

Lecture 1

Introduction to Mobile Business I:
Technology, Markets, Platforms,
and Business Models

Mobile Business I (WS 2022/23)

Prof. Dr. Kai Rannenberg

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

- Chair of Mobile 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

E-Finance Prof. Dr. Peter Gomber	Business Informatics (Informatics) Prof. Dr. Mirjam Minor	Business Informatics & Information Management Prof. Dr. Oliver Hinz
Business Ethics & Business Education (associated) Prof. Dr. Gerhard Minnameier	Business Informatics Hon. Prof. Dr. Matthias Zieschang	Economic and Business Education (associated) Prof. Dr. Eveline Wuttke
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Information Systems Engineering Prof. Dr. Roland Holten	Business Informatics & Microeconomics Prof. Dr. Lukas Wiewiorra	Mobile Business & Multilateral Security Prof. Dr. Kai Rannenberg

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

Chair of Mobile Business & Multilateral Security

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Team & External PhD Students



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**Sascha
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**Ahad
Niknia**



**Frédéric
Tronnier**



**Zongxiong
Chen**



**Tim
Schiller**



**Christopher
Schmitz**



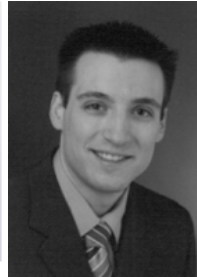
**Michael
Schmid**



Markus
Tschersich



Jetzabel
Serna-
Olvera



Mike
Radmacher



Andreas
Albers



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Weiss



Shuzhe
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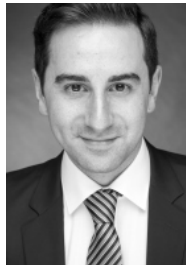
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Vita of Prof. Dr. Kai Rannenberg

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





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- **Course agenda is online.**
 - Please keep yourself updated!
 - Check the website of the course:
 - https://www.m-chair.de/index.php?option=com_teaching&view=lecture&id=71
- **Exam:**
 - <http://www.wiwi.uni-frankfurt.de/mein-wiwi-studium/pruefungsamt.html>
 - <https://www.wiwi.uni-frankfurt.de/fachbereich/dekanat/geschaeftsbereiche/pruefungsaamt.html>



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	WS 2022/2023	SS 2023
Bachelor	<p><i>Course</i> Business Informatics 2 (PWIN)</p>	<p><i>Course</i> Business Informatics 2 (PWIN)</p> <p><i>Seminar</i> Machine Learning: Privacy, Regulations and Ethical Issues</p>
Master	<p><i>Seminar</i> Digital Euro or Bitcoin: How will we pay in the future?</p> <p><i>Course</i> Mobile Business I: Application Design, Applications, Infrastructures and Security</p>	<p><i>Course</i> Mobile Business II: Application Design, Applications, Infrastructures and Security</p> <p><i>Course</i> Privacy vs. Data: Business Models in the digital, mobile Economy</p>

Teaching Topics

Identity Management

Privacy

ICT Security

Mobile Business

Business Informatics

Master Courses

Lectures

Mobile Business 1

Privacy vs. Data

Seminars

Mobile Business 2

Master Thesis

I & C Security

Bachelor Courses

Lectures

Business Informatics
2

Seminars

Bachelor Thesis

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Standardization & Regulation

M

*Mobile
Business II*

Business Models

ICT Security

Mobile Business

Social Media/Marketing

Privacy/Data Protection

Multilateral Security

*Information &
Communication
Security*

M

M

*Mobile
Business I*

Applications & Services

Identity Management

Online/Mobile Economy

Information & Communication Technology

B

Bachelor

M

Master

B

*Wirtschaftsinformatik 2
(Business Informatics 2)*

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Security

Standardisation & Regulation

Business Models

ICT Security

Social Media/Marketing

Privacy / Data Protection

Applications & Services

Identity Management

Mobile Business

Multilateral Security

Online/Mobile Economy

Information & Communication Technology

European & national-funded Projects

Industry Co-operations

PhD Projects



Premium*



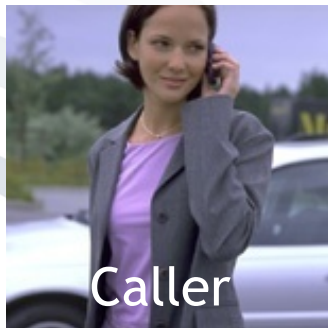
predict
prioritise
prevent



- **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 signalise 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

