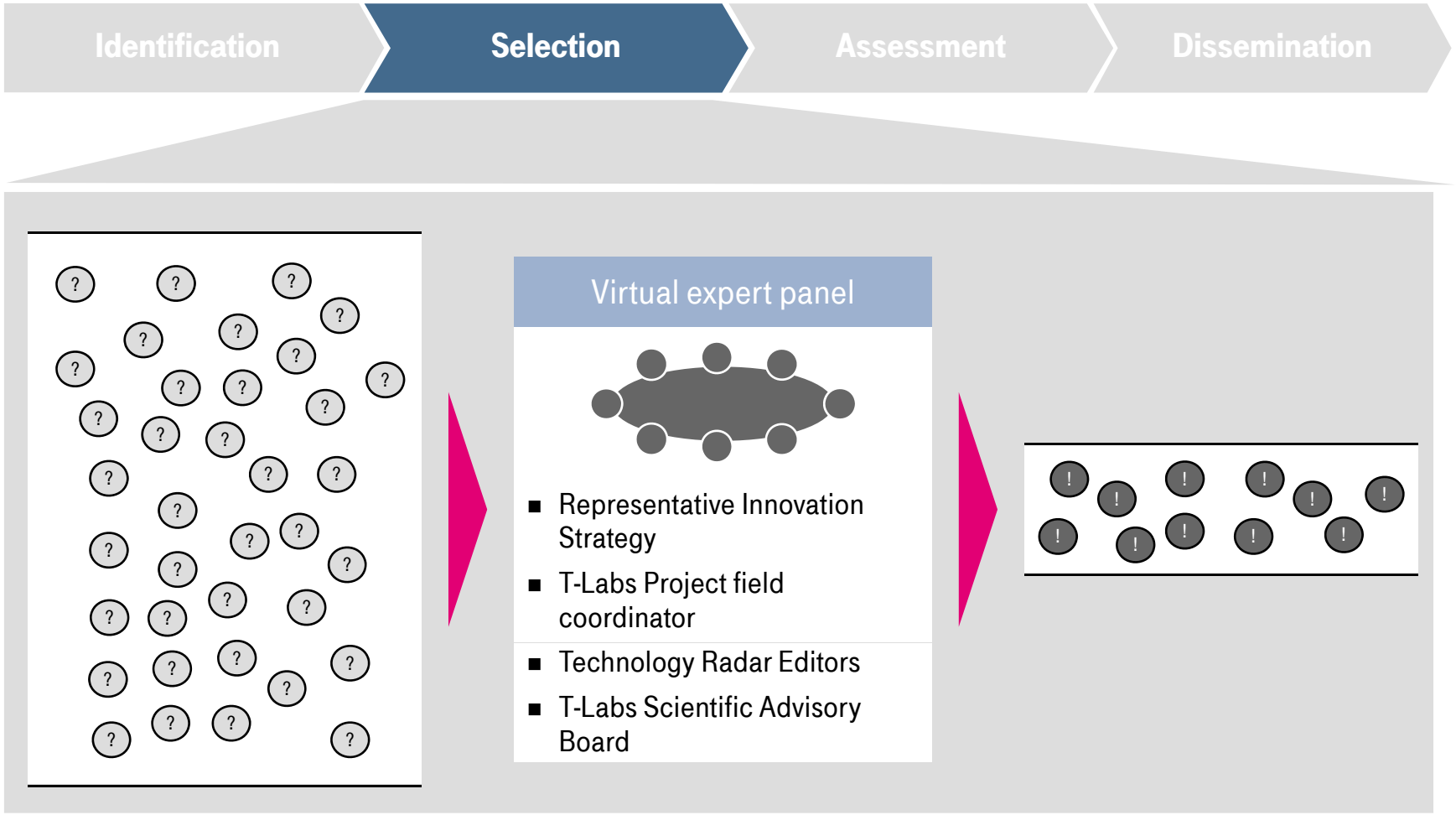
An international network of scouts uses contacts in industry and academia to identify new technologies.

