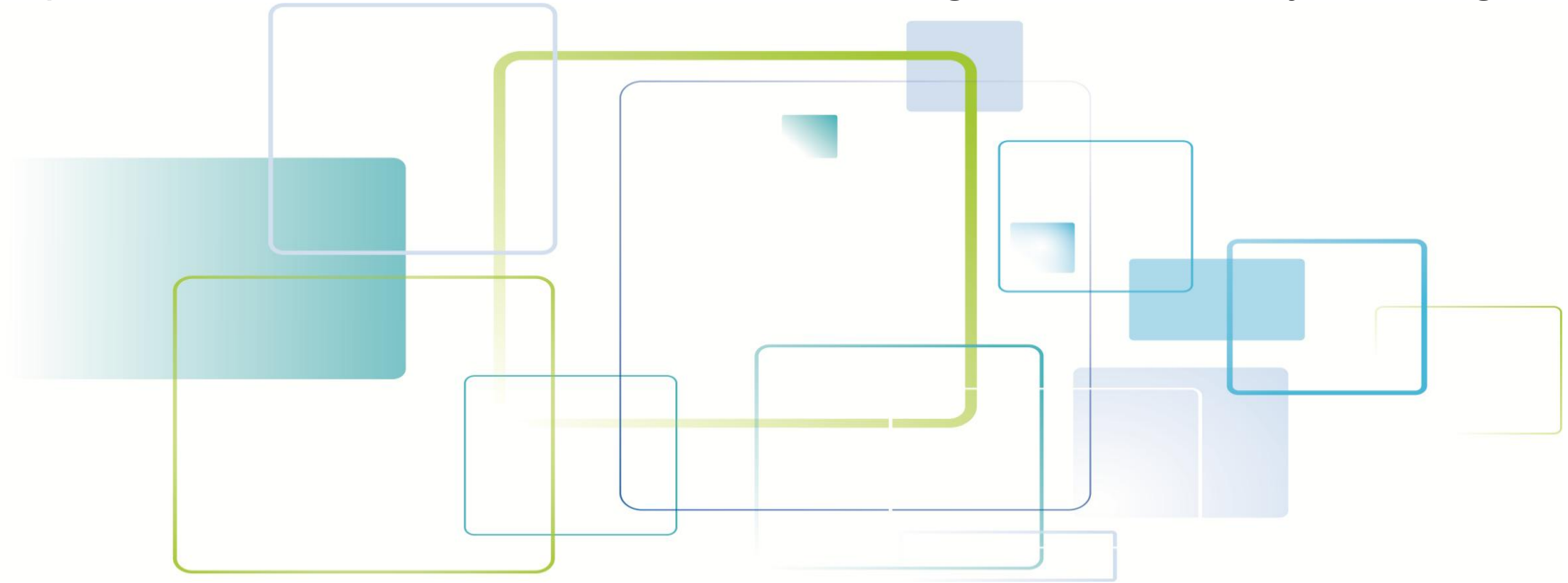

FRAUNHOFER INSTITUTE FOR FACTORY OPERATION AND AUTOMATION IFF

Kazakh Academy of Transport and Communications (KazATK)
Prof. Burghard Scheel, Chairman of the Advisory Board
Almaty, March 20, 2014

Experiences of Fraunhofer IFF in the Field of Logistics and Factory Planning



STRUCTURE

- 1. Overview (History and Strategy)
- 2. The profile of the Fraunhofer Gesellschaft
- 3. Diverse Expertise of IFF
- 4. Selected comments to current logistics aspects of Kazakhstan
- 5. Conclusion

1. OVERVIEW

HISTORY AND STRATEGY

- „Technical innovation and social trends frequently go hand in hand.
While it is not always clear which influences the other more, they are virtually inseparable.
- It is the job of researchers and engineers to provide answers.
INNOVATION ON DEMAND we could say.
- This is also what sets institutes of the Fraunhofer-Gesellschaft apart.

OVERVIEW

- IFF was founded over years ago in the wake of German reunification in a volatile situation with an Economy in the necessity of reconstruction.
At this time, Magdeburg was a center of heavy machinery and plant engineering.
Consequently, factory and production planning, production logistics, quality management, maintenance and factory automation were the first cultivated fields.
- The technical progress and changing basic conditions over the past years have also left their mark on the expectations on our research and services.

OVERVIEW

- We've been aware of this pressure to innovative all along. Consequently, we've unremittingly oriented our pursuits toward the changing need of business and industry.
- Our reliance in researchers with an IHERENT AMBITION TO INNOVATE and state-of-the-art-technologies, such as automated systems and digital engineering for efficient, reliable and better production or construction of resource efficient factories from the very early start is certainly an advantage to master the challenges of the future.

