Todo list

University of Heidelberg
Institute for Computer Science
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Bachelor thesis

Messaging Architecture for Integration of Customer Self-Services

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I assure that I have written this bachelor thesis on my own and only used the specified sources and resources and that I followed the principles and recommendations "Responsibility in Science" of the University of Heidelberg.

Date of Submission: October 22, 2020

Zusammenfassung

Abstract

Contents

1 Context

Expand Context Chapter: Add more content to this chapter

Digital customer self-service (DCSS) is a great tool for improving customer experience and reducing cost. Many enterprises therefore heavily rely on it for main business services. Especially recent governmental regulations like "Onlinezugangsgesetz" (OZG), "Datenschutzgrundverordnung" (DSGVO) and "Digitale Versorgung Gesetz" (DVG) have increased requirements for DCSS capabilities.

Adding DCSS to a system architecture is a common task. It usually involves integration of new DCSS components into an existing system architecture. Due to the complicated nature of system architectures, integration proves to be a difficult task.

One possibility for adding DCSS capabilities is the usage of solutions from DCSS providers. They keep companies and organizations up to date with DCSS requirements and help with integration. Another possibility is the usage of websites and applications developed in self-work.

2 Objectives

Expand Objectives Chapter: Add more content to this chapter

The objective of this bachelor thesis is to improve the capability of enterprises and organizations to integrate DCSS providers (or solutions?). The thesis explains the basis of what DCSS and its providers are, which relevant scenarios exist and how DCSS providers can help in the digital transformation.

The technological challenge of integrating DCSS providers into existing system architectures is focus of this bachelor thesis.

Based on DCSS scenarios resulting from governmental regulations (due to their current relevance), an integration architecture is presented, which describes integration of these scenarios. It provides information on which type of systems and data objects an existing architecture requires. It models how CSS providers and system architectures can communicate - deliver data and instructions. And it shows how, with fast development and deployment speed, integration can be applied to heterogeneous system architectures, be non-invasive and reliable.

The integration architecture is evaluated in respect to technological feasibility and real-life applicability. The results are incorporated into an operating manual, providing guidance in developing and deploying the presented integration architecture.

3 Structure of Work

Write Structure of Work Chapter: Briefly explain each chapter and their relationships

4 Digital Customer Self-Service (DCSS)

Expand DCSS Chapter: Add more content to this chapter

This chapter introduces the concept of digital customer self-service. It defines DCSS, describes what it is by usage of examples and mentions benefits such as challenges.

Definition: Digital self-service is the consumption of services provided by an enterprise over the internet without human to human interaction.

It is important to distinguish between "service" and "self-service". The difference is shown through two examples:

Example 1: A service is the availability to purchase items whereas digital self-service is the order placement over a website.

Example 2: A service is the availability of video on demand whereas digital self-service is the access of video files over a website.

Digital self-service is one of many possible ways to access a service: An order placement could also be done through email or phone call and access to videos could be granted through same-day-delivery of DVDs.

Customers are able to do self-service because companies provide them with self-service tools. Creating them is not trivial and is the main business model of many companies. Video on demand websites for example do not only flourish as a result of providing access to videos (this business model existed long before them) but as a result of the digital self-service tools they provide.

Reasons for the widespread usage of digital self-service are significant benefits in ease of service usability for customers and cost reduction for enterprises. Customers can self-service from almost every place, easily manage customer data like phone number and address, configure services like subscription plans and access lots of information on available products or trouble shooting steps in an immediate way. Digital customer self-service improves usability, saves time, increases availability, saves money and therefore increases customer experience [Dave Oliver, 2009, cf. 243]. Enterprises, especially in progressive countries, aim to keep employment at a minimum, as it is a big cost factor. Digital self-service turns customers into unpaid employees [Oliver D, 2005].

Decreasing employment cost while increasing customer experience sounds like a win-win situation. Sadly, digital self-service does have its downsides. One downside is most immediate to the elderly. In order to use DCSS, computers have to be available and one has to be experienced in their usage. Technological complexity, however, is not only a problem for customers but also for enterprises providing DCSS. Based on existing system architectures, adding DCSS functionalities can turn out to be a difficult task. Some form of integration is often necessary. With increased system complexity and business dependability come additional maintenance cost.

