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## **Knowledge, Research & Education at University and in Industry**

Vobecký, Jan  
2010

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# Knowledge, Research & Education at University and in Industry

**Jan Vobecky**

ABB Switzerland Ltd. Semiconductors, Product Management & Technology

CTU in Prague, Faculty of Electrical Engineering, Microelectronics Department

# Outline

- Introduction
- Knowledge
- Research
- Education
- Summary

*Disclaimer: The objective of this presentation is not to evaluate the organizations under discussion, but rather to inspire by their best practices...*

# How CTU in Prague is organized

## Eight faculties



CTU in Prague

**23,500 students**

**4,000 employees**

**13,400 BSc.**

**5,200 MSc.**

**2,300 PhD.**

*The Times Higher Education  
Supplement Ranking  
2009: 394. CTU in Prague*



**Civil  
Engineering**

**6,600  
students  
450  
teachers**



**Mechanical  
Engineering**

**2,900  
students  
270  
teachers**



**Electrical  
Engineering**

**6,000  
students  
400  
teachers**



**Nuclear Sc.  
Phys. Engng.**

**1,700  
students  
100  
teachers**



**Architecture**

**1,000  
students  
100  
teachers**



**Transportation**

**1,900  
students  
140  
teachers**



**Biomedical  
Engineering**

**750  
students  
60  
teachers**

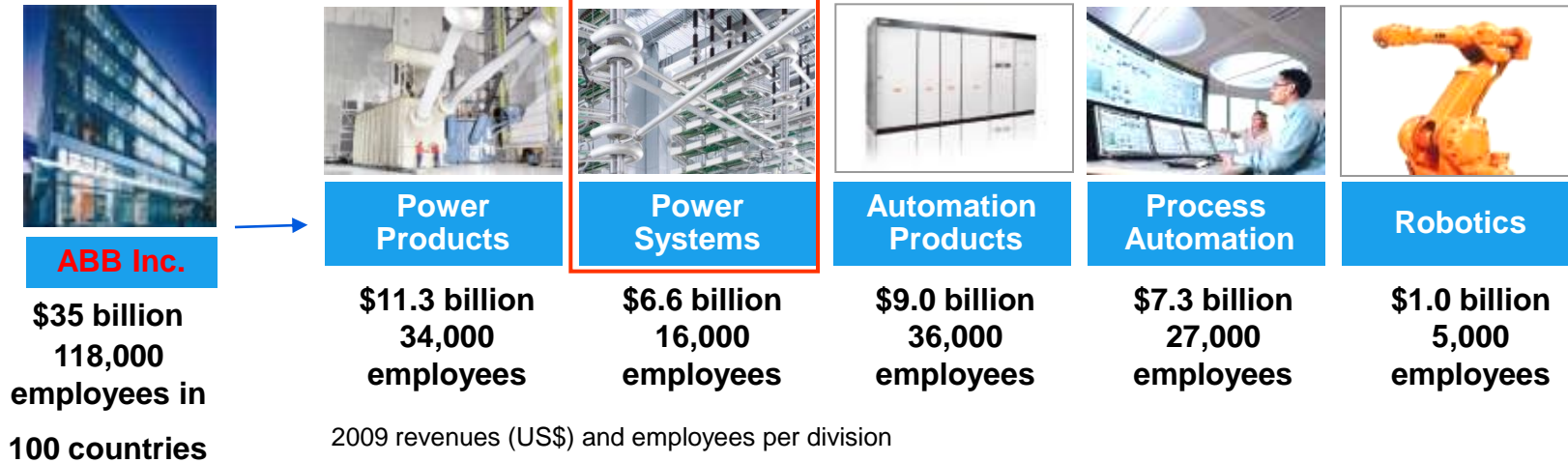


**Information  
Technology**

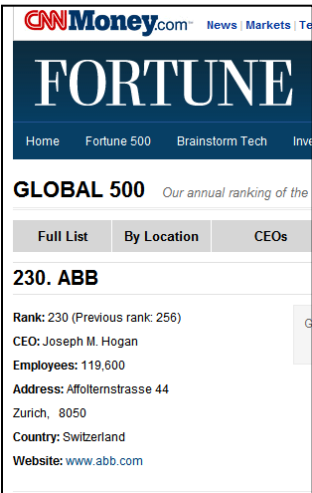
**500  
students  
180  
teachers**

# How ABB is organized

## Five global divisions

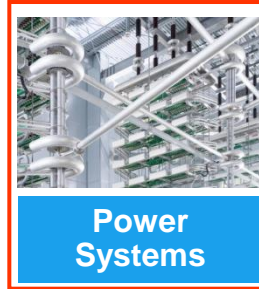
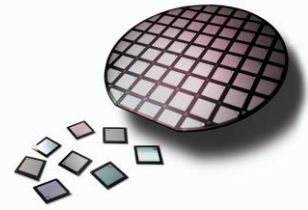


- ABB's portfolio covers:
  - Electricals, automation, controls and instrumentation for power generation and industrial processes
  - Power transmission
  - Distribution solutions
  - Low-voltage products
  - Robots and robot systems

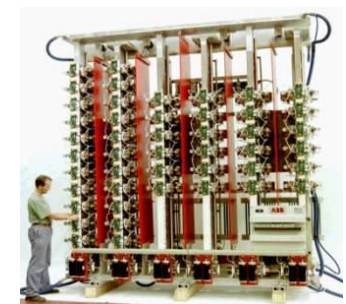
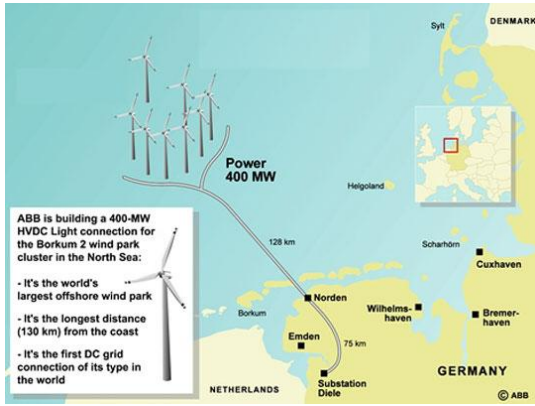
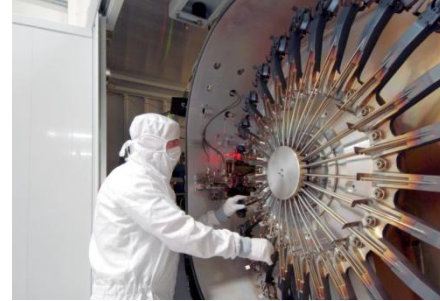