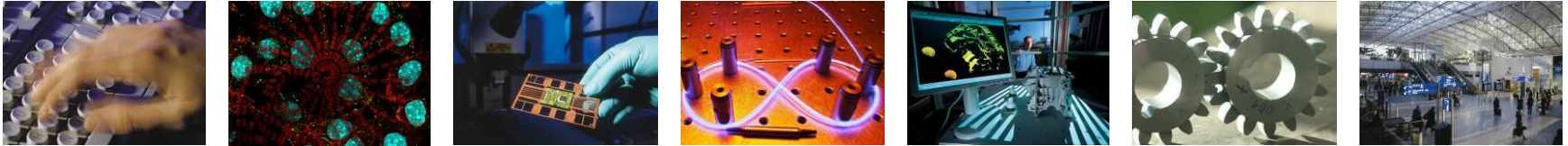
OVERVIEW

- We're paying close attention to five of these challenges:
 - Demographic – driven Organization of Production
 - Smart Automation
 - Development of Resource Efficient Factories and Production Systems
 - Mastery of increasingly „Distributed and Dynamic Knowledge about Production“
 - Refinement of „Digital Engineering“

Source: Prof. Schenk, Head of IFF Special Fraunhofer IFF 20th Anniversary Issue 2012

Folie 6

2. The Profile of the Fraunhofer-Gesellschaft

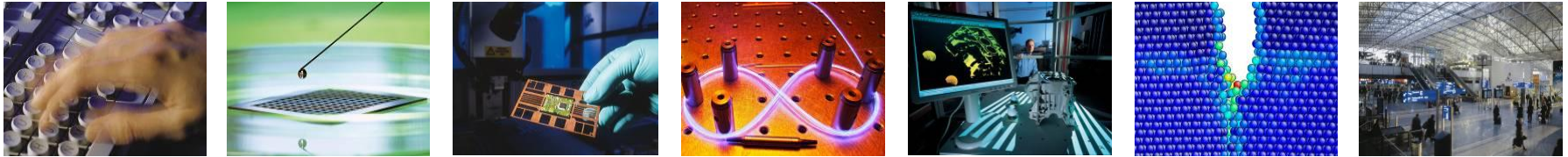


- 66 institutes and independent research units
- more than 22,000 staff
- An annual research volume of €1.9 billion, of which €1.6 billion is generated through contract research.

7 Groups:

- Information and Communication Technology
- Life Sciences
- Microelectronics
- Light & Surfaces
- Production
- Materials and Components – MATERIALS
- Defense and Security

The Fraunhofer-Gesellschaft in a multi-dimensional field of tension



Institutes with different
“institute cultures”



