

Minerva Community

–

A CRM System developed on the basis of Virtual Communities.
The Use Case of CompuGroup Medical



Masterarbeit

Zur Erlangung eines Grades eines Master of Science im Studiengang
Web Science

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Koblenz, im Februar 2019

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Abstract

Institute for Management

Master of Science

**Minerva Community - a Customer Relationship Management system
developed on the basis of virtual communities. The use case of
CompuGroup Medical**

by Alisa Karolina Becker

The goal of this master thesis was to develop a CRM system for the Assist team of CompuGroup Medical that is aiding in integrating open innovation into the development of the Minerva 2.0 software. To achieve this, CRM methodology has been combined with Social Networking Systems, following the research of Lin and Chen (2010, pp. 11 – 30). To achieve the predefined goals literature has been analyzed on how to successfully implement a CRM system as well as an online community. Subsequently the results have been applied to the development of the Minerva Community according to the guidelines of Design Science suggested by Hevner et al. (2004, pp. 75 – 104). The finished product is designed based on customer and management requirements and evaluated from a customer and company perspective.

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Zusammenfassung

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**Minerva Community - a Customer Relationship Management system
developed on the basis of virtual communities. The use case of
CompuGroup Medical**

von Alisa Karolina Becker

Das Ziel dieser Masterarbeit war es ein CRM System für das Assist Team der Compu-Group Medical zu entwickeln, welches Open Innovation in die Entwicklung der Minerva 2.0 Software integriert. Um dies zu erreichen wurden CRM Methoden mit Social Networking Systemen kombiniert, basierend auf der Forschung von Lin und Chen (2010, S. 11 – 30). Um die definierten Ziele zu erreichen wurde Literatur analysiert, wie ein CRM System und eine Online Community erfolgreich implementiert werden können und dies auf die Entwicklung der Minerva Community angewendet. Dabei wurde sich an den Design Science Richtlinien von Hevner u. a. (2004, S. 75 – 104) orientiert. Das fertige Produkt wurde basierend auf Kunden- und Managementanforderungen entworfen und wurde anschließend aus Kunden- und Firmenperspektive evaluiert.

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List of Abbreviations

CGM	CompuGroup Medical
CRM	Customer Relationship Management
CSD	Central Service Development
CSS	Cascading Stylesheets
DSR	Design Science Research
FAQ	Frequently Asked Questions
GUI	Graphical User Interface
HTML	Hypertext Markup Language
ID	Identification number
IPA	Importance-Performance Analysis
IT	Information Technology
QFD	Quality Function Deployment
R&D	Research & Development
SNS	Social Networking Services
UI	User Interface
UX	User EXperience
UML	Unified Modeling Language
VOC	Voice of Customer
VS	Voting Score

Chapter 1

Introduction

1.1 Problem Definition / Motivation

The principle of institutional openness as it is reflected in Open Innovation and Open Research & Development (R&D) is becoming more and more popular. Open Innovation has penetrated the industries and is being implemented by different sectors and companies. Benefits include, but are not limited to, cutting development costs, reducing risks, and accelerating growth (Gassmann, Enkel, and Chesbrough, 2010). Consequently, research about how to implement and succeed in integrating external knowledge has been highly requested by companies. One of the possible implementation strategies is to integrate customers in the operational and innovation value creating activities (Piller and Walcher, 2006). Commonly, this can be done by finding aggregations of (potential) customers, for example on the basis of virtual communities that represent those (Ebner, Leimeister, and Krcmar, 2009). However, there are also less direct and obvious methods that companies can apply if they want to drive open innovation through customers. In 2010 Lin, Chen and Kuan-Shun Chiu published a paper researching the effect that specifically Customer Relationship Management (CRM) practices can have on different types of innovation capabilities, namely:

1. Product innovation
2. Process innovation
3. Administrative innovation
4. Marketing innovation
5. Service innovation

(Lin and Chen, 2010). The authors came to the conclusion that technology-based CRM is the most effective method for improving all of the five types. For further research, they propose that CRM should be integrated with innovation programs and they should not be implemented separately. In this paper, we want to combine these two approaches

as proposed by Lin, Chen and Kuan-Shun Chiu and evaluate them in the setting of an international software company based in Koblenz, Germany.

The medical software producer CompuGroup Medical has no central IT system for CRM. Customer Contact is largely handled by the developer teams responsible for implementing a product. An example for this is the CGM Assist Team developing a product called Minerva 2.0. Minerva 2.0 is dependent on the CGM Assist functionality, which will be introduced in the following subchapter 1.2. These teams are not only faced with the difficulty of managing Customer Relationships, but also issues in managing resources to develop new functionalities on one side and refining and enhancing existing projects on the other side. For these reasons they strive to open up their innovation and development processes to customers. The purpose of this thesis is to develop a CRM system fitted to the existing problems of the CGM Assist team (further explained in 1.2.3) on the basis of virtual communities.

1.2 Introduction to the Scenario and Research Questions

1.2.1 CGM Assist

The CGM Assist is an interface allowing communication between different host systems (e.g. medical information systems) as can be seen in Figure 1.1, as well as CGM Assist plugins that implement diverse functionalities. Communication is realized through status updates being sent to the interface while using the company's medical software. These updates are implemented through object states, i.e. different states (open/close/save/change/etc.) related to a data object (e.g. patient file). The CGM Assist is integrated (amongst others) in the majority of CGM's medical information system products and used by more than 80.000 doctors worldwide. As a new addition, CGM Assist will be released with the Minerva 2.0 host system.

1.2.2 Minerva 2.0

Minerva is a tool for the implementation of work-flow objects using JSON strings. It is developed for non-developers and therefore equipped with a user-friendly GUI, which replaces the need for coding. The concept design of Minerva 2.0 can be found in Figure 1.2. The Minerva host connects to the CGM Assist interface and listens to any updates sent to the interface. In the Minerva GUI, the user can drag-and-drop predefined snippets and connect them to create a Minerva workflow. These snippets do for example include triggers, which allow the execution of an attached workflow when a certain update has been sent to the CGM Assist. Other snippets are validations, which determine the workflow's execution flow, and results, which end the execution and can evoke further functions. An example application of Minerva 2.0 is for example to display a certain advertisement if



FIGURE 1.1: CGM Assist as an interface (Source: company-internal document (2018))

it is applicable to a patient. In this case, a trigger object could for example react to an opened patient file with the diagnosis of high blood pressure. In the following validations a person's age and weight could be assessed. If the patient is in the target group of a certain drug, the result would evoke an advertisement window of this drug to show to the practitioner. The workflow presentation is visually inspired from and resembling flowcharts, as they are used in software engineering.

1.2.3 Issues

There are some existing issues concerning the current CRM of the Assist team and the development of Minerva 2.0.

The first issue is that the further development of Minerva 2.0 and Minerva 2.0 snippets cannot be fully realized through the current capacities. There exists a need to integrate customers into the development following the principles of Open Innovation and Open R&D. A second issue is the general lack of a CRM tool. Customers contact is mostly handled over telephone or email and is, therefore, not in any way managed or organized around a customer or supporting the management of the customer relationships. There exists the need for a newly implemented CRM tool handling these problems. As discussed in the previous chapter, it is optimal to propose and implement an integrated solution to fulfill both of these needs through one platform.

In cooperation with CGM, it has been decided that the main goal of this thesis is to develop a platform called 'Minerva Community' integrating CRM and Social Networking elements to instantiate a novel approach for institutional openness. For this the following questions need to be discussed in this thesis:

1. How should an efficient CRM be constructed?

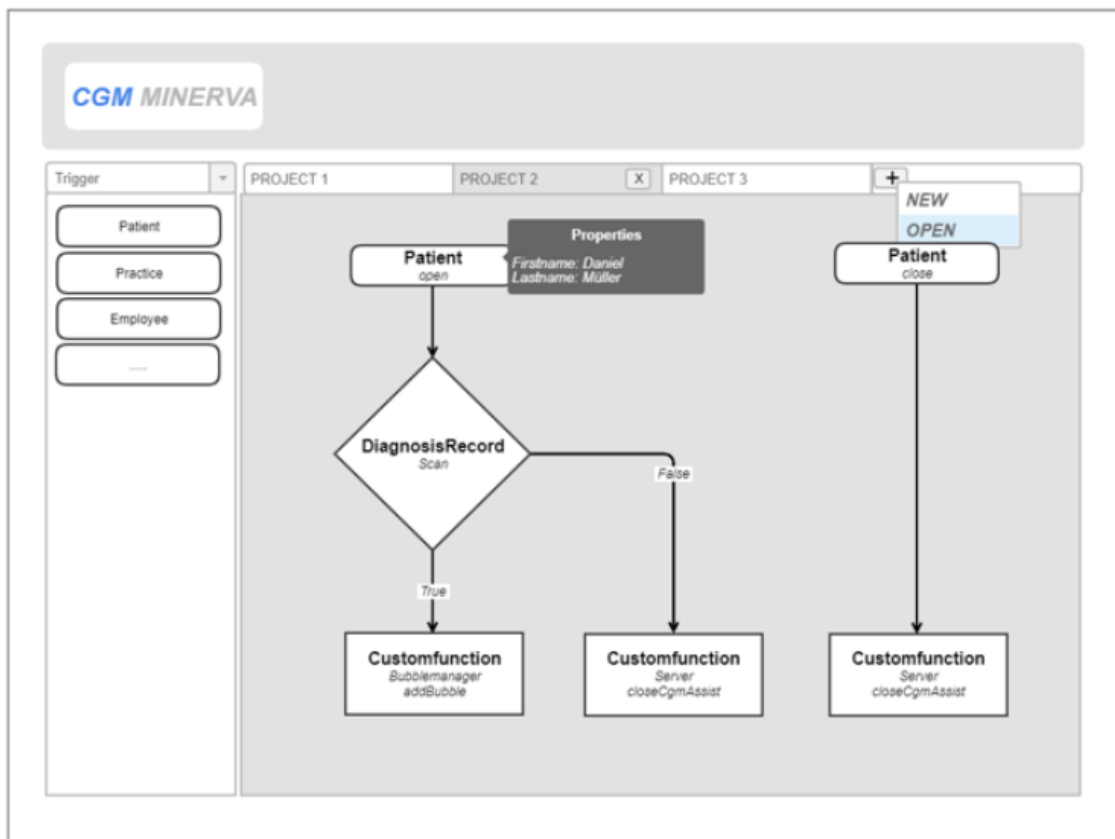


FIGURE 1.2: Minerva 2.0 GUI Concept (Source: company-internal document (2017))

2. How should an efficient Social Network be constructed?
3. How can both be combined?
4. How should a system architecture fitted for CGM Assist look like?

By answering and working on these questions, based on the research deducted in this field, we want to create a way for customers to take part in the innovation processes of the company department.

1.3 Scope of Study

The study is conducted in cooperation with the CGM Assist team. While certain CRM strategies might already be implemented in the CompuGroup Medical on a higher level, these are not considered in this paper. The study only deals with the issues identified for CGM Assist and the implementation will only be used within this department of CGM and within its customers, meaning that this will impose some limitations on the final product. While certain success characteristics may be identified in this paper, not all of them are fitted for the implementation because of structural, physical or organizational reasons. This decision process however will be elaborated on in detail. There might also be design decisions directly imposed by CGM which are not related to the already mentioned limitations. Since this thesis is written in cooperation with the company, it has to serve an industrial purpose, i.e. the implementation has to follow these decisions.

1.4 Structure of the Paper

This thesis already gave an insight in the motivation of this paper as well as the situation and problems regarding the company and the department in question. The following chapter (3) will give the state-of-the-art introductions to the topics of building successful and efficient CRMs and Online Communities. In the chapter 'Method' (4) the scientific method of Design Science is presented, which is the approach used in this study, along with the measurements used in the evaluation phase. The next chapter, which is named 'Artifact description and Design' (5), is an evaluation and application of the previously discussed literature in regard to CRM and community building. It will be discussed which research findings are appropriate and useful for integration in the Minerva 2.0 Community. The finalized conceptualization will be specified through different architectural diagrams and tables. The 'Evaluation' Chapter (6) will demonstrate how the selected evaluation methods will be used to measure if the proposed and implemented system is fitted to the original problem and their results. Final thoughts on the evaluation and the overall implementation process will be given in the chapter 'Discussion and Conclusion' (7). Since our principal method used is design-science research, which will be explained in

the 'Methods' chapter (4), the structure of the paper is oriented towards the proposed publication schema for a design science research study (Gregor and Hevner, 2013).

Chapter 2

Conceptual Background

Since the goal of this thesis is to implement a combined solution of CRM and virtual community, it is necessary to first have a look at the definition of these concepts, their components and implementation frameworks that are already explored in research. In the following sections the state-of-the-art research regarding CRM and online communities will be discussed.

