

## *Lecture 1*

# Introduction to Mobile Business II

Application Design, Applications,  
Infrastructures, and Security

**Mobile Business II (SS 2023)**

**Prof. Dr. Kai Rannenberg**

Chair of Mobile Business & Multilateral Security  
Goethe University Frankfurt a. M.



- The Chair of M-Business and Multilateral Security
- Teaching and Research Agenda
- Introduction into Mobile Business - History of Mobile Business & Mobile Telecommunication Systems
- Outline of this Course

## Business Informatics @ Goethe University Frankfurt

<b>E-Finance</b>  Prof. Dr. Peter Gomber	<b>Business Informatics (Informatics)</b>  Prof. Dr. Mirjam Minor	<b>Business Informatics &amp; Information Management</b>  Prof. Dr. Oliver Hinz
<b>Business Ethics &amp; Business Education</b> (associated) Prof. Dr. Gerhard Minnameier	<b>Business Informatics</b>  Hon. Prof. Dr. Matthias Zieschang	<b>Economic and Business Education</b> (associated) Prof. Dr. Eveline Wuttke
<b>Business Education</b>  Prof. Dr. Helmut Niegemann	<b>Information Systems &amp; Information Management</b>  Prof. Dr. Wolfgang König	<b>Business Education</b>  Dr. Christin Siegfried
<b>Information Systems Engineering</b>  Prof. Dr. Roland Holten	<b>Business Informatics &amp; Microeconomics</b>  Prof. Dr. Lukas Wiewiorra	<b>Mobile Business &amp; Multilateral Security</b>  Prof. Dr. Kai Rannenberg

# Chair of Business Administration, especially Business Informatics, Mobile Business and Multilateral Security

Chair of Mobile Business & Multilateral Security

Theodor-W.-Adorno-Platz 4  
Campus Westend  
RuW Building, 2<sup>nd</sup> Floor

Phone: +49 69 798 34701  
Email: [info@m-chair.de](mailto:info@m-chair.de)  
URL: [www.m-chair.de](http://www.m-chair.de)



# Team & External PhD Students



**Kai  
Rannenberg**



**Narges  
Arastouei**



**Diana  
Weiss**



**Peter  
Hamm**



**Ann-Kristin  
Lieberknecht**



**Sascha  
Löbner**



**Ahad  
Niknia**



**Frédéric  
Tronnier**



**Tim  
Schiller**



**Michael  
Schmid**



**Christopher  
Schmitz**



# Selected Alumni



Prof. Dr.  
Jan  
Muntermann  
*Göttingen  
University*



Dr. Stefan  
Figge  
*BuyIn  
(Deutsche  
Telekom /  
Orange)*



Dr. Mike  
Radmacher  
*Deutsche  
Telekom*



Dr.  
Andreas  
Albers  
*Deutsche  
Telekom*



Dr.  
Stefan  
Weiss  
*Swiss Re*



Prof. Dr. Denis  
Royer  
*Ostfalia -  
Hochschule für  
angewandte  
Wissenschaften*



Dr.  
Markus  
Tschersich  
*Continental*



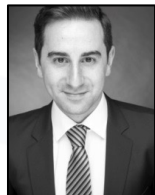
Dr.  
Ahmad  
Sabouri  
*Continental*



Dr.  
Falk  
Wagner  
*EE*



Dr.  
Christian Kahl  
*CyberSolution  
s GmbH*



Dr.  
Gökhan  
Bal  
*Deutsche  
Bahn*



Dr.  
André Deuker  
*KfW*



Dr. Shuzhe  
Yang  
*GLS*



Dr.  
Ahmed  
Yesuf  
*FARO*



Dr.  
Welderufael  
Tesfay  
*Deutsche  
Telekom*



Dr.  
Fatbardh  
Veseli  
*Capgemini  
Germany*



Dr.  
Majid  
Hatamian  
*Google*



Dr.  
habil.  
Sebastian  
Pape  
*Continental*



Dr.  
David  
Harborth  
*Capgemini  
Invent*

**Office:**

**Diana Weiß**

**Email: [diana.weiss@m-chair.de](mailto:diana.weiss@m-chair.de)**

**Office Hours: On appointment**



## Vita of Kai Rannenberg

Einbeck, Göttingen, Eystруп, Wolfsburg, ...  
TU Berlin (Dipl.-Inform.)  
Uni Freiburg (Dr. rer. pol.)

Dissertation on **“Kriterien und Zertifizierung  
mehrseitiger IT-Sicherheit“**  
Standardization at ISO/IEC JTC 1/SC 27 and DIN NI-27

Kolleg **“Sicherheit in der Kommunikationstechnik“**  
Gottlieb Daimler- and Karl Benz-Foundation

**Multilateral Security:**  
**“Empowering Users, Enabling Applications“, 1993 - 1999**





## Recent History

1999-09 till 2002-08

Microsoft Research Cambridge UK

[www.research.microsoft.com](http://www.research.microsoft.com)

Responsible for “Personal Security Devices  
and Privacy Technologies”



2001-10 Call for this chair

2001-12 till 2002-07 Stand-in for the chair

Since 2002-07 Professor at Goethe University Frankfurt at the Faculty of Business and Economics (FB02)

Since 2012-04 Visiting Professor at the National Institute for Informatics (Tokyo, Japan)

Since 2020-07 Professor, by courtesy, Goethe University Frankfurt at the Faculty of Computer Science and Mathematics (FB12)



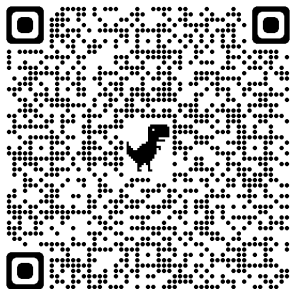
**Dr. Ahad Niknia,**

RuW Building, Office 2.232

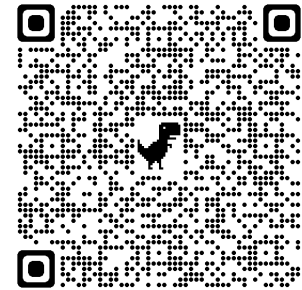
Phone: 069 / 798 - 34705

Email: [ahad\[dot\]niknia\[at\]m-chair\[dot\]de](mailto:ahad[niknia@m-chair.de])

