



LUDWIG-
MAXIMILIANS-
UNIVERSITÄT
MÜNCHEN

Faculty of Business Administration
Munich School of Management

Germany: Digitalization and the Future of Work

ICT as an Enabler for Intelligent City Development:
Perspectives from Germany and China

September 12, 2013

Arnold Picot

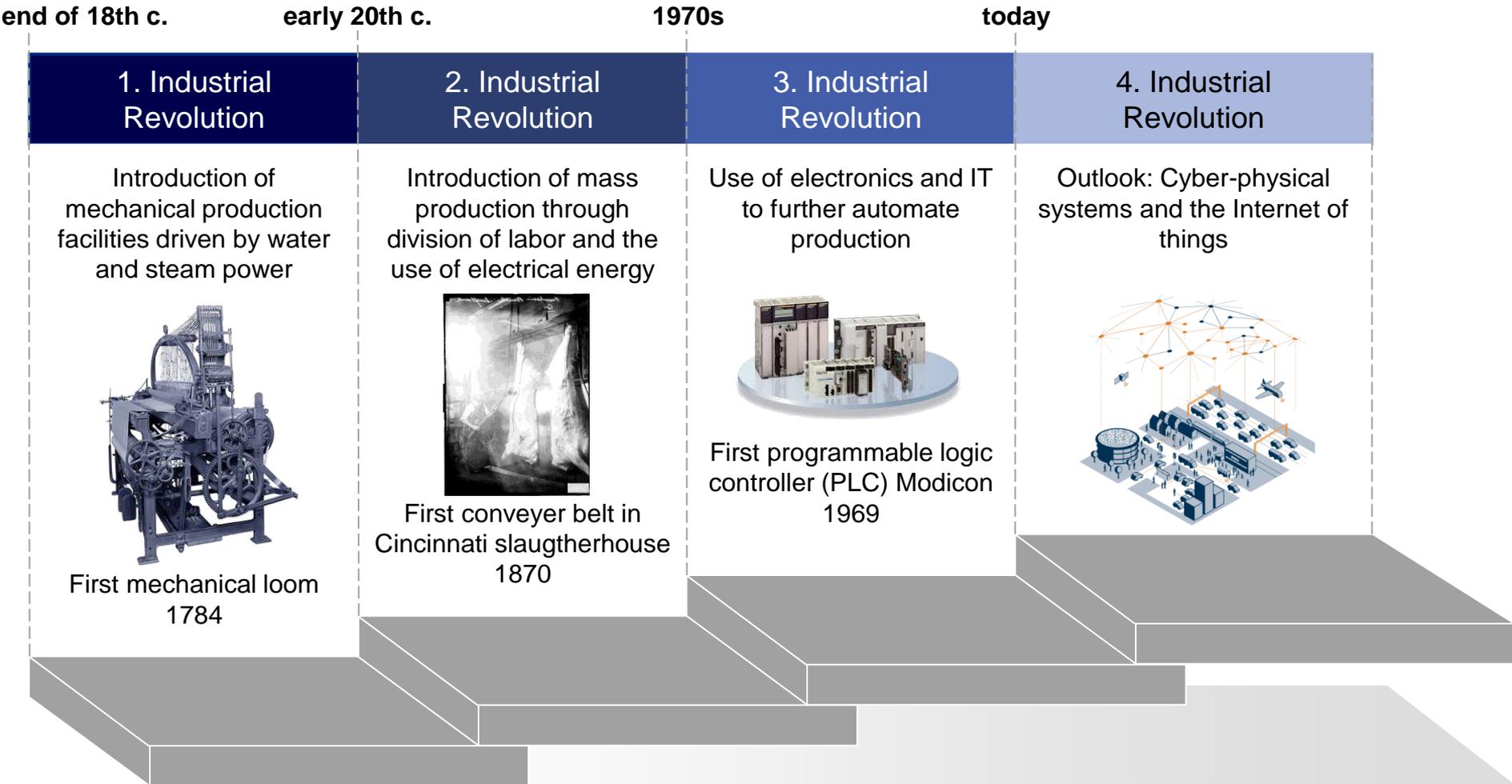
Research Center for Information, Organization
and Management, Ludwig-Maximilians-University Munich

Münchner Kreis – Non-profit supra-national association
dedicated to communications research



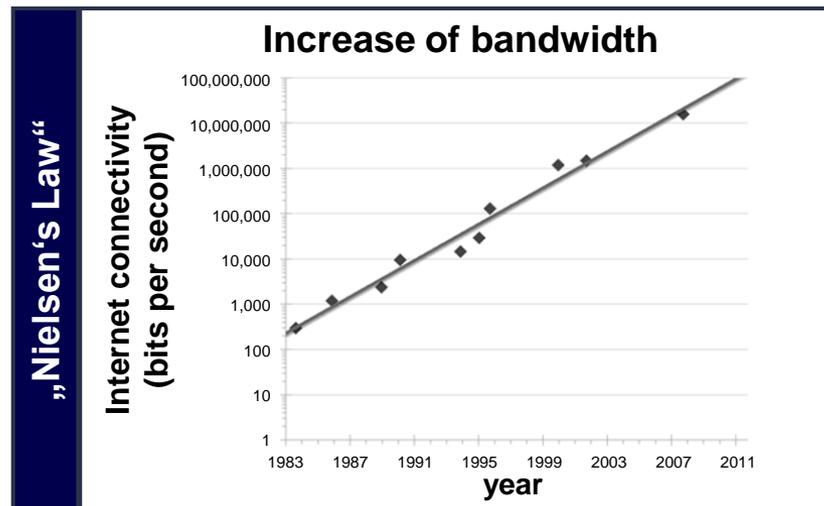
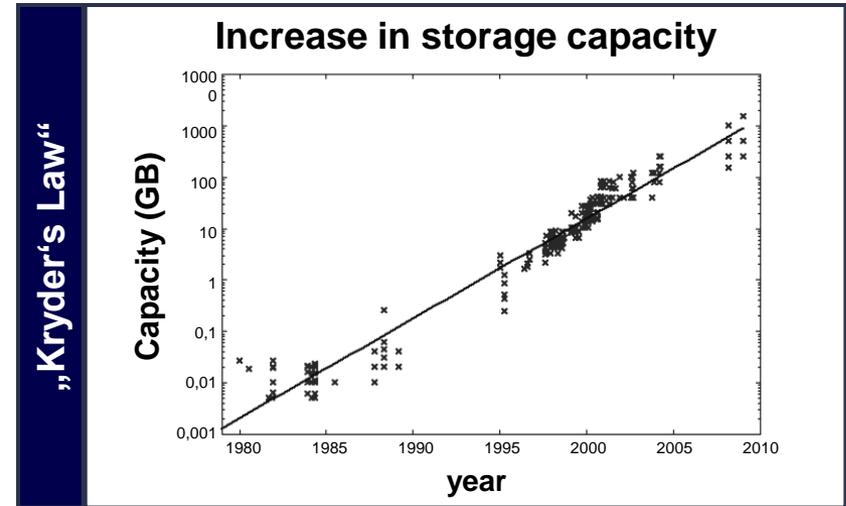
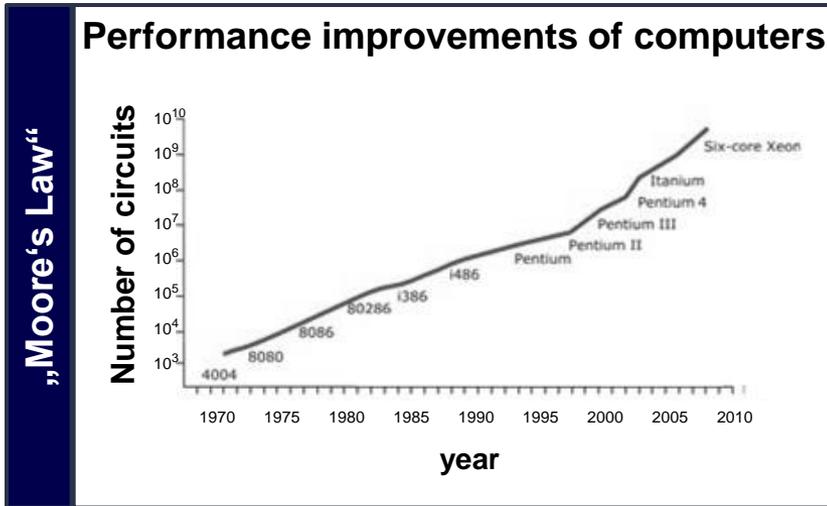


