

## *Lecture 1*

# Introduction to Mobile Business II

Application Design, Applications,  
Infrastructures, and Security

**Mobile Business II (SS 2022)**

**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

<p><b>E-Finance</b></p> <p>Prof. Dr. Peter Gomber</p>	<p><b>Business Informatics (Informatics)</b></p> <p>Prof. Dr. Mirjam Minor</p>	<p><b>Information Systems Engineering</b></p> <p>Prof. Dr. Roland Holten</p>
<p><b>Business Education (associated)</b></p> <p>Prof. Dr. Gerhard Minnameier</p>	<p><b>Mobile Business &amp; Multilateral Security</b></p> <p>Prof. Dr. Kai Rannenber</p>	<p><b>Business Education (associated)</b></p> <p>Prof. Dr. Eveline Wuttke</p>
<p><b>Information Systems &amp; Information Management</b></p> <p>Prof. Dr. Wolfgang König</p>	<p><b>Business Informatics &amp; Microeconomics</b></p> <p>Prof. Dr. Lukas Wiewiorra</p>	<p><b>Business Informatics &amp; Information Management</b></p> <p>Prof. Dr. Oliver Hinz</p>

# 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, 2<sup>nd</sup> Floor

Phone: +49 69 798 34701

Fax: +49 69 798 35004

eMail: [info@m-chair.de](mailto:info@m-chair.de)

[www.m-chair.de](http://www.m-chair.de)



## Vita of Kai Rannenberg

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

Dissertation on **“Kriterien und Zertifizierung  
mehreseitiger 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)



**Kai Rannenberg**



**Sebastian  
Pape**



**Narges  
Arastouei**



**Welderufael  
Tesfay**



**David  
Harborth**



**Frédéric  
Tronnier**



**Ahad  
Niknia**



**Sascha  
Löbner**



**Ann-Kristin  
Lieberknecht**



**Peter  
Hamm**



**Markus  
Tschersich**



**Jetzabel  
Serna-  
Olvera**



**Mike  
Radmacher**



**Andreas  
Albers**



**Stefan  
Weiss**



**Shuzhe  
Yang**



**André  
Deuker**



**Christian  
Kahl**



**Gökhan  
Bal**



**Ahmad  
Sabouri**



**Tim  
Schiller**



**Niels  
Johannsen**



**Stephan  
Heim**



**Marvin  
Hegen**



**Fatbardh  
Veseli**



**Majid  
Hatamian**



**Michael  
Schmid**



**Christopher  
Schmitz**



**Office:**

Diana Weiß

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

Office Hours: Mo.-Fr. 09:00-15:00





**Peter Hamm, M.Sc.**

Building RuW, Office 2.223

Phone: 069 / 798 - 34666



**Frédéric Tronnier, M.Sc.**

Building RuW, Office 2.231

Phone: 069 / 798 - 34707



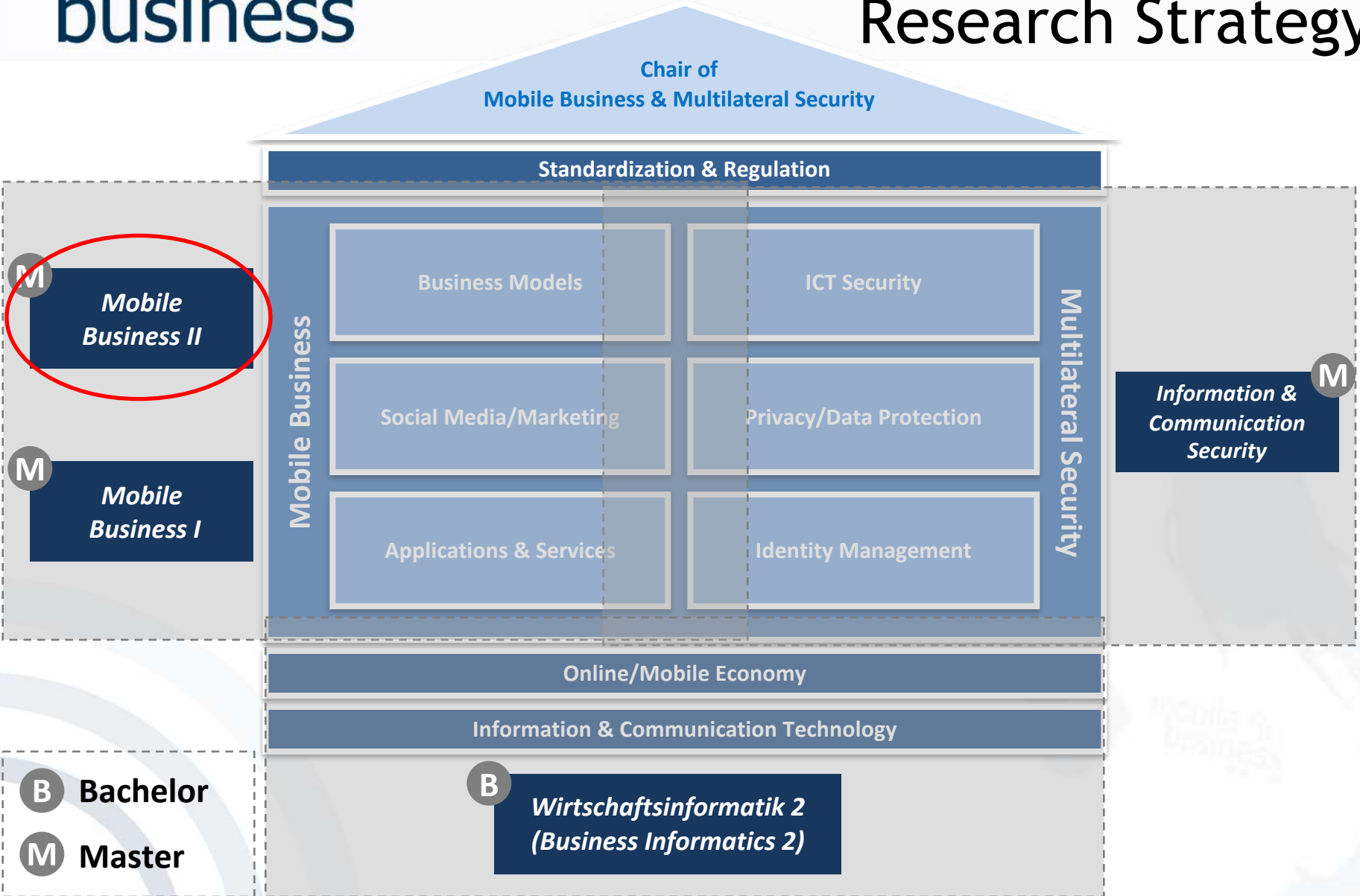
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[mob2@m-chair.de](mailto:mob2@m-chair.de)