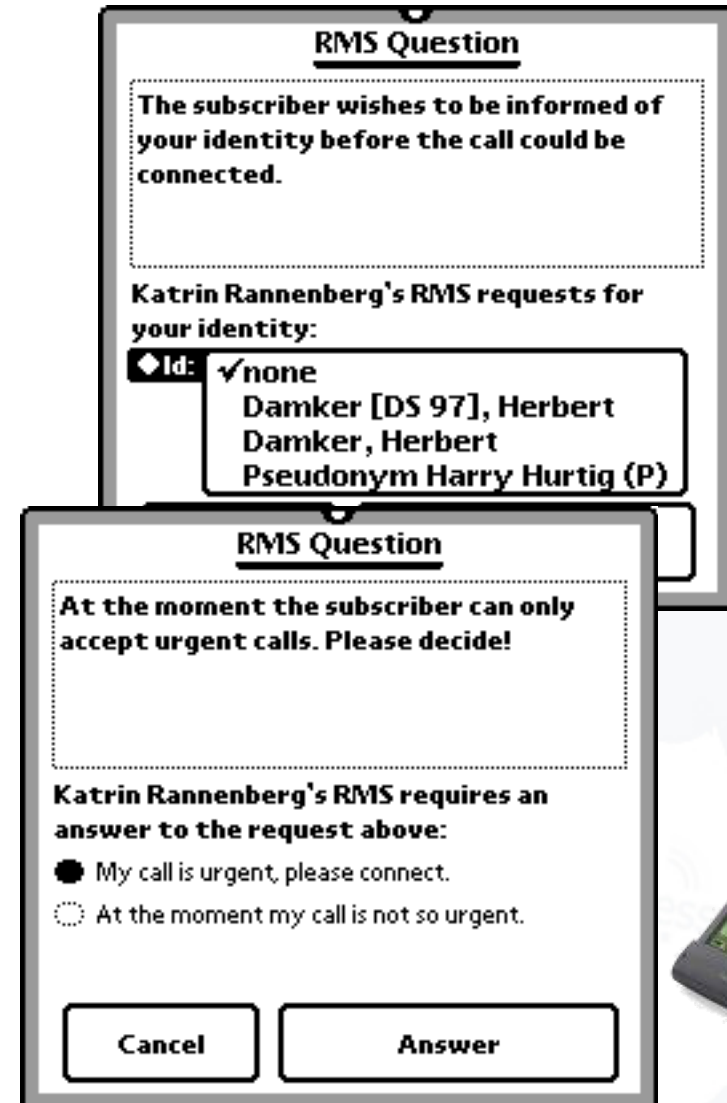
“I welcome you calling back.”

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



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 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