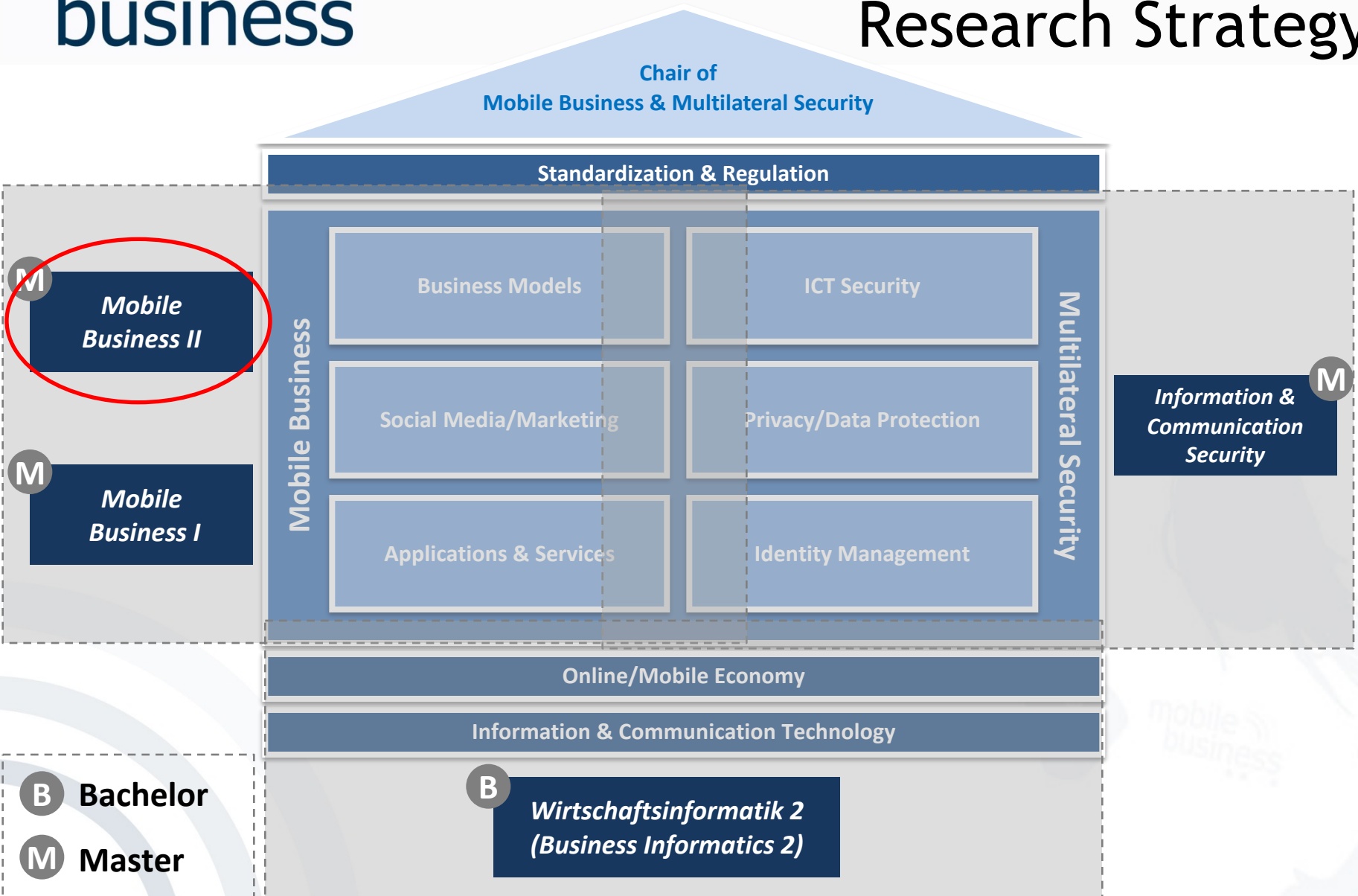
Contact address: [mob2\[at\]m-chair\[dot\]de](mailto:mob2@m-chair.de)



- **Course agenda is online.**
  - Please keep yourself updated!
  - Check the website of the course:
    - <https://www.m-chair.de/teaching?view=article&id=260:mobile-business-ii-application-design-applications-infrastructures-and-security-summer-2023&catid=2:uncategorised>
- Exam:
  - <https://www.wiwi.uni-frankfurt.de/en/faculty/deans-office/operational-divisions/examination-office.html>



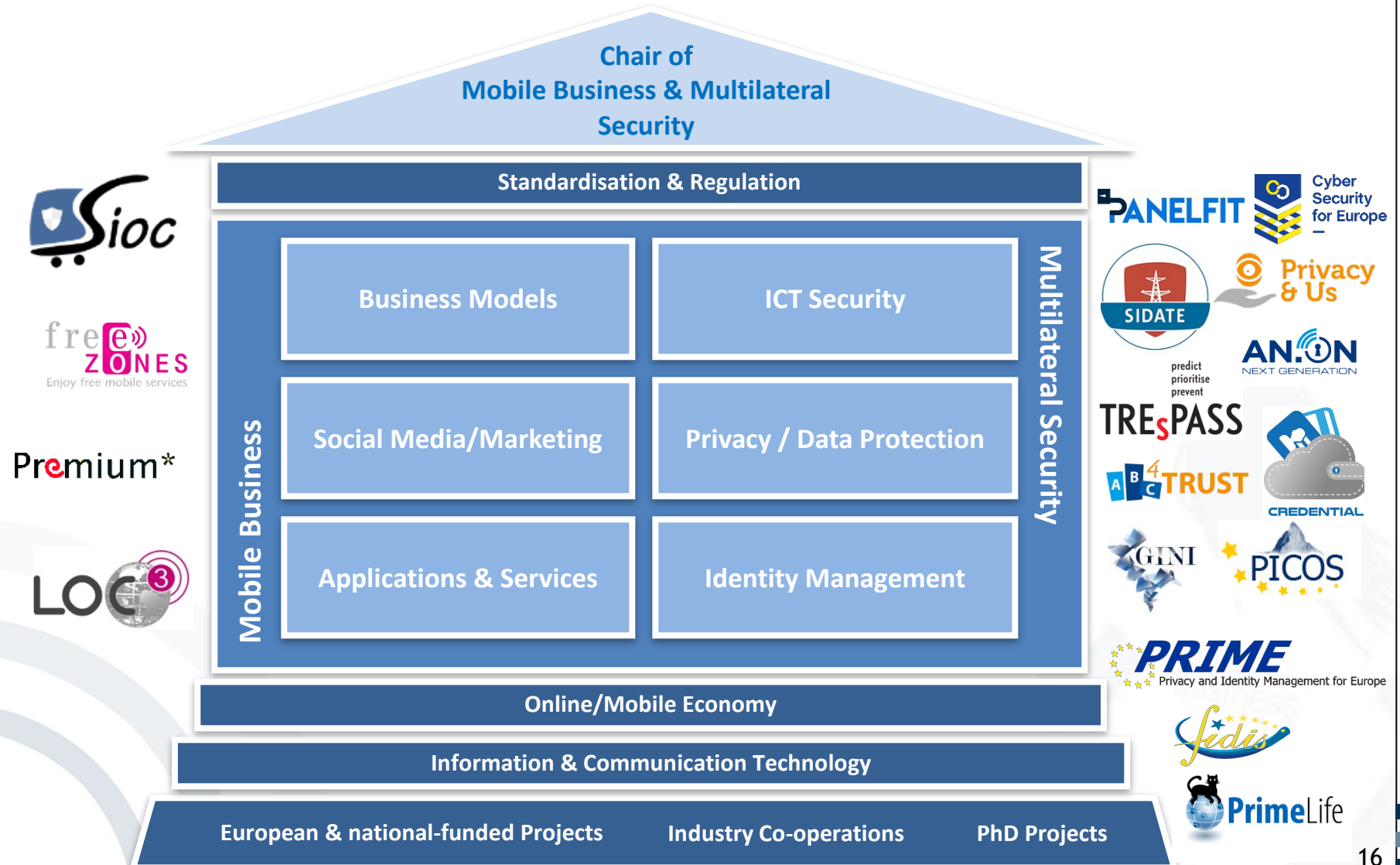
- The Chair of M-Business and Multilateral Security
- Teaching and Research Agenda
- Introduction into Mobile Business - History of Mobile Business & Mobile Telecommunication Systems
- Outline of this Course