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  - Please keep yourself updated!
  - Check the website of the course:
  - [https://m-chair.de/index.php?option=com\\_teaching&view=lecture&id=66](https://m-chair.de/index.php?option=com_teaching&view=lecture&id=66)

- The Chair of M-Business and Multilateral Security
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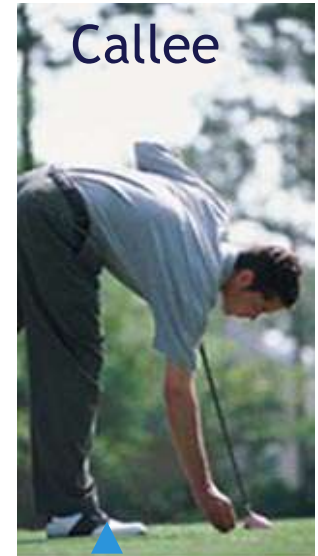
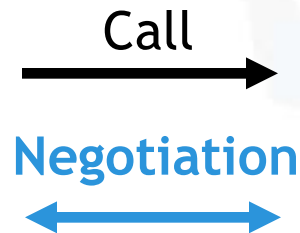


	SS 2022	WS 2022 / 23
Bachelor		<p><i>Course</i> <b>Business Informatics 2 (PWIN)</b></p>
Master	<p><i>Course</i> <b>Information &amp; Communication Security: Infrastructures, Technologies and Business Models</b></p> <p><i>Course</i> <b>Mobile Business II: Application Design, Applications, Infrastructures and Security</b></p> <p><i>Course</i> <b>Privacy vs. Data: Business Models in the digital, mobile Economy</b></p> <p><i>Seminar</i> <b>Privacy Analysis in Cloud Services</b></p>	<p><i>Course</i> <b>Mobile Business I: Technology, Markets, Platforms, and Business Models</b></p> <p><i>Seminar</i> <b>Digital Euro or Bitcoin: How will we pay in the future?</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](#)

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

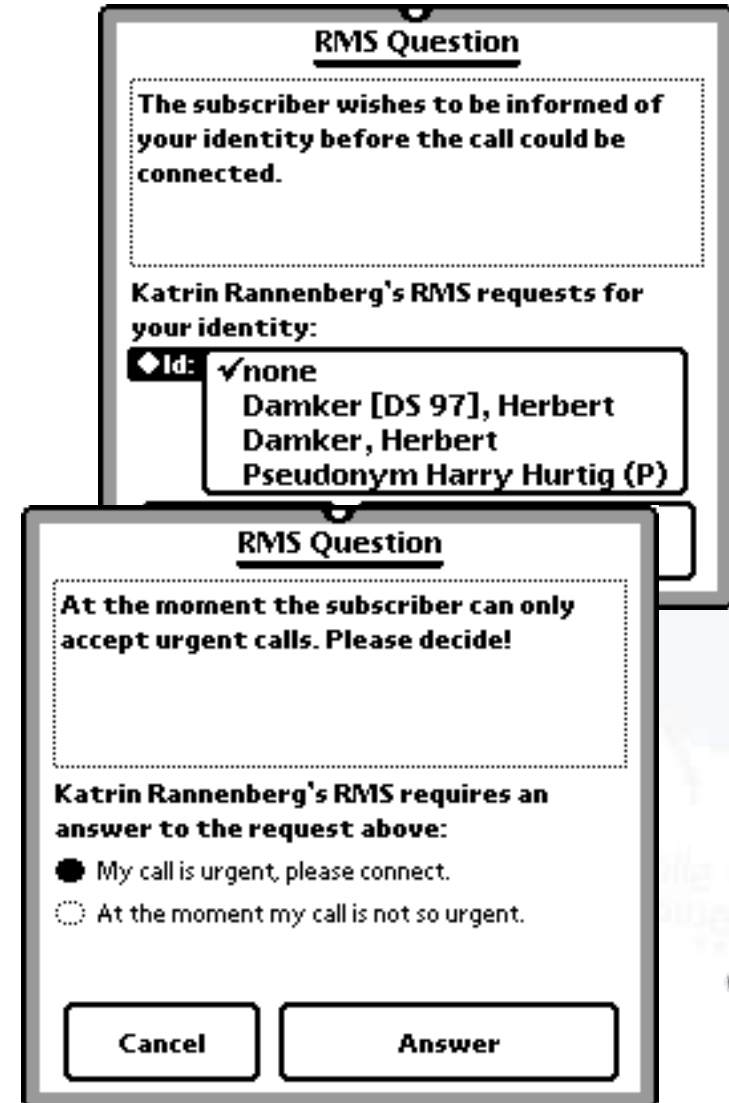
“I welcome you calling back.”