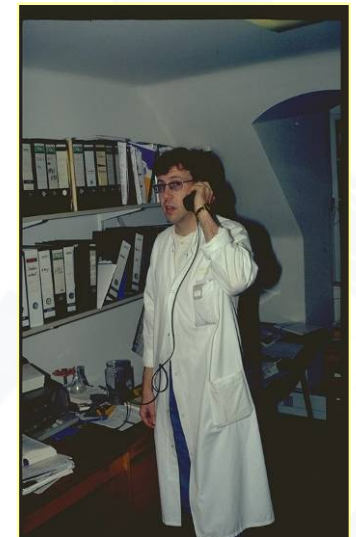
Overall results

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

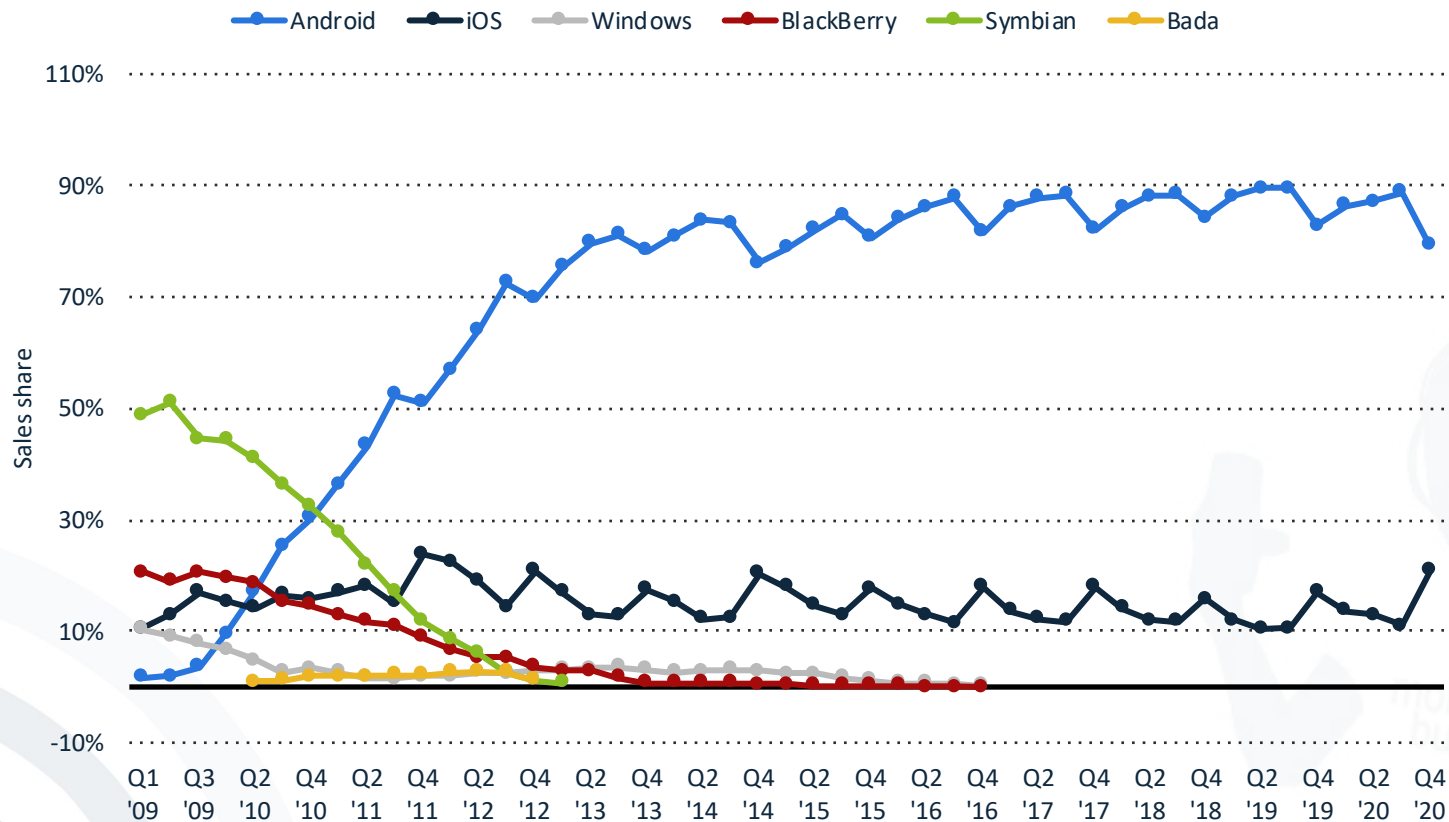
User demands

- 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 1.500.000 Applications in Apple's App-Store in July 2015 (over 725.000 native iPad Apps)
- 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 may integrate the advantages of Apps and mobile websites



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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 have been changing thoroughly through mobile technologies and services.
- This implies extraordinary challenges and chances.
- The development is strongly influenced by international factors.



