

# A NFC-based Concept for Medication Related Patient Services

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# Motivation

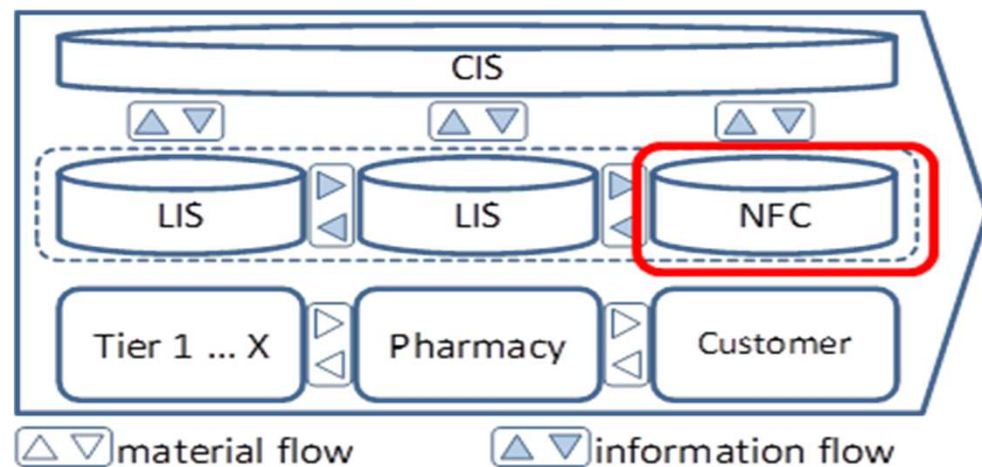


- ▶ Current pharmaceutical supply chains do not integrate the patient

- ▶ Therefore, we proposed a concept to integrate patients using NFC-technology

- ▶ Mobil Devices

- ▶ Central and decentral approach



Engel et al., 2012

# Agenda

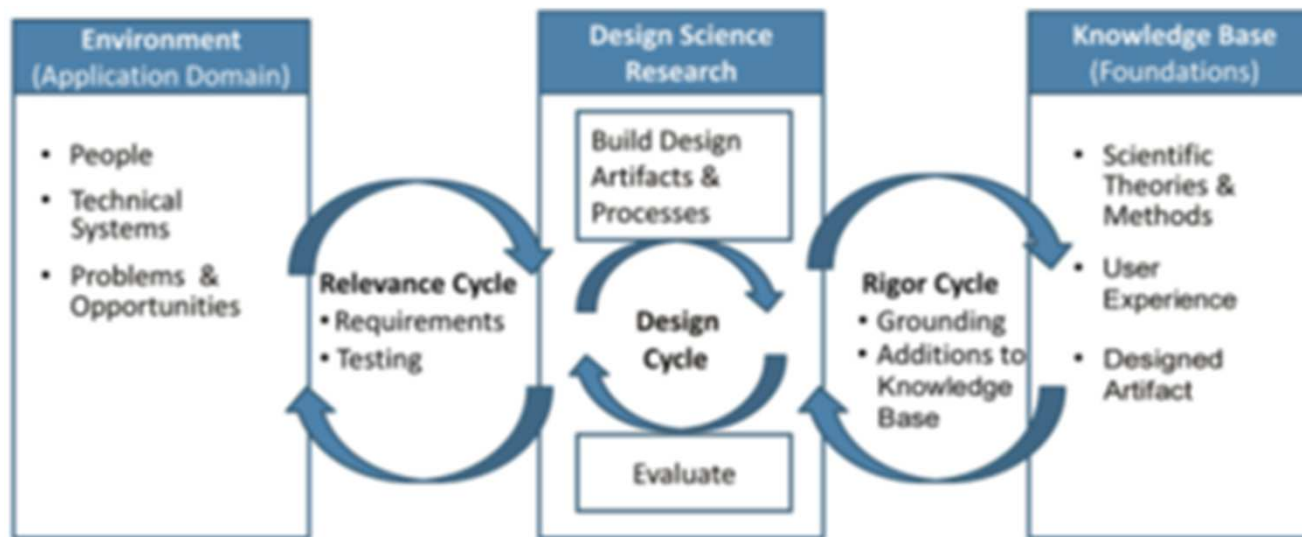
- ▶ Introduction
- ▶ Related work
- ▶ Redesigned concept of German Health Card
- ▶ Use-Cases: Examples
- ▶ Discussion & Implications
- ▶ Limitations & Further Research