2.1 Customer Relationship Management

2.1.1 CRM Definition

While Customer Relationship Management (CRM) has become an important buzzword with companies spending billions of dollars on CRM technology, a uniform definition of what is CRM and what it is constituted of is non-existent (Zablah, Bellenger, and Johnston, 2004). Instead, there are multiple perspectives on CRM in literature, which have been collected by Zablah, Bellenger and Johnston. They divide the conceptualization of CRM into CRM as a process, strategy, philosophy, capability and technological tool:

- **Process:** CRM is either defined on a macro level as a process, including all activities a firm executes to build long-lasting, mutually beneficial relationships, or on a micro level, containing smaller processes, e.g. data aggregation.
- **Strategy:** The strategy perspective emphasizes that the value of different customers is not equal and thus resources and effort spent on CRM should be managed according to the customers' lifetime value.
- **Philosophy:** CRM is seen as a continuous ongoing relationship rather than isolated events. Therefore, it is important to also be responsive to customers' evolving needs.
- **Capability:** The capability view suggests that a certain mix of resources is necessary to manage customer relationships, like the ability to gather relevant information and use it effectively.

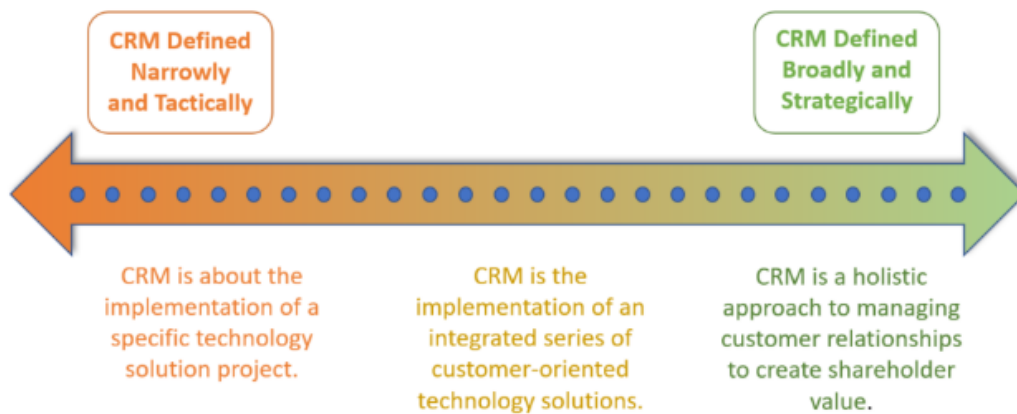


FIGURE 2.1: The CRM Continuum (Source: Payne and Frow (2005) [modified])

- **Technological Tool:** There exist numerous tools in order to help a company achieve CRM goals, like connecting front and back office and process gathered customer information (see image).

However, these perspectives are not mutually exclusive and some CRM strategies might take multiple perspectives into consideration (e.g. Kim, Suh, and Hwang (2003)). In fact, companies have to align themselves along the CRM Continuum in figure 2.1 (Payne and Frow, 2005) and either take a more narrow viewpoint at CRM, i.e. only taking few perspectives into account, or a more broad viewpoint. Underlying all perspectives is the intent of companies to shift from product- or brand-centric marketing to a customer-centric approach (Kim, Suh, and Hwang, 2003 and Reinartz, Krafft, and Hoyer, 2004) and create firm and customer value simultaneously (Boulding et al., 2005).

While these perspectives try to define the general concept of CRM including the underlying intentions and principles, there is another common segmentation that focuses on the usual components of a CRM implementation as well as their functionality and interaction. These building blocks are referred to as Analytical, Operational and Collaborative CRM. The blocks, their components and relation to one another are shown in Figure 2.2 .

2.1.2 Analytical CRM

The analytical CRM is the foundation of both, operational and collaborative CRM (Grabner-Kräuter and Schwarz-Musch, 2006). The main objective of the analytical CRM tools and techniques is the analysis of customer data for strategic and/or tactical purpose, as well as to enhance customer and firm value (Buttle, 2004). For this purpose, the analytical component includes information systems that are concerned with the collection and analysis of data (Vogt, 2008), such as a customer Data Warehouse and Data Mining or

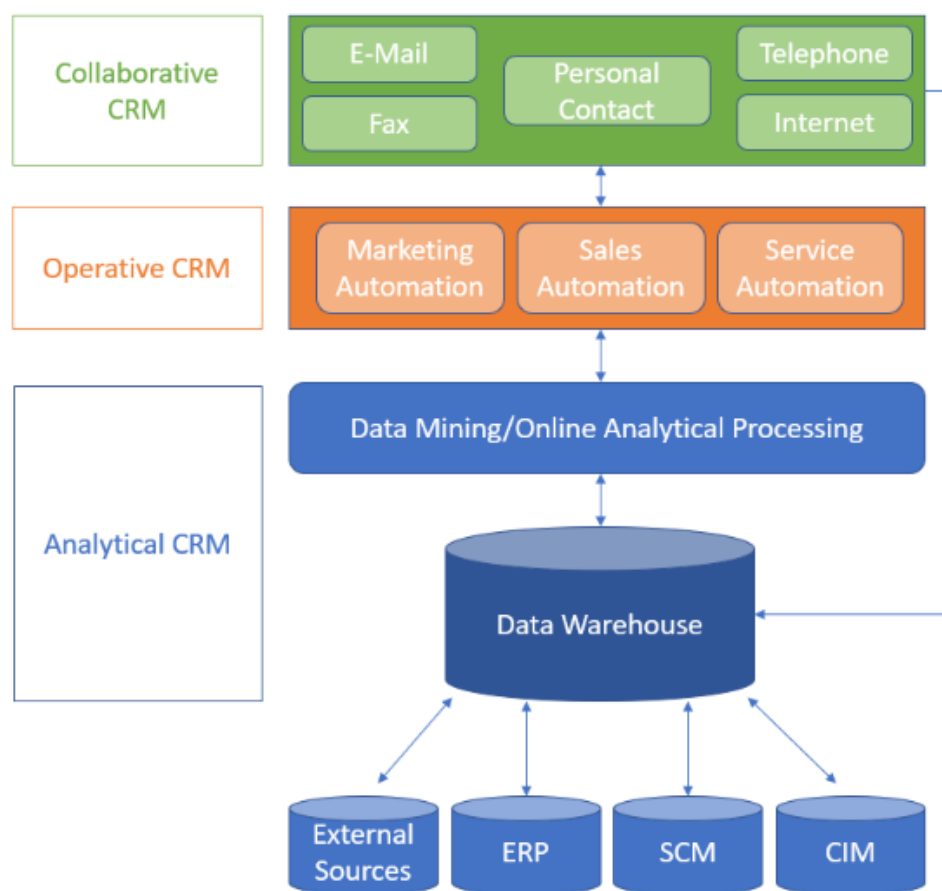


FIGURE 2.2: CRM Building Blocks (Source: Hippner and Wilde (2006, p. 48) [modified])

Online Analytical Processing Systems. The collected data is turned into systematized information, which helps to understand business events and increases customer knowledge (Rajola, 2006). This enables the company to efficiently segment customers as well as build profiles and behaviour models, which provide this information to the operational and collaborative components. It is important to note that not only sophisticated tools and techniques, like data mining, are used for CRM-based decision-making, but also simple ones, e.g. spreadsheet analysis (Tanner Jr. et al., 2018), which is not shown in the above graphic.

2.1.3 Operational CRM

The operational or operative CRM is part of the customer-facing front office. It is integrating automated solutions in order to support the processes and interaction between customer and company (Grabner-Kräuter and Schwarz-Musch, 2006). The major applications of an operational CRM are Marketing Automation, Sales Automation and Service Automation, as shown in figure 2.2. The core of Marketing Automation is the campaign management, which is supposed to help presenting a customer a unique offer at the right point in time and through the most adequate medium (Buttle (2004) and Grabner-Kräuter and Schwarz-Musch (2006)). An efficient campaign management is based on the previously gathered information of the analytical CRM (Vogt, 2008). Another point in Marketing Automation is event-based marketing, also known as trigger-based marketing, that starts if a certain event happens, which is caused by the customer. Sales-force Automation applies technology to routine and administration tasks of the selling process. Such technology includes the functionality for, e.g. contact management, opportunity management, proposal generation and product configuration (Buttle, 2004). Service automation is supporting external and internal customer service and therefore directly connected to back-office solutions for resource and supply chain management (Grabner-Kräuter and Schwarz-Musch, 2006).

2.1.4 Collaborative CRM

Collaborative CRM as the final component includes all the communication channels between company and customer. Some researchers suggest that also the communication channels of company and partners or suppliers are included (Vogt, 2008). Through the customer touch points data for the analytical and operational components is acquired. As the name suggests these communication channels can also be the source for collaborative activities.

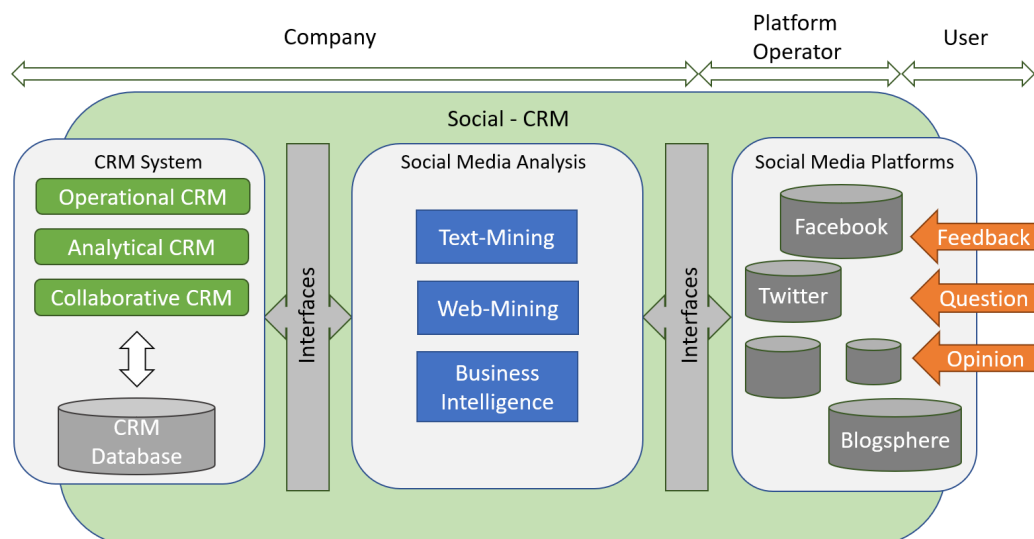


FIGURE 2.3: Components of an integrated Social CRM Architecture (Source: Alt and Reinhold (2012) [modified])

2.1.5 Social CRM

Social CRM is a new extension of Customer Relationship Management. It is an already existing approach to use Social Networking Sites (SNS) in Customer Relationship Management, which is why we want to introduce it briefly. Technology has always been important in regard to CRM implementation and new technologies, therefore, have a great influence on it (e.g. Jayachandran et al. (2005)). Social CRM incorporates Web 2.0 technologies, meaning online interaction through social media platforms like Facebook, LinkedIn, Twitter, etc. and gained importance through the rise in popularity of those. Social CRM is defined as "the integration of customer-facing activities, including processes, systems, and technologies, with emergent social media applications to engage customers in collaborative conversations and enhance customer relationships" (Trainor et al., 2014, p. 1201). Social CRM is mainly used for greater access to customer information (either through firm-customer or customer-customer interaction) (Agnihotri, Kothandaraman, and Singh, 2012).

As seen in Figure 2.3 this information gathering is done via Social Media Analysis, i.e. Text Mining, Web Mining and Business Intelligence (Alt and Reinhold, 2012) and relevant information is, e.g. customer requirements, complaints and experiences (Trainor et al., 2014). This information can be useful for developing new products, improving existing products and enhancing the customer relationship (Alt and Reinhold, 2012). Social CRM can be beneficial to every component in the CRM architecture. It adds a new communication channel to the collaborative CRM, extends the operational processes to Social Media and adds additional Social Media data to the analytical databases (Alt and

Reinhold, 2012). The concept of Social CRM differs from our proposed approach since virtual communities (in this case social networks) and CRM are not combined into one platform. Like mentioned, only the data gathered on Social Media is used to influence CRM processes and can therefore also trigger internal development through external innovation, however it does not directly open up all development and innovation processes to customers.

2.2 Online Communities

In this section we will focus on the community aspect of our to-be-developed application. Community building is an important part of CRM itself, as it will also be mentioned in 3.1. Furthermore, Social Networking Sites or their parent concept of Online Communities have been shown to aid in multiple business activities, which are also relevant for our project.