Stages of technological progress



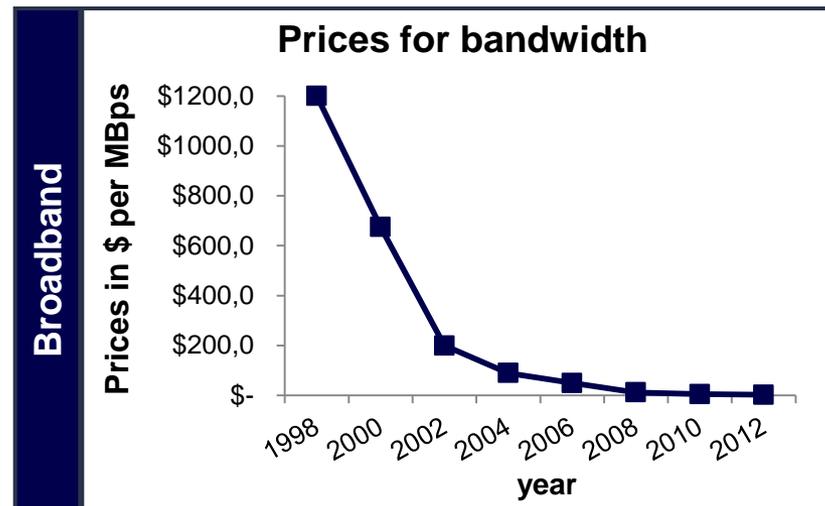
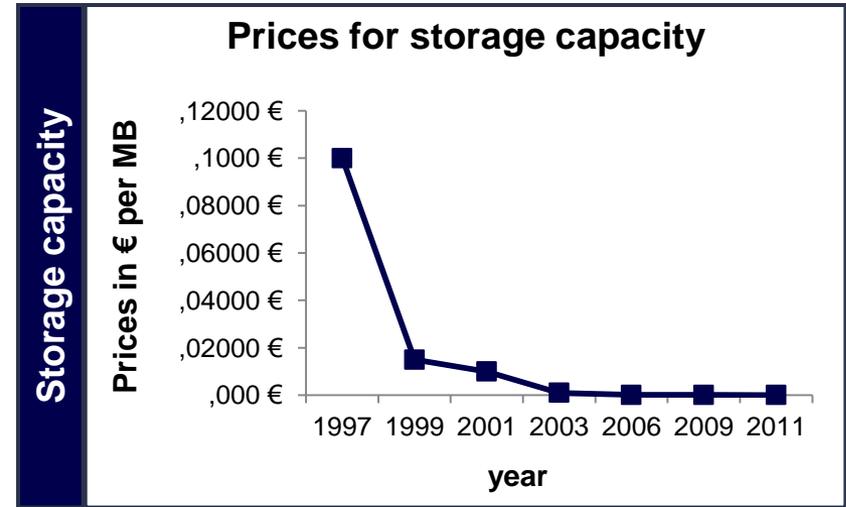
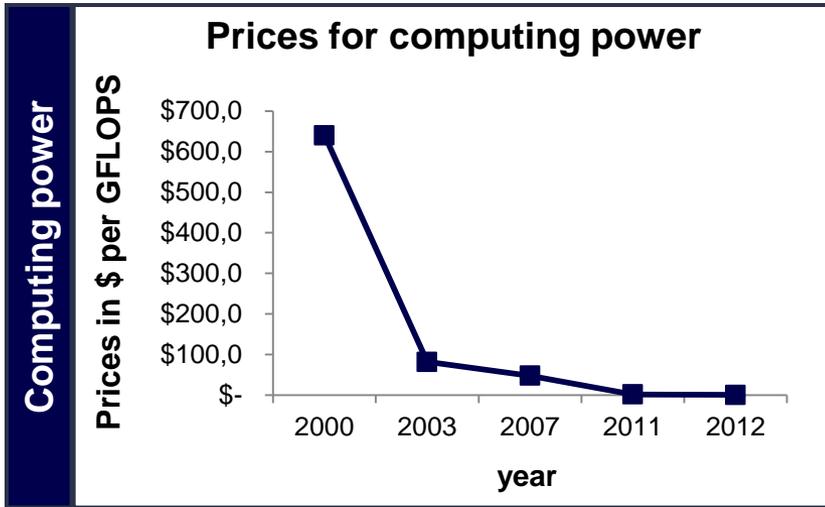


Exponential performance improvements...