# Power Systems



Power Systems





Francis Bacon (1561-1626)

*„Knowledge is Power“*

# Knowledge

# Knowledge

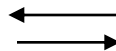


Francis Bacon (1561-1626)

„Knowledge is Power“

## Discipline based Research\*

Academic, investigator-initiated, discipline based production of knowledge, homogeneous, hierarchical,



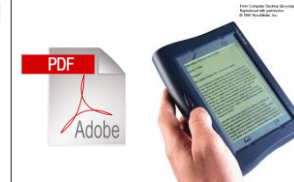
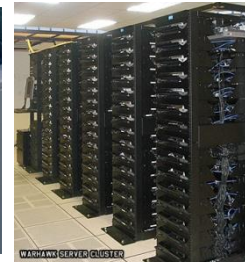
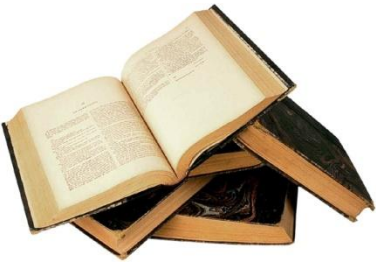
## Research in a context of application\*

Context-driven, problem-focused, interdisciplinary based production of knowledge, heterogeneous, temporary, specific, localized...

\*1994 Gibbons et al, The new production of knowledge



# External Sources of Knowledge (Information)



1970

1980

1990

2000

2010

2020

# External Sources of Knowledge at CTU in Prague

The screenshot shows a Windows Internet Explorer browser window displaying the homepage of the Central Library of CTU. The browser's address bar shows the URL <http://www.knihovny.cvut.cz/home/>. The website features a navigation menu with categories: HOME, INFORMATION RESOURCES, LIBRARY SERVICES, FOR STUDENTS, FOR RESEARCHERS, and CENTRAL LIBRARY. The main header includes the CTU logo, the text "Czech Technical University in Prague CENTRAL LIBRARY", a search bar, and links for ONLINE CATALOG, HELP DESK, and CONTACTS. A "WELCOME TO THE CENTRAL LIBRARY OF CTU WEBPAGE" section provides information about the library's founding and location. A "QUICK LINKS" sidebar lists various services like Contacts, Online catalogue, and EIR Gateway. The bottom of the page features a row of four photographs showing the library's interior.


Home - Windows Internet Explorer

http://www.knihovny.cvut.cz/home/

Soubor Úpravy Zobrazit Oblíbené položky Nástroje Nápověda

Oblíbené položky Google ČeskéNoviny

HOME INFORMATION RESOURCES LIBRARY SERVICES FOR STUDENTS FOR RESEARCHERS CENTRAL LIBRARY

 Czech Technical University in Prague  
**CENTRAL LIBRARY**

SEARCH:

ONLINE CATALOG | HELP DESK | CONTACTS

Home >

- Opening time
- Information retrieval
- Opening time during summer 2010

**QUICK LINKS**


- Contacts
- Online catalogue
- Personal account
- EIR Gateway
- 360 Search

**WELCOME TO THE CENTRAL LIBRARY OF CTU WEBPAGE**

Central Library of CTU was founded by merging former CTU libraries.

Central Library of CTU - [National technical library building](#), Technická 6, Prague 6

[Local Libraries](#)



# External Sources of Knowledge at CTU in Prague

Brána k vybraným informačním zdrojům - Windows Internet Explorer

https://dialog.cvut.cz/index.html

Brána k vybraným informačním zdrojům

Knihovny ČVUT  
Informační zdroje

České vysoké učení technické  
FELNET/VOBE

**Brána k vybraným informačním zdrojům**

Jakým způsobem chcete přistupovat: -- vyberte si informační zdroj --

-- vyberte si informační zdroj --

- CSA - Metadex aj.
- IEEE - IET (IEEEExplore)
- IEEE Computer Society Digital Library
- ISI Web of Knowledge (WoS)
- Journal Citation Reports
- Scopus
- MathSci
- MIT CogNet
- Physical Review Online Archive (PROLA)
- Springer Link
- Lecture Notes in Computer Science
- Science Direct (Elsevier)
- IoP Science
- InterScience (Wiley)
- Wiley Encyclopedia of Medical Devices and Instrumentation
- EBSCOhost
- The ACM Digital Library
- Computer Science Library
- Lecture Notes in Mathematics
- Pacific Journal of Mathematics
- RefWorks - Personal Database and Bibliography Creator
- RefAware
- 360 Search - Metavhledavac
- 360 Search (in English)
- E-Journal Portal
- COS Research Support Suite (trial do 2.4.2010)
- COS Scholar Universe (trial do 2.4.2010)
- COS Funding Opportunities (trial do 2.4.2010)

ISI Web of Knowledge

V databázi ISI Web of Knowledge

RefWorks

Pro uživatele knihoven ČVUT

Novinka

Z každé stránky zpřístupněné tlačítko

Pozn: Tlačítko je dostupné v Internet Exploreru

University in Prague, pro vyhledávání v poli adresa použijte Czech Tech Univ

vytváření osobní (institucionální) databáze bibliografických záznamů.

utím tlačítk **BránaELZ** dě že tato ikonka zakrývá na obrazovce něco důležitého, můžete ji skrýt kliknutím na její zavírací

7, a ve všech verzích Mozilly. Tlačítko vyžaduje povolený JavaScript.

