



Wintersemester / Sommersemester

Matrikelnummer: (Bitte auch auf jedes Lösungsblatt oben rechts eintragen!)

Fach: Mobile Business 1 (MOB1)

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Wichtig: Durch Ihre Unterschrift in der Teilnehmerliste bestätigen Sie, folgende Prüfungsvorschriften zu beachten:

- Sie haben den nachfolgenden Text gelesen und stimmen allen Punkten zu.
- Sie fühlen sich gesund und sind in der Lage, an der Prüfung teilzunehmen.
- Sie haben sich über die Vorschriften der PO, die Teilnahme an Klausurprüfungen betreffend, informiert.
- Sie haben zur Kenntnis genommen, dass Sie für die ordnungsgemäße Abgabe der Klausur vor Verlassen des Prüfungsraumes selbst verantwortlich sind. Dazu gehört, dass Sie auf Ihrem Platz bleiben, bis alle Klausuren eingesammelt sind, und den Prüfungsraum nicht verlassen, bevor die Klausuren gezählt und die Vollständigkeit festgestellt wurde.
- Es sind keine Hilfsmittel erlaubt
- Das Mitbringen eines Mobiltelefons oder anderer elektronischer Kommunikationsmedien in die Klausur ist verboten. Zuwiderhandeln gilt als Täuschungsversuch.
- Bitte lassen Sie ausreichend Korrekturrand, und schreiben Sie deutlich und **nicht** mit Bleistift oder roter Tinte.

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3. Falls Sie Hilfe benötigen, wenden Sie sich an die Aufsicht.
4. Gehen Sie **unmittelbar** zum Arzt und reichen Sie innerhalb von drei Arbeitstagen ein Attest, das Ihnen die Prüfungsunfähigkeit bescheinigt, beim Prüfungsamt ein.
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Die Bearbeitung der Klausur erfolgt direkt innerhalb dieses Klausurheftes. Beantworten Sie jede Frage an den dafür vorgesehenen Stellen unterhalb der Aufgabenstellung. Sollten der Platz nicht ausreichen verwenden Sie die zusätzlichen Ersatzblätter am Ende der Klausur nur, wenn der Platz nicht ausreicht, und machen Sie auf dem Aufgabenblatt kenntlich, auf welcher Seite die Weiterbearbeitung der Aufgabe erfolgt.

Bitte für die Korrektur freilassen!

Aufgabe:	1	2	3	4	5	6	7	Summe
Punkte:								

Punkte: Note:

Unterschrift des Prüfers:

Question 1: Market structure and value creation (18 points)

1 A) Name four different players of m-commerce markets and describe the functions of these players? (8 points)

Players:*

- Device manufacturers (Manufacture and distribute mobile terminals)
- Infrastructure manufacturers (Produce and provide infrastructure, necessary for network operation, such as GSM base stations.)
- Network operators (Operate mobile networks and provide access)
- Mobile virtual network operators (A **mobile virtual network operator** (MVNO) is a company that does not own a licensed frequency spectrum and wireless infrastructure, but resells wireless services under their own brand name, using the network of another mobile network operator.)
- Service providers (Provide different kinds of services, e.g. Billing and customer management, Acquisition of customers, Advertising campaigns...)
- Content providers (Provide information to customers: Banks, shops, Media-companies, "Game-stations")
- Customers (Use infrastructure, network, devices, service and information)

(je Nennung 1 Punkt (max 4 Punkte), je Erklärung 1 Punkt (max 4 Punkte))

1 B) Why is it attractive for mobile operators to allow Mobile Virtual Network Operators on their network? Name and explain three types of strategies related to this attractivity! (6 points)

- **Segmentation-driven strategies:** MOs often find it difficult to succeed in all customer segments. MVNOs are a way to implement a more specific marketing mix, whether alone or with partners and they can help attack specific, targeted segments.
- **Network utilisation-driven strategies:** Many MOs have capacity, product and segment needs. An MVNO strategy can generate economies of scale for better network utilisation.
- **Product-driven strategies:** MVNOs can help MOs target customers with specialised service requirements and get to customer niches that MOs cannot get to.