Identification | Selection | Assessment | Dissemination



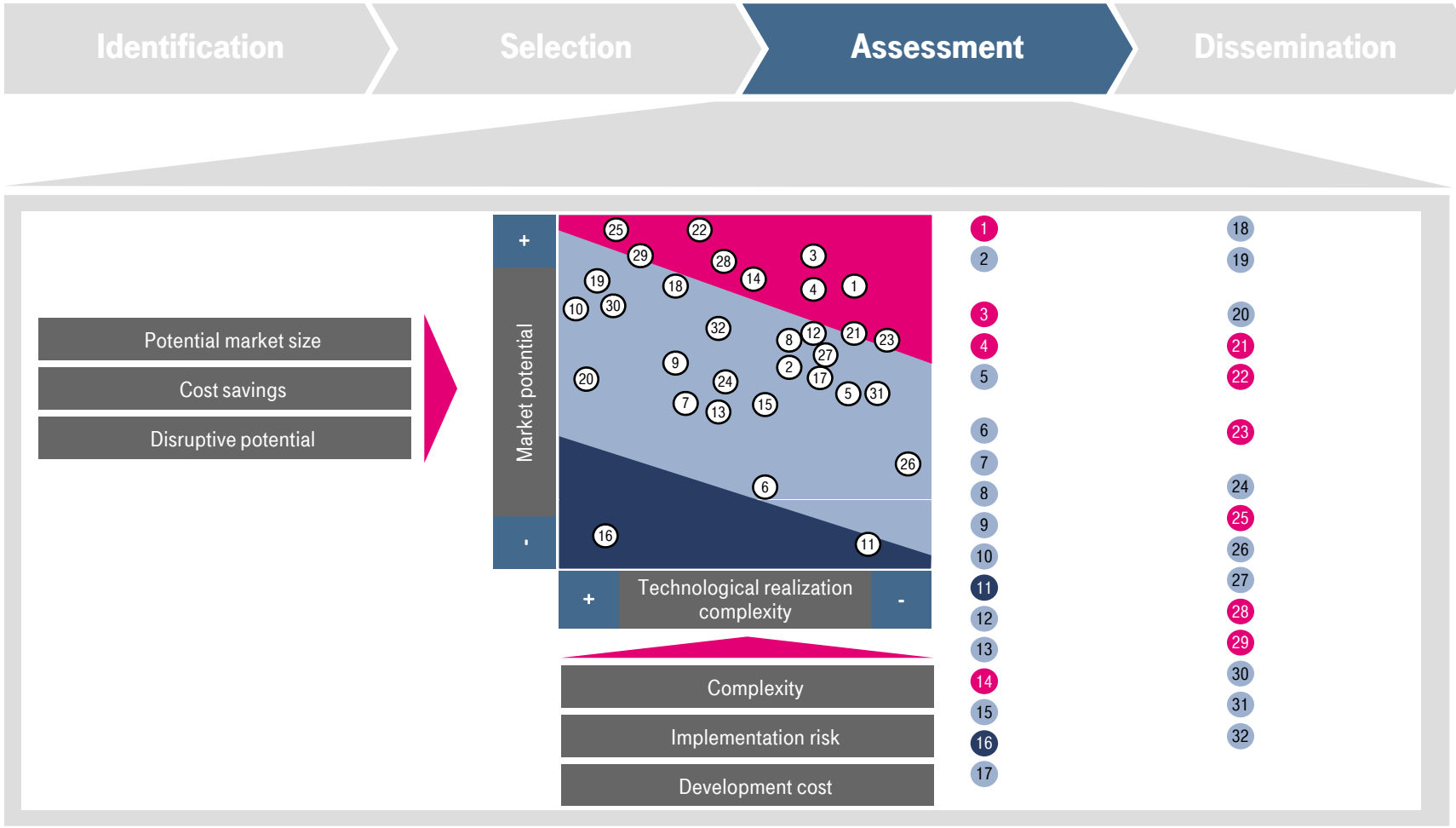
Methodology of Technology Brokering Tool.

A virtual expert panel screens the proposed technologies.



Methodology of Technology Brokering Tool.

With a portfolio rating framework the relevance of technologies is assessed.