ěvní centrum ČVUT, [oddělení knihoven](#). Poslední změna 01. 03. 2010

# CTU Central Library vs. other Universities

The image displays three overlapping web browser windows from the Windows Internet Explorer era. The background window shows the CTU Central Library website (http://www.knihovny.cvut.cz/home/), featuring a blue and yellow design with a lion logo and navigation links like 'HOME', 'Direct Access', and 'Contact Center'. The middle window shows the ETH-Bibliothek website (http://www.ethz.ch), with a blue header and navigation links for 'Home', 'ETH', and 'Deutsch'. The foreground window shows the Cambridge University Library website (http://www.lib.cam.ac.uk/electronicresources/), featuring a green and white design with the University of Cambridge crest and navigation links like 'Plan your visit', 'About the Library', and 'Catalogues'. The Cambridge page includes a search bar, a list of resources (databases A-Z, ebooks, etc.), and a 'Find resources by subject' section with a dropdown menu.

# Knowledge Management Control

- **Groupware** (e. g. Lotus Notes)
  - **Intranet**
  - **Document Management System**
  - **Content Management System**
  - **Web Engines**
  - **Push Technology** (e.g. IP Agent)
  - **Helpdesk Systems**
  - **Workflow Technologies**
  - **Data Warehouse**
  - **Data Mining Tools**
  - **Expert Systems**
  - **Distance Learning**
  - **e-Learning Systems**
- **Companies with best-performing IT investments are often most frugal IT spenders**
  - **SW and SW-oriented services too costly for industry →**
    - **Universities provide more advanced services**
    - **Universities profit from multi-user approach of services**
    - **Industry puts money mainly to core functions and businesses**
    - **Industry is mostly customer & competition driven**



# Knowledge Management (example)



## **ABB's Process Automation:**

Expert Optimizer, Knowledge Manager and SpectraFlow solutions combined into a single Collaborative Production Management operational unit.

### **Expert Optimizer**

- Raw Mix Preparation
- Economic Process Optimization

### **Knowledge Manager**

- Laboratory Information Management Systems module
- Production Information Management Solution modul

## **ABB's Automation Division Service organization:**

**A global Knowledge Management System APSwebs** to help with best-in-class practices and field experiences to better execute site service contracts

**... is all about networking and sharing knowledge and best practices within ABB's service organization worldwide...**

# Protection of Knowledge (IP)



US006159830A

United States Patent [19] Patent Number: 6,159,830  
Galster et al. [45] Date of Patent: Dec. 12, 2000

## Situation at CTU

- Money from IP wanted
- Increase reputation through IP

.....rather than ....

- support start-up's of spin-off companies
- strengthen cooperation with industry - bridge the gap between academia and industry
- master the technology transfer

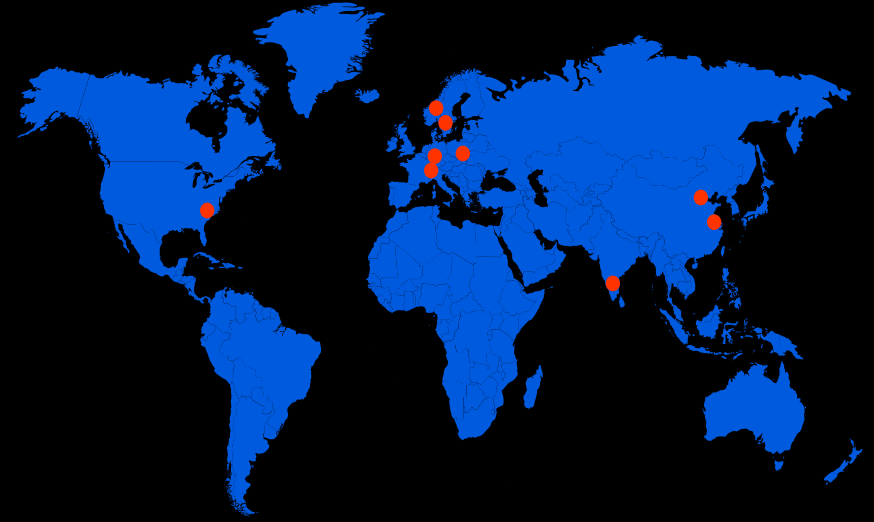
## Strategy of ABB

- Safeguard and enhance technological leadership in the market
- Protect proprietary technology of own products and systems
- Protect brand, identity and reputation
- Defend own IP rights against misappropriation and un-authorized use by others
- Avoid conflicts with third party's rights

# Protection of Knowledge (IP)

## Implementation in ABB

- Group wide process and structure to ensure
  - IP rights generation, ownership, maintenance and exploitation
  - Alignment with business & technology strategies
  - Proper awareness and capabilities throughout the organization
- Global Management designed to achieve
  - Involvement of all functions concerned
  - Harmonized and effective decisions (Review Process)
  - Flexible adaptation to changing strategies and regulations
- Strategic orientation to :
  - Core technologies, products and markets
  - Quality rather than quantity
  - Value creation through long term company assets



# Research

# Research

## CTU in Prague

- Research at Departments
- Research at Institutions
  
- To strengthen reputation and attractiveness for students
- Maintain leadership between technical universities within CR
- To improve worldwide ranking
- Annual investment highly dispersed (Government, Grant Agencies, Industry,...)