2.2.1 Online Community Definition

Online Communities have been defined by Preece (Preece, 2000) as consisting of:

- People, who interact socially as they strive to satisfy their own needs or perform special roles, such as leading or moderating
- A shared purpose, such as an interest, need, information exchange, or service that provides a reason for the community
- Policies, in the form of tacit assumptions, rituals, protocols, rules, and laws that guide social interactions
- Computer systems, to support and mediate social interaction and facilitate a sense of togetherness

In general Online Social Networks are Online Communities consisting of the following common features (Heidemann, Klier, and Probst, 2012):

- Personalized user profiles
- Friend/followers relationships
- Private messages or chats
- Message board/feed
- Commenting, liking and sharing to spread information

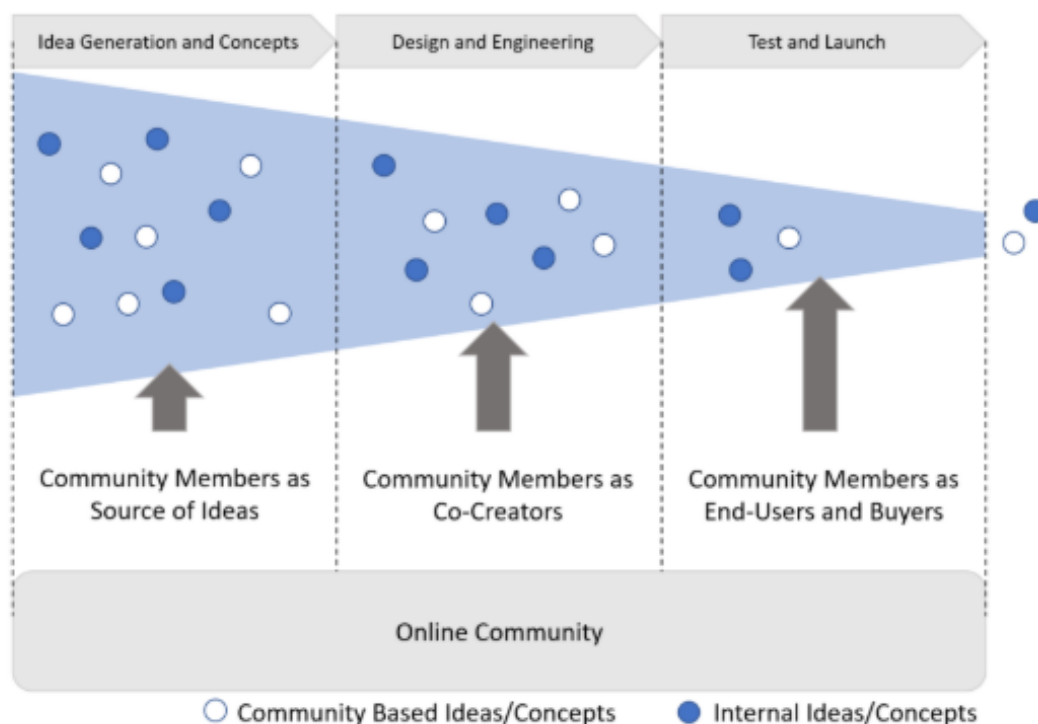


FIGURE 2.4: Utilization of Online Communities (Source: Füller et al. (2006) [modified])

2.2.2 Innovation and CRM in Online Communities

It has been shown that online communities support Research & Development by allowing for open innovation through users possibly participating in the development, design, discussion and evaluation of products (Potts et al., 2008). This interaction is possible by the users taking up different roles throughout product development processes (see Figure 2.4). SNS are also used for marketing research, conducting marketing campaigns or targeted advertising (Enders et al., 2008) all of which are of interest in CRM and have been taking advantage of in Social Customer Relationship Management. Online Communities have further beneficial effects on traditional Customer Relationship Management. They are believed to increase customer loyalty, communication and trust between members, visibility and reputation, and productivity (Millen, Fontaine, and Muller, 2002). Therefore, these findings further support our core idea of combining a CRM and Social Networking System.

Chapter 3

Identified Frameworks and Guidelines

In this chapter we will have a look at existing frameworks and guidelines on the implementation of CRM systems and virtual communities. The findings will later be applied in the design and implementation of the Minerva Community.

3.1 CRM Development Frameworks

In this section we are going to have a look at two different frameworks that have been proposed by Winer (Winer, 2001) and Payne & Frow (Payne and Frow, 2005). These frameworks give an overview of how to start implementing a CRM strategy and important aspects that are to be considered. While Winer is focused on the general built of the system and which metrics and aspects are important, Payne and Frow give a defined ‘best-practice’ road map (Boulding et al., 2005), that is cross-functional and process-based. This road map is showing, which steps are to consider before progressing to a CRM implementation, focusing on the strategic aspects. A combination of both of these will be used by us as a framework to the to-be-developed system for CGM, as both take partly different aspects into consideration and Winer’s strategy in particular greatly overlaps with identified online community strategies in chapter 5.2.

In ‘A Framework for Customer Relationship Management’ (Winer, 2001) the author first highlights the benefits of CRM. This includes the results of a McKinsey study, in which investment into customer retention is found to have the greatest leverage among the identified customer-based metrics, i.e. customer retention, customer conversion and customer attraction (Cigliano et al., 2000). Winer proposes a Customer Relationship Management Model, that is supposed to reflect a complete CRM perspective and can be seen in Figure 3.1.

The first necessary step in Winer’s Model is to create a customer database or information file. In these several kinds of customer data should be collected, like:

- Transactions — purchase history and purchase details
- Customer Contacts — customer- or company-initiated contacts
- Descriptive information — for analysis purposes



FIGURE 3.1: Customer Relationship Management Model (Source: Winer (2001) [modified])

- Response to Marketing Stimuli — customer response to sales/direct contact etc.

The collected data is the foundation for the next phase — ‘Analysis’. In the analysis phase different methods of analyzing data can be implemented. Which one is chosen is an important and far-reaching decision. Possibilities are for example market basket analysis, click-stream analysis and either customer segmentation or 1-to-1 marketing. The results of this analysis decide, which customers should be targeted for future marketing programs or retention programs. The selection of customers should be done with great care, in order to not eliminate important customers. Selection and targeting of customers happen in the next two stages of the CRM model. The goal of the ‘Relationship Marketing’ stage is to increase customer satisfaction, since it has been shown to be linked to company profits (Anderson, Fornell, and Lehmann, 1994). Some important relationship programs are:

1. Customer Service

A customer encounters the customer service of a firm through all contacts or ‘touch points’ he or she has with the company. There are two main types of customer service. One of them is the reactive service, which includes dealing with customer problems, complaints, questions, etc. The other is the proactive service in which the company reaches out to the customer to initiate dialogue prior to any reactive situation.

2. Frequency/Loyalty Programs

These programs provide rewards to customers for repeated purchase or usage of a system or artifact. These programs can have multiple negative effects like high costs and difficult management so it should be extensively evaluated whether they should or have to be implemented.

3. Customization

Customization is a component of 1-to-1 marketing. It simply refers to the creation of products and services fitted to individual customers.

4. Community Building

The purpose of the Community Building is to build a network between customers, where it is possible to exchange product-related information and create relationship to the company. This helps increase customer retention by binding customers to the company.

The next stage highlights the importance of privacy issues. There exists a trade-off between the benefits received from customized products and services and the amount of user data that has to be gathered and customers are increasingly worried about their personal data. These issues have to be addressed by the company. In the last stage,

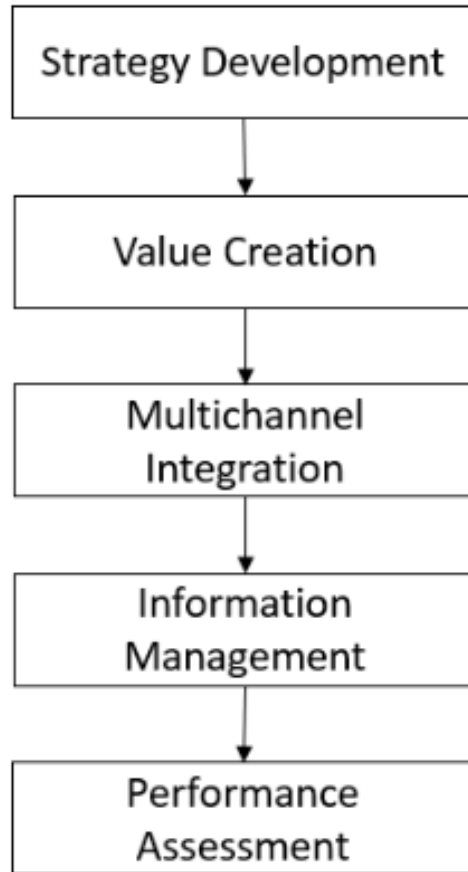


FIGURE 3.2: The Strategic CRM Framework by Payne and Frow
(Source: Payne and Frow (2005) [modified])

‘Metrics’, the measures that were used to measure the company’s success have to be updated by customer-centric metrics.

Payne and Frow, on the other hand, base their CRM framework in ‘A strategic Framework for CRM’ (Payne and Frow, 2005) on the most broadly defined perspective of the already shown CRM Continuum in Figure 2.1. They acknowledge that even though useful frameworks have been defined previously (e.g Winer (2001)), there is no cross-functional process-based framework yet, which they are addressing in their research. They tried to identify generic CRM processes through interaction research, i.e. literature research on one hand and communication with industry experts on the other to identify and test the identified processes. In the end five processes were found to be important and generic, which were (1) the strategy development process, (2) the value creation process, (3) the multichannel integration process, (4) the information management process, and (5) the performance assessment process (Figure 3.2).

1. Strategy Development Process

In the Strategy Development Process the firm's business strategy and its customer strategy have to be developed. The first to be considered is the business strategy, in which the company's vision needs to be articulated. The second step is to review the industry and competitive environment. The chief executive officer is usually responsible for this phase. Afterwards, the customer strategy has to be considered. This is usually the responsibility of the marketing department. The development of a customer strategy includes identifying the potential customer base and deciding on appropriate forms of customer segmentation. This process is meant to provide a clear understanding of necessary CRM activities.

2. Value Creation Process

There are three questions that are considered in the Value Creation Process:

- What value can the company provide to the customer?
- What value can the company receive from the customer?
- How can the lifetime value of customer segments be maximized?

The first question can be explored by the creation of a value proposition that relates the performance of the product to the fulfillment of the customers needs. In newer research work, also the role of the customer as co-creator and co-producer is reflected (e.g. Skålén et al. (2012)). In order to ensure a most fitted value proposition, companies should deduct value assessment to quantify the importance, which customers place on certain product features. Payne and Frow clearly answer the second question as in customer value equals the results of the co-production of value, the improvement of acquisition and retention strategies and the improvement of the channel management. These values can be maximized through the analysis and understanding of customer acquisition and retention, opportunities for sales and building customer advocacy.

3. Multichannel Integration Process

The Multichannel Integration takes the results from the two previous processes and translates them into value-adding activities. In this step it has to be decided, what combination of channels should be used and how to create a unified positive experience for the customer across all channels. Most companies choose to enter the market through multiple channels (hybrid model), for which it is necessary to define standards for each channel on how to offer a perfect user experience. Furthermore, it is important, that the company can gather information from all these channels and unify it, therefore making co-creation of customer value possible.

4. Information Management Process

The Information Management Process is concerned with the gathering and usage of customer data and information. These can then be used to generate customer insight and marketing responses. The key artifacts in this process are:

- **Data Repository:** Is an enterprise-wide data store and provides relevant data analyses.
- **IT Systems:** Refers to all hardware and software used in the company. Technology integration might be required before the data repository integration.
- **Analytical Tools:** Provide data mining functionality (i.e. finding meaningful patterns and relationships)
- **Front/Back Office Applications:** They provide customer contact points or respectively internal administration. They have to be sufficiently connected.

5. Performance Assessment Process

The last process is meant to ensure that the organization's identified goals regarding CRM are met. This happens by looking at two components, the shareholder results as a macro level view and the performance monitoring as a micro level view. To deliver shareholder results the company has to organize how to build employee value, customer value, and shareholder value and reduce costs. In the performance monitoring more fine-grained standards, metrics and key performance indicators have to be defined and implemented in the five major processes.

3.2 Online Community Design Guidelines

In the following segment we are going to discuss the guidelines found on how an online community can be efficiently designed.

Andrews (Andrews, 2002) and Iriberry and Leroy (Iriberry and Leroy, 2009) differentiate between phases of online community design and phases of the online community life cycle, which define requirements for the implementation. Each evolution phase of an online community has specific characteristics and needs (Iriberry and Leroy, 2009).

Andrews focuses her research on developing an architecture for an audience that is assumed to be highly resistant. The design of the community is dependent on user characteristics like age, attitudes, beliefs and behaviour towards the Internet. In general, she defines the purpose of a community as common interest information sharing and problem solving. Andrews identifies three stages in the resistance mitigating framework:

1. Starting the Online Community
2. Encouraging Early Online Interaction
3. Moving to a Self-Sustaining Interactive Environment

In the first component trust building techniques have to be provided. Trust and reputation can be gained through the advertising of alliances with recognized reputable organizations. Furthermore, focused content should be delivered through an easy to use and navigate website. Used language should be clear and accurate. Another suggestion from the author in this phase are outreach transitional events to induce positive perceptions of the community's trustworthiness. The second component is meant to engage resistant audiences slowly through incremental interaction. Beneficial to this is the reinforcement of the purpose of the community, for example through the website URL/name, logo, tagline or/and statement on the home page. Crafted policies and privacy guarantees are important to be defined and made obvious to the user. Like other authors (e.g. Powazek (2002)), Andrews mentions how important it is to connect content with the community discussion. To allow private communication and face-to-face interaction direct messaging and video conferences should be considered. Lastly, to make the website sustainable, members should be able to actively participate in the development of policies, practices and topic, for example as moderator. Moving to self-sustainability is also the effort of the last phase. Here, the focus relies on techniques to make the website and interaction with the community more personal. This can for example be achieved through private discussions, information sharing functionality and recognition programs that rewards participating members.