GSM World

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

Telcos
(Telekom, Vodafone, Telefónica...)



IBM,
Infineon, ...

MS, ...

Dell, ...

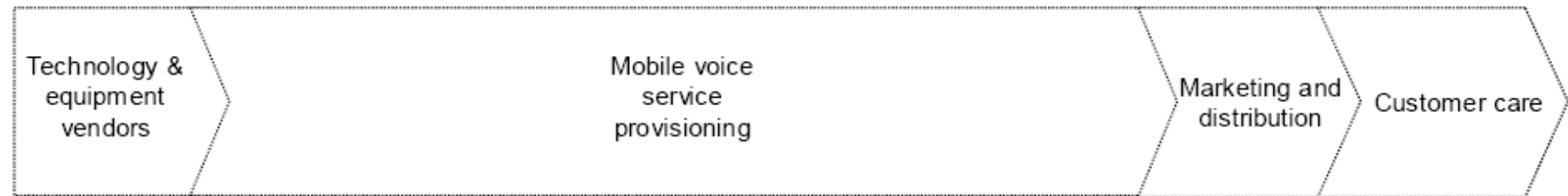
Cisco,...

Telekom
Vodafone
...

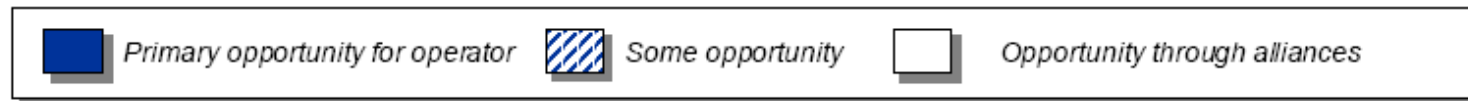
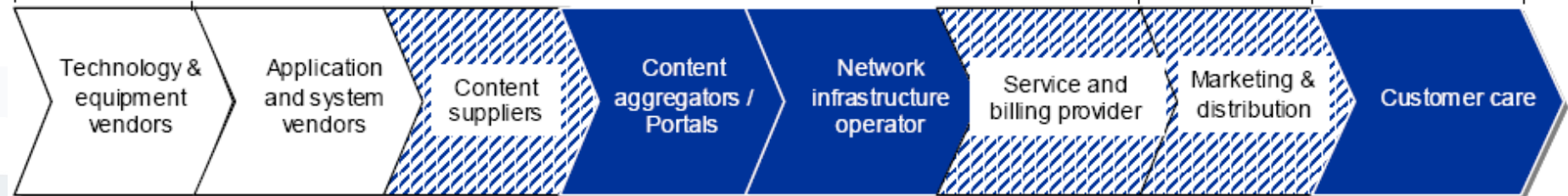
MS,
IBM,
...

MS,
SAP,
Telekom,
Google
...

TRADITIONAL VALUE CHAIN OF MOBILE SERVICE DELIVERY



EMERGING MOBILE OPERATOR VALUE CHAIN



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.