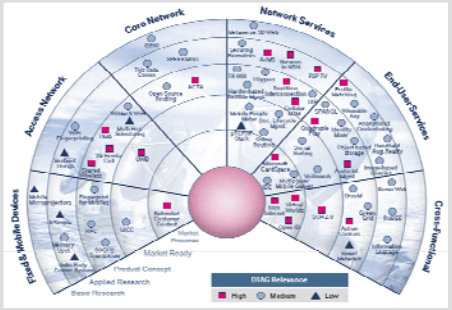


Methodology of Technology Brokering Tool.

For dissemination the technologies are positioned in the Technology Radar™ screen.

Identification → Selection → Assessment → **Dissemination**

Technology Radar Screen



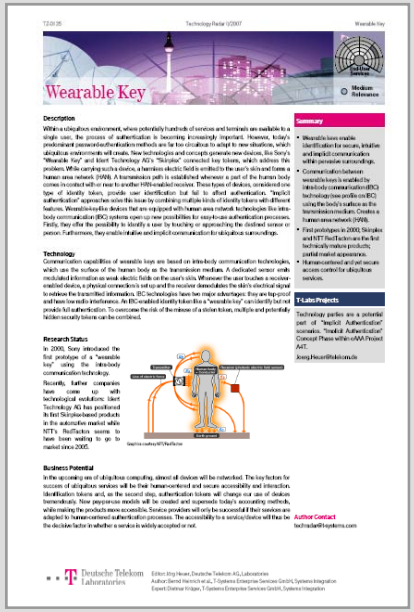
Key Message (Example)

100 $ Laptop

Recent technological advances and efforts to eliminate the existing overhead in today's software designs will bring Laptops to price point below $100/unit incl. $10 or more contingency/profit. A $100 Laptop will have a 500 MHz CPU with Linux and 1 GB HD, 1 mega-pixel full-color screen with 12inch diagonal and will be WiFi and cell phone-enabled.

Innovation: Telco operators could subsidize Laptops, making them virtually free, and trying them to service subscriptions (e.g. broadband, cellular, music or video on demand).

Profile (Example)



Project Brokering

T-Labs Projects

- **What is happening?**
- **Where?**
- **Stage?**
- **Contact?**

Agenda.

- Introduction of Deutsche Telekom Laboratories
- Knowledge management framework
- Technology brokering as a concept
- Technology Radar as technology brokering tool (T-Labs)
- **Application scenario with regard to Slovak enterprise specifics**

Implementation case study - technology brokering

Implementation options - and decision thresholds.

Technology brokering implementation options			
Exemplary decision criteria*	**In-house**	**Consultant**	**Conclusion**
▪ Sustainability	▬		? ? ?
▪ Implementation costs	▬		
▪ Resources intensity		▬	
▪ Speed of implementation		▬	
▪ organizational memory	▬		
▪ Dependency on broker	▬		
▪ Variety of brokers/flexibility		▬	Priority based !!
▪ Tacit knowledge of org.	▬		
▪ Security issues (unique know-how)	▬		
▪ Inside perspective	▬		
▪ Outside perspective		▬	

▬ The red bar means positive attribute

*Source: Own assessment, Dunaj & Winzer

Implementation case study - technology brokering
Implementation options - and decision thresholds.

Technology brokering implementation options*

- Organizational memory and tacit knowledge and full control make it good for in-house technology brokering.
- However, the important trends from outside could be omitted, (the solutions from completely different industry)
- The flexibility, implementation speed and outside view could be in favour of consultancy. However, tacit knowledge grasp is extremely problematic and consultancy is less motivated in a organizational memory development.

*Source: Own assessment, Dunaj & Winzer

Back-up for decision thresholds on the technology brokering.
Selection paths indications for in-house or consultancy implementer.