# Introduction

- ▶ Ageing society will significantly increase the demand for health care products & services
- ▶ By 2060 > 34 % of the German population will be at least 65 years, compared to 20 % in 2008
- ▶ Rising demand for health care, including medication
- ▶ Illustrates the significance of health care in the future & implies the necessity of its effective management
- ▶ Important to develop new approaches and concepts to enhance value realization in the pharmaceutical supply chain
- ▶ **GOAL:** Propose a technical concept to realize the proposed concept from Engel et al. 2012

# Related work – Design Science

- Technology-oriented design approach to create constructs, models, etc.
  - Relevance: Requirements from the Application Domain
  - Design Process: Ensure functionality, completeness, consistency, etc.
  - Rigor Cycle: Ground the building and evaluation process of the artifact



# Related work – NFC Applications

- ▶ Latest developments stimulated availability and acceptance of NFC
  - Attractive for personal services
  - Smart Devices are an essential part of our daily life, also for elderly
- ▶ NFC allows to create new downstream/upstream business models
  - High security levels
  - Bi-directional exchange of information, allows to add and modify
- ▶ Current examples in the field of healthcare
  - Focus on firms benefits, e.g. hospitals
  - Do not work efficiently, e.g. German health card
- ▶ Therefore: We want to include the patient and enhance his value proposition
  - E.g., counterfeit products, individual drug dosage, avoid unnecessary trips to pharmacies, reduce out-of-stock situations

# Related work – NFC Design Rationales

## ► Non-functional requirements (example):

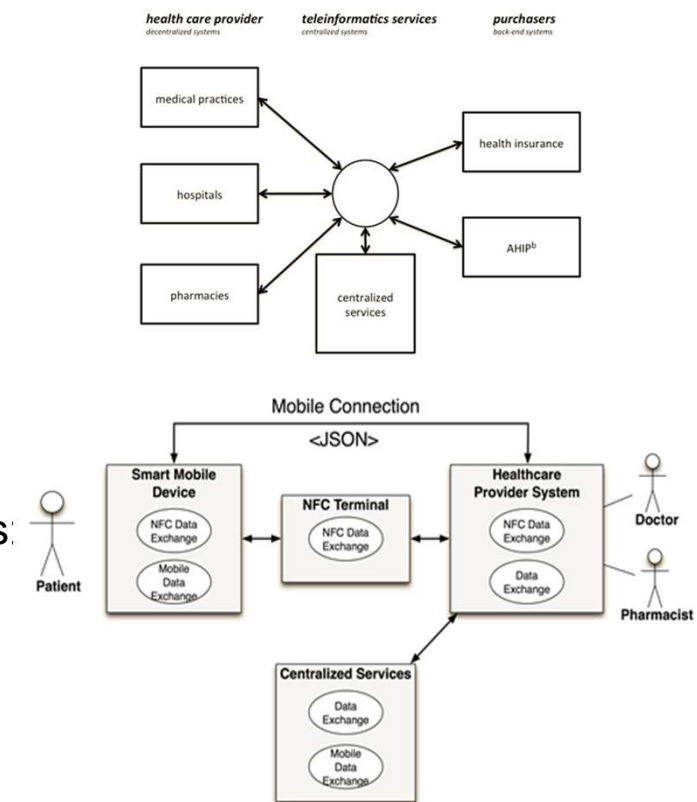
Non-functional requirements	Implication in this study
Few choices after the single top level choice	The example application (Papp) uses a well-known tab navigation as a single top level choice for the functionalities that are provided.