## ABB

- Factory Research
- Corporate Research Institutions

- ↔
- ↔
- ↔
- ↔
- To strengthen market position
- Ensure technology leadership
- To increase profitability

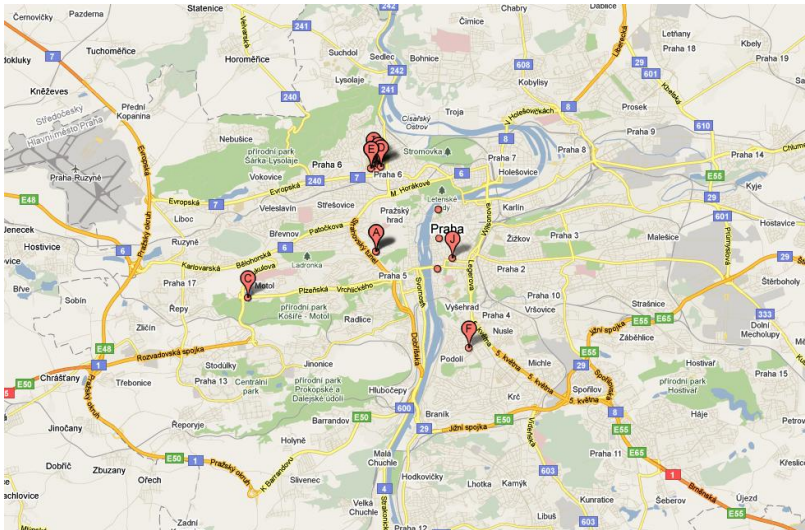
Annual investment more than \$1billion  
(from own revenues)



# Research

## CTU in Prague

- Research Institutions



## ABB

- Corporate Research Institutions



Research Institutions spread everywhere → remote information services needed...

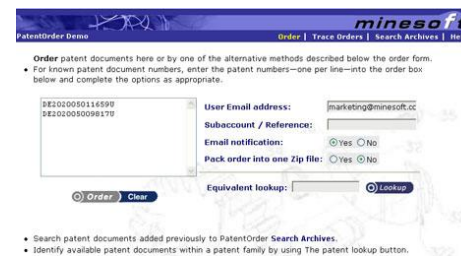
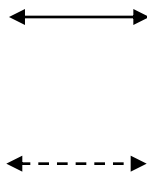
# Research & Access to Information

## University

- Public sources - journals, books, patents, ...
- Cooperation with research institutions and industry
- .....
- .....
- Strongly dependent on public sources (= mostly history)

## Industry

- Public sources - journals, books, patents, ...
- Cooperation with research institutions and universities
- Technology offers from suppliers
- Cooperation with competitors
- More dependent on forecasting (= often wrong) and road mapping



CMOS Node	130nm	90nm	65nm	45nm	32nm
Lithography	KrF + HT	ArF + HT	ArF + PSM → ArF + Immersion	EUV or ArF + HPC	
Isolation	STI/HDPC-CVD			STI (another gap fill)	
Gate Electrode	poly Si		Metal		
Insulator	SION		SION/High-k → High-k		
Junction	CoSi2 RTA → Spike Anneal	N2S1 Spike Anneal → Laser Anneal		Raised S/D N2S1 Laser Anneal	
Barrier /Metal	PVD-Ta/Cu		CVD-Ta/Ni/Cu		CVD or Direct plating
Inter-Layer Dielectric	FSGk+3.8	SiOCk-3.0 → 2.6 option		low-k (k=2.6-2.4)	low-k (k=2.4-2.2)
mobility ↑ SD-resistance ↓	Strain Si Channel → (110)-face-TR		Strain Si On Insulator/SSOD → (110)-face-TR		Ge channel? Meta-SD?

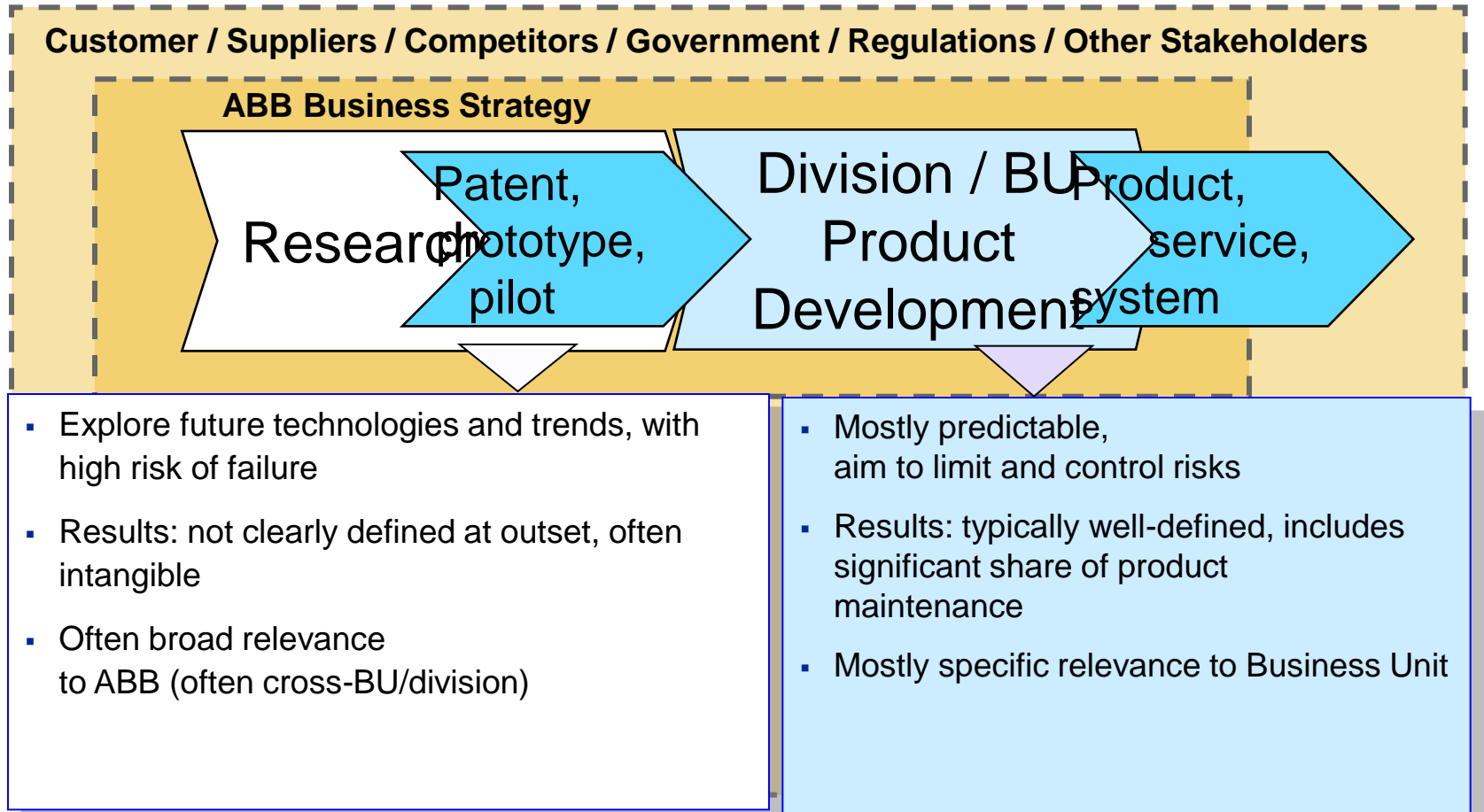
# Cooperation of Industry with Universities