...and exponential price reductions.





From evolution to revolution – Implications of exponential technological growth

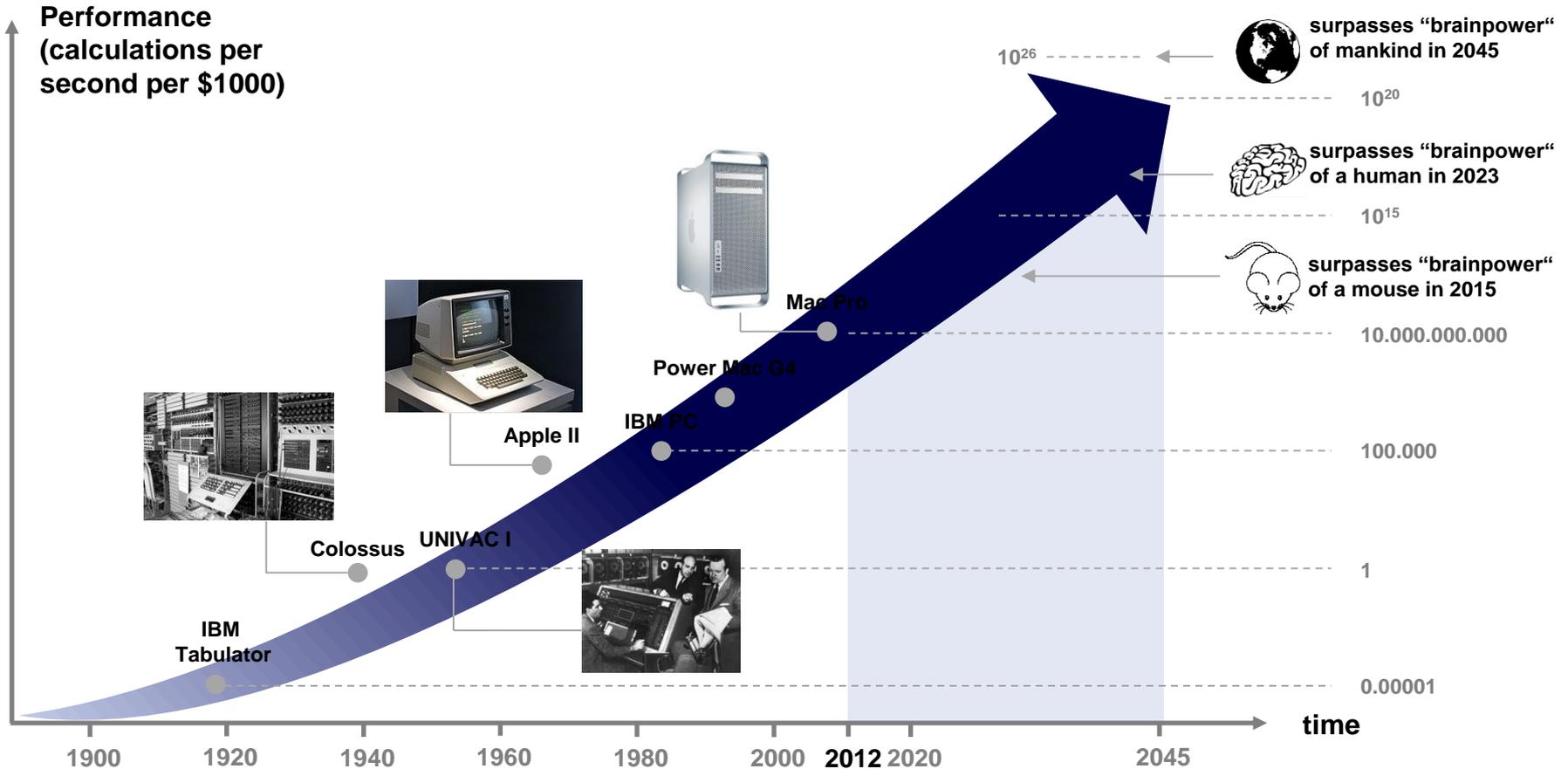


Figure based on Times Magazin (2011)

Technological progress has ever since influenced the organization of work

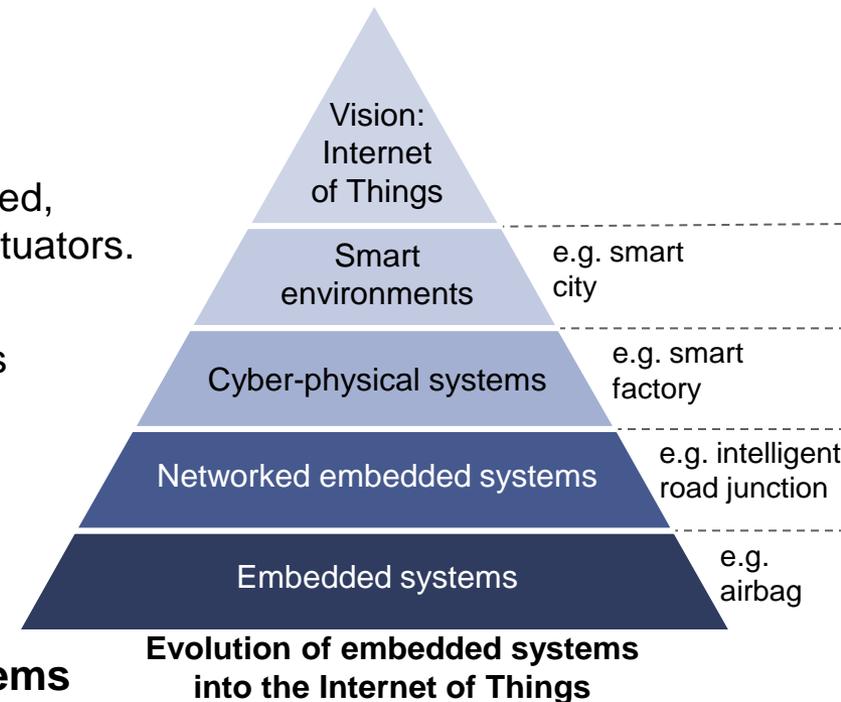
- **At times of industrial mass production**
 - the physical centralization of production was a prerequisite for mass production
 - the physical centralization of administration was required as part of the necessary coordination and communication processes

- **As a result industrial work and life structures emerged:**
 - Location-bound working environments in factories and office buildings with hierarchical structures
 - Extensive division of labor
 - Separation of execution and responsibility
 - Specified office and information channels (model of bureaucracy)
 - Strict separation of work and leisure time
 - Employer-employee relationship as default model
 - ...