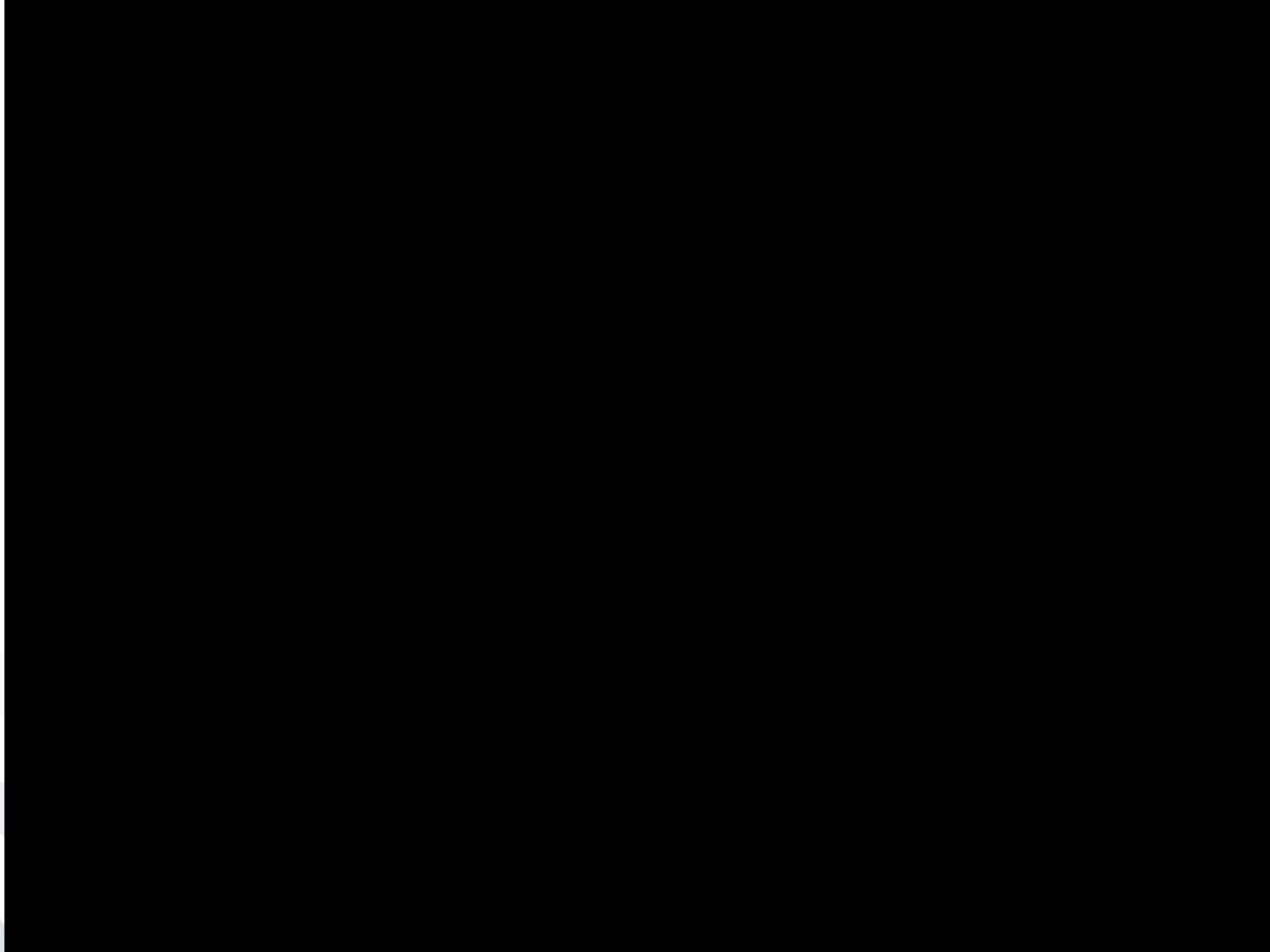
- Not every country's scenario (e.g. health care) can simply be transferred to another country.
- Mobile Business does not only relate to mobile phones. Other platforms are important, too.



- 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?