Industry cooperates with highly ranked institutions, developers of relevant IPs, top experts / specialists. Core business covered by industry. IP kept by industry. Reasons for cooperation?

→ Access to information, future trends, modern technologies, ... Access of talented graduates to industry.

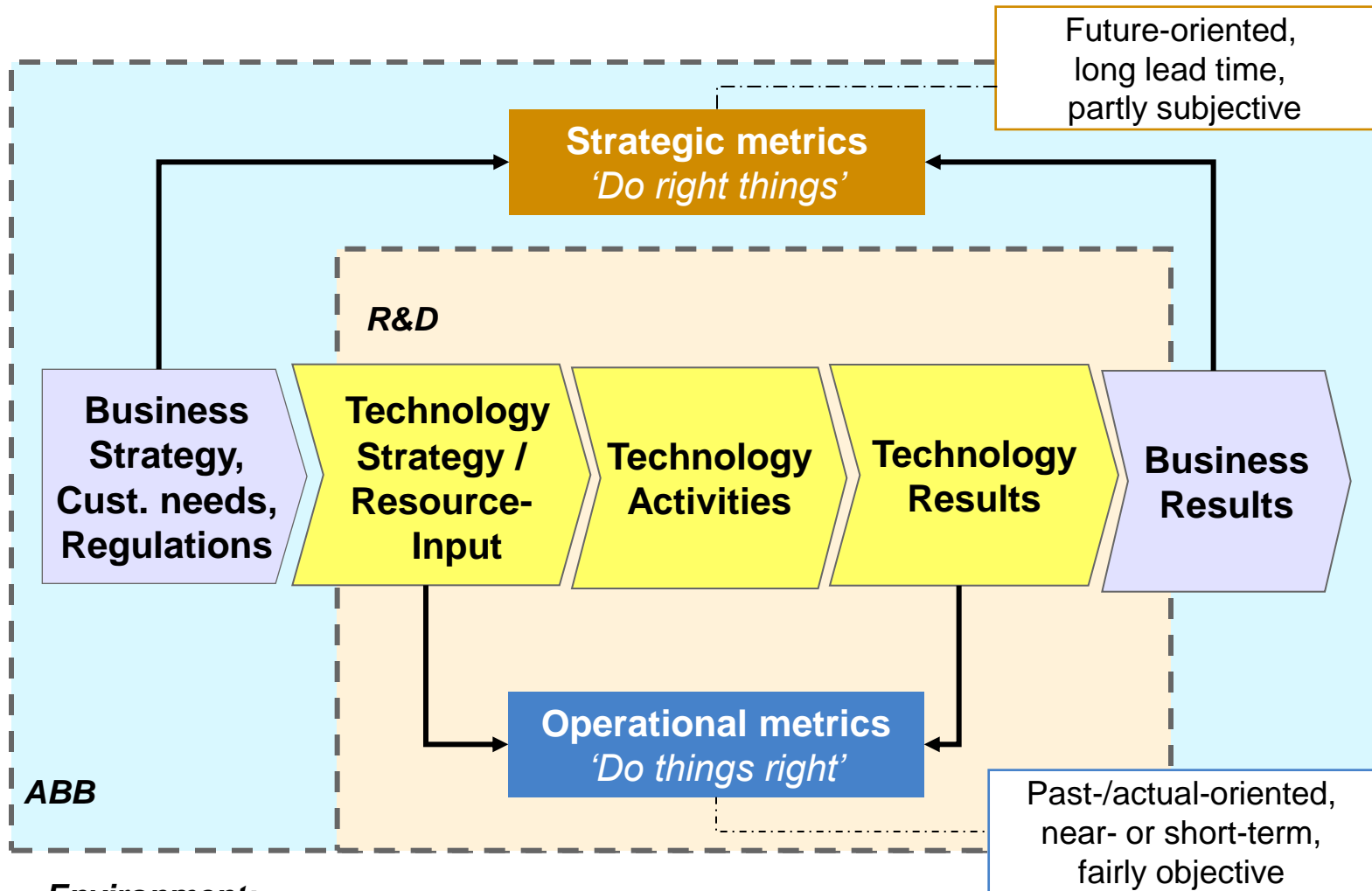
# R&D in Industry: Context and Expectations



„Research as part of the Business Strategy”

“Right balance between short-term vs. long-term orientation”

# Measuring and Reviewing R&D in Industry



**Environment:**

**Customers, Competitors, Governments, Suppliers, other Stakeholders**



# Research

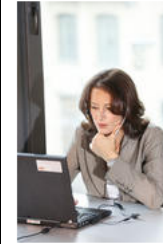
- is a global activity (spread worldwide),
- needs well defined strategy,
- needs efficient strategic and operational metrics,
- needs efficient planning,
- bridging the gap between University and Industry is a never ending task ...

## Growing role of

- on-line and remote information services and infrastructures,
  - i. e. the Digital part of Library,
- bibliometric tools
- close cooperation between Library and IT Specialists,
- close cooperation between Library and Researchers,...