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!

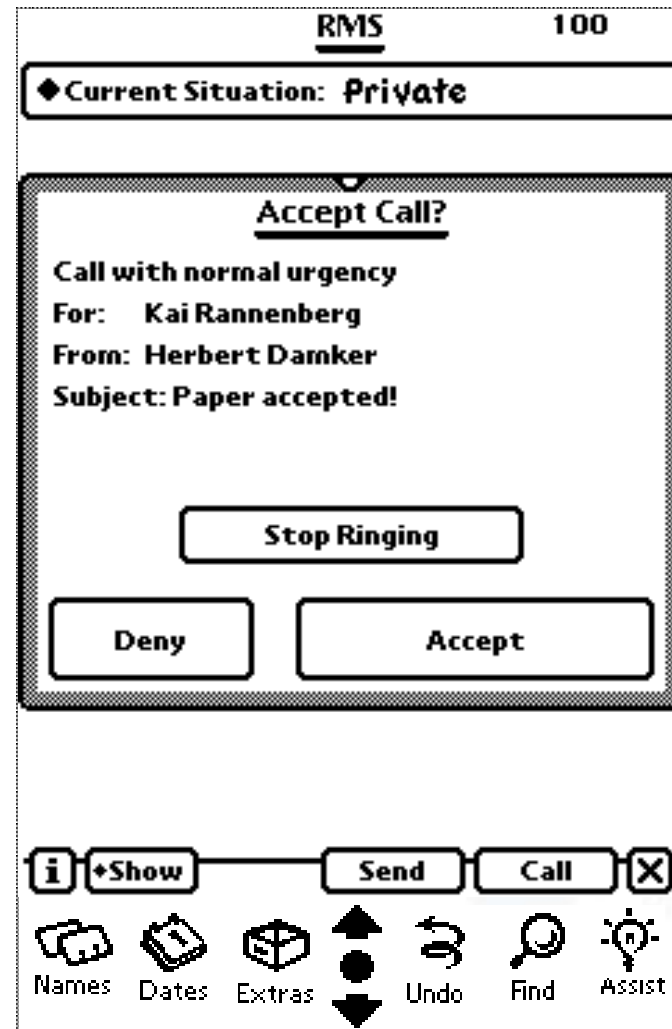
Katrin Rannenberg's RMS requires an answer to the request above:

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

Cancel Answer



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



- 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



## 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'**

Emergency  
-> connect

---

Callback voucher  
-> connect

---

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 ...**

all calls       calls of class:  
 business calls       private calls

**... and ...**

no caller ID  
 caller want to be anonymous  
 callback voucher  
 caller in group:  
 caller is:  
 every caller  
 Emergency

**... do the following:**

connect  
 deny  
 divert to:  
 require surety of \$10 and connect  
 require subject and connect  
 let caller decide  
 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