In comparison to Andrews, Iriberry and Leroy do not just focus on the beginning stages, but the whole life cycle of an online community. They also do not advise specific functionality for each stage, but give the more general success factors that are important to consider. Iriberry and Leroy identify five different phases in the Online Community Life Cycle: Inception, Creation, Growth, Maturity and Death (Figure 3.3).

During the inception phase the idea for an online community is born. It is critical for success to identify a clear purpose before the start of implementation, which is written down in the online community UI. Next the needs of the target audience need to be identified in order to be able to target to those. Clear Codes of Conduct should already be established. Further suggested are the development of an appealing tag line and to consider funding and revenue issues. Only in the creation phase the technological components should be selected based on the previously identified needs. The important success factors for this phase are user-centered design and evolution, high interface usability, sensitively handled security and privacy, anonymity in appropriate cases, performance and reliability of the website and the ability to identify users and see their history. In the growth stage the community is increasing in members. A community culture starts to emerge. It is important now that the creators focus on not only attracting new members, but integrate new members smoothly while ensuring up-to-date, quality content. The interaction and contribution of members need to be continuously encouraged. A trustworthy operator or alliance partner is again important, as well as conducting offline events or meetings.

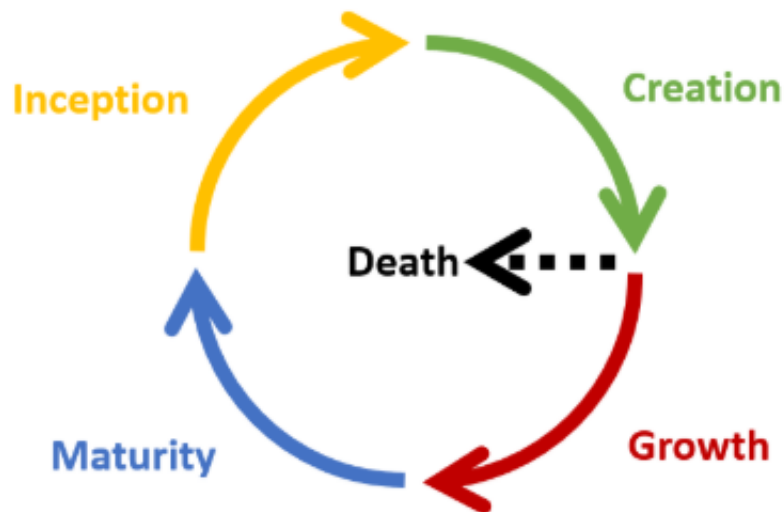


FIGURE 3.3: Online Community Lifecycle (Source: Iriberry and Leroy (2009) [modified])

Personalization should be considered as well. A point that is considered especially important in the maturity phase is the recognition of contributions and loyalty. In general, member satisfaction is a critical success factor. Since the number of members and content should reach a critical mass in the maturity phase, it is now necessary for creators to allow members to fulfill management tasks and allow the formation of sub-groups for discussing topics of interest. Depending on whether an online community is successful or not, it will either continue in the iterative process or enter the ‘death’ phase. If successful, the community will attract new members, with potentially different needs and characteristics so the community iteratively progresses and changes in the following stages. Unsuccessfulness and death might be a result from, e.g. low participation, unorganization, poor quality content and privacy issues.

3.3 Trust as a Common Factor

As it has been mentioned in various previously analyzed papers, trust is a decisive criteria for a successful community (Iriberry and Leroy (2009); Andrews (2002); Ebner, Leimeister, and Kremer (2009); etc.), but also for CRM activities (Boulding et al. (2005); Verhoef (2003); etc.). Therefore, we want to explore the concept of trust in regard to relationship management and online communities.

The concept of trust is a main construct in the commitment-trust theory of relationship marketing and the social exchange theory. According to the commitment-trust theory, relationship commitment and trust are essential for developing and maintaining a successful cooperation between relationship parties (Morgan and Hunt, 1994, p. 20). Relationship

Commitment in fact is built on trust, along with shared values and satisfaction. (Wu, Chen, and Chung (2010); Morgan and Hunt (1994)). In the social exchange theory, relationships of commitment and trust are found to be the outcome of reciprocal exchanges, then becoming benefits for later exchanges (Cropanzano and Mitchell, 2018).

Luo (Luo, 2002) identifies three trust-production methods that are based on the different types of trust, namely characteristic-based trust, process-based trust and institution-based trust. Characteristic-based trust has its foundation in social similarity creating a sense of community. In a technological context, this could be achieved for example by adopting technologies similar to those of other companies (Zucker, 1986) or offering chat rooms, interest groups and the like for inter customer communication (Jin and Robey, 1999). Privacy concerns are likely able to be relieved by characteristic-based trust (Luo, 2002). The next method that Luo identifies is process-based trust. Process-based trust is created by past transactions, repeated purchases, expected future exchanges and communication. The resulting customer satisfaction could be achieved from a business point of view by, e.g. free gifts or extra advice about products. Process-based trust is expensive in the relationship exchange, but more likely to solve privacy concerns of online customers than characteristic-based trust. A cheaper alternative is the last method, institution-based trust. This type refers to the purchase of certificates (e.g. trademark seals) from reputable third parties or intermediary mechanisms like banks or escrow accounts.

Shneiderman (Shneiderman, 2000) has taken the already conducted research and formulated key principles in response to the findings, along with guidelines on how developers can react to them in designing their e-commerce, online communities, web sites, etc. We want to give an overview on these:

1. Principle: Invite participation by ensuring trust

Users want to be reassured in a trusting relationship in order to participate. The following guidelines should be applied by the developer:

- Disclose patterns/statistics of past performance
- Provide user references
- Provide certification from third parties
- Formulate easy to read and to locate policies on privacy and security

2. Principle: Accelerate action by clarifying responsibility

Good website design inspires trust. Clearly stated responsibilities and obligations speed cooperation. The following guidelines should be applied by the developer:

- Clarify each participant's responsibilities
- Provide clear guarantees with compensation
- Support dispute resolution and

- Mediation services

Chapter 4

Method

This chapter will elaborate on the methods used in this paper for designing and implementing the required system. The qualitative measurements used for evaluating the final implementation will also be introduced in the process. The principal method used is design-science research, which will be discussed in the following sub-chapter 4.1. However, the first main component of this paper is the already conducted method of literature review, which was executed to assess functionalities that should be realized by the implemented system and guidelines the system should comply with. Articles have been selected according to the rank of publisher journals in the VHB JOURQUAL (*VHB Jourqual*) for business or the Scimago Journal & Country Rank (*Scimago Journal & Country Rank*) for IT focused journals. Journals had to be part of categories A or B in the VHB Jourqual or Q1 or Q2 in the Scimago Rank.

4.1 Design Science

Design science is concerned with the creation of successful artifacts, through creating an explicitly applicable solution to a problem (Peffer et al., 2007). The design science method is based on Hevner et al.'s research (Hevner et al., 2004) in which he developed the guidelines in table 4.1, to give an overview over the artifact design characteristics which are necessary to make the final product constitute as a contribution to design science research.

We want to discuss how our paper and products can fulfill the given guidelines and are, therefore, a valid contribution to the design science research. The guidelines should be fulfilled as follows:

- **Guideline 1:** Is fulfilled by the implementation of the system, which will be an instantiation in the above options.
- **Guideline 2:** Is fulfilled by implementing the system to fulfill CGM's needs and solve the issues that have been discussed in the introduction.
- **Guideline 3:** An analytical evaluation will be executed to fulfill this guideline. The evaluation methods will be further explained in the next sub-chapter 4.2.

Guideline	Description
Guideline 1: Design as an Artifact	Design-science research must produce a viable artifact in the form of a construct, a model, a method or an instantiation.
Guideline 2: Problem Relevance	The objective of design-science research is to develop technology-based solutions to important and relevant business problems.
Guideline 3: Design Evaluation	The utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation methods.
Guideline 4: Research Contributions	Effective design-science research must provide clear and verifiable contributions in the areas of the design artifact, design foundations and/or design methodologies.
Guideline 5: Research Rigor	Design-science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.
Guideline 6: Design as a Search Process	The search for an effective artifact requires utilizing available Process means to reach desired ends while satisfying laws in the problem environment.
Guideline 7: Communication of Research	Design-science research must be presented effectively both to technology-oriented as well as management-oriented audiences.

TABLE 4.1: DSR Guidelines (Source: Hevner et al. (2004) [modified])

- **Guideline 4:** This guideline is fulfilled as the development of the artifact is an ‘Exaptation’ according to the DSR Knowledge Contribution Framework, also proposed by Gregor and Hevner (Gregor and Hevner, 2013) shown in figure 4.1. Known solutions in CRM, Social Networks, etc. are applied to the problem.
- **Guideline 5:** This guideline will be fulfilled since the development of constructs, models, methods, and instantiations, as well as the evaluation, will be in cooperation and under the supervision of CGM.
- **Guideline 6:** Is fulfilled by conducting adequate analysis of literature and applying the adequate findings to the final product as well as cooperating with CGM to develop the most fitted solution.

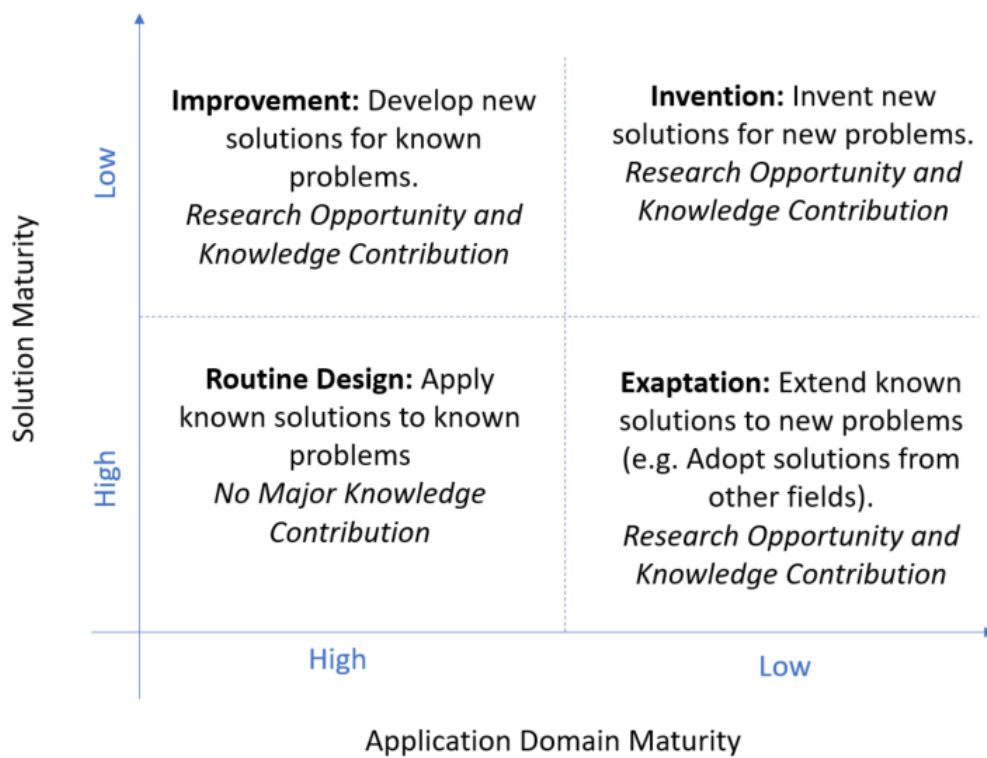


FIGURE 4.1: DSR Knowledge Contribution Framework (Source: Gregor and Hevner (2013) [modified])

- **Guideline 7:** Is fulfilled by the presentation of the final product to Assist team, the Corporate Vice President AIS and the fulfillment of this master thesis.

4.2 Measurements

A selection of measurements and metrics is given by the authors in chapter 3. They also mentioned several criteria that are important for successful CRM and online communities and can be evaluated, even though they did not specify how.

Payne and Frow (Payne and Frow, 2005) see the goal of CRM in building employee value, customer value and reducing cost. While a change in employee and customer value might be difficult to measure in our small time frame, some aspects of costs can be compared to the previous situation. Winer (Winer, 2001) claims that traditional measures of success have to be updated to more customer-centric ones. However, he also still regards the traditional ones as continuing to be important, i.e. measures like profitability, market share and profit margins. Therefore, these traditional measures will be evaluated in our context, as far as it is possible. Customer-centric measures can be, e.g. trust, interaction and most important customer satisfaction, which is also mentioned by Boulding. These measures can be collected in a survey after the customers have been able to test the website for some time. In this survey further success factor metrics regarding online communities can be included. Millen, Fontaine and Muller (Millen, Fontaine, and Muller, 2002) have shown that online communities can increase loyalty, communication, trust, visibility, reputation and productivity. Measurements for these criteria should, therefore, also be taken into consideration. Last, it is mentioned that it is also important to have user-friendly website in regard to clear language and easiness to navigate. However, also the general performance of the website should be considered (Andrews, 2002).