A single organization with a
mission

Applied research as a
profession



More than 250 business fields and
core competencies

Excellent research



Strong applications orientation

Institutional and project
funding



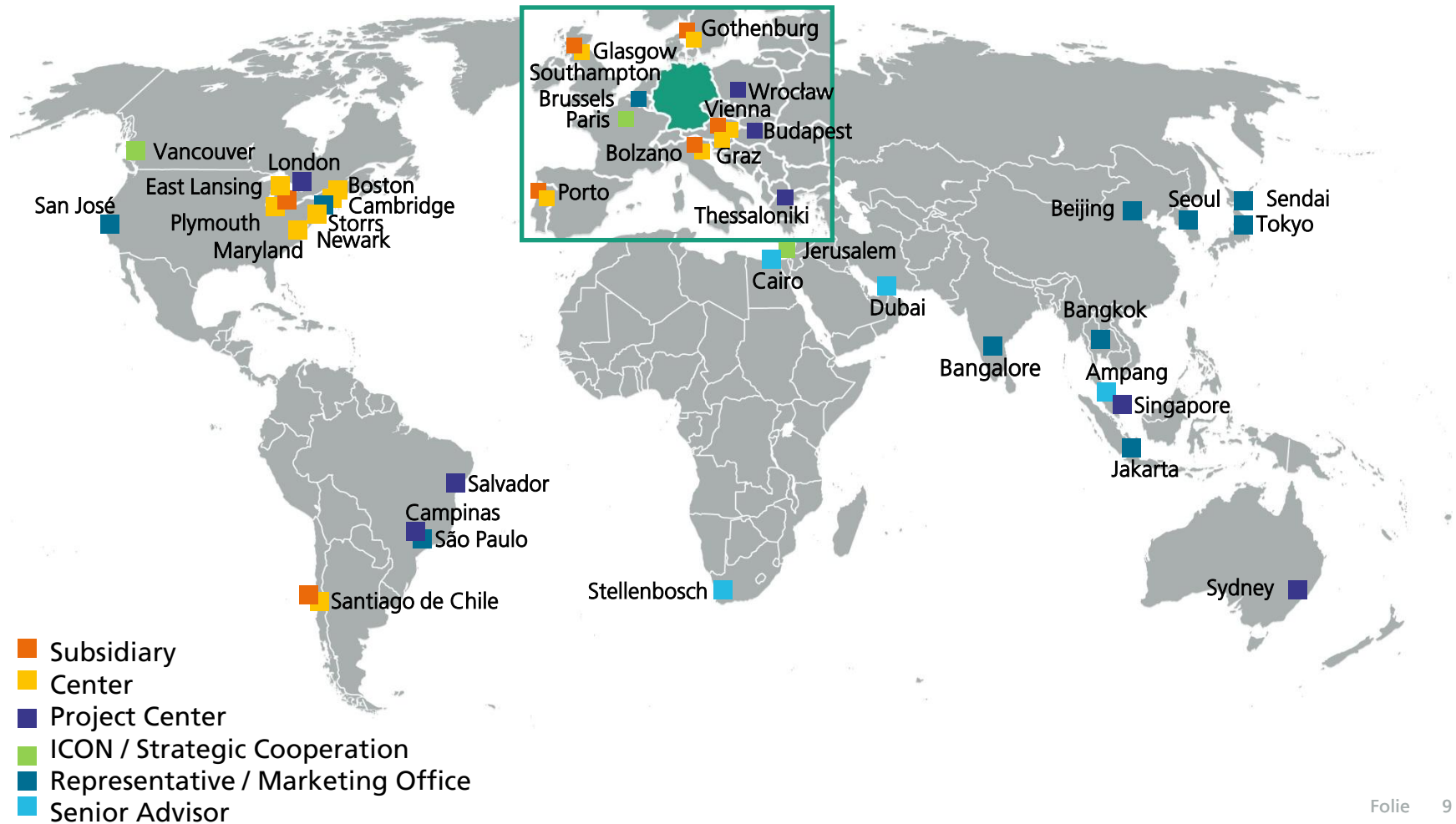
Revenues from contract research

Management/rules of a public
institution

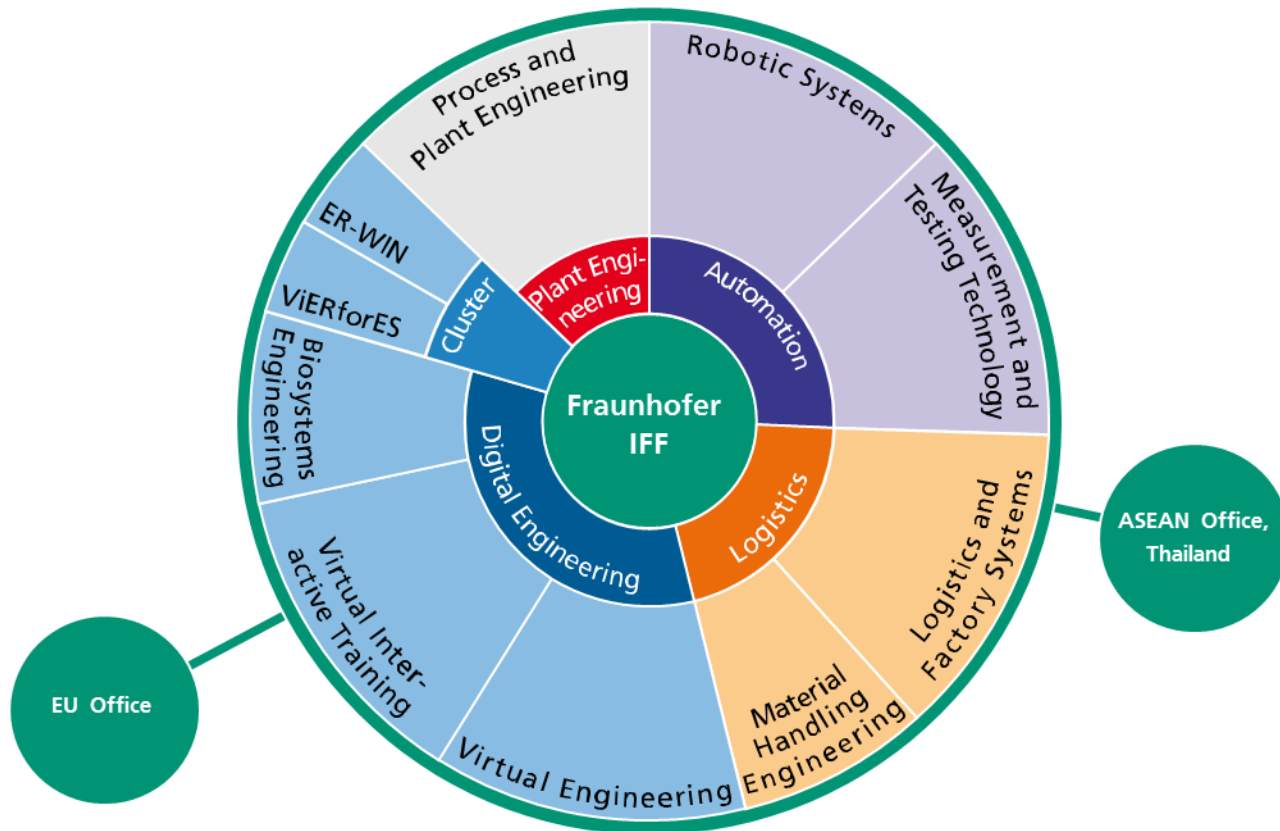


Entrepreneurial action

Fraunhofer worldwide



3. Diverse Expertise of IFF



Partner for Applied Research



LOGISTICS



AUTOMATION



**DIGITAL
ENGINEERING**



**PROCESS AND
PLANT ENGINEERING**

Photos: 1, 3, 4 Dirk Mahler; 2 Bernd Liebl

Folie 11

Diverse Expertise, Optimally Connected

Fraunhofer IFF

Otto von Guericke
University

Business Units	Expert Groups	Central Offices	Centers of Expertise	ILM
<ul style="list-style-type: none"> ■ Robotic Systems ■ Measurement and Testing Technology ■ Virtual Interactive Training ■ Logistics and Factory Systems ■ Process and Plant Engineering ■ Virtual Engineering 	<ul style="list-style-type: none"> ■ Material Handling Engineering and Systems ■ Biosystems Engineering 	<ul style="list-style-type: none"> ■ ViERforES ■ Fraunhofer IFF ASEAN Office ■ Fraunhofer IFF EU Office 	<ul style="list-style-type: none"> ■ Visualization Techniques ■ Training and Technology ■ Virtual Engineering ■ Simulation Techniques ■ Power Grids and Renewable Energies ■ Robotics and Embedded Systems ■ RobotsLab 	<ul style="list-style-type: none"> ■ Chair of Logistics Systems <ul style="list-style-type: none"> – Logistics Process Analysis – Logistics Process Modeling ■ Galileo Test Bed for Logistics and Transportation Telematics
			Center for Digital Engineering CDE	

Folie 12

Logistics

Logistics and Factory Systems

- Analysis, evaluation and engineering of physical and digitized logistics processes and design of the proper technical infrastructure
- Optimization of processes, factories, logistics systems and networks
- Development and modification of digital tools for planning and operation

Material Handling Engineering and Systems

- Automatic identification and localization of objects by smartly combining wireless and image-based identification and localization technologies indoors and outdoors