## Want to know more about e-learning?

Join the online forum and connect with e-learning developers



e-learning forum

The forum is open to all ABB employees and designed to connect e-learning developers of all skill levels. Whether you are new to e-learning or have lots of experience, the forum will help you find answers and support from other e-learning developers across the ABB organization.

Launched by ABB University, the forum is open to e-learning developers from all ABB organizations. A moderator group of very experienced developers manages the forum structure and will keep the content current.

To join the e-learning forum, [click here](#).

# Education



# CZECH TECHNICAL UNIVERSITY IN PRAGUE

[Home Page](#) → [For Incomers](#)

► [FOR  
INCOMERS](#)

► [CURRENT  
STUDENTS](#)

► [MEDIA, SPECIALISTS AND THE  
PUBLIC](#)

## Academic Calendar 2009/2010

[News](#) RSS



# CZECH TECHNICAL UNIVERSITY IN PRAGUE

[Home Page](#) → [Faculties](#)

► [FOR  
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PUBLIC](#)

## Faculties

### Academic Bodies

#### Faculties

[Faculty of Civil  
Engineering](#)

[Faculty of  
Mechanical  
Engineering](#)

[Faculty of Electrical  
Engineering](#)

[Faculty of Nuclear](#)

- [Faculty of Civil Engineering](#)
- [Faculty of Mechanical Engineering](#)
- [Faculty of Electrical Engineering](#)
- [Faculty of Nuclear Sciences and Physical Engineering](#)
- [Faculty of Architecture](#)
- [Faculty of Transportation Sciences](#)
- [Faculty of Biomedical Engineering](#)
- [Faculty of Information Technology](#)

Training & eLearning

ABB University Homepage

Student Login

TP Online Admin Login

Learning Paths

Virtual Classroom & Communications Center

abb.com/abbuniversity

News update

# Record number of web visitors for ABB University



Over the last few years, ABB University has invested significantly in its Learning Management System (LMS) and promoted its training web pages to employees and customers alike. LMS is the global application that helps the ABB Learning Centers to easily manage processes needed for delivering training online.

Almost 35,000 web visitors in 2009

As a result of these efforts, the ABB University's course locator recorded almost 35,000 visitors in 2009, where web visitors can choose from over 900 courses.

## Welcome to ABB University!



### ABB University overview presentation

Learn about our organization, objectives and administration.



### ABB University Team Room

Everything you need to know about ABB University.



### High5 moved to TP Online

Click here to learn more.

## Course locator

### Technology & solutions

ABB product related courses for project planning, operating, and maintenance personnel.

### Personal competencies & skills

Personal development of social competences including languages and cultures.

### Business processes & tools

Training courses relating to the business processes of development, manufacture, sell and deliver projects and products.

### Management & leadership

Comprehensive management development curriculum for developing the leadership competence of junior managers.

## Comments (16)

[Notify me of comments posted on this page](#)

High5 Users - Please read

gudrun.jackson@us.abb.com Montag, 29. März 2010 20:11



@ E-mail this page

### Rating

Rate this page: Average rating: Ratings: 41

### Contact us

Local country contacts



Page

information:

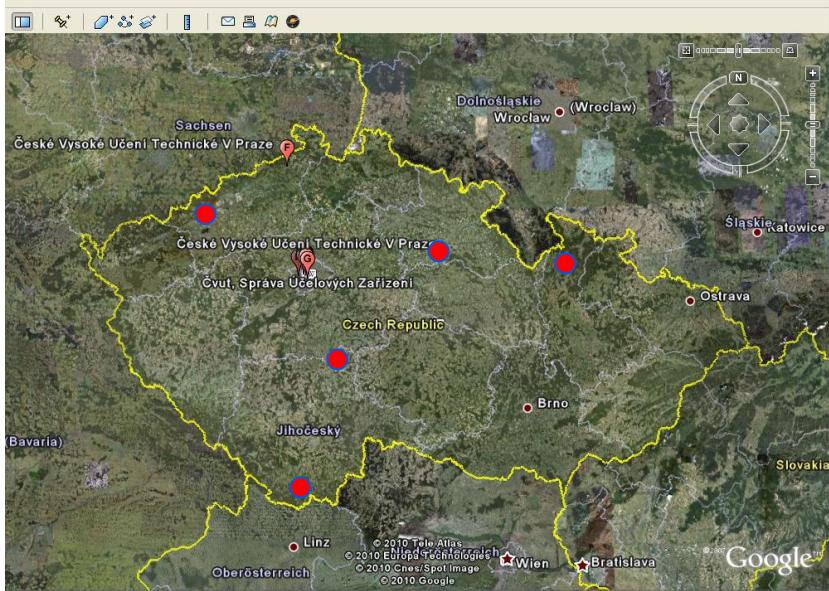
- [Gudrun Jackson](#)
- Web Communications
- ABB University

### Newsletters

- [ABB University LMS Newsletter - December 2009](#)
- [ARCHIVE](#) | [Web feed](#)