Changing industrial working environment as a result of digitalization and connectivity

Merging the physical and virtual worlds

- Today, about 98 percent of microprocessors are embedded, connected with the outside world through sensors and actuators.
- With the help of sensors, cyber-physical systems process data from the physical world and make it available for network-based services, which in turn can have a direct effect on processes in the physical world

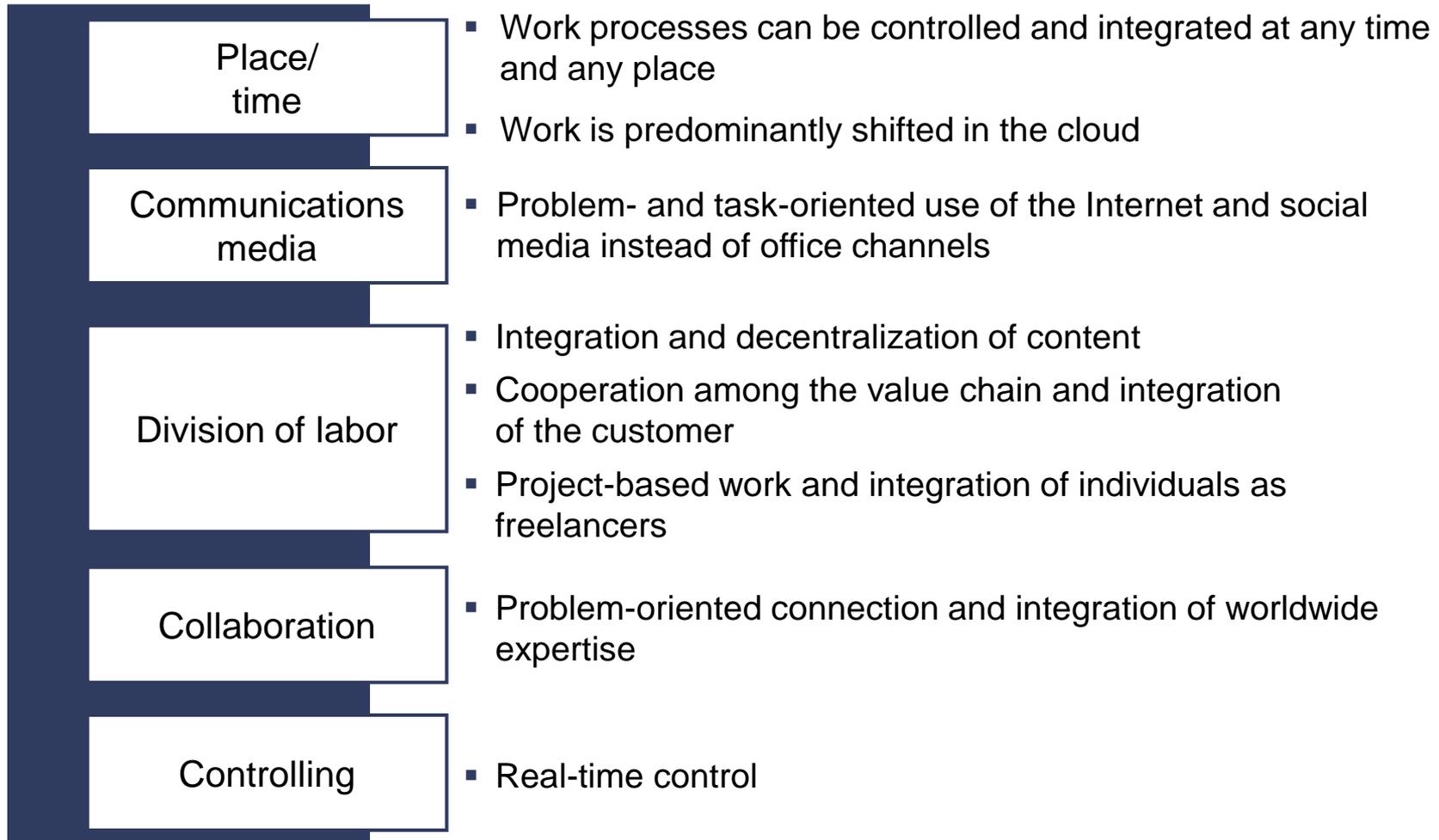


Opportunities through ICT and Cyber-physical systems

- Real time management of dispersed value networks
- Dynamic configuration of business processes allows flexible responses, optimization and execution of processes down to batch size of 1
- End-to-end transparency of business processes through access to meta-information