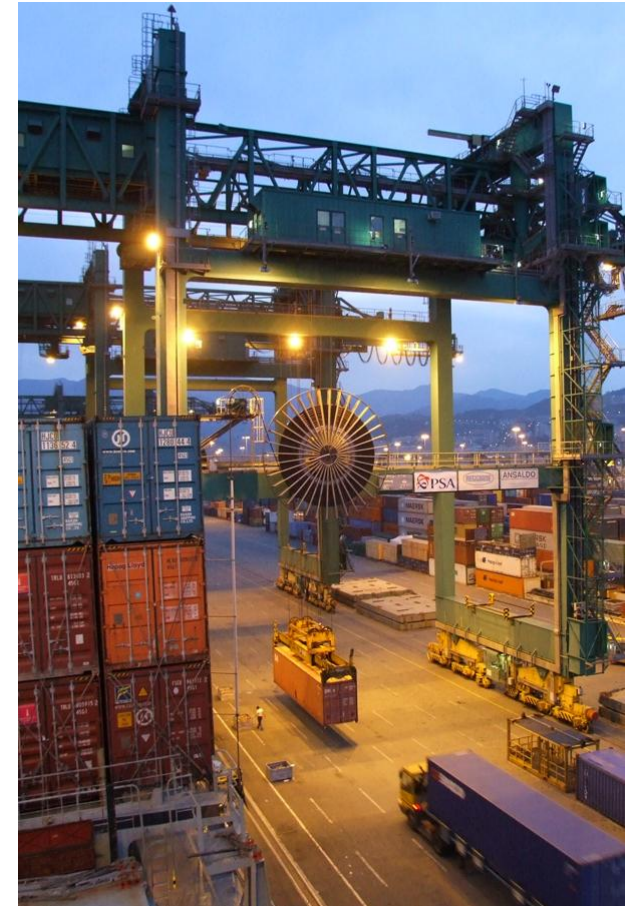


Photo: Woody Stein

Folie 13

Digital Engineering

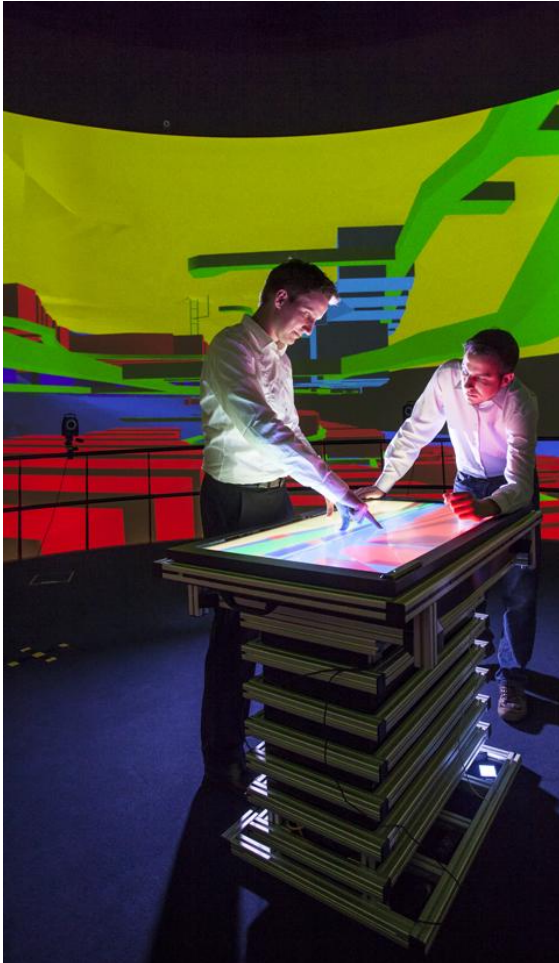


Photo: Dirk Mahler

Virtual Engineering

- Integrated virtual development, modeling and simulation of automated systems
- Virtual commissioning of machinery and plants and support when implementing digital design tools

Virtual Interactive Training

- Development of virtual reality technologies, methods and systems
- VR training and educational systems
- Visualization of urban structures

Biosystems Engineering

- Automatic analyses and modeling of processes of spatiotemporal development in biological and biomedical applications

Case Study

RFID solutions are a trend



Photo: Dirk Mahler

RFID chips in clothing

- Continuous monitoring from China to Germany
- Every shipping box is labeled with a barcode, which is read with a handheld scanner before the RFID is scanned in the RFID tunnel
- The system »tunes« the electromagnetic signals
- Real-time detection of missing items

Case Study

Maintenance and Material Management in the Steel Industry



Photo: Eyk Flechtner, Fraunhofer IFF

RFID for operational organization

- The actors must be integrated in the development of the overall system
- Improving the identification of parts, equipment and materials
- Reducing process times and handling work
- Reducing inventory times and inventory work
- Reducing manual identification work and
- Entering inventory in near real-time

Folie 16

Case Study

Continuous Production Facility Optimization



Generator production at Siemens in Erfurt

Site development and optimization

- Conceptual and detailed planning to expand and reorganize and increase the capacity of all production units
- Optimization of floor space, the material flow and the logistics concept
- Preparation for the production of new products
- Implementation of lean production
- Quality management support
- Project period: 1997 to present

Folie 17

Case Study

Sustainable Factory for the Future



- ✓ Total floor space of 25,000m²
- ✓ High-tech, manufacturing, office and development space for over 600 employees on six floors
- ✓ Certified by the German Sustainable Building Council DGNB

Construction of a new factory in Oberkochen-Königsbronn Intermunicipal Industrial Park

- Planning and implementation support for Carl Zeiss Meditec AG's new facility
- Collection, processing & visualization of all information and data relevant to planning
- Future-proof development of alternative layouts and concepts (equipment, security, logistics, furnishings, disposal, etc.), which meet requirements
- **Project period**
June 2010 to January 2013
- **Total investment budget**
Approx. € 50 million

Reference: Development of an Automated Plant

Challenge

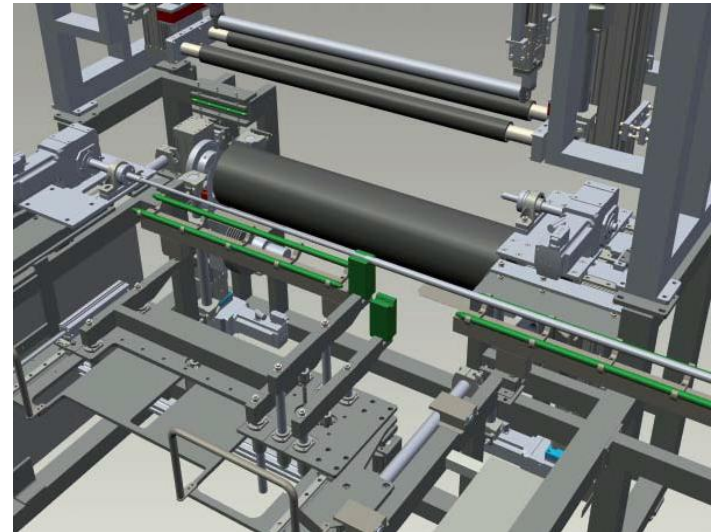
- Developing a new plant that produces water filters made of special membranes

Solution

- Digitally developing, testing and optimizing
 - Machinery functions and layout
 - Production steps and control systems
 - Product parameters
- Followed by constructing the physical plant

Benefits

- Plant built on schedule
- Minimized development risk



Graphic: Fraunhofer IFF; Photo: LANXESS AG

Folie 19

Challenge

Production Structures of the Future: Adaptable, Resource Efficient, Robust and Reliable



Photo: Dirk Mahler

- Production and logistical structures will be interconnected even more.
- Information and communications technologies will be the driving force.
- Digitized products, processes and equipment will constitute the basis.
- Digital engineering will deliver new methods and tools.