	SS 2023	WS 2023/2024
Bachelor	<p><i>Course</i> <b>Business Informatics 2 (PWIN)</b></p> <p><i>Seminar</i> <b>Machine Learning: Privacy, Regulations and Ethical Issues</b></p>	<p><i>Course</i> <b>Business Informatics 2 (PWIN)</b></p>
Master	<p><i>Course</i> <b>Mobile Business II: Application Design, Applications, Infrastructures and Security</b></p> <p><i>Course</i> <b>Privacy vs. Data: Business Models in the digital, mobile Economy</b></p>	<p><i>Course</i> <b>Mobile Business I: Application Design, Applications, Infrastructures and Security</b></p> <p><i>Seminar</i> <b>Data Privacy Analysis in Cloud Services</b></p>

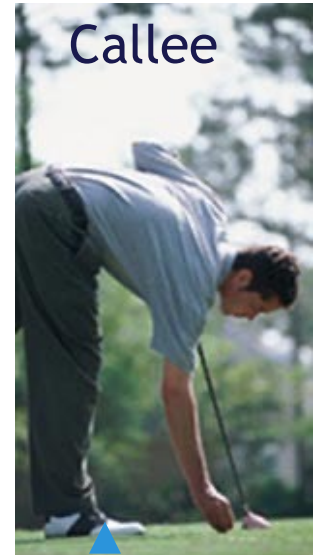
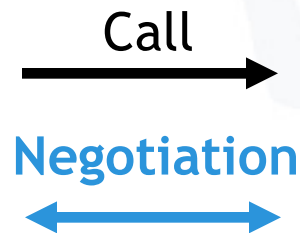
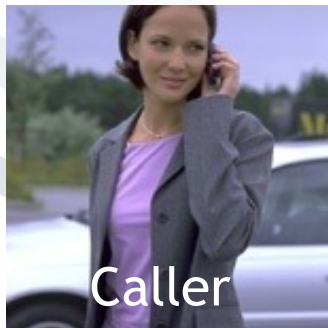


- **Multilateral Security**
  - Security, Trust and Privacy
  - Mobile Signatures
  - Personal Security Devices
- **Mobile Life, Work, and Business**
  - Location Based Services
  - Mobile Communities
- **M-Infrastructures**
  - Combination, Integration, Innovation
  - Standardisation, Regulation



### The features


- User specified automatic call filtering
- Higher protection for caller and callee
- Range of possibilities to signal urgency
- Range of reaction possibilities



# Topics of Negotiation

- Extent of identification
- Urgency of the call
- Security requirements
  - authentication
  - confidentiality
  - non-repudiation



**RMS Call**  
**Who** Rannenberg, Katrin  
◆ **My ID:** none  
◆ **Subject:** Meeting?  
  
**Urgency:**  
☒ Normal    ☐ High    ☐ Emergency  
  
**Security Settings:** View Details  
◆ **Confidentiality:** Important  
◆ **Authentication:** Don't care  
  
Cancel Call

# Expressing Arguments for Your Call

Statement of urgency

“It is really urgent!”

Specification of a function

“I am your boss!”

Specification of a subject

“Let’s have a party tonight.”

Presentation of a voucher

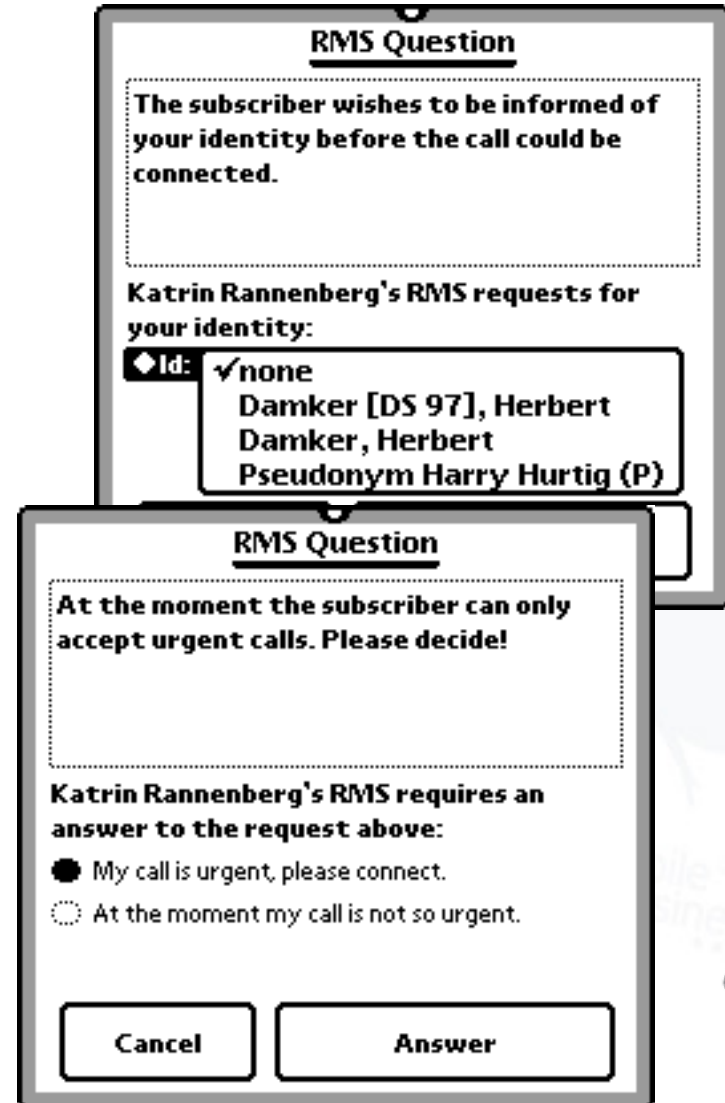
“I welcome you calling back.”