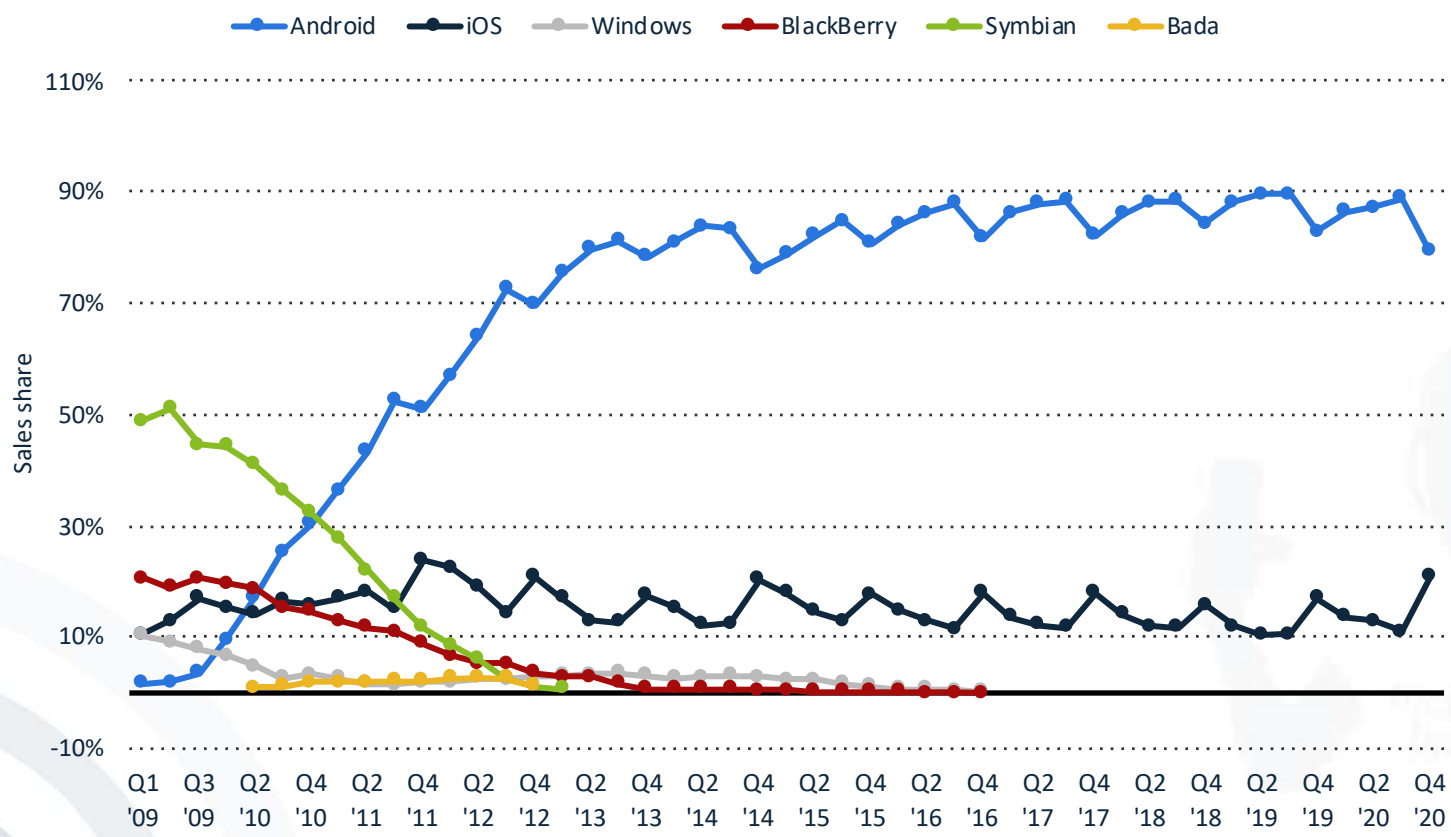
### User demands

- 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 4.754.000 Applications in Apple's App Store in August 2021
- 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.



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# 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 ?