➔ The fourth industrial revolution!

5. SELECTED COMMENTS

TO CURRENT LOGISTICS ASPECTS OF KAZAKHSTAN

- a. Kazakhstan belongs to the 25 fastest growing countries in the world



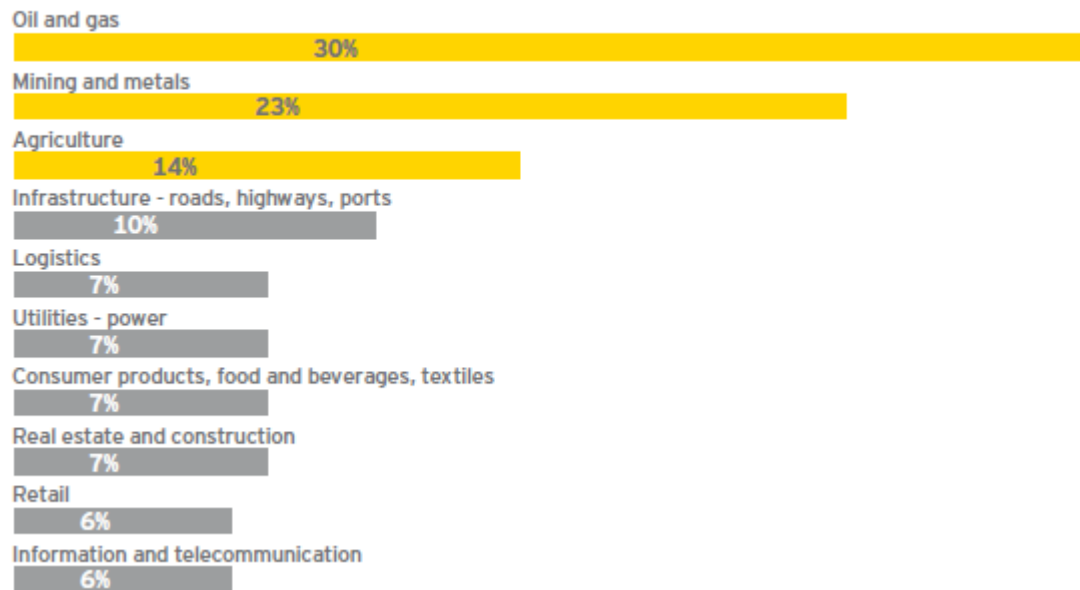
Source: Ernst&Young, Rapid-Growth Markets 2013

Folie 21

b. Build quality structure

- „Investors have cited a number of opportunities to improve Kazakhstan`s attractiveness profile...(for FDI). These include :
- Railways, , logistic centers and airports, and developing a regional transportation and logistic hub.“

Industry sectors with highest potential in the next three years



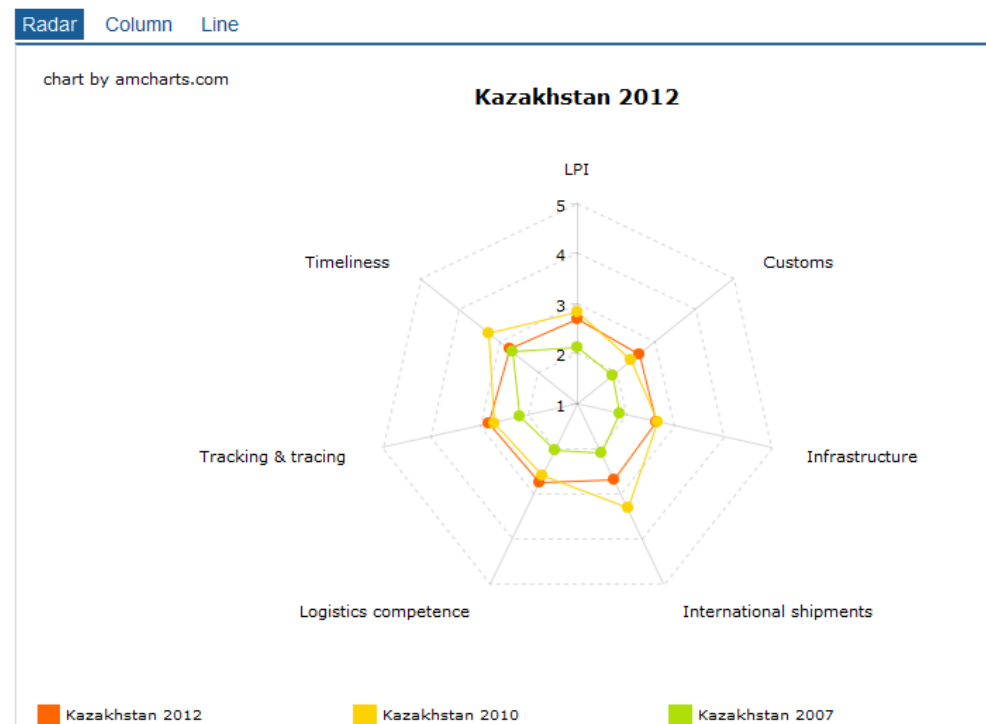
Source: Ernst&Young, 2012 Kazakhstan attractiveness survey, Bridging the perception gap

Folie 22

c. Worldbank LPI*

- Kazakhstan is actually indicated in comparison with the world on place 86 and the Government targeted place 40 as aim for the year 2020. Following graphics should be helpful for better understanding.