As tody most large enterprises provide DCSS, it can be assumed, that at a given size of an enterprise (measured in number of customers), the benefits of DCSS surpass its disadvantages.

5 Governmental Regulations

Research Governmental Regulations Chapter: Explain the three regulations in general, what their purpose is what their challenges are

5.1 DSGVO

5.2 OZG

5.3 DVG

6 DCSS Scenarios

Research DCSS Scenarios Chapter:

1. Should governmental regulations be the focus of scenarios? => good resources for OZG

Usage of DCSS OZG scenarios (**process diagrams and data schemas available** [BMI, 2020]), DSGVO scenarios (textual description available [intersoft consulting, 2020]) and DVG scenarios (textual desciption available [gematik, 2020])

The scenarios include more than just CSS and are partly non-digital. Therefore processes relevant for DCSS have to be selected and it has to be defined which processes are part of a CSS provider, the business systems or the integration architecture:

1. What part of a scenario is digital?
2. What part of a scenario can be done through a DCSS provider / is relevant for DCSS?
3. What part of a scenario is done through **existing** business systems?
   a) new necessary business logic part of (configurable) integration? => non invasive
4. What part of a scenario should be done by the integration architecture?
5. What are commonalities of scenarios?
   a) OZG scenarios often describe digital handling of applications
   b) In OZG scenarios, often multiple governmental institutions are involved. This could be modeled as one system architecture with the problem of distributed data and functionality which the integration architecture would solve.

6.1 OZG

6.1.1 Unemployment Benefit (AG2)

Available Resources

- Data Schema
- Process Diagram
- Process Diagram of Application
- Click-Dummy

6.1.2 Training Promotion (BAföG)

Available Resources

- Data Schema
- Process Diagram
- Click-Dummy

6.1.3 Drivers License

Available Resources

- Data Schema
- Process Diagram
- Process Diagram of Application
- Click-Dummy

6.1.4 Company Registration and Approval

Available Resources

- Data Schema
- Process Diagram
- Click-Dummy

6.1.5 Visa Issuance

Available Resources

- Data Schema
- Process Diagram

6.2 DSGVO

6.2.1 Transparent Accessability

The enterprise or organization can have the duty to make information about personal data accessible in transparent and understandable ways

6.2.2 Deletion of Personal Data

The user can have the right of removal of personal data

6.2.3 Correction of Personal Data

The user can have the right of modification of personal data.

6.2.4 Information about collected Personal Data

The user can have the right to be informed about various information of collected and stored personal data such as usage, duration of storage, ...

6.2.5 Restriction of Processing

The user can have the right to restrict the way in which personal data is processed

6.2.6 Availability of Transferral of Personal Data

The user can have the right to transfer personal data to himself or separate entities (company, organization).

6.3 DVG

6.3.1 e-Prescription

Reference can be found in the "Ärzteblatt" [Ärzteblatt, 2020].

The user can have the right to manage his prescriptions via an App. Doctors give digital prescriptions to users app, which can digitally be used in pharmacies also without physically being there.

Regulation: "Gesetz für mehr Sicherheit in der Arzneimittelversorgung (GSAV)"

e-Prescription processes [gematik, 2020]

1. Doctor creates digital prescription if he has access to "Telematikinfrastruktur" and "Heilberufausweis"
2. Prescription is saved on "Telematikinfrastruktur"
3. Doctor displays a QR-Code (prescription-token)
4. Patient can receive QR-Code in App (or get a printout)
5. Patient can check availability of drug in pharmacies via the app
6. Patient can "apply" the prescription to a pharmacy via the app
7. prescription is now irrevocably bound to the pharmacy and gets reserved
8. pharmacy can use prescription-token (in QR-Code) to access prescription in "Telematikinfrastruktur"
9. pharmacy notifies patient if or when the drug is available
10. drug can be picked up by patient or be delivered
11. If user picks drug up, he can show QR-Code in app or on printout (he got from doctor)
12. pharmacy can access "Telematikinfrastruktur" to validate prescription
13. pharmacy gives drug if validated