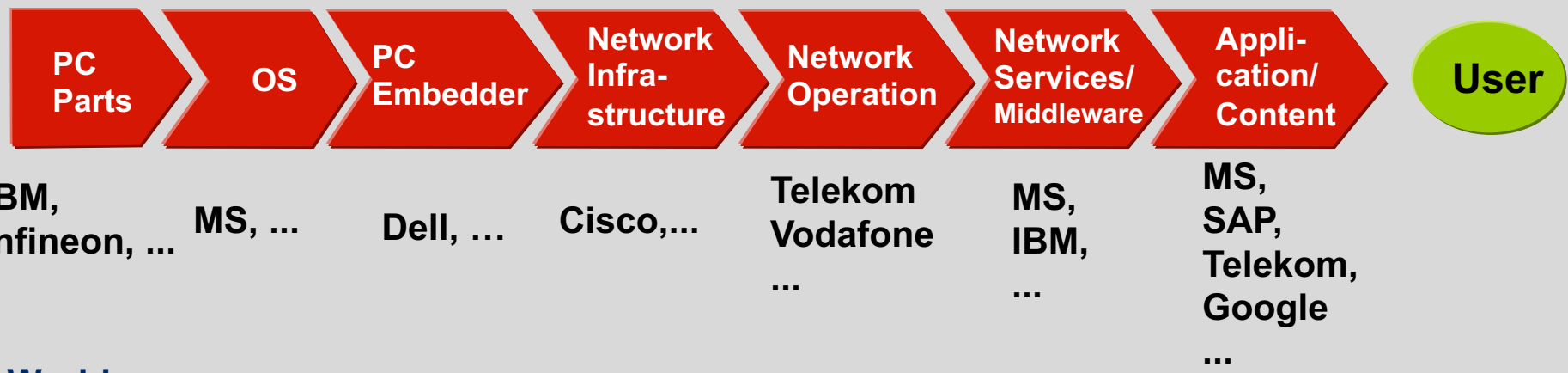
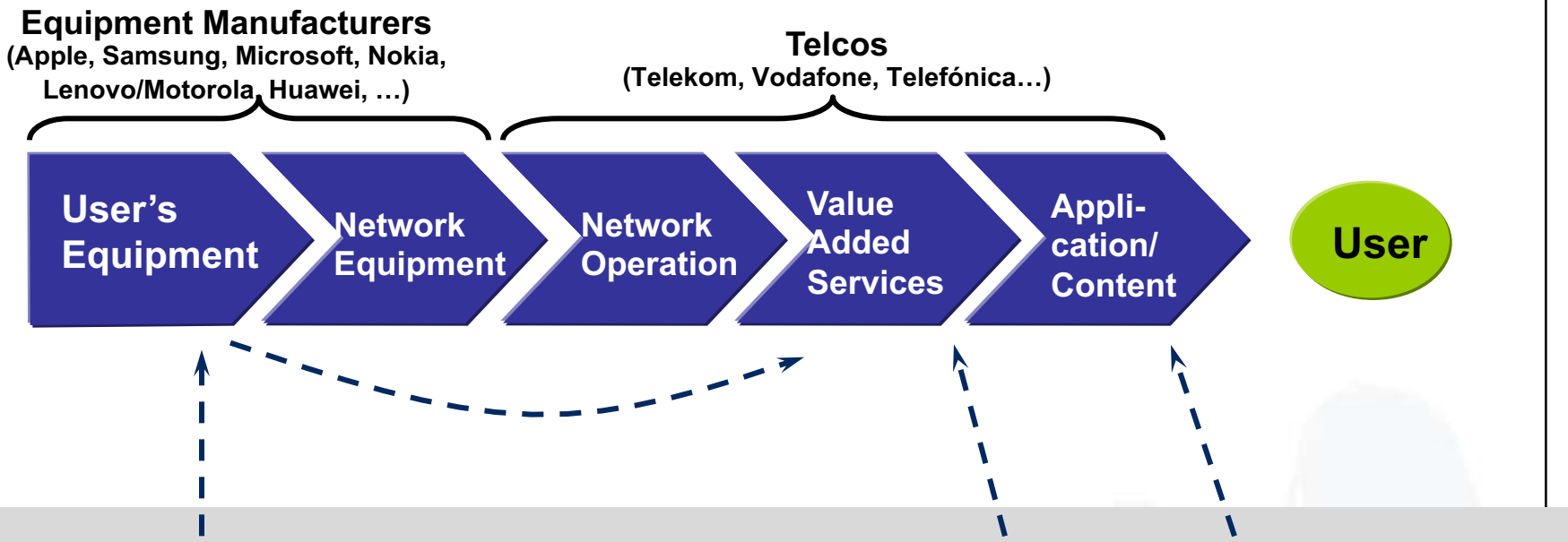
We chose a definition that (hopefully) lets us do interesting things:

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

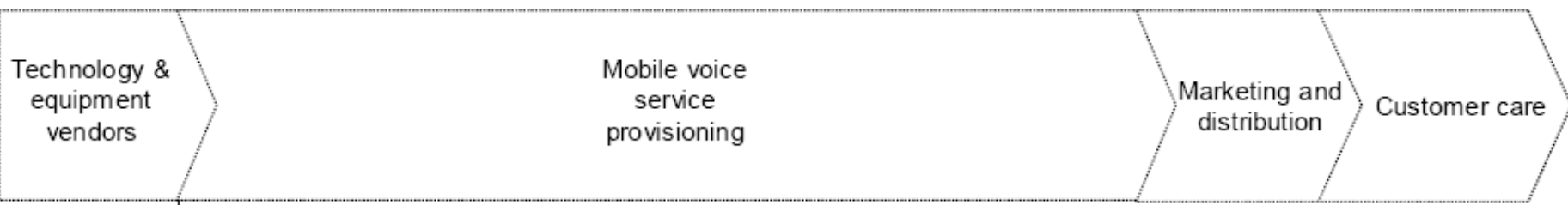
- Workplaces and private life will change thoroughly through mobile technologies and services.
- This implies extraordinary challenges and chances.
- The development will be strongly affected by international factors.



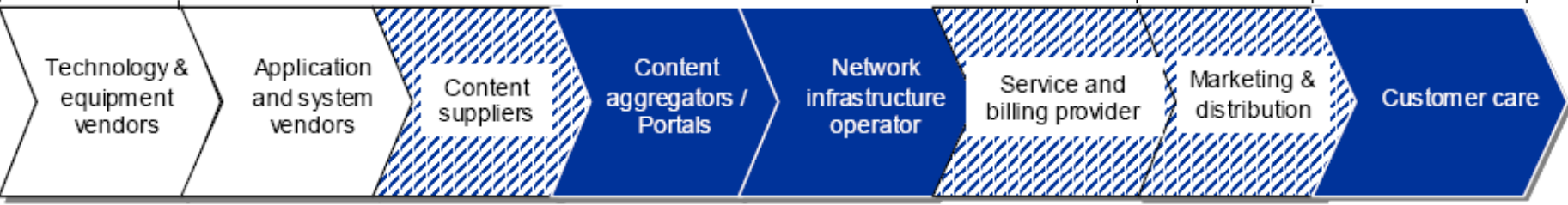
## GSM World






## TRADITIONAL VALUE CHAIN OF MOBILE SERVICE DELIVERY



## EMERGING MOBILE OPERATOR VALUE CHAIN



	<i>Primary opportunity for operator</i>		<i>Some opportunity</i>		<i>Opportunity through alliances</i>
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[Passerini et al. 2004]