Country Score Card: Kazakhstan 2012

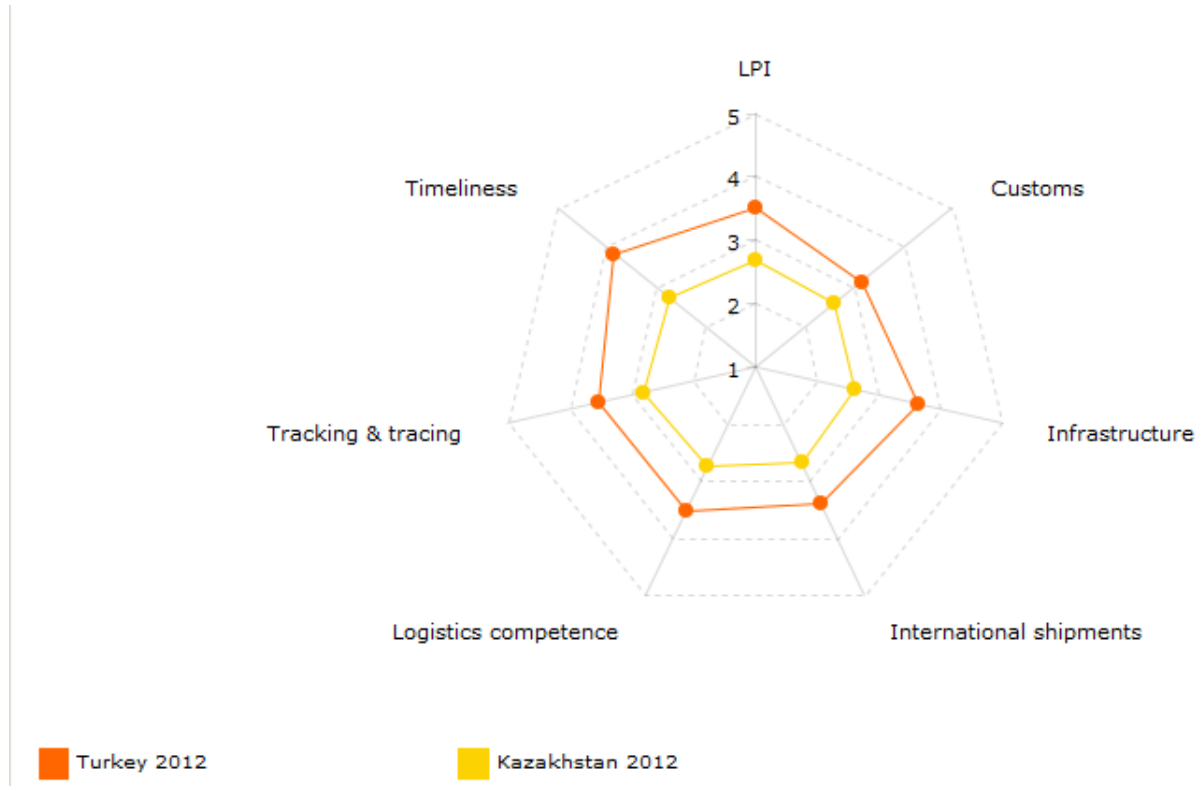


Source: Worldbank, Connecting to compete 2012, LPI (Logistics Performance Index);