Provision of a reference

“My friends are your friends!”

Offering a surety

“Satisfaction guaranteed  
or this money is yours!”



**RMS Question**

The subscriber wishes to be informed of your identity before the call could be connected.

Katrin Rannenberg's RMS requests for your identity:

◆ Id: ☒ none  
Damker [DS 97], Herbert  
Damker, Herbert  
Pseudonym Harry Hurtig (P)

**RMS Question**

At the moment the subscriber can only accept urgent calls. Please decide!

Katrin Rannenberg's RMS requires an answer to the request above:

☒ My call is urgent, please connect.  
☐ At the moment my call is not so urgent.

Cancel Answer



# RMS Accepted Call (Callee Display)

- Bell is ringing!
- Callee notified
- Callee can still decide to accept or deny the call.

RMS
100

♦ Current Situation: **Private**

Accept Call?


Call with normal urgency  
**For:** Kai Rannenberg  
**From:** Herbert Damker  
**Subject:** Paper accepted!


Stop Ringing


Deny
Accept


i
+Show


Send
Call
X


  
 Names

  
 Dates

  
 Extras

  
 Undo

  
 Find

  
 Assist





## RMS Denied Call (Caller Display)

- Call not connected
- Caller gets information (configured by callee)
- Caller can leave a message or request a call back.

**RMS: Call denied**

Unfortunately the subscriber can not accept the call at the moment.

**Leave with Katrin Rannenberg:**

☒ Text message  
☐ Request for callback (with voucher)  
☐ No message

**Cancel** **OK**



## Situations

Set of rules how to deal with an incoming call

## Rules

Combination of features

Users can reconfigure initial rules and situations as they like.

### Define Situation 'Meeting'

<input type="checkbox"/>	Emergency	-> connect
<input type="checkbox"/>	Callback voucher	-> connect
<input type="checkbox"/>	Caller in group Colleagues	-> let caller decide Text: 'Request decision'
Else		-> deny Text: 'Not available'

### Define Rule

In the situation 'Meeting'  
my RMS should for ...

<input checked="" type="radio"/> all calls	<input type="radio"/> calls of class:
<input type="radio"/> business calls	<input type="radio"/> private calls

... and ...

<input type="radio"/> no caller ID
<input type="radio"/> caller want to be anonymous
<input checked="" type="radio"/> callback voucher
<input checked="" type="radio"/> caller in group:
<input type="radio"/> caller is:
<input type="radio"/> every caller
<input type="radio"/> Emergency

... do the following:

<input checked="" type="radio"/> connect
<input type="radio"/> deny
<input type="radio"/> divert to:
<input type="radio"/> require surety of \$10 and connect
<input type="radio"/> require subject and connect
<input type="radio"/> let caller decide
<input type="radio"/> require caller ID

Text to send: -



- **Fictitious**, but **realistic** cases
- **Real users:**  
ca 40 doctors, nurses,  
admin people, etc.
- 1 week **“Playtime”**
- 18 months **preparation  
and analysis:**  
workflow analysis  
usability tests, script  
writing, attack planning



- Reachability manager
- Negotiating security
- Identities and pseudonyms
- Signing device
- Medical information (patient records and knowledge base)
- Hospital communication

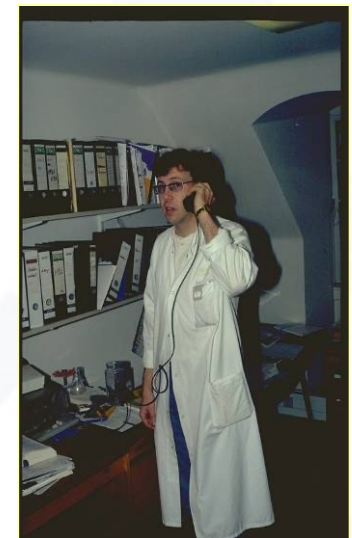
### Overall results

- High benefit for everyday tasks
- Increasing awareness of security
- Integration of asynchronous messages very useful
- Manual filtering of calls often used