Taken all aspects into consideration we decided to divide the evaluation into two parts. The first part is evaluating the final system from a company perspective by assessing its financial benefits and effectiveness. The second part is a customer-based evaluation. A scientific measure that gives a good overview over the mentioned criteria without overwhelming the survey participants is the WebQual (Barnes and Vidgen, 2002), which is an instrument for user evaluation of websites in, e.g. usability, usefulness and accessibility. Based on this, the product's effectiveness and possible future to-dos will be evaluated.

Chapter 5

Artifact Description and Design

The design decisions introduced and taken in the next subchapters are the results of the previous literature research and coordination with CGM. This implies that insights from the previous research have been discussed with CGM, suggested processes have been applied if possible and requirements specified that possibly do not allow to fully comply with the literature research results of this paper.

5.1 Application of the identified Frameworks on CRM

For the development of the CRM component of the system we will orient ourselves towards the frameworks discussed in chapter 3.1. It is important to mention here, that the existing frameworks are focused on a company-wide implementation of a Customer Relationship Management solution. For the scope of this thesis however, because of the existing limitations, the frameworks have to be applied and possibly modified accordingly, to be fitted to a smaller application area. This means for example, that results will be still subordinate to already existing company regulations, strategies, etc.

We start with the theoretical part of CRM development as proposed by Payne and Frow. Winer starts with the Creation of a Database and Analysis. However since results of the theoretical evaluation might have an impact on our implementation, but not the other way around we chose this prioritization. There are two topics that have been discussed with the CGM Assist team first, namely the underlying strategy that is to be developed and the topic of existing and potential customers. These subjects originate from Payne and Frow's first phase, the 'Strategy Development', but since we are acting on a department and not company level, we are mainly establishing a common understanding of necessary tasks rather than develop a true business strategy. The vision of the Assist team regarding its Customer Relationship Management, as it has already briefly been mentioned in the introductory part, is to improve interaction and communication with their customers by means of quality and quantity. This means that customers should be better supported in their development of extensions to the team's software. Support should happen proactively, in offering a larger amount of organized helpful resources, and reactively, in direct

support in case of any problems and issues experienced by the customer during the development. Furthermore, better communication and interaction is supposed to benefit the team's requirement analysis. Since the customer is better educated he/she is able to give specific and realistic requests for software extension and improvement. By achieving the previous two goals the Assist team expects to see an increase of customer satisfaction and ideally as a result an increase of Word-of-Mouth marketing. A description of the industry environment, as proposed by the framework of Payne and Frow is not necessary for the strategy development in this case since the application of the software is only going to be internally and with subsidiary companies.

As a next step, the existing and potential customers have been analyzed based on the already existing users and developers of Minerva. In general, the target customers will be either developers or requirement managers of the customer business units. Following business units can be regarded as potential customers:

1. CGM Germany
 - Kostenträger (at least 2 users)
 - CSD (up to 30 users)
2. Intermedix (at least 4 users)
3. CGM Italy (at least 4 users)
4. CGM France (potential unknown)
5. CGM CZ (potential unknown)

Additionally, the following subsidiary companies can be regarded as potential customers:

6. Gotthardt Healthgroup (at least 4 users)

It has been decided in regard to customer segmentation and targeting that in the beginning stages the main goal is to increase the usability of the application. Other purposes, e.g. marketing, sales, etc., might be considered in the future. Multiple strategies have been discussed for the customer segmentation. The first one is the segmentation based on the business units. The reason for this segmentation is that the availability of features can be different between different units. For example, certain features might only be developed or released for certain countries or the date of the release varies between different countries, which should be reflected in the application. The other possible segmentation strategy is by role of the user. While a developer should have access to a variety of necessary resources, requirement managers should for example only be able to access and download finished implementations of extensions. This prevents possible problems in misuse of the platform.

After this initial steps in the framework of Payne and Frow, they address the Value Creation. The values given to the customer and the values received by the company (here the Assist team) will be highlighted in the following table:

Customer Gains	Company Gains
<ul style="list-style-type: none"> ● Direct and indirect support (Assist team or other users) ● Faster responses than through traditional support ● Independent implementation is faster than implementation through Assist team (usual planning delay is half a year) ● Access to other implementations 	<ul style="list-style-type: none"> ● Distribution of the software ● Less support effort ● Less development effort ● Improved reputation

TABLE 5.1: Customer Gains vs. Company Gains (Source: Own Representation)

The maximization of a customer's lifetime value will in this case be achieved through customer retention and customer advocacy. In the Value Creation Process it was suggested to create a value assessment of which product feature the customer regards as important. In the Relationship Management Phase customization to customer's needs is also an important part. For this reason, we sent out a questionnaire to potential customers and rated it based on the KANO Model by Noriaki Kano. The questionnaire can be found in the Appendix section. The results of the survey are discussed in chapter 5.4.1.

The last missing part of the theoretical CRM development is the Multichannel Integration. It has been discussed that the CGM Assist team wants the to-be-developed website to be the only available channel as a customer touch point. Therefore, they will try to direct currently used channels to this one and the Multichannel Integration does not need to be discussed in this thesis.

The Customer Segmentation and Customer Targeting discussed in the context of Pane and Frow's model are of course equivalent to the corresponding stages in Winer's model. After these two stages, Winer focuses on Relationship Marketing and Privacy Issues. Again, we are able to observe one of the many recurring similarities between CRM and virtual communities as loyalty programs, customization and privacy concerns will be discussed in chapter 5.2 as well and therefore is avoided here for redundancy reasons. The only addition that should be mentioned here are that support should happen proactively, in offering a larger amount of organized helpful resources, and reactively, in direct support

in case of any problems and issues experienced by the customer during the development. Furthermore, of course community building is an implemented program by nature of the system.

Finally, based on the previous theoretical results we could now decide to implement a database, collecting customer contacts and descriptive information, which is based on the customer segmentation and targeting results as well as containing all necessary data to offer the functionalities requested by customers in our user survey.

For the performance analysis and metrics stages the website's usability will be evaluated using the WebQual, an instrument for consumer evaluation of websites developed by Barnes and Vidgen (e.g. Barnes and Vidgen (2001) and Barnes and Vidgen (2002)).

By following the introduced frameworks, we now defined the concept for our CRM implementation. The analytical CRM is based on our database and the selected data, which allows for service automation in the operative CRM. The collaborative CRM is implemented by the platform itself, which allows for interaction and communication. Furthermore, we discussed all CRM perspectives of chapter 2.1, which allows us to align towards the broadly and strategically defined CRMs of the CRM Continuum. This broadness, however, is limited by the scope of this thesis.

5.2 Application of the identified Frameworks on Online Communities

For the design of the Online Community we again followed both discussed models by Andrews and Iriberry and Leroy. Even though Iriberry and Leroy's model is more extensive the first phases are overlapping in concept to a great extent with the one proposed by Andrews. The Growth and Maturity phases are mostly out of scope of this thesis since they can only be evaluated after a longer time period.

In the Inception phase of Iriberry and Leroy and the second stage of Andrews model, the purpose of the community is enforced. For this reason, an appropriate tagline, logo and URL should be chosen. This is in the responsibility of CGM. Additionally, the website should have a description of its purpose and functionality in a separate page. The user identification and targeting has already been done in the CRM phases, along with the analysis of customer's needs in functionality that has been done by a user survey. For the creation of the community Ruby on Rails has been chosen as a development framework as well as Bootstrap for the UI design. These technologies will be further explained in the next chapter 5.3, but it is important to note here since they provide usability and a familiar feel of the website since both models stress the importance of a well-designed website. In the growth phase both authors agree that offline events are considered beneficial. There are no events planned solely for our application, however, seminars for teaching the usage of Minerva 2.0 will be conducted, which can also introduce the Minerva Community.

There are some elements of the maturity phase that also correspond to Andrews model. These are the establishment of self-sustainability through, in our case, giving users admin rights for their own created groups and a recognition program, which allows users to up-vote helpful posts and give recognition to helpful users.

One of the most important aspects in an online community (and CRM), as it was already mentioned, is trust. CGM was asked to establish appropriate policies, guarantees, etc., which will be placed easily visible on the website. This goes hand in hand with the proposed methods on trust building by Andrews. These policies are aimed towards a characteristic-based trust as explained by Luo (Luo, 2002). Also, institution-based trust is considered by the others as they recommend trusted third-parties and institutional parties. This is expected to be the strongest trust factor of our system since customers are part of CGM units or CGM subsidiaries. Additionally privacy concerns will also be alleviated by the community running on the internal network and not being accessible from outside. As mentioned since also a good website design inspires trust, this is part of the final evaluation to identify any issues of it.

5.3 Proposed System

It was agreed on using Ruby on Rails as the underlying framework of the web application. Ruby on Rails was especially developed to develop business-critical, database-supported Web applications in a way that it would increase programmer productivity and reduce entry barriers to programming Web Applications (Bächle and Kirchberg, 2007). This is beneficial to our purpose since it was necessary to implement a well designed, fast website that can communicate smoothly with the underlying database system, in a limited time frame. The reduced entry barriers allow for the Assist Team, which is not specialized in Web Development to maintain and modify website by itself. Since the Ruby on Rails framework is based on a well-known design principle, the model-view-controller architecture, it is easier for not very experienced web developers to understand and manipulate its functionality. Since by nature of an Online Community we need to work on a database system to establish the functionality of the system, using Ruby on Rails and its Active Record sub-framework provides an easy method to access and modify the underlying database system, perform validations or transform entries into data objects. As mentioned in the previous chapter 5.2, the User Interface was realized with the help of the Bootstrap Framework first developed by Twitter developers Marc Otto and Jacob Thornton in 2011 (Cochran, 2012). Bootstrap incorporates HTML, CSS and JavaScript technologies to allow the user to create a visually appealing, up-to-date website UI design. According to Builtwith.com Twitter Bootstrap currently owns about 72% market share in the design framework category (*Design Framework Usage Distribution on the Entire Internet.*). Due to its widespread use in popular web pages, e.g. Netflix.com or

Samsung.com (*Bootstrap Market Share and Web Usage Statistics.*) it provides the user with a familiar feel of the website and therefore encourages usability and trust.

The actual design of the websites functionality and structure has been influenced by the vision and existing conceptualization of the CGM Assist Management, the identified customers and stakeholders and existing standards. To finish the implementation of the website in a timely manner, the development process was first started with the predefined requirements of CGM. These requirements, however, were also included and challenged in the customer survey. During the implementation phase the results of the customer survey were collected, discussed and resulted in changes of the requirements if the result was unexpected or requirements needed modification. According to the followed timeline, the result of the user survey and the changes to initial requirements will be discussed in the following chapter under 5.4.1.

The initially proposed system needed to include an About page, an Impressum page, a page for Terms and Conditions as well as one for the website's Privacy Policy. These pages must legally be included and accessible from every subsequent HTML page. The user should be able to create an account via registration on the website, which needs to be validated using activation emails. Without log-in to the website it should not be possible to view any of the website's content. Upon log in it should be possible for every user to create groups. Groups are the communication platform for add-on development and should not be viewable by unauthorized users. This means that if a user wants to join a group he has to first be able to send a join request to the group creator. Group creators are administrators of their own groups and responsible for accepting new members, deleting inappropriate, wrong, or misleading information, guide the development process and submit the final implementation of the development. Therefore, each group contains its own post feed including post comments and an area to submit the final implementation. As post categories and votes should be used for CRM possibilities, it should be possible to annotate them with tags, which are already predefined, and give a positive or negative vote. While Group Creators are also Group Administrators, the Assist team members will receive member accounts equipped with general administrator rights. These include the ability to delete groups and users as well as view and delete group posts, whether they joined the group beforehand or not. General Admins also have the responsibility to review group submissions. Accepted submissions will be able to be downloaded by every user, as far as it is allowed by CRM strategies. As an initial landing page a news feed will be implemented containing all posts published in the users joined or created groups. Last, for easier navigation on the website, a search feature will be implemented to find posts and/or users. However, it is of high importance that the search result is not including data which the user is not authorized to view. The landing page can be seen in figure 5.3

5.4 Implemented System

To understand the final implementation of the system it is necessary to know the results of the conducted user survey.

5.4.1 Conduction and Results of the User Survey

For analyzing the customer needs of our platform and prioritize them we made use of the Kano model. The Kano model developed by Prof. N. Kano and other researchers (Kano, 1984) provides a widespread and effective approach to categorize customer attributes and the nature of them (Matzler and Hinterhuber, 1998). It is used to translate customer requirements into technical requirements (Sullivan, 1986) in the processes of listening to the customer (VOC) and quality function deployment (QFD), which are important tools in reaching customer satisfaction (Tan and Shen, 2000). The model classifies product feature into the following kinds (Chen and Chuang, 2008):

- One-dimensional attributes: Result in customer satisfaction when fulfilled - dissatisfaction when not.
- Attractive attributes: Their absence does not lead to dissatisfaction, however, a positive presence lead to customer delight
- Must-be attributes: Their presence does not lead to satisfaction since they are taken for granted, absence, however, leads to strong dissatisfaction.

The relationship of these categories and customer satisfaction and performance are illustrated in Figure 5.1.