Defining decision criteria (exemplary)*

Decision criteria	Explanation
1) Sustainability	1) Long term oriented development ability of a company
2) Implementation costs	2) Costs incurred in knowledge management solution implementation
3) Resources intensity	3) Resources of company spent on knowledge management solution
4) Speed of implementation	4) How fast are immediate results needed?
5) Organizational memory	5) Referring to acquisition, storage and retrieval
6) Dependency on broker	6) Dependency on a broker and his skills, as a unique brokering solution provider
7) Variety of brokers/flexibility	7) The variety o brokers, possibility of replacement of brokers
8) Tacit knowledge of org.	8) The sticky knowledge of experts or organization, hard if to transfer w/o direct involvement in procedures
9) Security issues (unique know-how)	9) Not all best practices should be shared, some knowledge is unique strategic corporate asset
10) Inside perspective	10) Perspective of internal – inside people and people
11) Outside perspective	11) Coming from external – outside environment

*Source: Own assessment, Dunaj & Winzer

Case study with the application scenario on Slovak enterprise specifics. Implementation steps.

Technology brokering implementation steps (illustrative)*

1 Passive In-house

1) Identify your strategic segments
2) Map your network (inside and outside the company)
3) Activate your network (can be done in stages)
4) Identify Experts
5) Feed them with micro –impulses or scenarios
6) Let them evaluate trends (according to your developed scheme)
7) Collect the results and add corporate information about different areas and entities
8) Transfer suitable knowledge
9) Foster Innovation

2 Strategic Alliance

- Get to know and activate your partners network
- Agree on the structure of the shared data