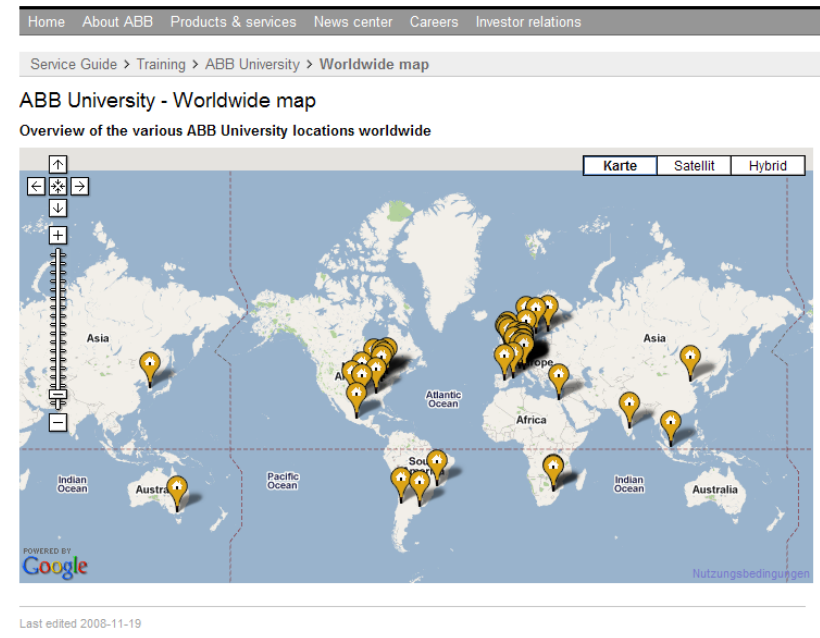


# Education



## CTU in Prague

- Covers multiple technical fields
- Operates within the Czech Republic

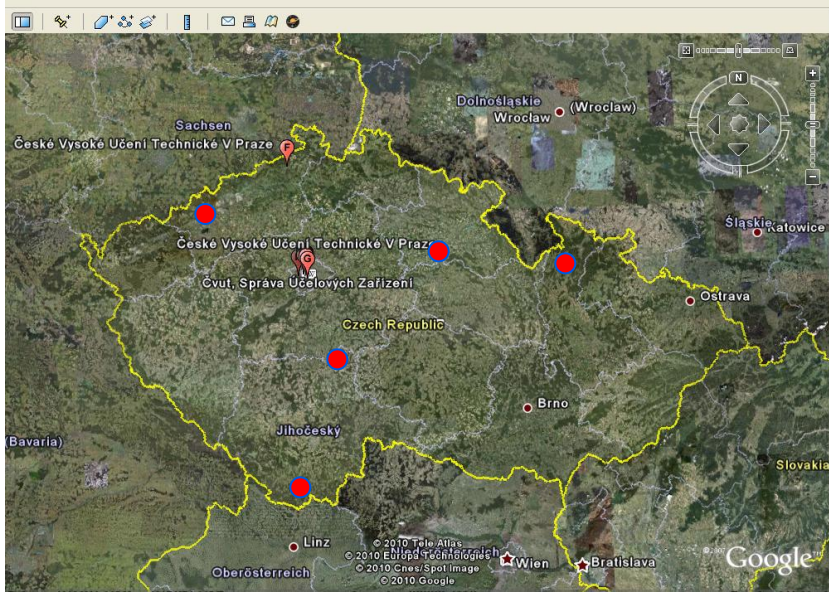


## ABB University

- Covers technology, management & business oriented fields
- Operates at many corners of the globe

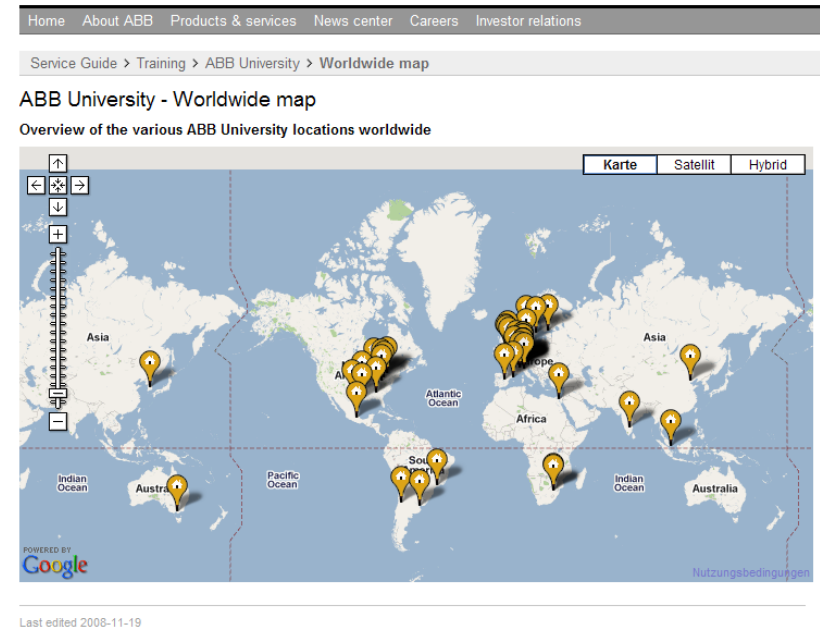


# Education



## CTU in Prague

- A classical teaching organization built from 8 faculties
- Comprising approximately 15 learning centers in single country

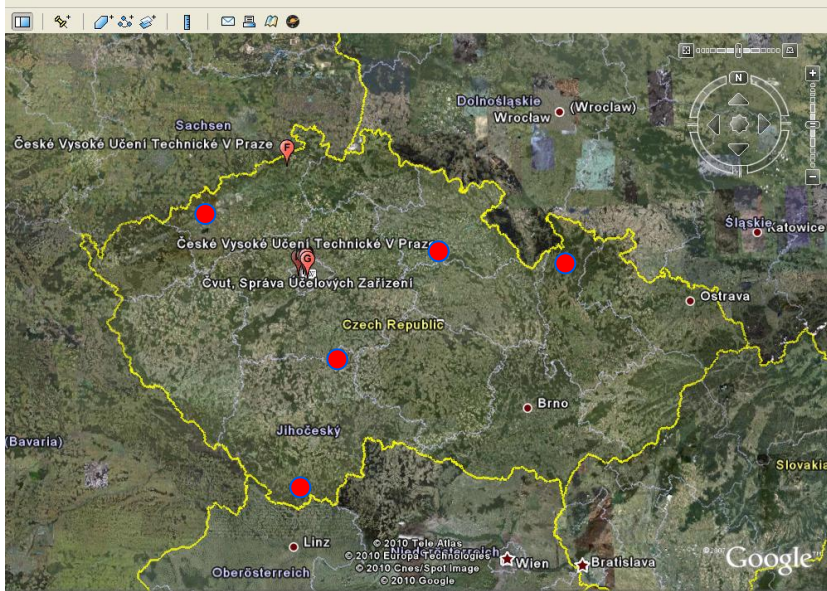


## ABB University

- A virtual organization built from all ABB divisions
- Comprising approximately 120 learning centers in over 30 countries