(je 2 Punkte, max. 6 Punkte)

1 C) What are the effects of an increasing number of sellers (i.e. network operators, MVNOs) in an oligopolistic market? (4 points)

- causes tendency towards competitive market:
 - The price converges to the marginal costs.
 - The output converges to the economically efficient level.
 - Lower MVNO prices due to lower service costs of MVNOs

symmetrischen und asymmetrischen (je 1 Punkt, max. 4 Punkte)

Question 2: Business models (10 points)

2 A) A business model is an abstract description of a business. Name and explain the three main parts a business model consists of. (6 points)

- A business model consists of three main parts:
 1. Value Proposition
 2. Value Creation Architecture
 3. Revenue Model

(3 Punkte)

Value Proposition:

1. A business model contains a **description of** what the **benefit** can be for customers or other partners by association with the respective business. This part of the business model is called **value proposition**.

It deals with the question:

What is the benefit of the business?

Value creation architecture:

2. At the same time a business model is a **value creation architecture**, viz how the benefit can be generated for the customers. This architecture contains a description of the different stages of value creation.

It deals with the question:

How is the output generated in which configuration?

Revenue Model:

3. Besides asking for “*what*” (see 1.) and “*how*” (see 2.) a business model describes as well, which revenue the business generates from which sources. The future revenue decides on the value of the business model and the sustainability.

It deals with the question:

Whereby will the money be made?

(3 Punkte für die Erklärungen)

2 B) Name two similarities and two differences between a price model in m-commerce and e-commerce. (4 points)

M-Commerce Commonalities with E-Commerce

- Network effects imply a penetration strategy in order to build an installed base
- High price transparency implies little space for pricing decisions
- Heterogeneity/differences in Willingness-to-Pay (WTP) encourage differential pricing
- Low transaction costs facilitate flexible price adjustments and variable pricing mechanisms

Differences to E-Commerce

- Cooperation of equipment and terminal manufacturer and operators allows new revenue models
- Very low WTP for internet services, higher WTP for mobile services

- Mobility, availability, localization and identification allow new forms of product and price differentiation
- Services may be offered just-in-time on the mobile phone (e.g. flights) ➔ variable pricing mechanisms.

(je 1 Punkt, max 4 Punkte)

Question 3: Diffusion of technology (17 points)

3 A) Diffusion of Innovations (DOI) describes the process by which an innovation is accepted by a social system, e.g. a market. The Diffusion of Innovations theory describes the key innovation characteristics that influence the adoption process. Name and explain three key innovation characteristics and provide one example for each characteristic from the innovation adoption of mobile telephony. (9 points)

Vorteile:

- **Relative Advantage:**
 - The degree to which the innovation is perceived as being better than the practice it supersedes
 - Availability/reachability of the subscriber
 - Communicate (almost) anywhere / anytime
 - Personal device(s)
- **Compatibility:**
 - The extent to which adopting the innovation is compatible with what people do
 - High compatibility in society, as flexibility and reachability get more and more important.
- **Complexity:**
 - The degree to which an innovation is perceived as relatively difficult to understand and use
 - Low to medium:
 - Basic functionality (e.g. telephony) can be used by everyone being capable of using a standard, fixed-line telephone.
 - Advanced features (e.g. SMS) need further training to use them.
- **Trialability:**
 - The degree to which an innovation may be experimented with on a limited basis before making an adoption (or rejection) decision
 - High: A potential customer can subscribe to a prepaid contract for testing the technology and later on switch to a “normal” subscription based contract.
- **Observability:**
 - The degree to which the results of an innovation are visible to others
 - Reachability of the customers anytime and anywhere.
 - More and more people are using mobile phones and services.
 - People using mobile phones can easily be observed by non-users.
 - The concept and benefit of mobile telephony is easily observable by non-users.

(je 1 Punkt für die Nennung (max 3 Punkte), 1 Punkt für die Beschreibung (max 3 Punkte) und 1 Punkt für das Beispiel (max 1 Punkt pro key innovation characteristic), insgesamt max. 9 Punkte)

3 B) The Theory of Reasoned Action (TRA) posits that individual behavior is driven by behavioral intentions. Explain the TRA and its limitations (6 points). Draw the schematics of the TRA. (2 points)



(2 points)

- *Behavioural intentions* are a function of an individual's attitude towards the behaviour and the subjective norm surrounding the performance of the behaviour.
- *Attitude towards the behaviour* are the individual's positive or negative feelings about performing a behaviour, determined through an assessment of one's beliefs.
- *Subjective norm* is defined as an individual's perception of whether people important to the individual think the behaviours should be performed.
- *Behaviour is the actual behaviour of the user.*

Limitations:

- Significant risk of confounding between attitudes and norms since attitudes can often be reframed as norms and vice versa.
- Assumption that when someone forms an intention to act, they will be free to act without limitation, is often unfounded.
- In practice, constraints such as limited ability, time, environmental or organisational limits, and unconscious habits will limit the freedom to act.