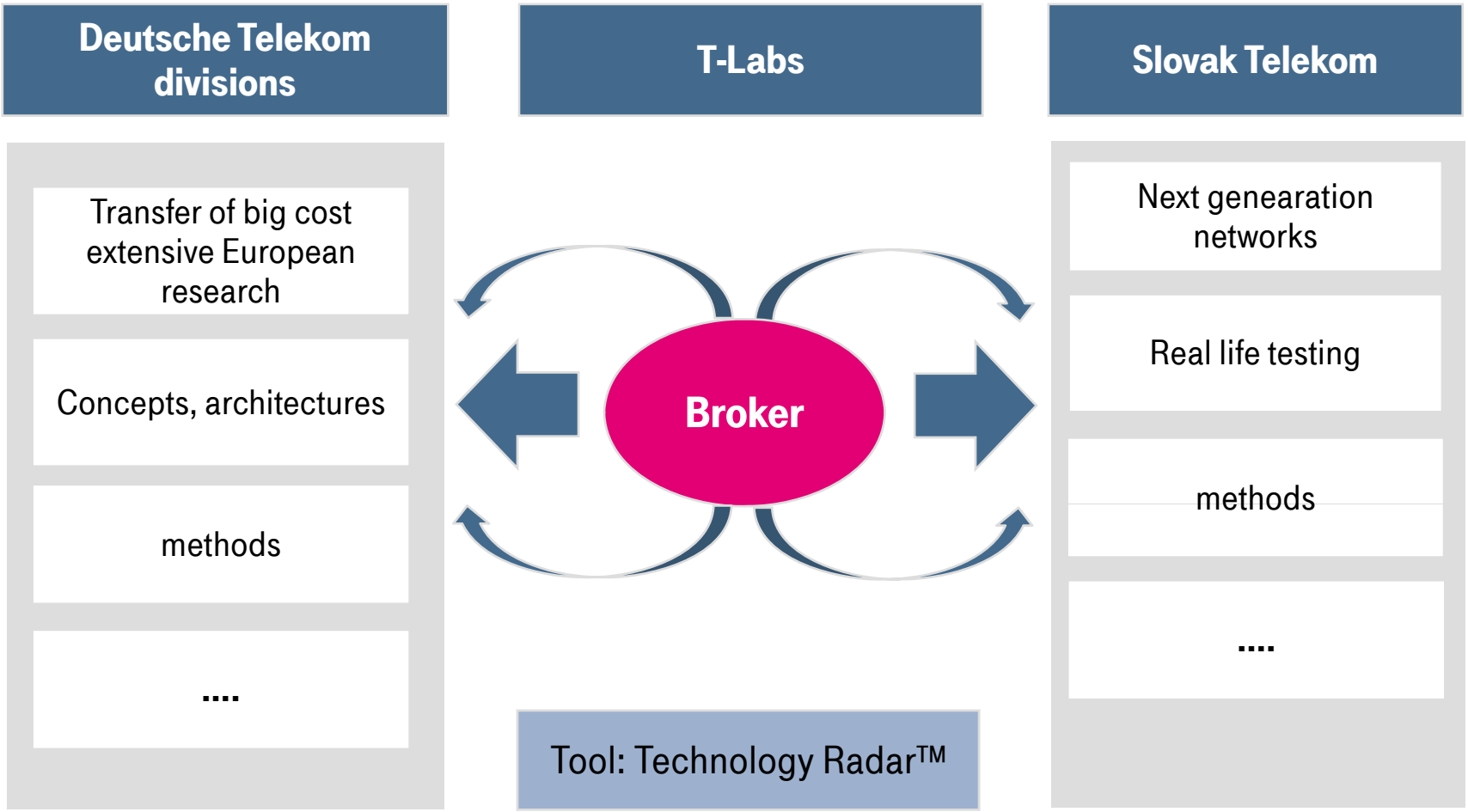
3 Active Brokering

- Takes the existing entities solutions
- Starts to change approaches, recombines them, enhances them, breaks them down and transfers approaches to a new level
- Transfer the gained knowledge among entities
- ....

*Source: Own assessment, Dunaj & Winzer

T-Labs as a broker in Slovakia.

Example: Slovak Telekom as part of technology brokering inside DTAG.



Contact data.

Ing. Michal Dunaj

This paper contact:
Deutsche Telekom AG, Laboratories,
Ernst-Reuter-Platz 7, D-10587 Berlin
Office:+49 30 8353 58421
Mobil: +49 175 2675171
XING: https://www.xing.com/profile/Michal_Dunaj
e-mail: Michal.Dunaj@telekom.de
Web: http://www.deutsche-telekom-laboratories.de/english/index.html

André Winzer

Case study and implementation expert:
Schaltzeit GmbH,
Sorauer Str.3, D-10997 Berlin
Office:+49 30 6128 9260
Mobil: +49 179 1048410
XING: https://www.xing.com/profile/Andre_Winzer
e-mail: Winzer@schaltzeit.de
Web: http://www.schaltzeit.de

Thank you for your interest...

...looking forward to the discussion.

Michal Dunaj

R&D technology strategy

Deutsche Telekom AG, Laboratories

Ernst-Reuter-Platz 7

D-10587 Berlin

References.
Scientific Papers.

References

Arnold, M. Heinrich; Dunaj M (2007) Enterprise architecture – Modularization in Telco R&D as a response to an environment of technological uncertainty, ICIN Conference, Bordeaux, France proceedings forthcoming

Hargadon & Sutton (1997) Stanford University, in Technology brokering and innovation in a product development firm, Administrative science quarterly.

Rohrbeck, R., J. Heuer and H. M. Arnold (2006) The Technology Radar – an Instrument of Technology Intelligence and Innovation Strategy *The 3rd IEEE International Conference on Management of Innovation and Technology*. Singapore: IEEE Conference Publishing, 445 Hoes Lane, Piscataway, NJ 08854 USA, 978-983.

Rohrbeck, R. (2007) Technology Scouting - a case study on the Deutsche Telekom Laboratories *ISPIM-Asia Conference*: New Delhi, India.

The Knowledge Management Forum and Brian D. Newman. (c)1996, 2002, http://www.km-forum.org/what_is.htm, accessed 09/10/2007.

Pulkkinen, M., (2006) Systemic Management of Architectural Decisions in Enterprise Architecture Planning. Four Dimensions and Three Abstraction Levels, Proceedings of the 39th Hawaii International Conference on System Sciences.

Zachman, J.A., (1987) A framework for information systems architecture. IBM Systems Journal, Vol. 26, No. 3, IBM Corporation. pp. 276-292.

Technology Radar™ contact data.

Publisher

Deutsche Telekom AG, Laboratories

Ernst-Reuter-Platz 7

D-10587 Berlin

Responsible for the Technology Radar™

General Manager:	Peter Möckel
Management:	Dr. Heinrich Arnold Dr. Udo Bub Klaus J. Buss
Editor-in-Chief:	Jörg Heuer
Editorial Assistant:	René Rohrbeck

Email feedback or subscription requests to **techradar@telekom.de**