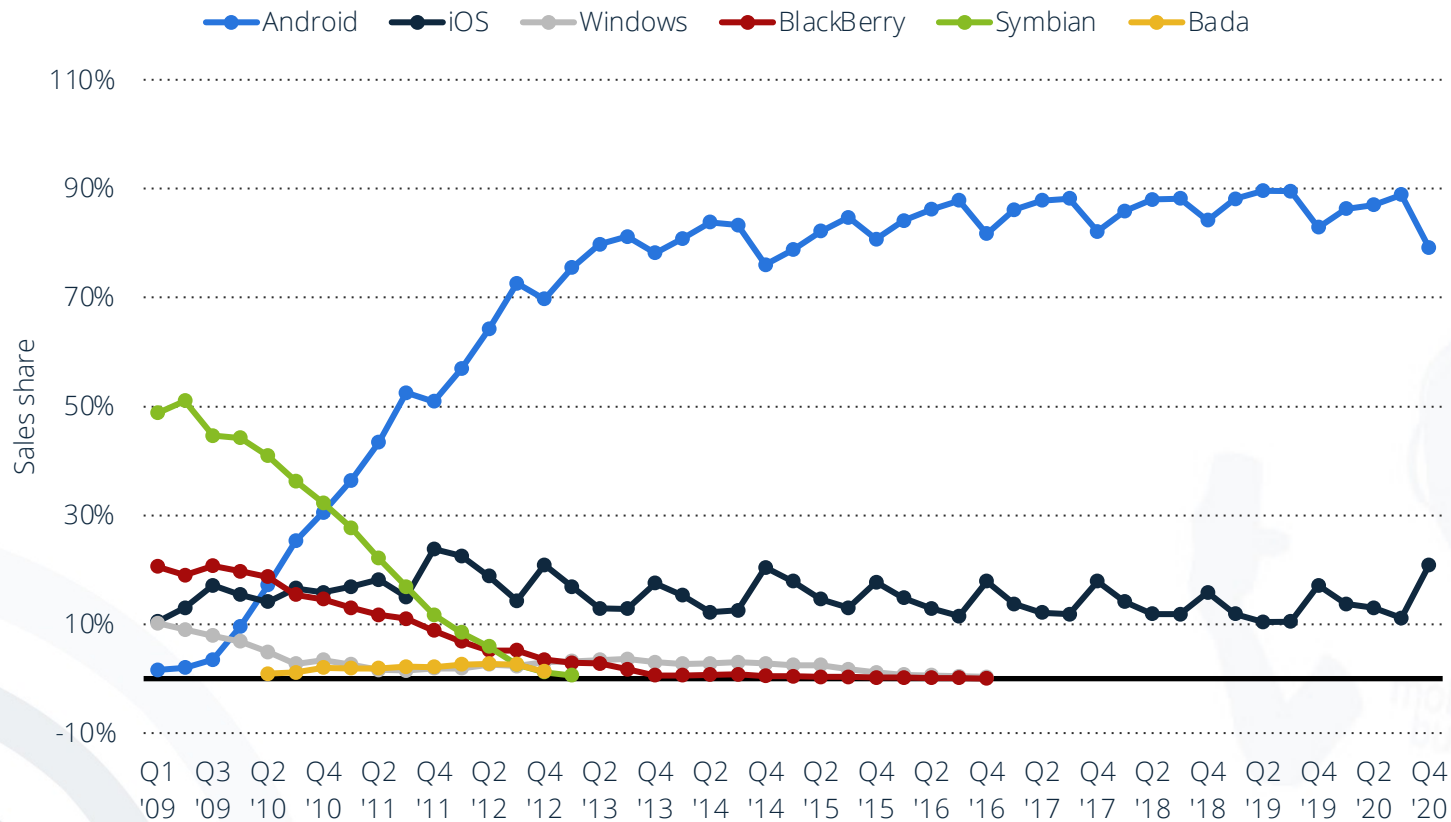
### User demands

- Smaller device - RMS functionality in mobile phone
- Integration of full-flavour email
- Authentication also during a call

Many more *design hints*



# Worldwide Smartphone Sales to End Users by Operating System (2009-2020)



# Mobile Applications are getting more and more popular

- Over 1.6 milion Applications in Apple's App Store in Q3-2022
- Centralised marketplace for software
- Several (dis)advantages compared with websites like
  - Access to hardware resources (like GPS)
  - Offline functionalities
  - Has to be developed for each OS individually
  - Mobile native apps vs. mobile web apps
- HTML5 enables mobile webpages to be an alternative to apps.





- The Chair of M-Business and Multilateral Security
- Teaching and Research Agenda
- Introduction into Mobile Business - History of Mobile Business & Mobile Telecommunication Systems
- Outline of this Course

# What is Mobile Business ?

- There are as many definitions as interested parties.
- “Ask again in 5 years at best, then we will have further information ...”
- A multitude of related notions:  
E/C/V-Business, Mobile Commerce, Mobile...
- Hypes and myths
  - “Mobile Business is THE future!”
  - “Mobile Business is just a hype!”

# What is Mobile Business ?

We chose a definition that (hopefully) lets us do interesting things:

*“The usage of  
mobile devices, infrastructure,  
communication and interaction  
for  
mobile applications and  
transactions.”*

- Workplaces and private life will change thoroughly through mobile technologies and services.
- This implies extraordinary challenges and chances.
- The development will be strongly affected by international factors.



## GSM World

**Equipment Manufacturers**  
(Apple, Samsung, Microsoft, Nokia,  
Lenovo/Motorola, Huawei, ...)

**Telcos**  
(Telekom, Vodafone, Telefónica...)



IBM,  
Infineon, ...

MS, ...

Dell, ...

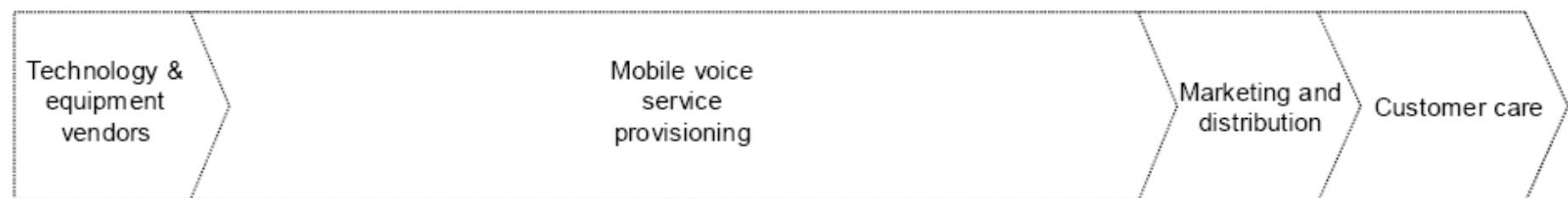
Cisco,...

Telekom  
Vodafone  
...

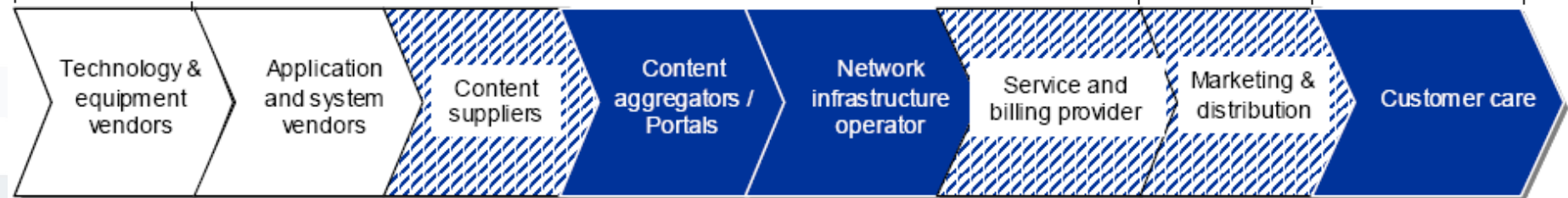
MS,  
IBM,  
...

MS,  
SAP,  
Telekom,  
Google  
...

## TRADITIONAL VALUE CHAIN OF MOBILE SERVICE DELIVERY



## EMERGING MOBILE OPERATOR VALUE CHAIN



Primary opportunity for operator



Some opportunity



Opportunity through alliances



## What makes Mobile Business mobile?

- Customers?
  - Terminals?
  - Service provisioning?
  - Means of payment?
  - Possibilities of interaction?
  - Business cases for Mobile Operators (and others)?
- ➡ One instrument for analysing are scenarios & visions.