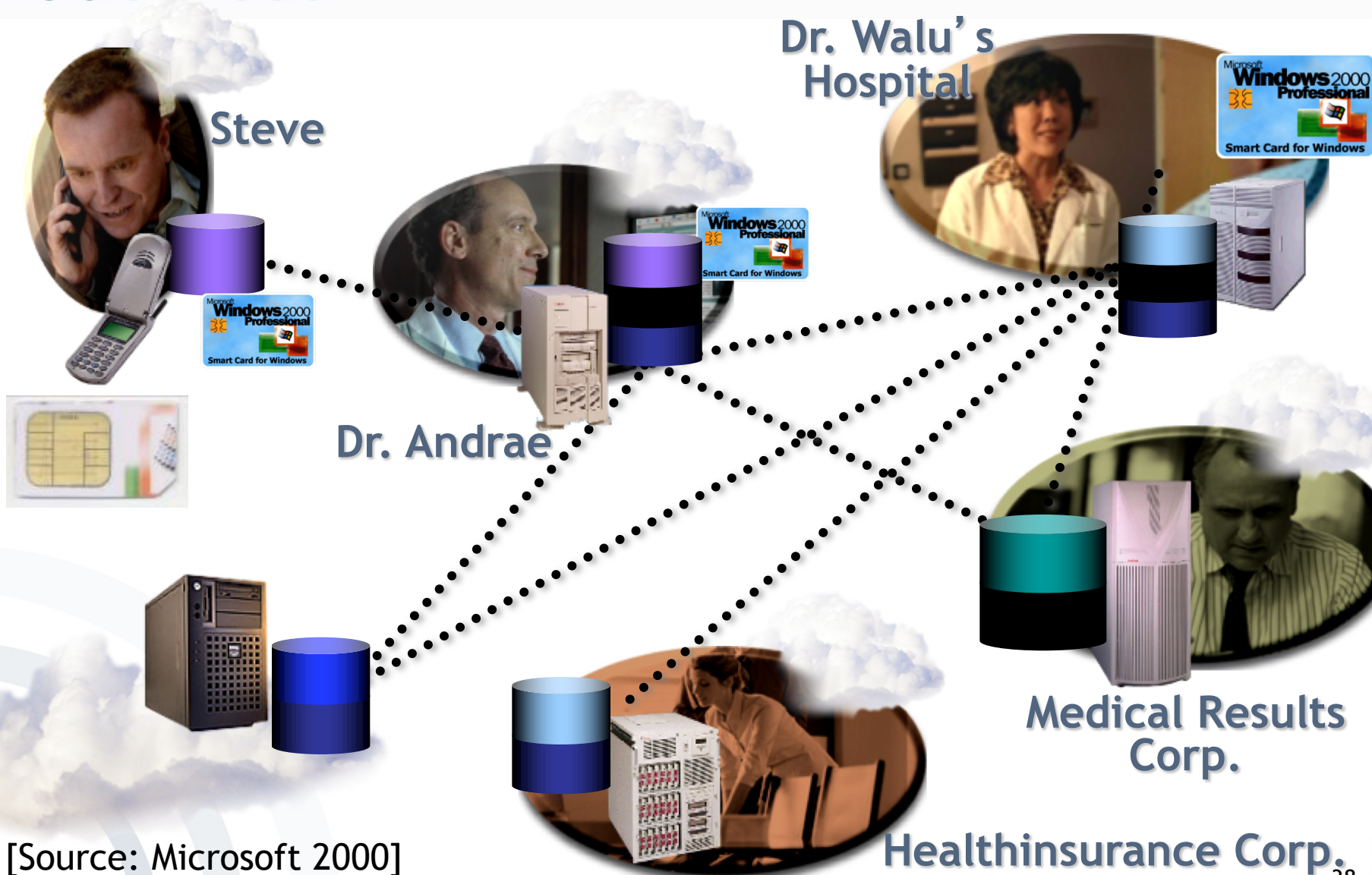


Illustrative Microsoft Video



mobile business

Parties Involved



[Source: Microsoft 2000]

History of Mobile Business Early Approaches



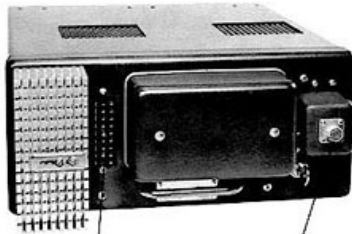
- February 14, 1876. Alexander Graham Bell, a Scotch deaf-mute teacher, patents his telephone (no. 174.465).
- June 17, 1946. AT&T and Southwestern Bell introduce MTS (mobile radio telephone service) in St. Louis, Missouri.