## 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.



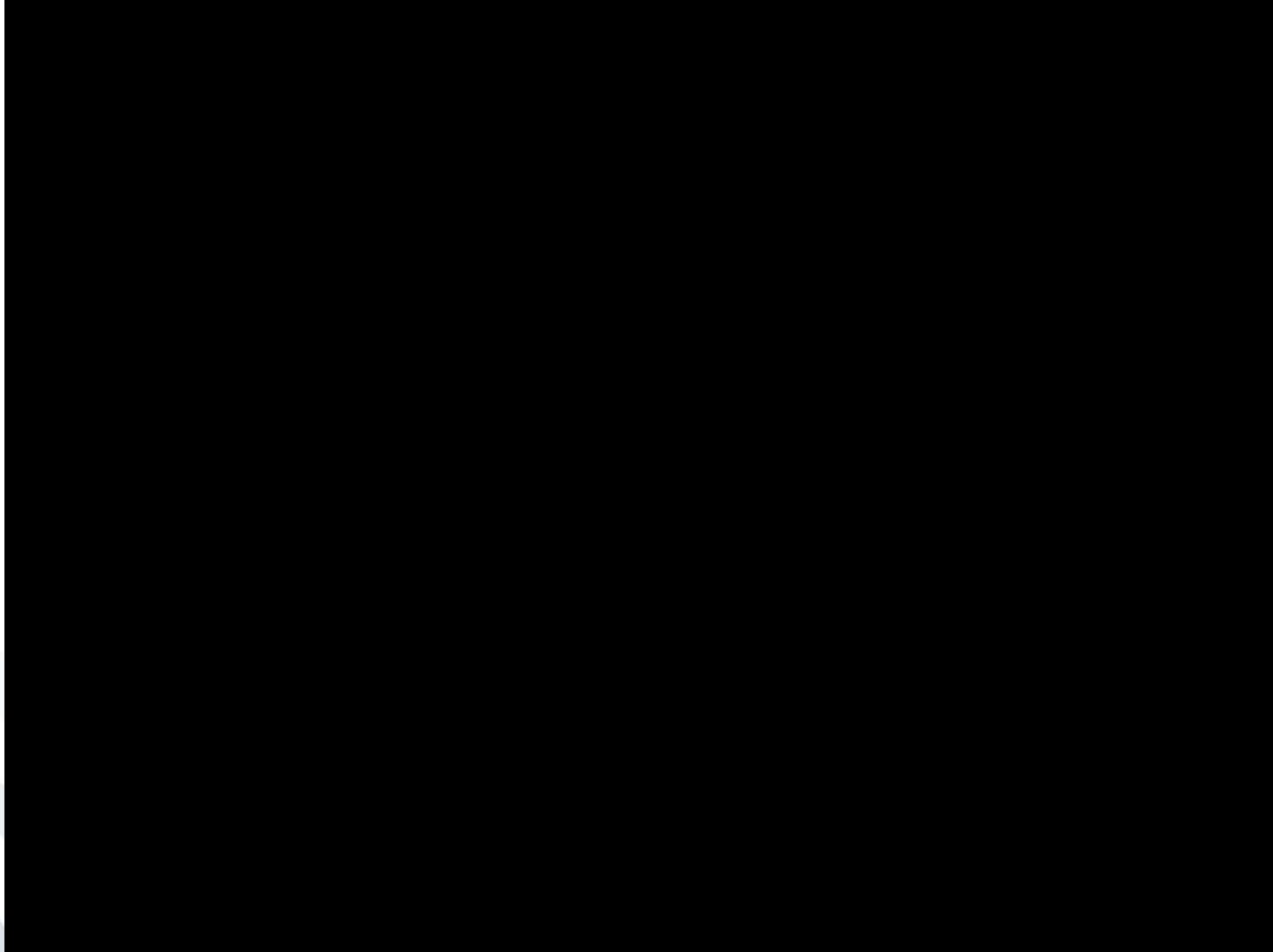
- Not every country's scenario (e.g. health care) can simply be transferred to another country.
- Mobile Business does not only relate to mobile phones. Other platforms are important, too.



- 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?