## ► Design Guideline (example):

Design guidelines	Implication in this study
Design for the process, not for NFC	During the development of the technical concept and the integration of the example application (Papp) within this new medical infrastructure, the process for the involved parties, especially for the patients, had priority. Therefore, we defined processes, for example to exchange digital prescriptions, that are enabled – and not forced – by NFC.

# Re-designed concept of German HealthCard

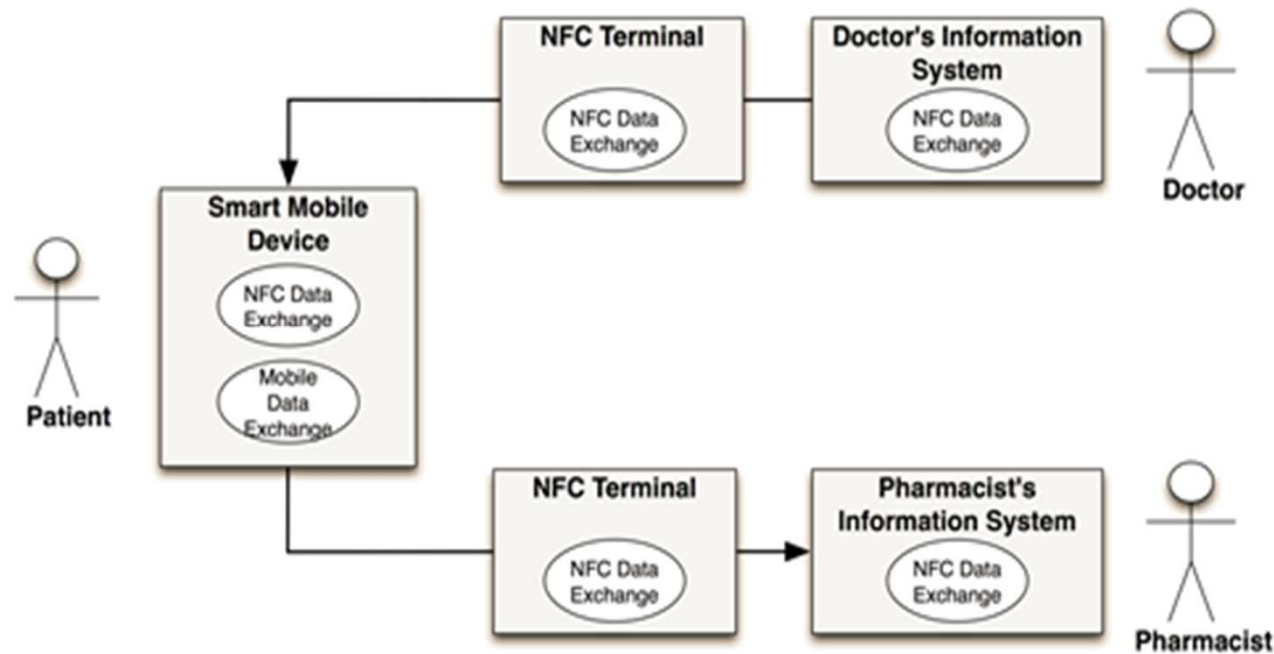
- ▶ Advantages: decentralized services
  - Allows to use the system in case of a break-down / no access (LAN/WAN)
  - Ability to connect mobile devices
  - Offline-/Online Mode
- ▶ New challenge
  - Proper Synchronization
  - Inconsistencies
- ▶ New exchange interface to connect patient
  - Representational State Transfer (REST)
  - JSON as data exchange format
  - HTTPS & encrypted JSON to meet security req.
  - Results in a new format for medication related services:  
**NDEF** (NFC Data Exchange Format)