As a result industrial working structures increasingly dissolve

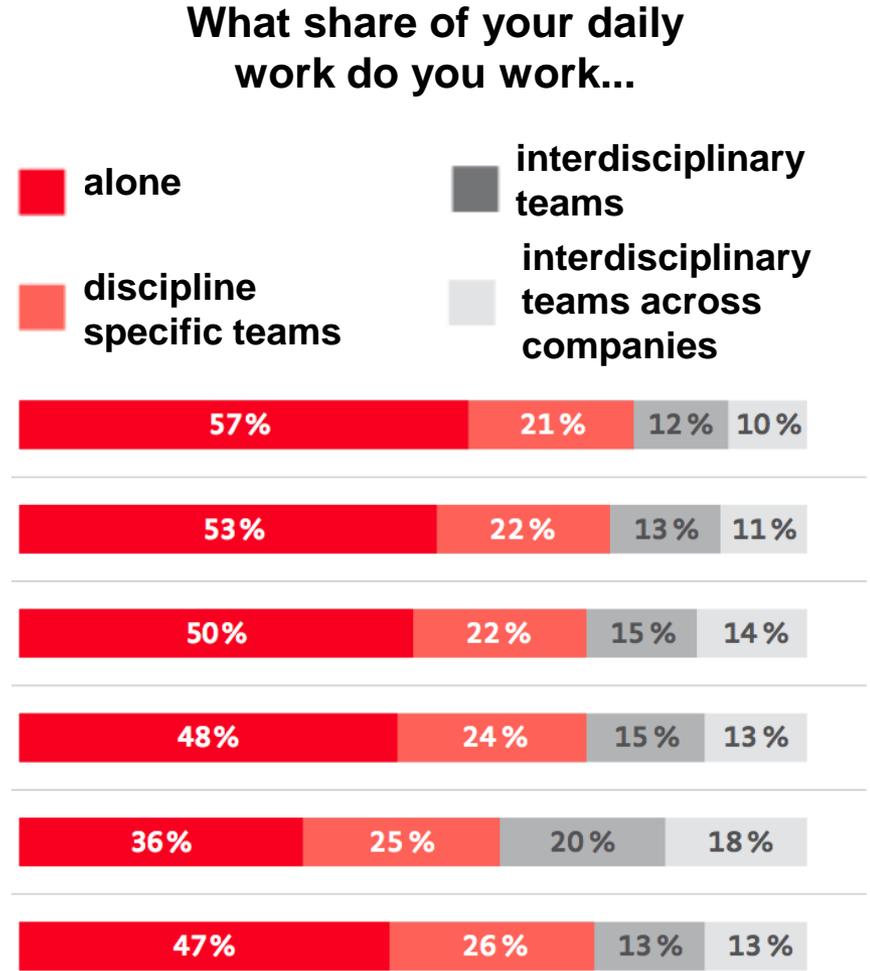
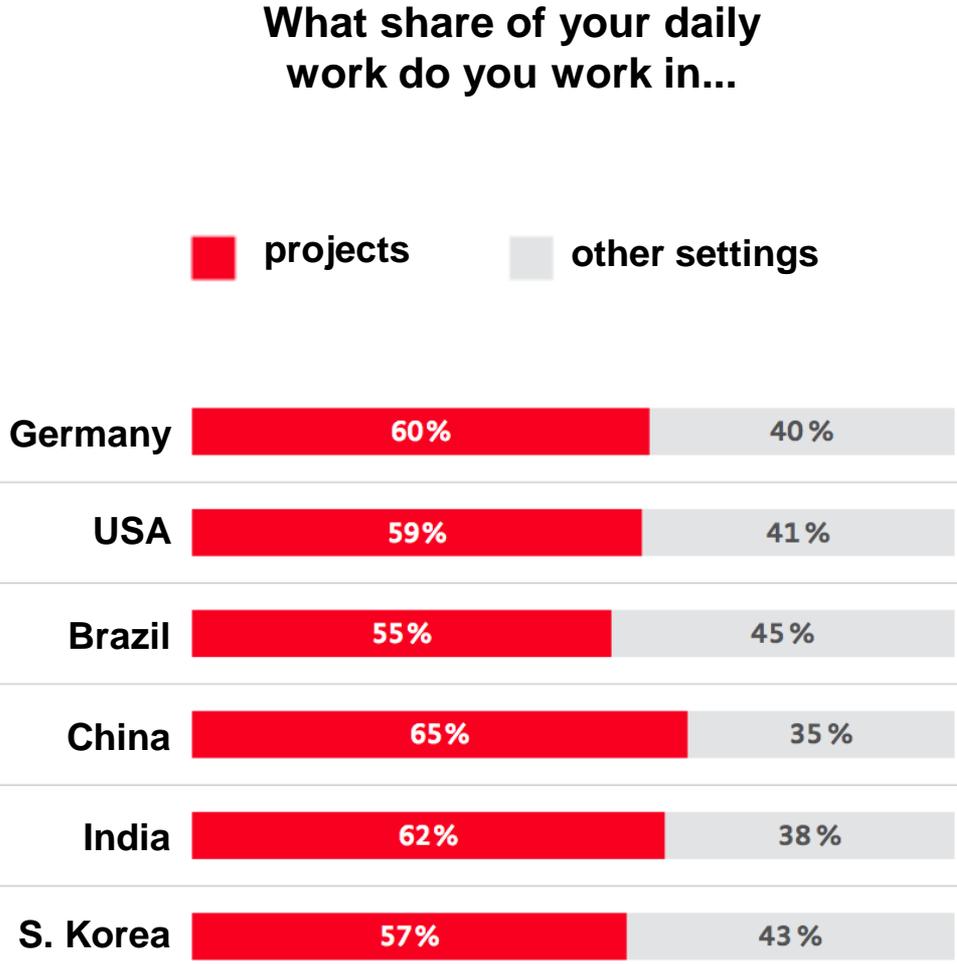
ICT allows for new forms of organization related to:



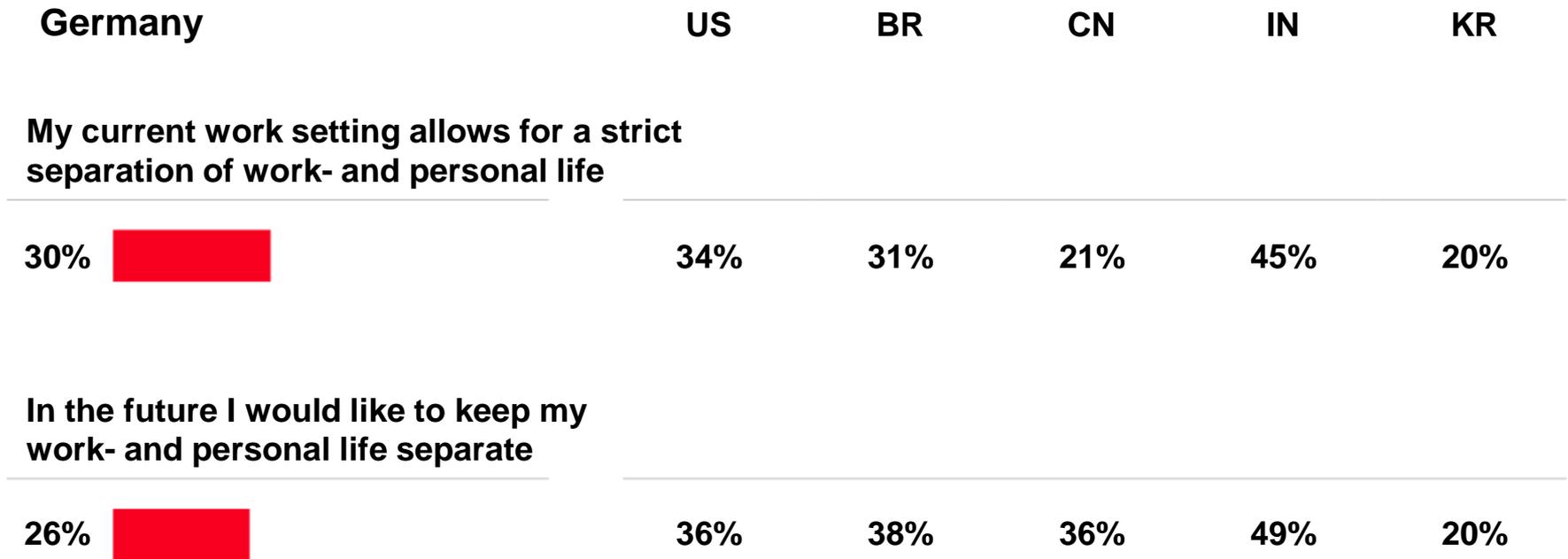


Implications for Intelligent City Development

The organization of work becomes increasingly flexible and is predominantly carried out independently in project based settings