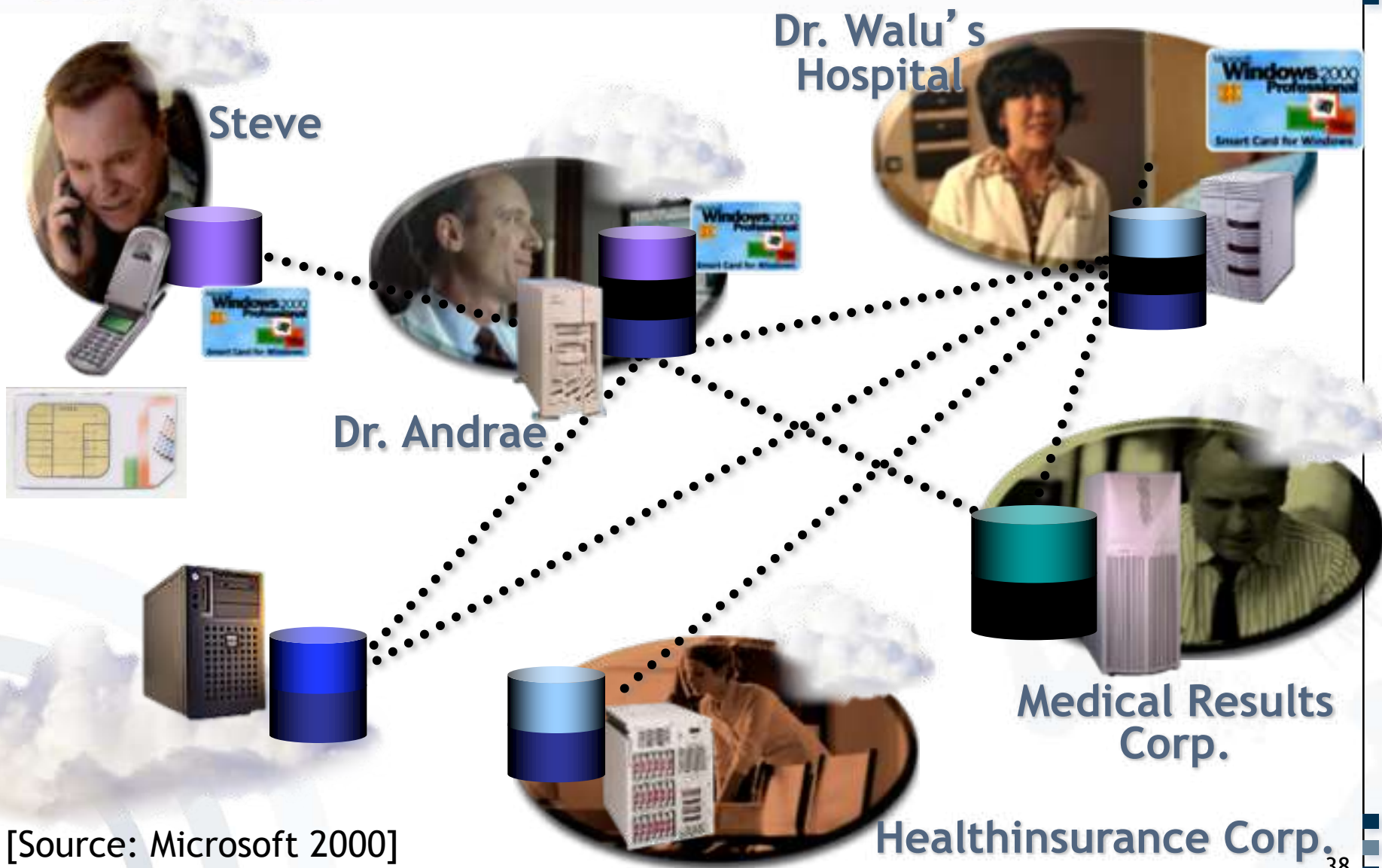


# Illustrative Microsoft Video



# mobile business

## Parties Involved



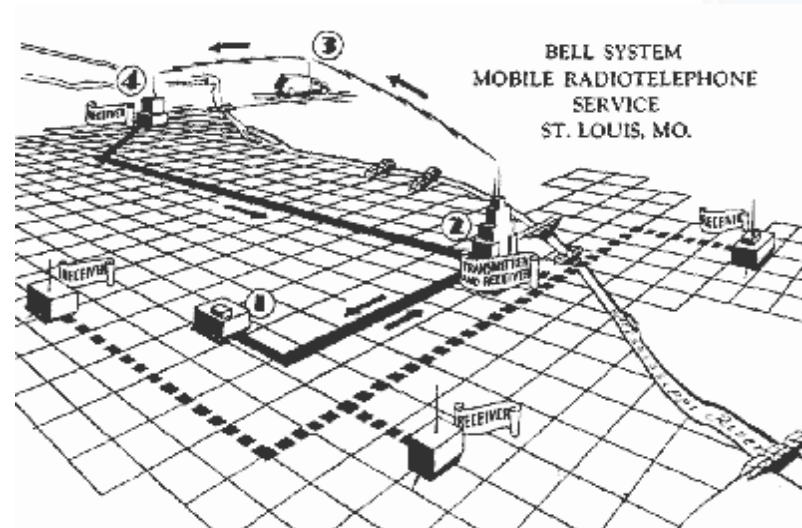
[Source: Microsoft 2000]