*Ost-West-Contact 10/2012

Folie 23

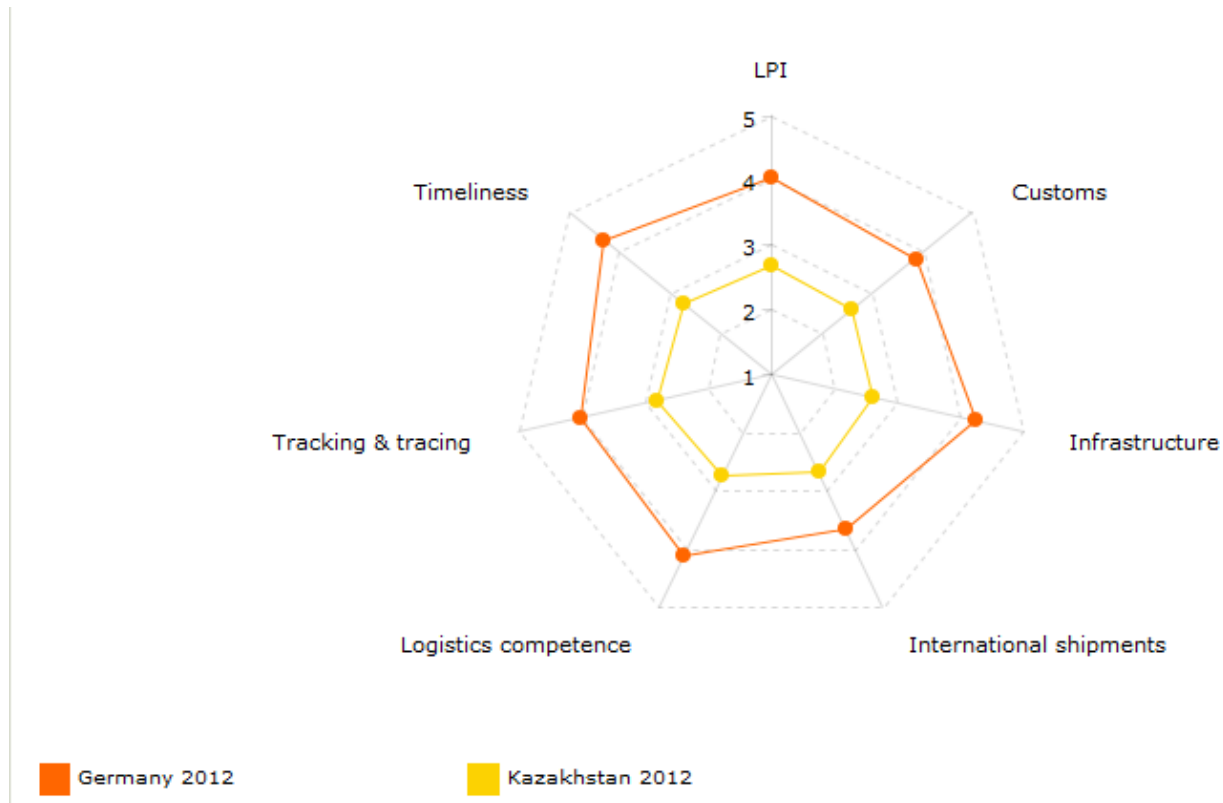
■ Turkey : Place 27 (China : 26)



Source: Worldbank, Connecting to compete 2012, LPI (Logistics Performance Index);
*Ost-West-Contact 10/2012

Folie 24

■ Germany : Place 4 (best performer : Singapur, Honkong, Finland)



Source: Worldbank, Connecting to compete 2012, LPI (Logistics Performance Index);
*Ost-West-Contact 10/2012

Folie 25

d. Education & Knowledge

- „Available macroeconomics statistics of Kazakhstan show a generally degree of innovation activity, both in terms of output and the number of companies engaged in innovation...the very low number of innovative companies reflect a degree of low innovation capabilities across all sectors“
- „...ISL – Policy support must reflect the specific characteristics of innovation agents on both, the supply chain and demand sides of knowledge production and use“

e. Science and Technology in modern economics

- „...Globalization has created an international market for know-how in which research institutes compete on a global scale. Technology has become a commodity that companies trade among themselves, as well as with research institutes“ *
- „The use of imported technology requires some domestic research capacities for effective absorption...In many countries, the government (partly) finances applied research on behalf of industry, for instance through the Fraunhofer – Gesellschaft in Germany“ .**
- „Public education and research institutions in Kazakhstan are still not well equipped to meet so many different expectations“ .**

Source: *H.W. Chesbough, Open Innovation-the new imperative for creating and profiting from technology, Harvard Business School Press 2003

** Innovation Performance Review of Kazakhstan, United Nations 2012

Folie 27

5. CONCLUSION

- 1. „Logistics“ is more than transportation- and traffic-management.
- 2. From our experience we know, that (specially) producing companies needs support for optimizing their processes and improving their competitiveness .
- 3. From our experience we know very well, that „excellent research“ is indispensable for a successful way, i.e. close partnership with companies and universities („applied research“) .
- 4. Education and knowledge-transfer should be based on networking and cooperation with aspects of entrepreneurial action.
- 5. KazNTU and KazATK should be leader of operating „Logistics“ in a professional partnership with strong applications orientation.

Partnership ...

- ... has already started and needs to be developed

2012 – Berlin-Meeting with
President Nursultan
Nasarbayev



2012 – IFF Visit of Prime
Minister Serik Akhmetov



- Thank you all for your kindly attention!

Your Technology Partner for Applied Research in Saxony-Anhalt



Fraunhofer Institute for Factory Operation and Automation IFF

Sandtorstrasse 22
39106 Magdeburg
Germany

Phone: +49 391 4090-0

ideen@iff.fraunhofer.de

www.iff.fraunhofer.de