(je 1 Punkt, max 6 Punkte)

Question 4: Mobile network technologies (24 points)

4 A) Several technologies for the use of mobile data in GSM and 3G mobile networks have evolved over time. Name three technologies, sorted from slowest to fastest and state the maximum transmission rate of one of these technologies while paying regard to the measurement unit of the transmission speed.

Hint: Acronyms (abbreviations) for the relevant technologies are sufficient. (5 points)

Lösung (Geschwindigkeit in aufsteigender Reihenfolge):

- Modem (modulator-demodulator) in analogue mobile networks (300 –2400 bit/s)
- CSD (Circuit Switched Data) in GSM networks (9.6 Kbit/s)
- HSCSD (High-Speed Circuit Switched Data) in GSM networks (28.8, 43.2, or 57.6 bit/s)
- GPRS (General Packet Radio Service)
- EDGE (Enhanced Data Rates for Global Evolution) 384 kbit/s
- UMTS (Universal Mobile Telecommunications System) 384 kbit/s
- HSPA (High-Speed Packet Access), HSPA+(=Evolved HSPA)
1.8, 3.6, 7.2, 10.2 and 14.4 Mbit/s downlink speed (HSDPA)
- LTE, LTE Advanced (Long Term Evolution)

(je 1 Punkt für Nennung der drei Technologien, 1 Punkt für richtige Reihenfolge, 0,5 Punkte für Übertragungsgeschwindigkeit, 0,5 Punkte für Maßeinheit, max. 5 Punkte)

- 4 B)** Subscriber authentication for GSM and 3G mobile networks is done using a specific protocol. What is the name of this protocol? You do not need to explain it. (2 points)

Lösung: Challenge-response protocol

(2 Punkte für die richtige Nennung des Protokolls)

- 4 C)** Are the following statements true or false?
(0,75 points per correct answer, together 9 points)

In GSM networks the terminal/subscriber authenticates itself towards the GSM network.

☒ true ☐ false

In GSM networks the network authenticates itself towards the terminal/subscriber.

☐ true ☒ false

In GSM networks, in order to guarantee the anonymity of the users, temporary user identification is used.

☒ true ☐ false

Subscriber localization in GSM networks can be avoided by end-to-end encryption.

☐ true ☒ false

The UMTS standards by the 3rd Generation Partnership Project (3GPP) include the following features (more than one feature possible):

- Quality of Service (QoS) for data services
☒ true ☐ false
- Multilateral Security (with regard to authentication)
☒ true ☐ false
- End-to-end security (without additional application framework)
☐ true ☒ false
- Extended Service Sets (ESS)
☐ true ☒ false
- High Speed Downlink Packet Access (HSDPA)
☒ true ☐ false

All features that have been included in the UMTS standard are actually implemented in existing networks.

☐ true ☒ false

Multimedia Broadcast Multicast Service is a technology

- to broadcast any type multimedia through any type of network
☐ true ☒ false

- to broadcast Mobile TV through UMTS/3G networks
☐ true ☐ false

0,75 points pro richtiger Antwort, max. 12x 0,75 = 9 Punkte

- 4 D)** Name two (2) methodologies to transmit data via communication networks (2 points). In which one of the two are channels only blocked when data is actually transferred? (1 point)

Lösung:

- Circuit-Switched Networks/Circuit Switched Data (CSD)
- Packet-Oriented Networks/General Packet Radio Service/GPRS → channels only blocked when data is actually transferred

(1 Punkt für CSD, 1 Punkt für GPRS, 1 Punkt für die richtige Zuordnung, max. 3 Punkte)

- 4 E)** What is the application purpose of *Virtual Private Networks (VPN)*? Which level of security do VPNs provide? (2 points)

Lösung:

- Secure connection between two or more networks over an unsecured transport network like the Internet.

(2 Punkte für die Aussage, dass mit VPNs zwei Netzwerke verbunden werden)

- 4 F)** Are the following statements true or false? (1 point per correct answer, together 3 points)

In Wireless-LAN networks, *Wired Equivalent Privacy (WEP) 128-bit* is a secure method for encryption of Wireless LAN as it uses 128-bit encryption.

☐ true ☒ false

Carrier Sense Multiple Access / Collision Avoidance and *Carrier Sense Multiple Access / Collision Detection* are used in Wireless LAN networks to reduce collisions and hence to improve performance.