# 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.



# History of Mobile Business

## Early German Mobile Networks

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



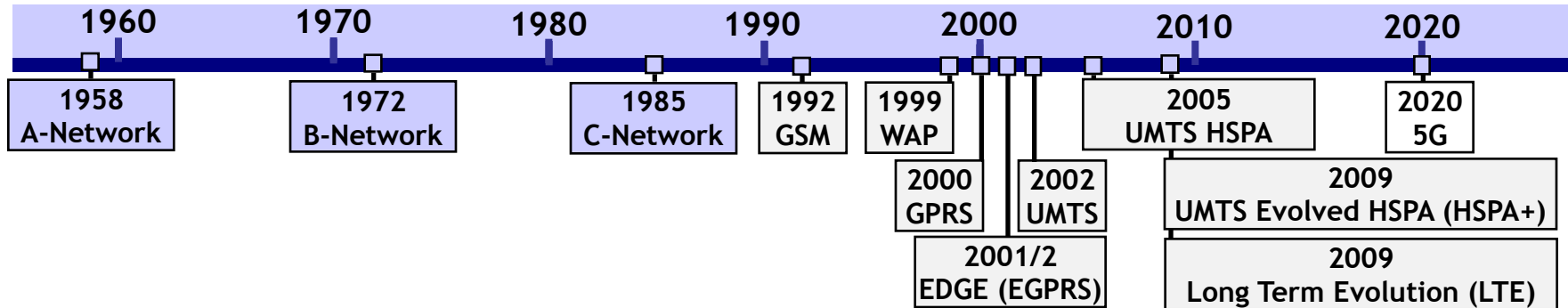
- Since 1981 NMT-450 (Nordic Mobile Telephone) in Norway, Sweden, Saudi Arabia, Denmark, Finland, ...



- 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 EDGE.







### 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.



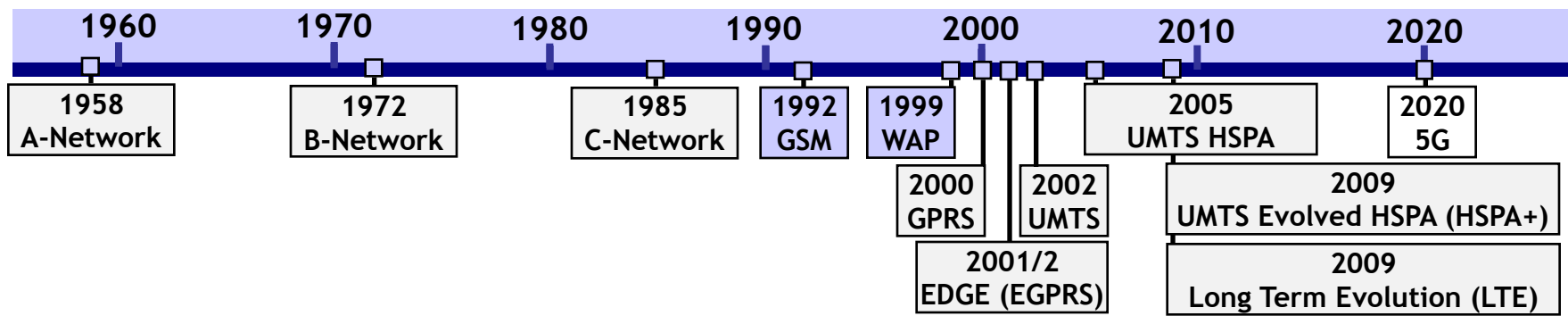
### B-Network (1972 - 1994-12-31)

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

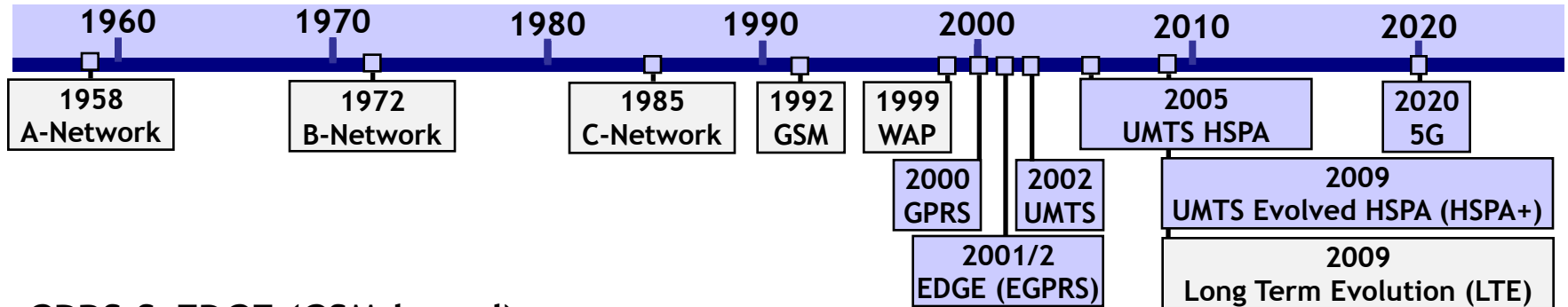
The technical standard for digital mobile radio networks in more than 100 countries; GSM includes data transfer services.

### 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.

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



*Please keep yourself updated*

1. Schedule:

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2. Exam:

<http://www.wiwi.uni-frankfurt.de/mein-wiwi-studium/pruefungsammt.html>

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

Microsoft (2000) Materials for the Introduction of .Net

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.

Statista2020a, 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/>