# Education



## Lecture-based vs. CTU in Prague Objectives

- Attract maximum of fresh talents
- Deliver excellent education
- Maintain the established brand name
- Optimize teaching models across faculties



## Competence-based learning ABB University Objectives

- Remain close to customers
- Maintain a corporate identity
- Synergies across all divisions and countries
- Optimize business processes & tools
- Eliminate internal competition

# Blended Learning – combine delivery methods



- **Classroom training**
  - Worldwide locations
- **On-site training**
  - Conducted at a plant site or other suitable training facility
- **Virtual Classroom training**
  - Real-time interaction with live instructor and application sharing via computer
- **Web-based training (WBT)**
  - Online access and completion of courseware modules



# On-site Training Example

Diese Information geht an Kader - MA der Funktionsbereiche:

**01** Forschung **02** Entwicklung **04** Projektmanagement/Marketing/Verkauf **11** Management **10** HR (z.K.)



Werte KollegInnen

Den **Umgang und Einsatz verschiedenster Präsentationsmedien und Tools** beherrschen; wirkungsvoll, stilsicher und gekonnt.  
Dies lernen Sie im Kurs .....

**CHW060 Präsentationstechnik im Beruf - Medien wirksam einsetzen und effektiv informieren** (Version **Deutsch**)

**CHW060 Presentation Techniques - Effectively Informing your Business Partners** (Version **English**)

Der 2-tägige Kurs richtet sich an **Fach- und Führungskräfte**, ist auf das ABB Umfeld zugeschnitten und wird von André Bischoff, Präsentationstrainer und Managing Director von HPS Schweiz durchgeführt, ein seit über 20 Jahren führendes Spezial-Trainingsinstitut.

Details zum Kurs und die Möglichkeit sich anzumelden finden Sie unter folgenden Links:

Klick -> [CHW060](#) nächster Kurs in **Deutsch**: **Mi+Do, 20. + 21. Okt. 2010**

click -> [CHW060](#) next course in **English**: **Tue+Wed, 7 + 8 Dec 2010**

Auskunft erteilt Markus von Allmen, PS-BT (5 66 00).

Anmelden können Sie sich über obigen Link oder per Lotus Notes bei: Anni Gurini, Tel. 058 - 589 32 25  
**(bitte leiten Sie diese Mail an Interessierte oder Ihre MA weiter)**

Wir würden uns freuen, von Ihnen zu hören.

Mit freundlichen Grüßen

Markus von Allmen  
ABB University  
Lerncenter Business Processes

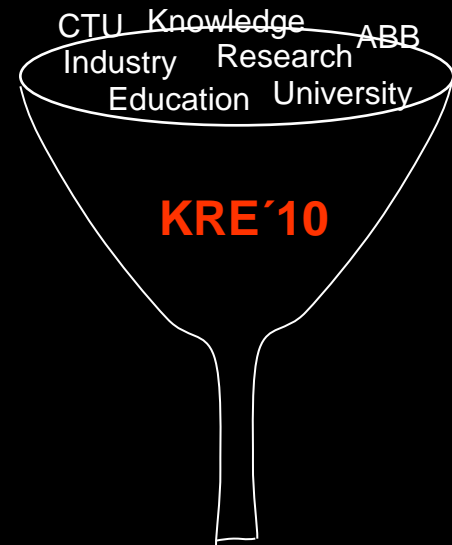
**P.S.:**

ABB University im **Internet**:

[ABB University Switzerland on Internet](#)

# Education

- Industry is already teaching worldwide (close to customers)
- The best Universities are also going global (operate all over the world)
  
- Growing role of
  - on-line and remote information services and infrastructures
  - e-learning
  - worldwide searching for talents (especially in technical fields)



# Summary

# Summary – Current situation

The level of services provided by CTU Library is excellent (my personal view), but

- Access to information is fast as has been never before,
- Amount of digital information to be processed on daily basis is enormous,
- Our operations (teaching/servicing) are more and more remote (global),
- Our „customers“ (students/buyers/users) are all over the world,
- Technical fields need to gain back at least a part of their attractiveness, ...

## Consequences

- Growing role of on-line and remote information services and infrastructures,
- Increasing demands on the flexibility of librarians and their services,
- Increasing demands on the skills of users and providers,
- Increasing efficiency of search engines is a must,
- Increasing role of e-learning,
- Cost is a limiting factor, both in the Industry and Academia,



# Summary – Claims against Libraries

- **Provide state-of-the-art services**

- Provide maximum possible on-line and remote information services
- Provide search engines with high efficiency
- Enlarge the portfolio of sources, e. g. Patent database, all prominent publishers should be available, digitize old publications, books, ...

- **Learn and teach new skills**

- Build your teams for required skills and flexibility
- Understand “customer” needs – present, future, latent
- Stay close to enthusiastic “customers” – scientists, teachers, students
- Be step ahead of them
- Train your “customers” / be involved in university teaching
- Be open and brave to changes

- **Logistics and Management**

- Continue in joint usage of resources for a wider portfolio of services (cost efficiency )
- Cooperate closely with IT specialists

# Summary – Claims against Management

- **Assure continuous and sufficient financial support** (stability)
- Negotiate alliances with other subjects for joint usage of information sources
- .....
- .....
- .....
- Stimulate appropriate technical level and skilled labour in Libraries (Prestige),
- Stimulate the growth of the University (Level of Library)
- Require the usage of efficient business processes and tools (Efficiency),
- Support the understanding of strategic value of state-of-the-art technologies for Libraries and their services
- Move bibliometric evaluation from Faculties to Libraries  
(Independent judgement, unification, empower the position of Library...)



Thank you for your attention...