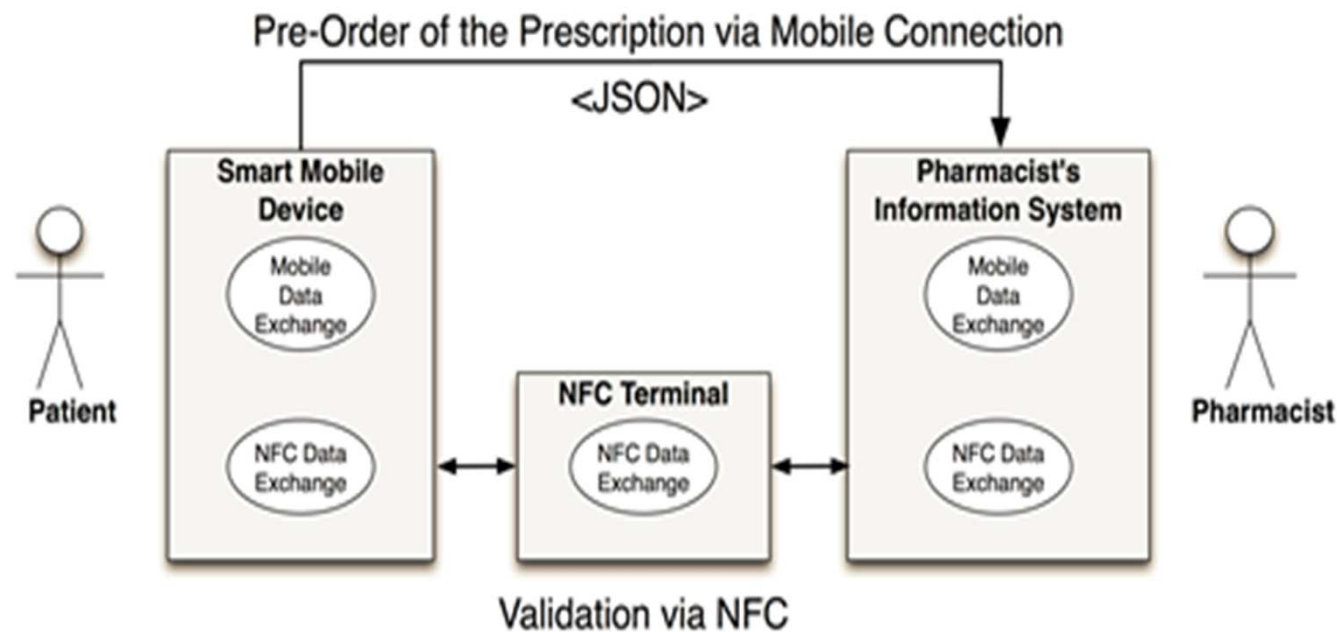
# Use-Cases: Examples

## ► Exchange of digital prescription



# Use-Cases: Examples

## ► Pre-order and validation



# Discussion and Implications

- ▶ Application can address the needs patient have
  - E.g., closest location, avoidance of over-dosage, etc.
  - Increase mobility of patients with online/Offline services
- ▶ Application reduces dependency on central infrastructure
  - Improve supply chain processes by easily linking up-/downstream supply chain partners
  - Create new business models and integrate further stakeholders
- ▶ Proposed concept provides basis for further mobile medication related services

# Limitations & Further Research

- ▶ Limitations & Further Research
  - ▶ The concept and application were developed on research findings
  - ▶ The technical concepts needs to be validated
  - ▶ Prototype should be tested in longitudinal studies

# Backup

## Literature Review on NFC/RFID usage

- ▶ RFID enables the implementation of efficient processes in every area of the supply chain [12]
  - ▶ Supply Chain **performance** can be **improved** [13]
  - ▶ Increased traceability allows **avoiding stock-out situations** [15]
  - ▶ RFID systems can be used to **enrich** tagged **products** during the handling process at each SC member with additional information [18]
- ▶ RFID supports firms in case of call-backs [19, 20]
- ▶ RFID tags can be combined with sensors [22]
- ▶ RFID technology allows
  - ▶ **preventing** patients taking **counterfeit products** accomp. by health risks [27] and companies loosing revenues [23, 24, 25]
  - ▶ Drug **theft** [30]
  - ▶ Encryption prevents **misuse** [32]