To classify the users' needs Kano proposed a survey methodology consisting of functional and the equivalent dysfunctional question, which we followed in our survey that can be found in the attached documents. The results of the survey will then be analyzed according to the evaluation table of the Kano model (Table 5.2). It is suggested to use the most voted categories as a basis for implementation. These can be seen in Table 5.3. However, because the survey had a smaller participation rate than typical surveys using the KANO model, we are also considering overall trends of the results. The complete results of the survey can be found in the Appendix.

It was assumed by CGM that the content of most development groups has to be kept confidential, because of department internal policies. Therefore, we started the implementation with this requirement. Surprisingly however, even though most Users found this feature attractive, the share of users being indifferent and even preferring groups to be open was almost the same. This result was then discussed in a later meeting and the requirements changed, such that both options should be made possible and can be chosen

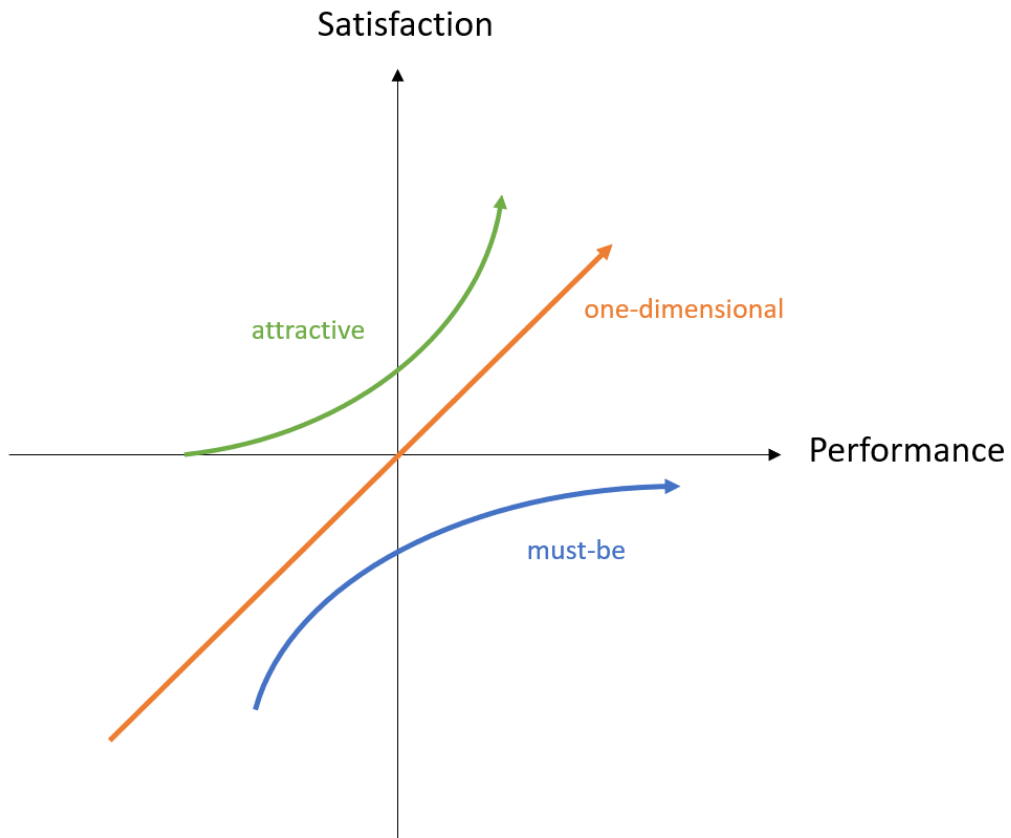


FIGURE 5.1: Kano Model Relationships (Source: Tan and Shen (2000) [modified])

		Dysfunctional form of the question				
		Like	Must-be	Neutral	Live with	Dislike
Functional form of the question	Like	Q	A	A	A	O
	Must-be	R	I	I	I	M
	Neutral	R	I	I	I	M
	Live with	R	I	I	I	M
	Dislike	R	R	R	R	Q

A: Attractive; O: One-dimensional; M: Must-Be; I: Indifferent; R: Reverse; Q: Questionable.

TABLE 5.2: Kano Evaluation Table (Source: Xu et al. (2009) [modified])

by the user. While a news feed was already part of the initial requirements, group invitations and attachments that can be added to microposts showed themselves to be important for customer satisfaction through the survey. They have consequently been implemented. mobile phone support was not seen as a necessary or attractive feature therefore we made the website usable on mobile devices, but did not focus much more on it during implementation. The possibility of issuing Jira Tickets through the community was seen as an attractive feature, however, the Assist team already has a website which allows for doing this. To not make it necessary to maintain the same functionality on two different websites, it has not been implemented in the Minerva Community. However, the older website is directly linked to, so the impact on community users should be minimal. Most users voted to be indifferent about e-mail notifications, however, also a large percentage thought more positively about them. We decided to implement Email notifications for some of the most important functionalities that would not result in a large amount of email generation since this might also result in negative user reactions. Depending on future tests and community usage it might be advised to adjust this. A feedback form was also implemented based on user requests. Even though many users preferred a chat functionality or even saw it as necessary, this was the only time we decided to decide against the user requests. The reason for this is that the purpose of the community is to communicate openly within groups, so that help can be received from other users and future problems are solved proactively. Implementing a chat functionality, especially with members of the Assist team could cause users to fall back to current behaviour and endanger the purpose of the community. In this case we have to accept that this decision might result in some (possibly initial) reduction of customer satisfaction. The last two points, User Rewards and Up-/Downvoting were indifferent to survey participants, however, we implemented them for other purposes like it is explained in the next section.

5.4.2 Implementation of the Web Application

In this chapter the underlying database structure and realization of functionalities will be shown along with some representations of the website's user interface.

The core of the implementation is centered around the creation of content in the form of groups, posts or comments. In figure 5.2 we can see the structures of the respective entries in the database as they are created by Ruby on Rails forms implemented into the website. As it also can be seen in the following figures, Ruby on Rails automatically attaches an ID, created_at and updated_at column to each database. A new entry to the user database is made upon registration. In our user model we enforce an array of constraints for every user. These include:

- maximum length and presence of a user name
- validity, uniqueness and presence of email address

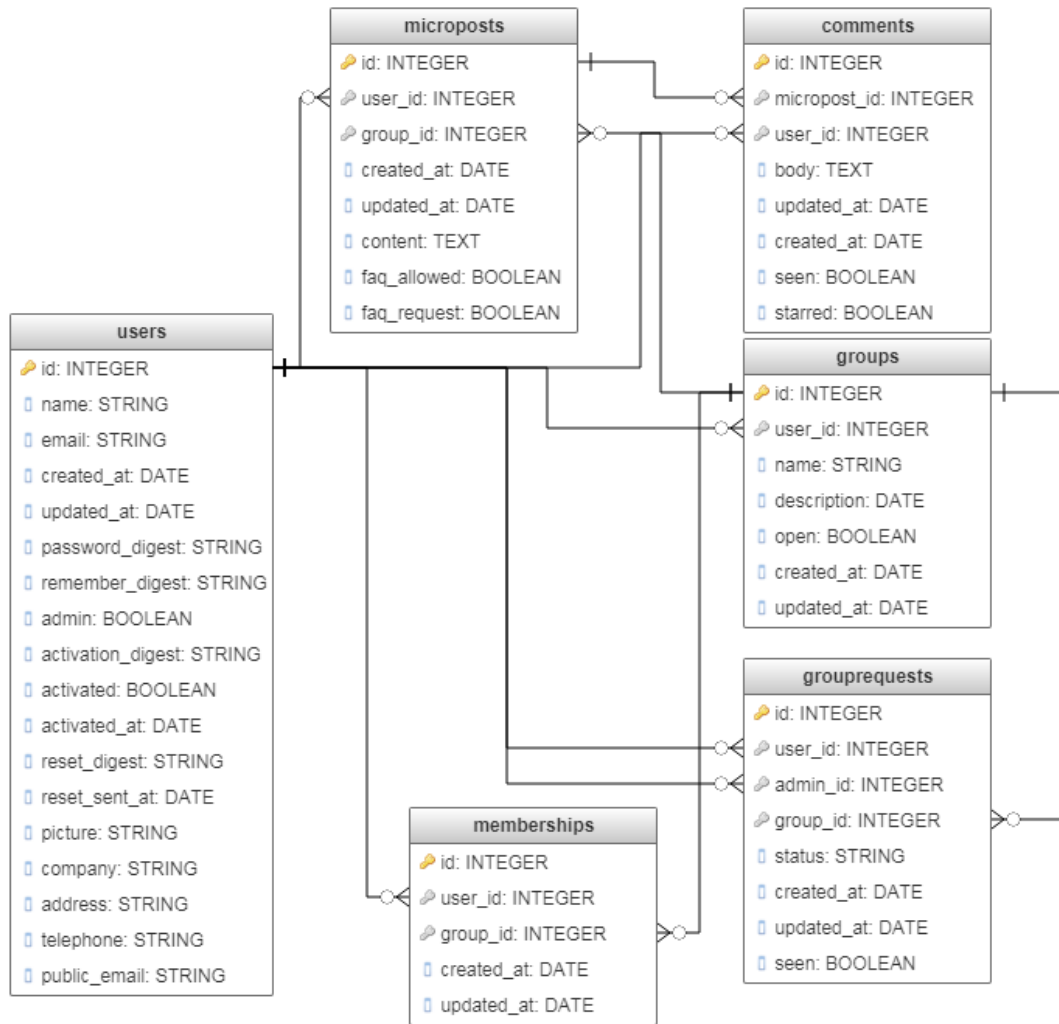


FIGURE 5.2: The Core Database Structure (Source: Own Representation)

- minimum length and presence of password

The password is of course stored encrypted, using the BCrypt hashing function. A user will be activated after clicking the link sent in his activation email. For usability purposes the user can select the option to be remembered when logging in. This will store a cookie in the browser and allow the user to automatically log in if he/she did not purposefully log out before.

In Figure 5.3 we can see the Home screen that is displayed upon successful log in. On the top of the page the main menu, notification alert icon, search bar and help icon is located. The main menu consists of the options Home, Download, FAQ, Groups and Account. Here, the Home Feed is located which lets the user see all relevant posts. CGM also requested that it should be possible to directly create new posts from the Home screen. For this a form is located on top of the Home Feed. To use this form, however, the user has

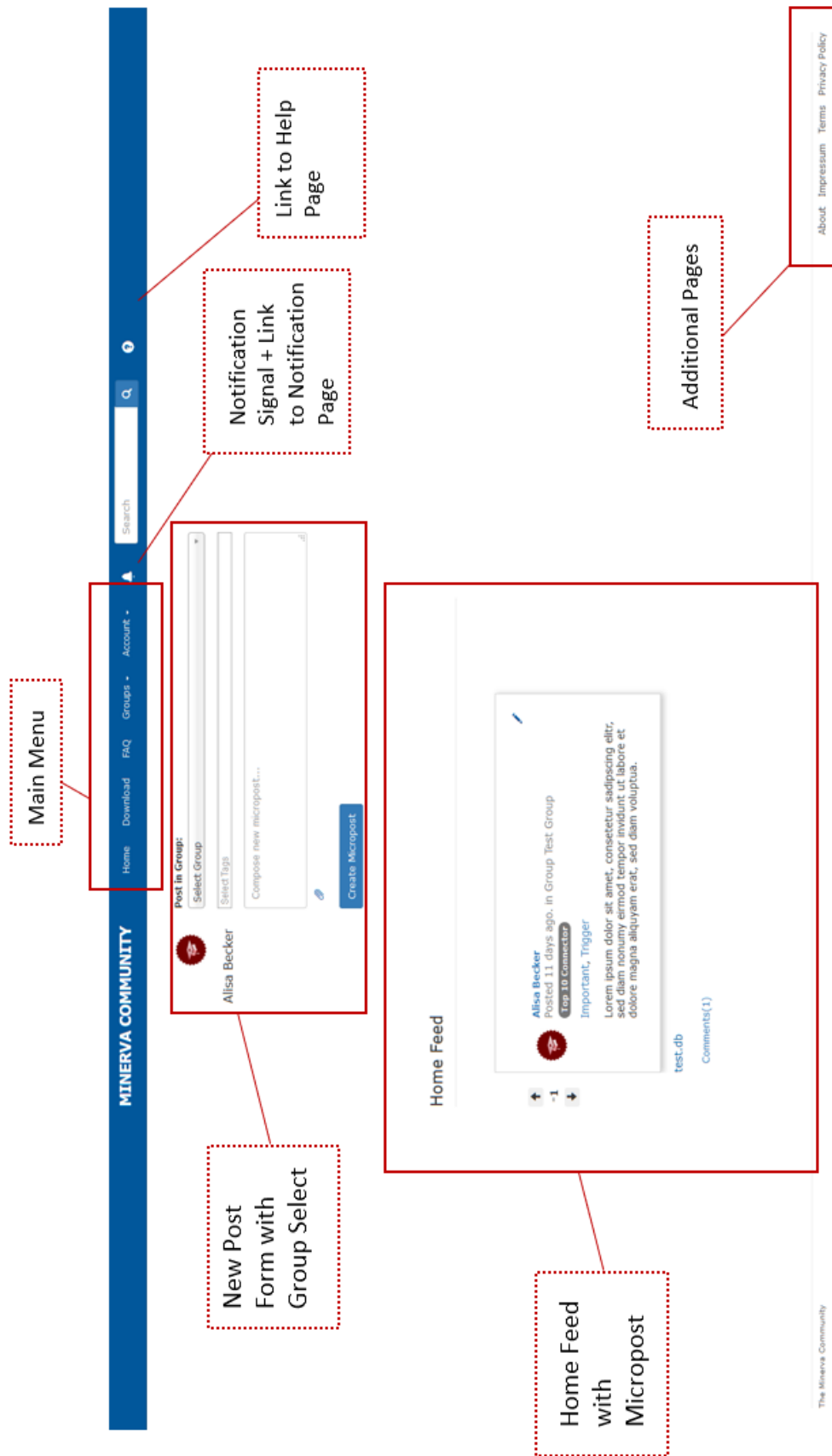


FIGURE 5.3: The Website Home Feed (Source: Own Representation)