For many workers a separation of work- and personal life is not given anymore – a situation that only a minority would like to change



The office as a specific place for our professional lives is becoming less important, leading to a diminishing need for downtown office centers



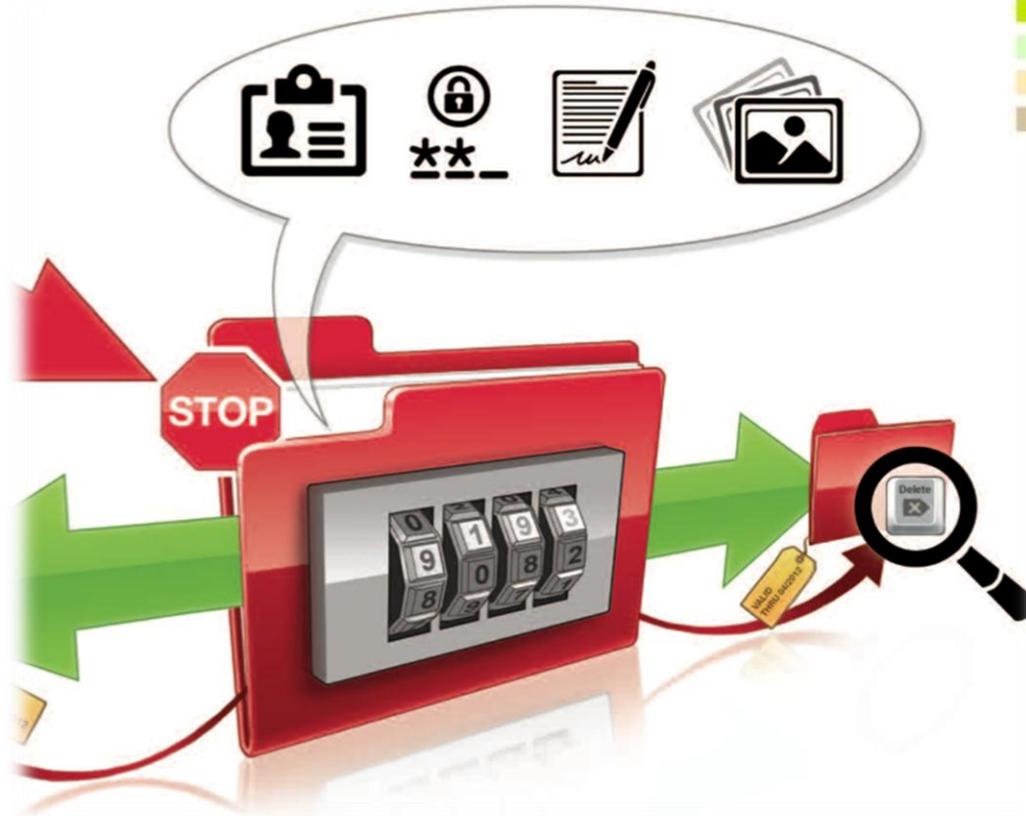
By 2024 at the latest, over 75 percent of office workers in Germany will regularly use a home or mobile office



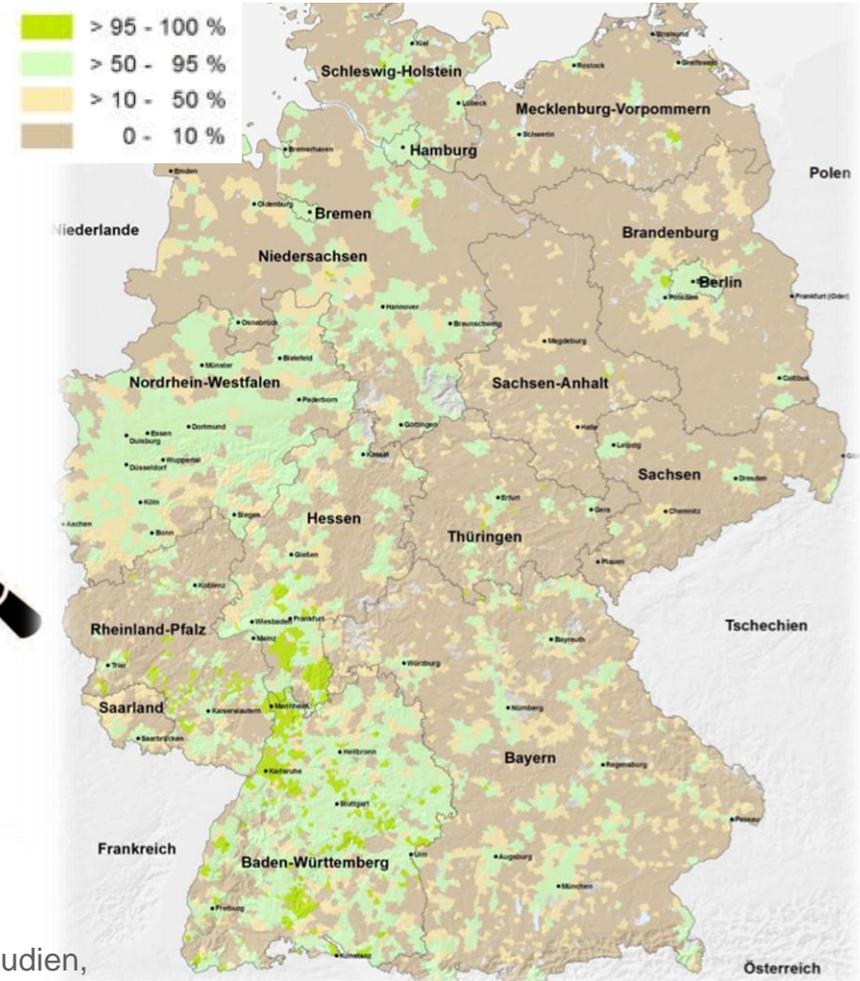


Pervasive demand for secure remote data access – the prerequisite of high performance broadband connectivity still underdeveloped