# Popular misunderstandings

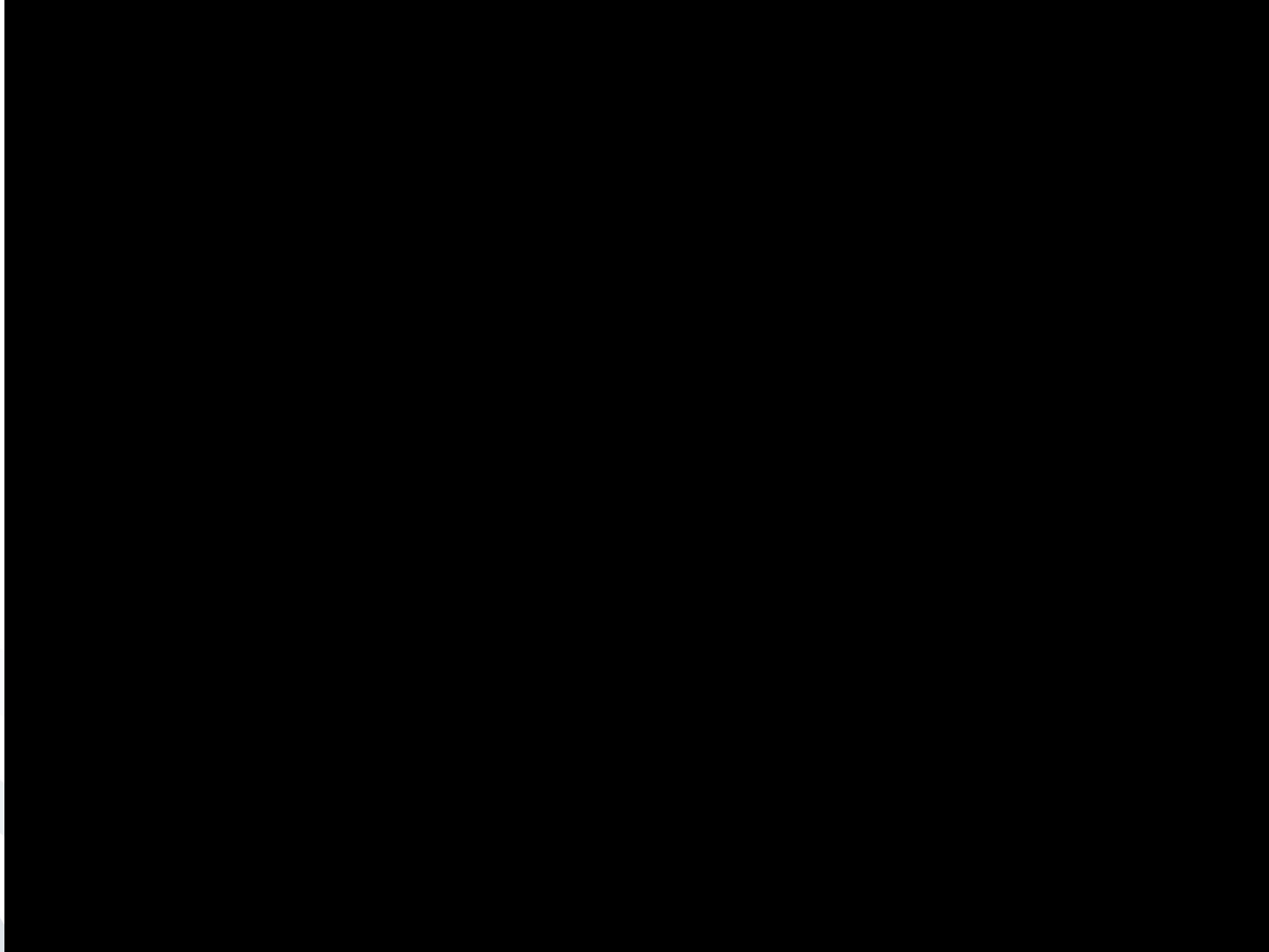
- Not every country's scenario (e.g. health care) can simply be transferred to another country.
- Mobile Business does not only relate to mobile phones. Other platforms are important, too.



- Classification of videos
  - Videos are useful because they convey visions.
  - Visions have to be benchmarked by reality.
  - Which aspects of visions are reasonable / useful?
  - What is necessary for their realization?
  - Can a business model emerge from this?
  - For whom?