GE DTD/DTO Mobile Telephone
DIAL CONTROL UNIT



MANUAL CONTROL UNIT

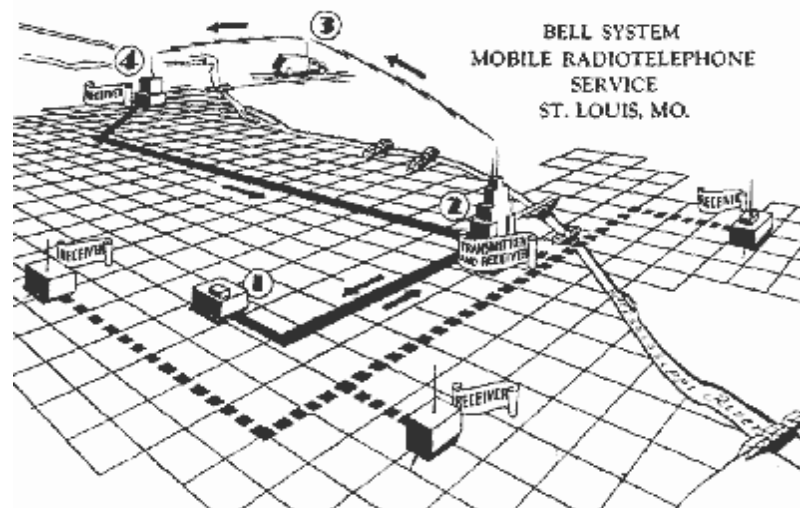


POWER/CONTROL CONNECTOR



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)

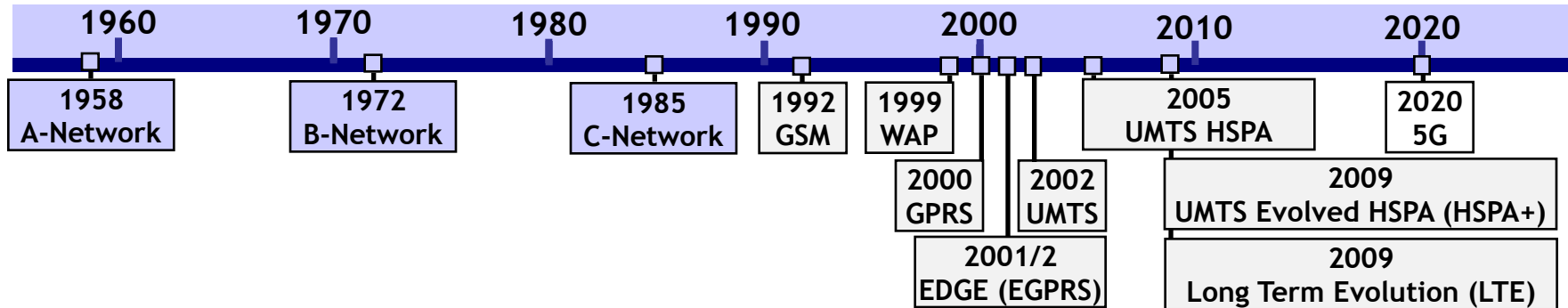


- Since 1981 NMT-450 (Nordic Mobile Telephone) in Norway, Sweden, Saudi Arabia, Denmark, Finland, ...



- 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.



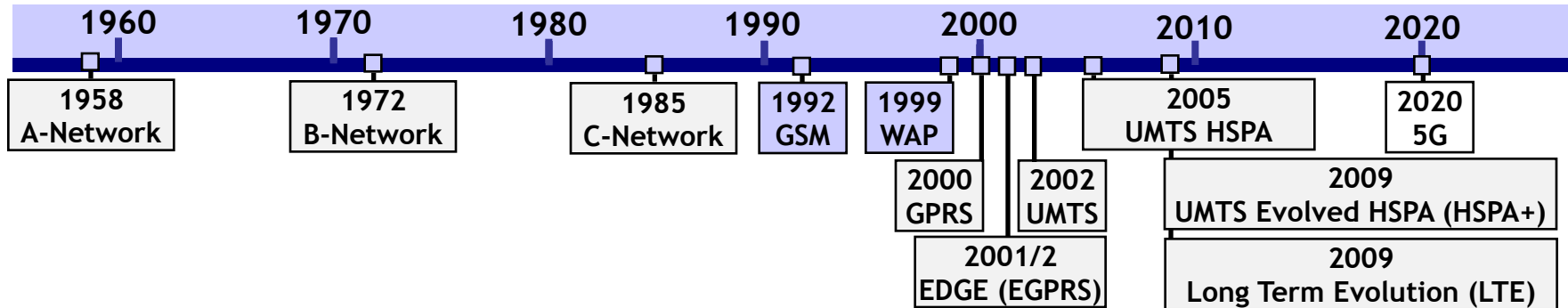
B-Network (1972 - 1994-12-31)