to specify a group, where the respective micropost belongs to. Under the menu entry ‘Account’ in the main menu (5.3) the user has the possibility to update his profile and account settings. The profile of a user shows his/her personal information and a chosen profile picture. If no profile picture is uploaded, the default Minerva Community profile picture is displayed. In his or her account settings the user has the possibility to change the email address which was used for registration as well as change the account password. The email address used for registration will not be displayed as contact information to other users if this is not wanted. For this, the user database has a separate `public_email` field that can be set when editing the user profile. A logged in user can create a new group under the menu entry ‘Groups -> New Group’. He will be prompted to give a group name and description and further select, whether he/she would like to create a closed (i.e. joining only with previous requests) or open group. It was originally expected that customers would only want closed groups for information protection reasons. However, since many users chose differently in the survey, it was decided to implement both possibilities and let the group creator decide on the type of group. Submission of the new group form will create a new entry in the group table with the respective inputs and a Boolean variable (‘open’) indicating whether it is an open or closed group. As we can see in figure 5.2 each group also holds a reference to the user that created the group. Created and joined groups can be found under the menu entry ‘Groups -> My Groups’ or under the entry ‘Groups (5.3)->All Groups’. In these listings users can see the group name and description, the responsible group administrator, as well as the creation date of the group. A link is placed under each listing to view the content of the group. For a user that has not joined the group yet it is only possible to see the group members, general group information and request to join the group. Members of the group can see all posts and comments, post and comment themselves and invite other users to the group, like it is shown in figure 5.4. For the group creator it is furthermore possible to submit a final implementation and see the current status of his/her submission. These options can be selected in the group menu. Group creators and general admins will also find the option under each group listing to delete the respective group.

If a user wants to join a group he or she issues a new entry to the group requests table. Each group requests references the requesting user, the group for which the request has been issued and the administrator of the group, who has to accept or decline the request. Requests with the status ‘new’ will be notified to the group administrator. If the request is chosen to be accepted or declined the status will be updated accordingly and the request issuer will be informed about the decision. If a request is accepted a new entry to the membership table will be created, which references the newly joined user and group. Microposts and comments share a very similar data model with the difference that microposts belong to groups and comments belong to microposts, which they reference accordingly. Another important difference is that comments can be starred, i.e. set as

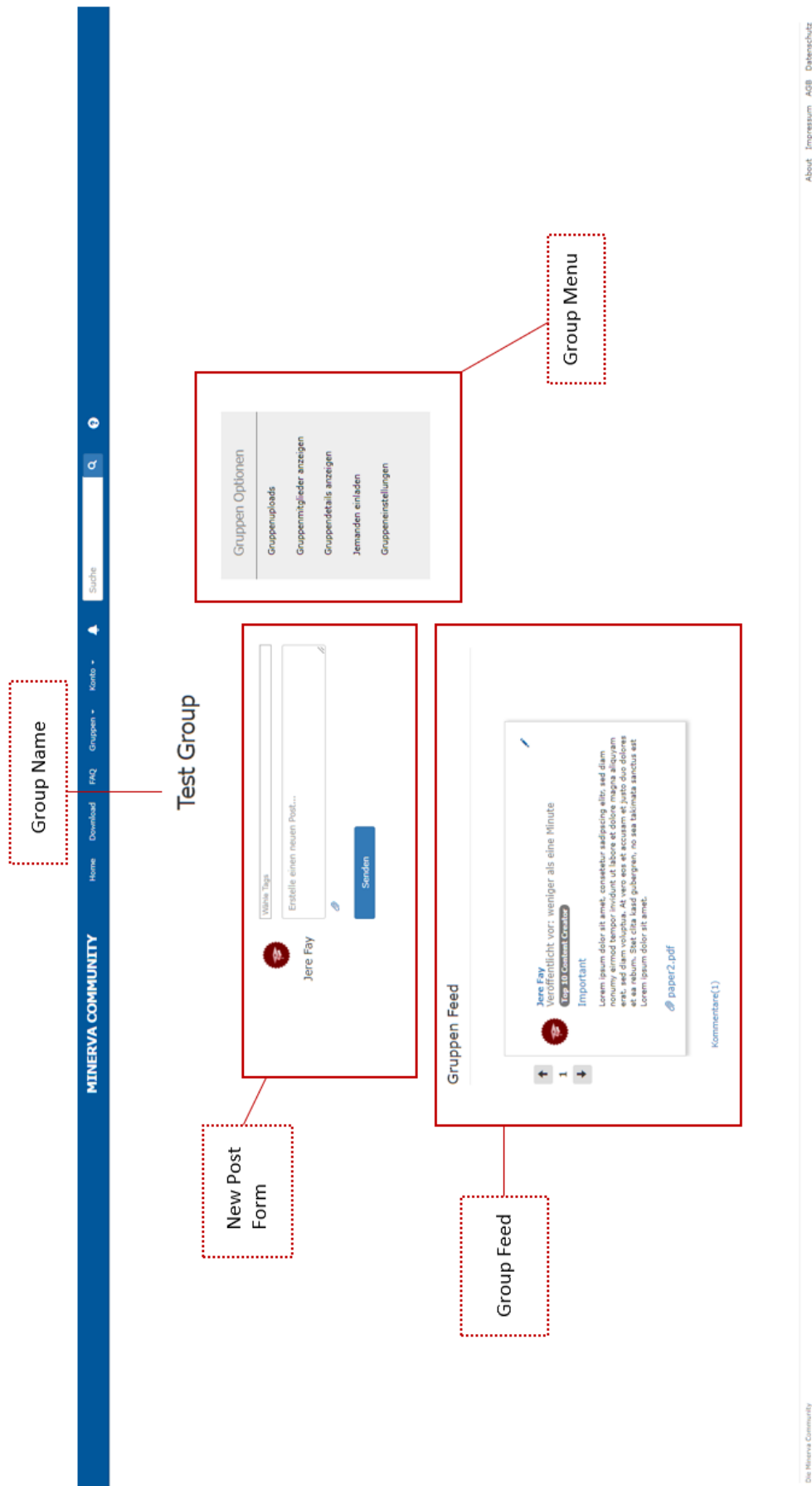


FIGURE 5.4: The Website Group Page (Source: Own Representation)

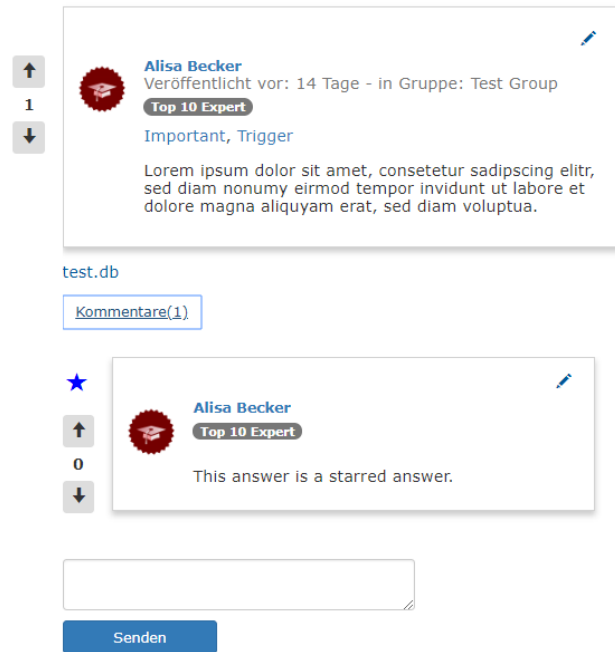


FIGURE 5.5: Starred Comment (Source: Own Representation)

the correct and accepted answer by the micropost creator. Users will see this comment marked with blue star like it is shown in figure 5.5.

To be able to evaluate which components of Minerva need to be further developed by the Assist team and offer proactive help to the user regarding these components, a tagging system needed to be implemented. To realize the annotation of posts with tags two new tables were added to the database: ‘tagging’ and ‘tags’ (Figure 5.6). The tag table has to be filled with the tags that are predefined for categorizing posts. This can be done manually through the Rails Console or by using seeding. To connect tags to microposts and realize a many-to-many relationship the tagging table is needed. The tagging table entries connect a specific micropost to a specific task by reference. When creating a post in a group the user can attach tags to it by selecting from a search-able drop-down menu. Selected tags will be shown in the input field and are separately deselect-able. These tags are then used in the FAQ page and can be used in the search functionality.

Similarly to the function of the tagging table, to implement a voting functionality for comments and microposts that is describing a many-to-many relationship, separate tables have to be specified. These tables can be found in Figure 5.7. The micropost_votes table allows the connection between a specific user and specific post that he voted on. The voting entry needs to be connected to a user because each user is only allowed to vote for a post once. After giving a vote for the first time, he or she is able to update the voting value, but no new entries in the database will be created for this micropost and user. At first it might be unintuitive that two booleans for one voting value are created,

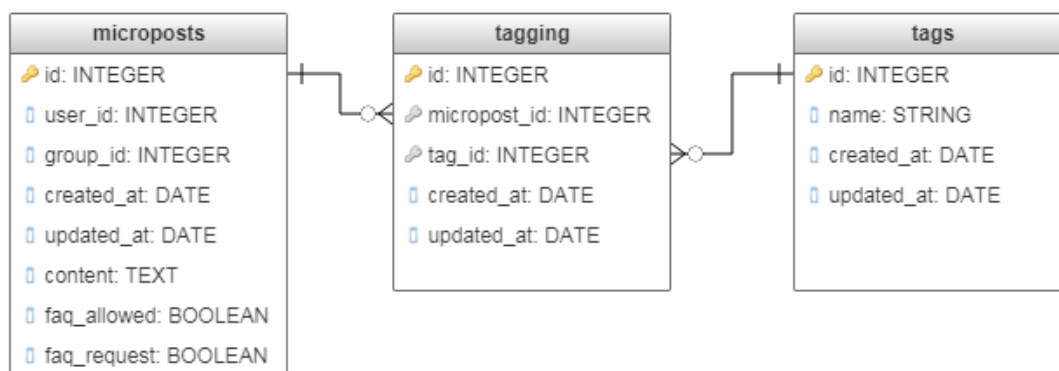


FIGURE 5.6: The Database Structure of Post Tagging (Source: Own Representation)

‘up-vote’ and ‘down-vote’. However, it is necessary for the correct implementation of the functionality to differentiate between three states:

1. The user voted negatively
2. The user voted positively
3. The user did not vote yet/It is the initial vote

This differentiation is necessary because on his/her initial vote, a users judgment will influence the post’s voting score (VS) by VS+1 or VS-1, meaning the new result differs by 1. For subsequent voting the score will be influenced from either VS+1 to VS-1 or VS-1 to VS+1, meaning the new result differs by 2. Since a single Boolean can only represent two states not three, up- and down-votes have been separated in the voting model.

The voting model for comments is working analogue to the voting model for posts. The updated voting score is also immediately displayed to the user upon button click. The voting system was not necessarily requested by potential users, mostly users were indifferent to it. It is solely implemented for Customer Relationship Management activities.

Micropost Attachment (5.8) and Submission (5.9) both have a file upload as their main functionality. Therefore, they are also built quite similarly. Micropost Attachments were requested by the potential users and therefore added to the requirements. The uploading functionality is realized by the Ruby Gem Carrierwave. By clicking the paperclip symbol in the new post form, a file selection input field opens where one or multiple files can be selected via the system’s file picker. The files will be automatically uploaded upon form submission and stored on the server. The path and other file information will be stored in the ‘attachment’ database column, so that they are accessible from within the application. If a micropost has attachments the links to download them will be displayed underneath the post content when a post is rendered to a feed.