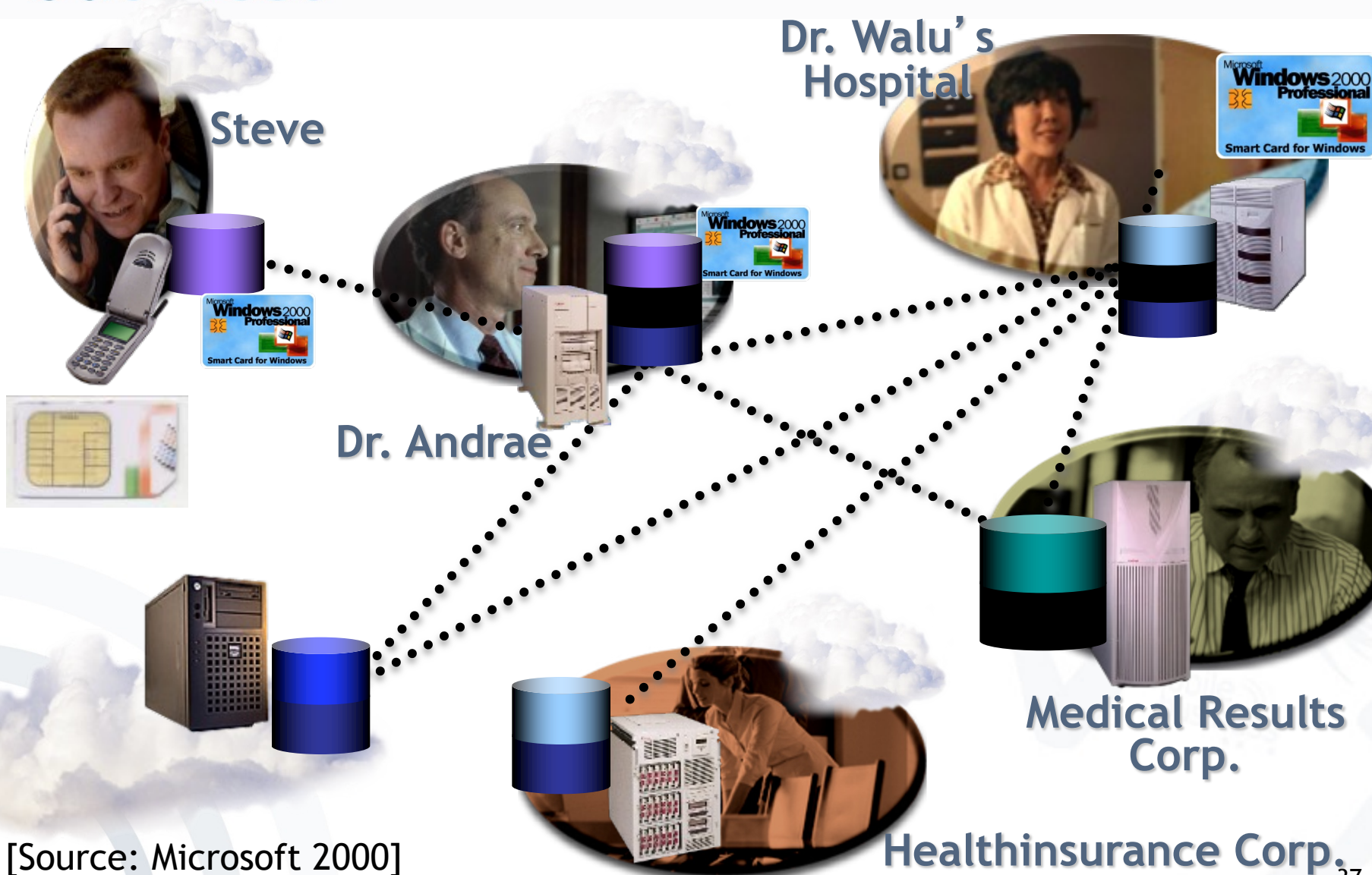


# Illustrative Microsoft Video



# mobile business

## Parties Involved



[Source: Microsoft 2000]

## History of Mobile Business Early Approaches



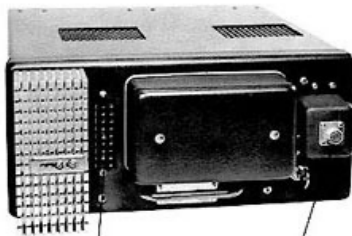
- February 14, 1876. Alexander Graham Bell, a Scotch deaf-mute teacher, patents his telephone (no. 174.465).
- June 17, 1946. AT&T and Southwestern Bell introduce MTS (mobile radio telephone service) in St. Louis, Missouri.



GE DTD/DTO Mobile Telephone  
DIAL CONTROL UNIT



GE DTD/DTO Mobile Telephone  
MANUAL CONTROL UNIT

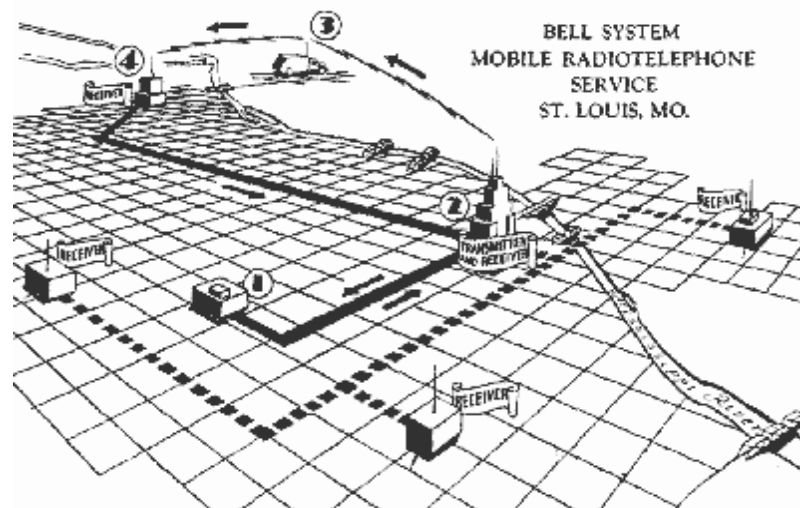


POWER/CONTROL CABLE  
POWER/CONTROL CONNECTOR



ANTENNA CONNECTOR

ANTENNA





# History of Mobile Business

## Early German Mobile Networks

- 1958 A-Net (till 1977)
- 1972 B-Net (till 1994)
- 1986 C-Net (till 2000)



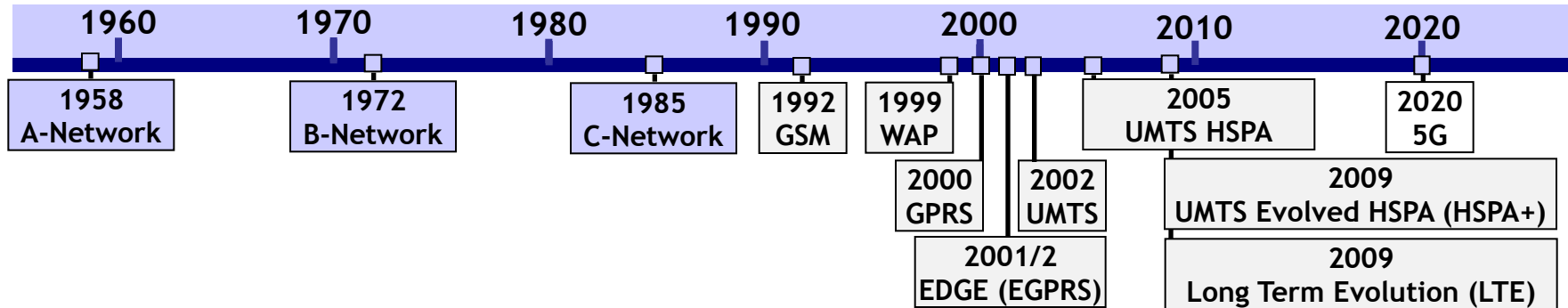


- Since 1981 NMT-450 (Nordic Mobile Telephone) in Norway, Sweden, Saudi Arabia, Denmark, Finland, ...



- First GSM trials 1991
- Commercial usage since 1992
- First digital mobile radio network with high voice quality and reliability (roaming).
- Global diffusion in more than 212 countries with more than 1 billion users.
- In February 2004 the first commercial mobile radio network (based on GSM) was launched in Iraq.
- GSM is the basis of data services like GPRS and EGDE.





### A-Network (1958 - 1977)

Switching was done manually by operators (switchboard clerks). To call one needed to know the location area of the mobile station.



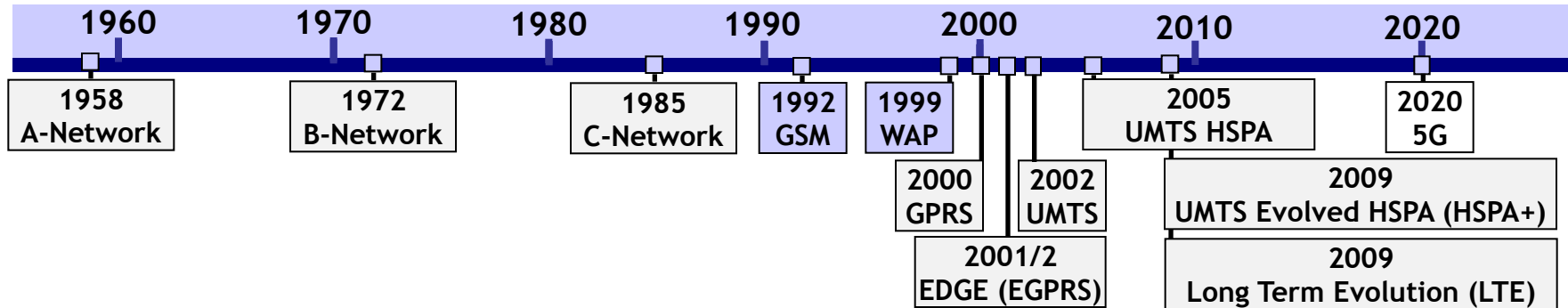
### B-Network (1972 - 1994-12-31)

Callers could call mobile stations directly, but needed to know the current mobile station's area and use the respective area code.