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



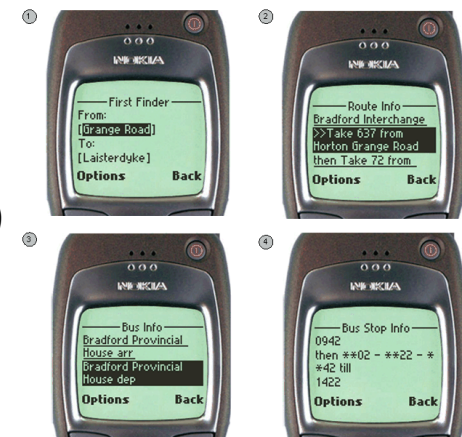
GSM

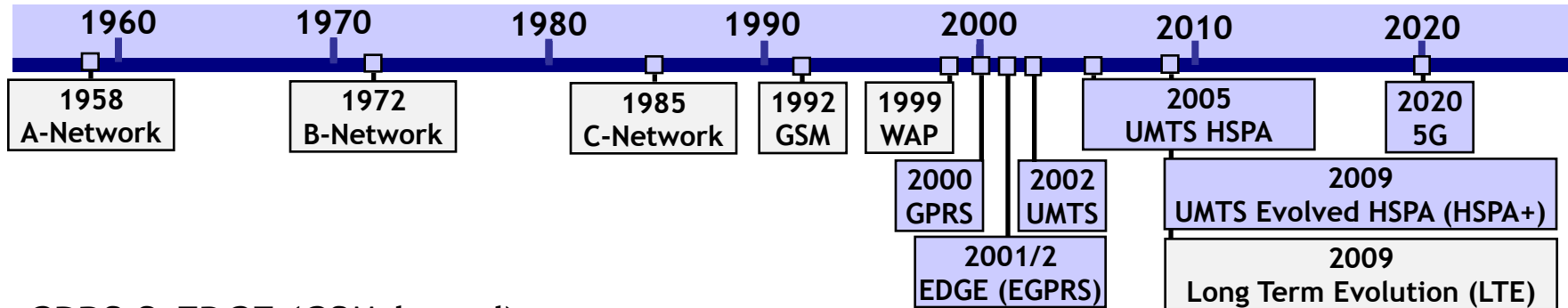
The technical standard for digital mobile radio networks in more than 100 countries; GSM includes data transfer services.

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

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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.



Lectures (https://www.m-chair.de/index.php?option=com_teaching&view=lecture&id=71)

1. Introduction to Mobile Business I
2. Mobile Telecommunication Infrastructures
3. Wireless Internet-oriented Infrastructures and Protocols
4. Mobile Communication Services
5. Electronic Business vs. Mobile Business
6. Market Structure and Value Chain
7. Business Models
8. Smartcards and Infrastructures
9. Mobile Devices
10. Concepts of Mobile OS
11. Mobile OS and Security Aspects - Examples
12. Trusted Devices
13. Acceptance and Success Factors in Mobile Business
14. Current Research
15. 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



search.epnet.com/login.asp
www.jstor.org



Internet search engines:

scholar.google.com
academic.live.com



[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.

Statista2014a,

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

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/>

[WAP 2010]

www.wapforum.org/what/technical.htm, accessed 01-10-2010.

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