Online Data Manager



Household Broadband connectivity (> 50mbit/s) in %



Sources: Münchner Kreis „Future Study“ (2011), www.zukunft-ikt.de/studien, <http://www.zukunft-breitband.de/DE/Service/publikationen,did=559116.html> (2012)

Besides internet access ubiquitous workplaces face several challenges

| | Germany | | SE | USA | BR | CN | KR |
|---|---------|---------------------|------------|------------|------------|------------|------------|
| my data could be misused | 63 % | Total | 54% | 38% | 34% | 50% | 47% |
| | 53 % | Innov. respondents* | 56% | 46% | 46% | 58% | 48% |
| my data will be saved somewhere | 52 % | | 46% | 23% | 28% | 24% | 39% |
| | 47 % | | 47% | 30% | 39% | 32% | 35% |
| the costs would be too high for me | 37 % | | 21% | 39% | 35% | 31% | 38% |
| | 43 % | | 20% | 33% | 31% | 28% | 34% |
| my data is not physically secure | 37 % | | 39% | 25% | 40% | 50% | 47% |
| | 30 % | | 34% | 26% | 43% | 56% | 55% |
| I do not actually know exactly where my data is | 35 % | | 36% | 39% | 32% | 20% | 28% |
| | 40 % | | 37% | 37% | 33% | 20% | 32% |
| without my mobile device, I can no longer access my data | 34 % | | 23% | 38% | 23% | 33% | 43% |
| | 27 % | | 23% | 47% | 31% | 34% | 37% |
| the systems fail or become unavailable | 22 % | | 33% | 24% | 25% | 35% | 28% |
| | 18 % | | 36% | 19% | 29% | 28% | 35% |
| There are no free terminals/I am not able to use it for as long as I need | 13 % | | 20% | 29% | 30% | 16% | 30% |
| | 14 % | | 27% | 32% | 38% | 23% | 32% |

Source: Münchner Kreis „Future Study“ (2011), www.zukunft-ikt.de/studien

Since gathering places will remain important in business, smart working centers will be crucial for future office work in cities and rural areas

Co.Up Coworking Space in Berlin

Edelstall Coworking Space in Hannover



In 2011 South Korea even launched a national “Smart Working” initiative to enable employees to work from home or in smart working centers



The benefits of telecommuting are manifold (US statistics)

If the 40 % of the U.S. work force that could work from home, did so half the time, annually:



\$200 BILLION

productivity gains by
American companies



100 HOURS

per person not spent commuting



\$190 BILLION

savings from reduced real
estate expenses, electricity
bills, absenteeism, and
employee turnover



50 MILLION TONS

of greenhouse gas emissions cut



**276 MILLION
BARRELS**

of oil saved, or roughly 32 %
of oil imports from the
Middle East



1,500 LIVES

not lost in car accidents



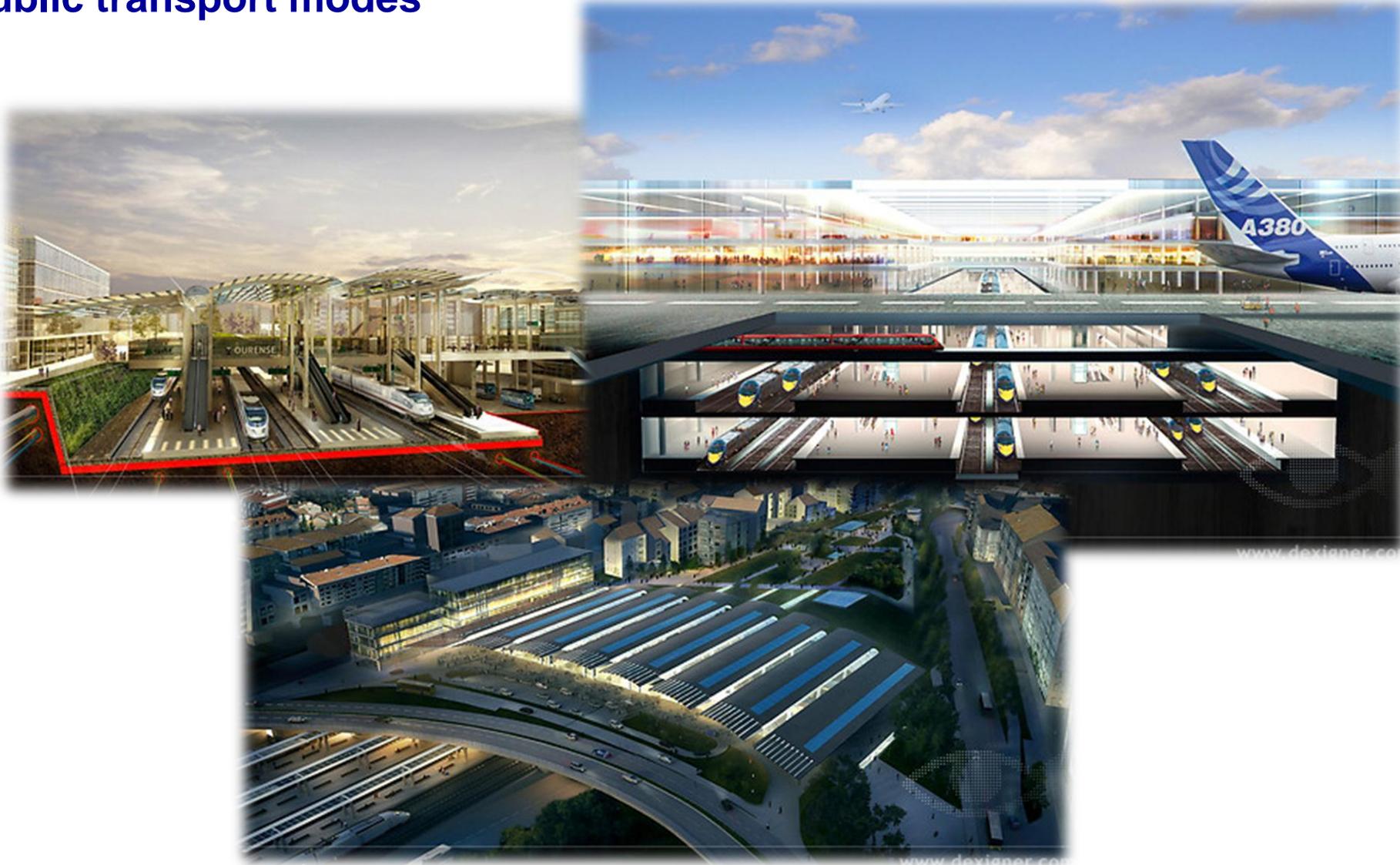
\$700 BILLION

total estimated savings
to American businesses

However, workers will still have to commute occasionally – when they do, they expect a seamless experience