☐ true ☒ false

A *Basic Service Set (BSS)* is one Wireless LAN access point including all associated stations.

☒ true ☐ false

1 Punkt pro richtiger Antwort, max. 3x 1 = 3 Punkte

Question 5: Smartcards (6 points)

- 5 A)** Please explain the term *credential* very briefly: What is a credential? Name two examples for user credentials:

- one user credential that is usually stored using (or generated inside) a smartcard (e.g. on a GSM SIMcard)
 - a user credential which is not stored on smartcards
- (4 points)

Lösung:

- Credential ist ein Berechtigungsnachweis zur Nutzung eines Dienstes wie z.B. eine Benutzerkennung, ein Passwort, ein errechneter Code
 - Signed Response SRes which is computed inside the GSM simcard, PIN number
 - Benutzername/Passwort

2 Punkte für den „Berechtigungsnachweis zur Nutzung“, je 1 Punkt für jedes Beispiel (weitere Beispiele neben den oben aufgeführten möglich!), max. 4 Punkte

- 5 B)** 7^a SIM Application Toolkit provides an interface for Value Added Services implemented on programmable SIMs for interacting with mobile devices. State one (1) application example (you do not need to explain it).
(2 points)

Lösung:

- Application examples:
 - Mobile Banking and Brokerage (e.g. SMS-based mobile banking)
 - Secure payment via cellular phone
 - Authentication of users trying to access servers
 - Location-based services
 - ATM search, navigation
 - Security applications in general
 - Mobile signatures

2 Punkte für ein Beispiel, max. 2 Punkte

Question 6: Mobile operating systems (15 points)

- 6 A)** Name two mobile operating systems that are unavailable to other device manufacturers. (2 points)

Lösung:

- Palm OS
- Apple iOS

1 Punkt pro richtigem Beispiel, max. 2 Punkte

- 6 B)** Name two Mobile Operating Systems that are hardware manufacturer-independent and hence available to other device manufacturers. (2 points)

Lösung:

- Symbian platform (by Symbian Foundation)
- Embedded Linux

- Android (by Open Handset Alliance)
- Microsoft Windows CE, Pocket PC, Pocket PC Phone Edition, Mobile
- Microsoft Windows Phone 7

1 Punkt pro richtigem Beispiel, max. 2 Punkte

6 C) Is the following statement true or false? (1 point)

The new Mobile Operating Systems *Microsoft Windows Phone 7* is aimed at the enterprise market while offering backward compatibility to applications written for e.g. Windows CE.

☐ true ☐ false

1 Punkt pro richtiger Antwort, max. 1 Punkt

6 D) In mobile operating systems, several processes are being run in parallel. First, in this context, please explain *scheduling* and why it is necessary. (4 points)
Second, please explain the *ready queue*. Why does it exist? (2 points)
Third, name one method (algorithm) used for scheduling and explain briefly how it works. You do not need to discuss pros and cons of the respective method. (4 points)

Lösung:

Scheduling

- Multiprogramming: Several processes are being run in parallel for:
 - Maximisation of the CPU usage
 - Enabling users to operate several programs simultaneously
 - Enabling several users to work on the same machine simultaneously
- On a CPU only one process is running at a time.
- The process switching must be fast, to enable the user to interact with all running programs.

Jeweils 1 Punkt, max. 4 Punkte

Bedingung für volle Punktzahl ist jedoch, dass aus dem Geschriebenen klar hervorgeht, dass mehrere parallele Prozesse existieren

Ready queue

- Queues are used to handle the scheduling task
- If the CPU is idle (no process is running), the scheduler invokes a process from the ready-queue to be run on the CPU.
- There are different methods (algorithms) to make the choice, which process to invoke.

Jeweils 1 point, max. 2 points

Methods (algorithm) used for scheduling

- First Come, First Serve (FCFS)

- Processes are executed by the CPU one after another in order of their occurrence.
- Shortest Job First
 - The processes are executed in order of their execution time.
 - Processes that can be finished fast are executed first.
- Priority Scheduling
 - Processes get an assigned priority number.
 - Process execution in the order of the assigned priority.
- Round Robin Scheduling
 - Especially used for Time-Sharing-Systems and one of the simplest scheduling algorithms
 - Similar to FCFS, assigning time slices of a time interval to a process being held in the scheduling queue.
 - After the time slice of a process is expired, the CPU is revoked from the process and the proce

2 Punkte für die richtige Nennung der Methode

2 Punkte für die Kurzbeschreibung wie die Methode funktioniert

max. 4 Punkte