### C-Network (1985 - 2000-12-31)

First German cellular mobile radio network with centralized management of the mobile station's location



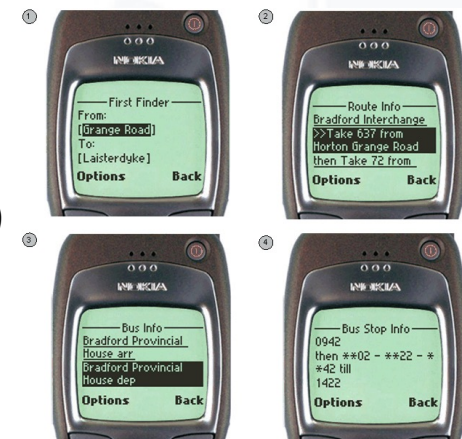
### GSM

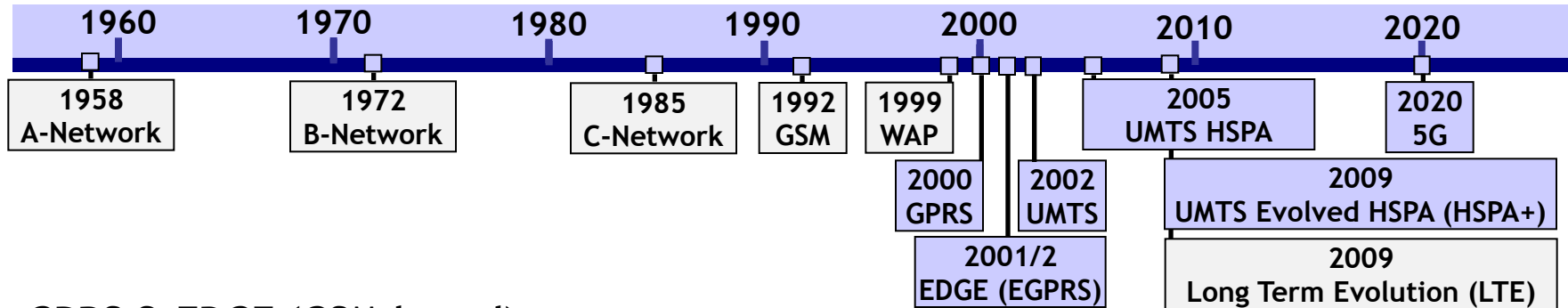
The technical standard for digital mobile radio networks in more than 100 countries; GSM includes data transfer services.

### WAP

The WAP standard describes a protocol suite. With special mobile phones certain mobile contents (pages) are accessible using WAP-enabled mobile phones.

[Source: WAP 2010]





## GPRS & EDGE (GSM-based)

Further development of the GSM standard: Data is transferred in packets. EDGE is an enhancement to GPRS and provides increased data transmission rates (3 to 4 times faster than GPRS).

## UMTS (3G) network

Third mobile radio standard and the successor of GSM for mobile multimedia incl. video and audio transmissions

## UMTS High Speed Packet Access (HSPA), UMTS Evolved HSPA (HSPA+)

HSPA and Evolved HSPA (HSPA+) provide enhanced performance in speed and latency.

## Long Term Evolution (LTE)

LTE is the first all-IP mobile network technology. It provides significantly higher data rates, capacity and lower latency than HSPA and HSPA+.

## Fifth generation cellular network technology (5G)

5G offers higher data rates (up to 10 Gbit/s), lower latency and use of higher frequency spectrums.

## Sixth generation cellular network technology (6G)

Research on 6G started in 2017, data rates up to 400 Gbit/s.

- The Chair of M-Business and Multilateral Security
- Teaching and Research Agenda
- Introduction into Mobile Business - History of Mobile Business & Mobile Telecommunication Systems
- Outline of this Course

- Interest ...
  - ... in new topics
  - ... in the interaction of technology, business, economy and society
  - ... in experiments
- Other Business Informatics lectures help but are not mandatory.





## Lectures

1. Introduction
2. Positioning Methods for Location-based Services (LBS)
3. LBS Business Models
4. Cryptography
5. Electronic Signatures
6. Mobile Payment I
7. Mobile Payment II
8. Data Protection / IdM
9. Regulation of Mobile Telecommunication
10. Regulation by Licensing
11. HCI Issues
12. Design Evaluation
13. Current Research / Q&A

## Please Note:

Electronic library of Journals, access to more than 2000 Journals

<http://www.ub.uni-frankfurt.de/online/emedien.html>

Available only for University members via HRZ account (141.2.XXX.XXX IP-addresses; PC Pool) or via University Library login:

[www.ub.uni-frankfurt.de/login.html](http://www.ub.uni-frankfurt.de/login.html)



[search.epnet.com/login.asp](http://search.epnet.com/login.asp)  
[www.jstor.org](http://www.jstor.org)



## Online search engines:

[scholar.google.com](http://scholar.google.com)

[academic.live.com](http://academic.live.com)

[Apple 2023]

<https://www.apple.com/app-store/> visited 2023.04.06

[Microsoft 2000]

Microsoft (2000) Materials for the Introduction of .net

[Passerini et al. 2004]

Passerini, K.; Gagnon, S. Cakici, K. (2004) Opportunities in the Digital Economy: A New Value Chain and Services for Mobile Telecom Operators, in: C. Bullen and E. Stohr (Eds.) *Proceedings of the 10th American Conference on Information Systems*, New York, NY, USA, pp.2530-2535.

[Statista2020]Marktanteile der führenden Betriebssysteme am Absatz von Smartphones weltweit vom 1. Quartal 2009 bis zum 4. Quartal 2020.

<https://de.statista.com/statistik/daten/studie/73662/umfrage/marktanteil-der-smartphone-betriebssysteme-nach-quartalen/>

[Statista 2022] Number of apps available in leading app stores as of 3rd quarter 2022

<https://www.statista.com/statistics/276623/number-of-apps-available-in-leading-app-stores/>

[WAP 2010]

[www.wapforum.org/what/technical.htm](http://www.wapforum.org/what/technical.htm), accessed 01-10-2010.

<https://www.wapforum.org/what/index.htm>, accessed 01-10-2022