Intermodal transportation hubs will be required to connect different public transport modes



Intermodal booking, route planners and integrated transportation services are prerequisites for seamless mobility

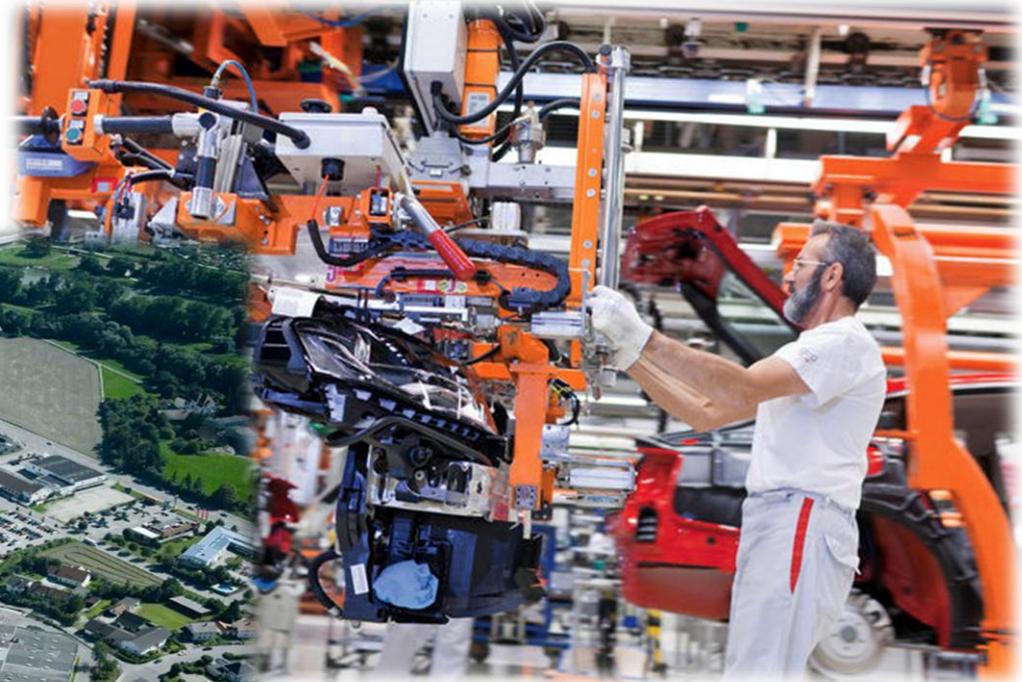
Deutsche Bahn – Touch & Travel Initiative



In contrast to office work, industrial mass production will be highly centralized in industry parks and economic development zones

Partly automated assembly line at Audi Ingolstadt

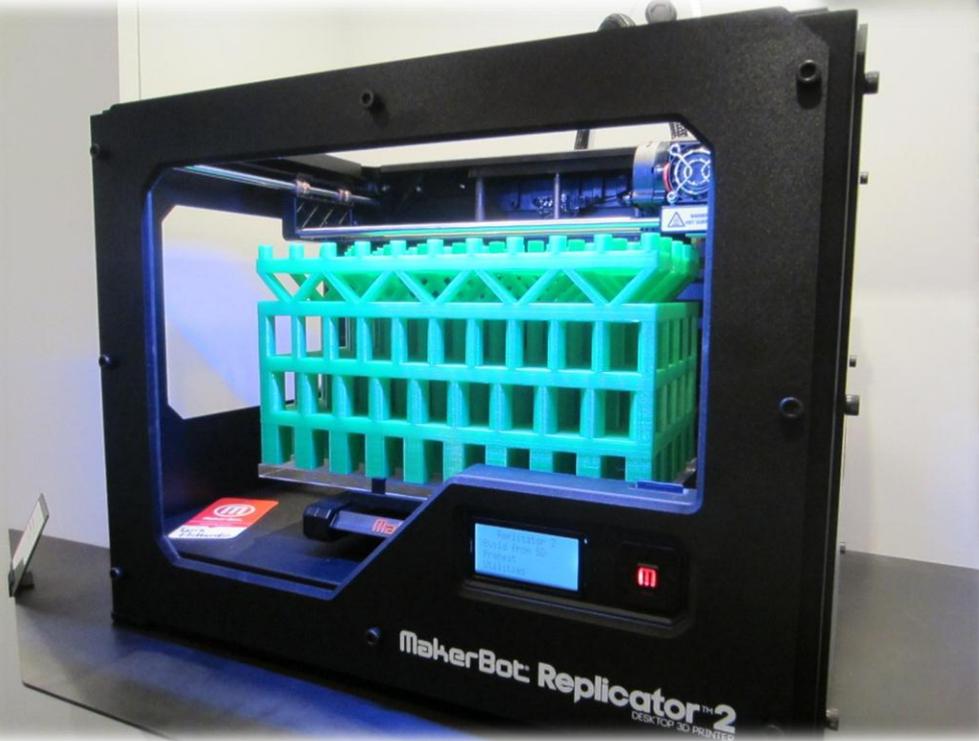
BMW Dingolfing manufacturing plant



The rise of 3D printing and fablabs are nevertheless first indicators of small scale decentralized production

Amsterdam Fab Lab at The Waag Society

3D Printer: MakerBot Replicator 2





Key takeaways

Lessons for the development of intelligent cities

Connectivity

Provide pervasive high performing connectivity (mobile and fixed networks) as a necessary infrastructure for future digital work

De-centralization

Envisage a shift from central downtown offices to decentral (home) offices and decentral production facilities

Changing spheres

The increasing reintegration of work into the private sphere must be reflected in the future design of urban quarters and homes

Smart working centers

Envisage a rise of smart working centers as technical platform and face-to-face meeting facilities next to residential quarters

Transportation

Provide flexible, seamless and well coordinated intermodal transportation means and logistic services

Manufacturing

Care for expanding plant locations (highly automated large scale manufacturing) outside of city centers



Thank you for your attention!

„The future of work in a digital world“

MÜNCHNER KREIS conference

October 10th, 2013, Hilton City Hotel in Munich

Registration and program via: www.muenchner-kreis.de