What are services and what are self-services in this scenario:

- Service: Access to prescription. Self-service: Digital management of prescriptions (prescription-tokens) inside app
- Service: Receiving drug for valid prescription. Self-service: Digital delivery of prescription (prescription-token) to pharmacy and digital instruction of delivery of drug

6.4 Requirements

7 CSS Providers

Write CSS Providers Chapter: Explain what CSS Providers are (what services they can provide -> what IDAS does) and how they can help creating DCSS. Also explain the concept of a business connector as technological communication point of the CSS provider

7.1 Description

7.2 CSS Solutions

7.3 Business Connector

8 Enterprise Architectures

Write Enterprise Architectures Chapter: Introduce Enterprise Architectures and challenges such as heterogeneous systems when trying to model them

1. Heterogeneous Enterprise Architecture Systems
   a) Different Applications
   b) Different Application Vendors
   c) Different / No Application Interfaces
   d) Legacy Systems
2. Different (proprietary) data models within and between Enterprises and Organizations
   a) Different (property)name for same data objects (syntactic integration)
   b) Different meanings for same (property)name (semantic integration)

8.1 Modeling of the real world

8.2 Modeling Challenges

8.3 Enterprise Architecture Patterns (EAP)

9 Relevant Systems and Data

Research Relevant Systems and Data Chapter: Explain the approach of modeling enterprise architectures by EAPs and explain the used EAPs. Analyze which system and data bricks of the system architecture could be necessarry for DCSS

9.1 EAPs

9.2 Architecture Bricks

9.3 Data Bricks

9.4 Integration Requirements

9.4.1 Regarding Integration Architecture

9.4.2 Regarding Business Connector

10 Integration

Write Integration Chapter: Introduce the concept of integration. What are challenges in general and what would be an ideal integration. Also explain the approach towards integration used (messaging, patterns)

1. Scarce Resources
    a) Integration Development Speed
        i. Necessary Development <=> Reuse of existing Technology
        ii. Complexity / Size of Integration
    b) Maintenance of finished Integration
    c) Hardware / Software Costs of Integration
        i. Licenses for Software
        ii. Scalability of Integration => Necessary Computing Power
    d) Messaging Integration
        i. Loose Coupling
            A. Loose Coupling simplifies adaption to changing EA => simpler Maintenance
            B. Loose Coupling simplifies integration of new EA systems => integration of heterogeneous EA
            C. Loose Coupling allows Reuse of "Modules" => faster development
        ii. Messaging enables communication with many systems through Adapters
        iii. Stability of Integration
            A. Future Changes of EA
            B. Scalability
            C. Failure of EA or Integration Components
        iv. Messaging provides mechanisms for Stability
            A. Store-and-Forward

B. Load Balancing

e) Integration Patterns

i. Patterns speed up construction of Integration Architecture

ii. Patterns are proven solutions

iii. Patterns abstract from concrete technologies

A. Simplifies understanding of integration concept

B. Allows implementation with different technologies

10.1 Definition

10.2 Requirements

10.2.1 Loose Coupling

10.2.2 Homogeneous Landscapes

10.3 Enterprise Integration Patterns (EIP)

10.3.1 Pattern 1

10.3.2 Pattern 2

11 Business Connector

Research Business Connector Chapter: Construct the model of the business connector

11.1 Functionalities and Interfaces

11.2 Integration Requirements

11.2.1 Regarding Enterprise Architecture

11.2.2 Regarding Integration Architecture

11.3 Documentation

11.3.1 Connector as Architecture Brick

12 Integration Architecture

Integration Architecture Chapter: Create the integration architecture

12.1 Scenario 1

12.1.1 Integration Documentation

12.1.2 Required System and Data Bricks

12.1.3 System Integration

12.1.4 Data Integration

12.2 Scenario 2

12.2.1 Integration Documentation

12.2.2 Required System and Data Bricks

12.2.3 System Integration

12.2.4 Data Integration

13 Integration Architecture Evaluation

13.1 Technology

13.2 Customer Example

13.3 Operating Manual

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