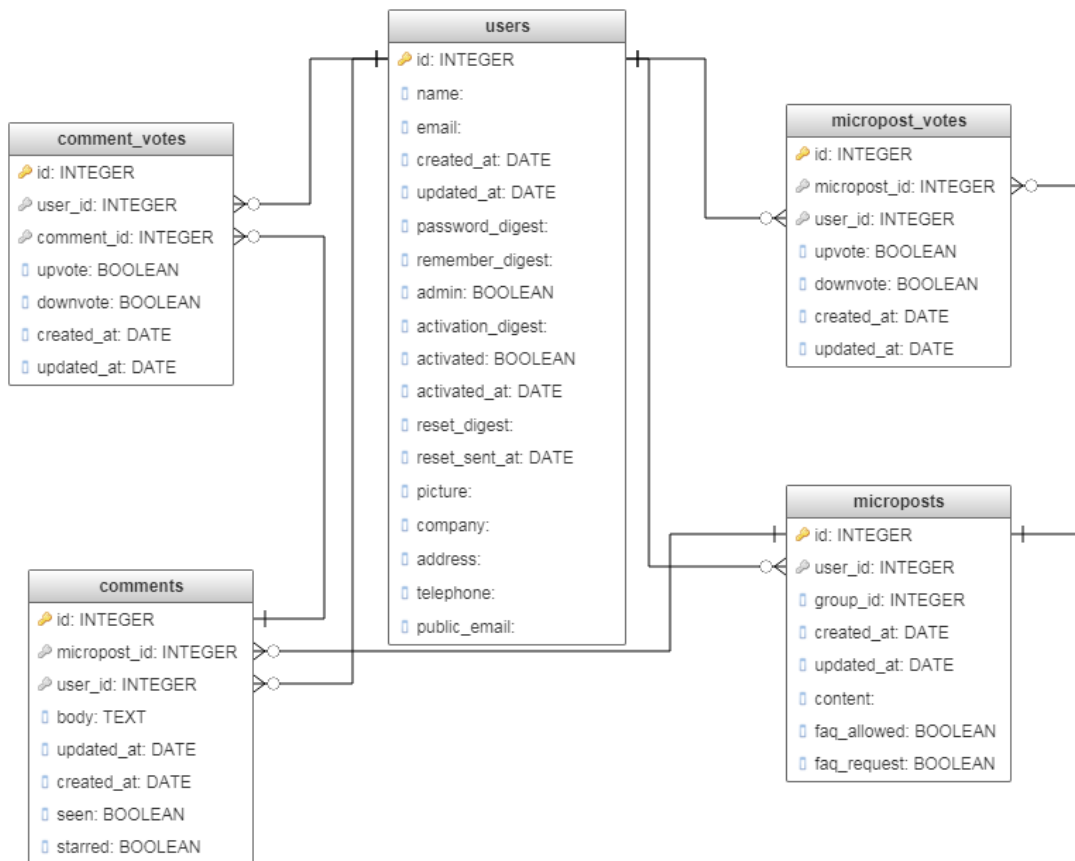


FIGURE 5.7: The Database Structure of Voting for Posts and Comments (Source: Own Representation)

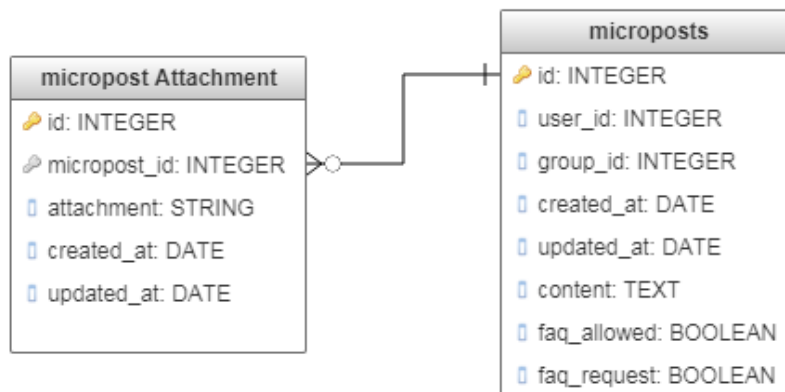


FIGURE 5.8: The Database Structure of Post Attachments (Source: Own Representation)

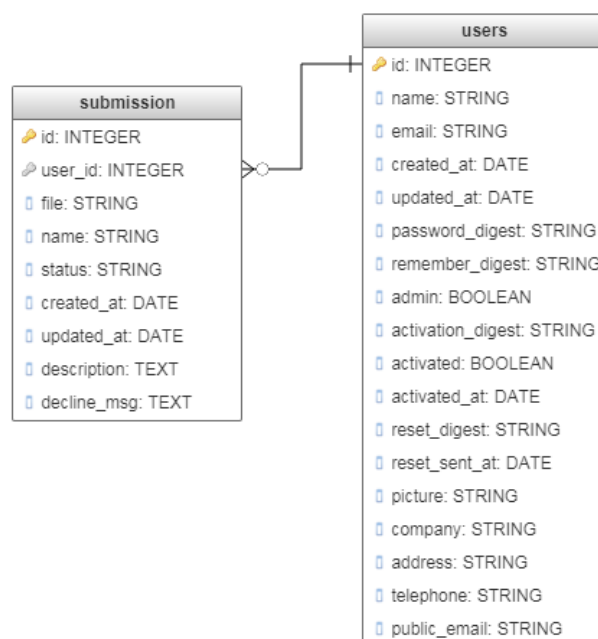


FIGURE 5.9: The Database Structure of Group Submission (Source: Own Representation)

The upload and storage of submission files is analogue to the one for micropost attachments. Submissions can be made from a form on the download page. Since the purpose of a group is to develop an add-on to Minerva, and this could also be useful for other users, the implementation can be officially made available as a download by the Assist team. Hereby a correct implementation will be guaranteed to users while there is only minimum development effort for the CGM Assist team. To submit an implementation the user must give a name and a description to the submission, as well as attach the submission file through the file picker as described above. Members of the CGM Assist Team will be notified on the landing page of the website if there are new submissions to be reviewed. They will also receive an email notification. The team can view all the submission information, download the files and then proceed to test the implementation extensively before either accepting or rejecting it. If an implementation is rejected the reviewer has to enter a decline message which explains the reasons for rejection. This message will then be displayed along with the notification that the submission has been rejected to the user that handed in the submission. Afterwards, he or she has the opportunity to submit a new implementation. If a submission is accepted it will automatically appear under the menu entry 'Download' to the community members that are permitted.

Group Invitations (Figure 5.10) were also not originally planned requirements and have been added due to the requests in the customer's survey. Users can be invited to a group on the respective group page. Upon clicking 'Invite someone' the user is displayed

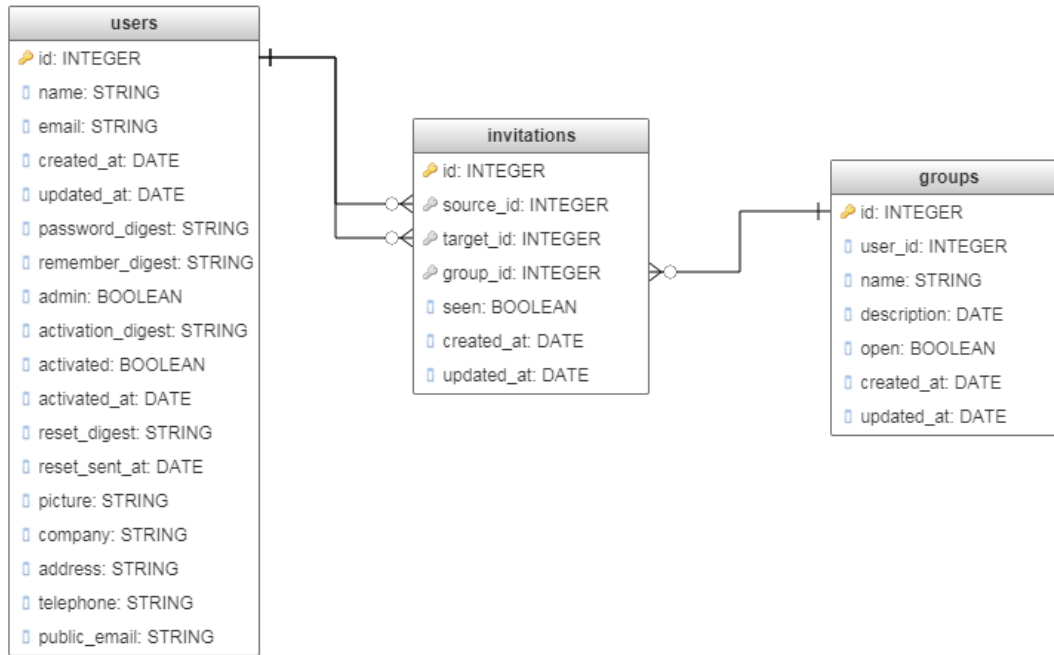


FIGURE 5.10: The Database Structure of Group Invitations (Source: Own Representation)

a list of all users which are not a member of the group yet, as well as the option to invite them and a search bar, to specifically look for certain users. The search bar is implementing a live search, meaning that the results are automatically updated as the user is typing. If the user is choosing a person, whom he wants to invite, a new entry to the table 'Invitation' is being made. The source_id column is filled with the user ID of the invitation sender, while the target ID is filled with the user ID of the invitation receiver. The receiver then gets a notification about the new invitation. As soon as the receiver visited the displayed link or chose to not display the invitation anymore it will disappear from his notification screen.

A feedback form has also been added on potential customers suggestion. The feedback form can be reached under the menu entry 'Account -> Feedback'. For the feedback form tags have been defined to categorize the feedback, like 'Bug', 'Complaint', 'Feature Request', 'General' etc. The selected tag will be saved in the label attribute of a feedback database entry. All the necessary database tables are shown in Figure 5.11. Since on the CGM Assist website it is already possible to create issues for bug fixes, feature requests and support requests for the Minerva project, we note to the user that if the feedback under these categories is concerning Minerva itself, it should be issued under the previous website. The Assist website is already connected to the Jira project management software used within the team and potential customers did not express a clear need for implementing this functionality as part of the Minerva Community.

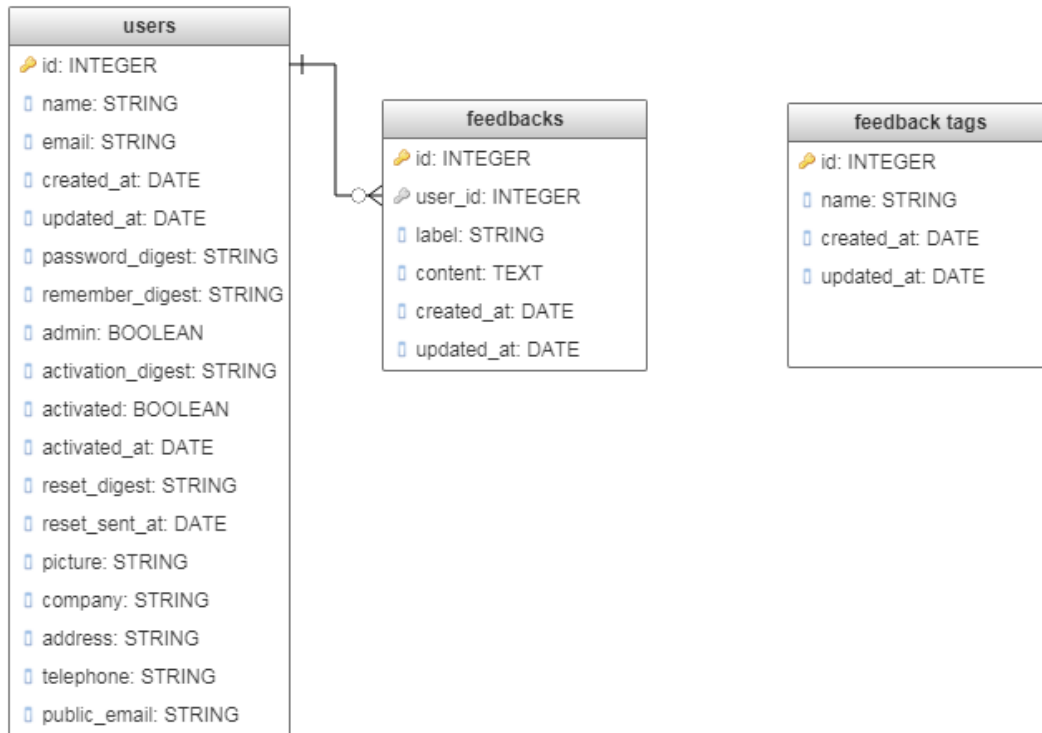


FIGURE 5.11: The Database Structure of Feedback and Feedback Tags (Source: Own Representation)

Since in the previous figures that show the database structure we can only see the tables that are important for implementing a certain functionality, the UML-diagram in figure 5.12 shows the complete structure of the application's underlying data model. The figure also includes the relationship between the single modeling components.

So far, the implemented system was only realizing the necessary functionalities for an online community. Any CRM purpose is only fulfilled by allowing users to organize themselves and support each other. Up to this point the application is aiding customer satisfaction by enabling shorter implementation time for needed Minerva plugins and possible support by the Assist team. However, according to our previously discussed CRM Frameworks we can improve Customer Relationship Management as well as internal processes by using data that has been gathered, in our case through the Minerva Community. Moreover, additional UI features are to be implemented for a successful CRM.

Links to the 'About', 'Impressum', 'Terms' and 'Privacy Policy' pages are all located in the footer of the websites layout and are, therefore, accessible from every internal page (see 5.3,5.4). CGM is responsible for filling these pages with the appropriate content. Additionally a 'Help' page explains the usage of the website.

The website is available in English and German. The displayed language changes automatically based on the default Browser language that the customer is using.

The header of the websites layout contains a search bar which lets the user search for

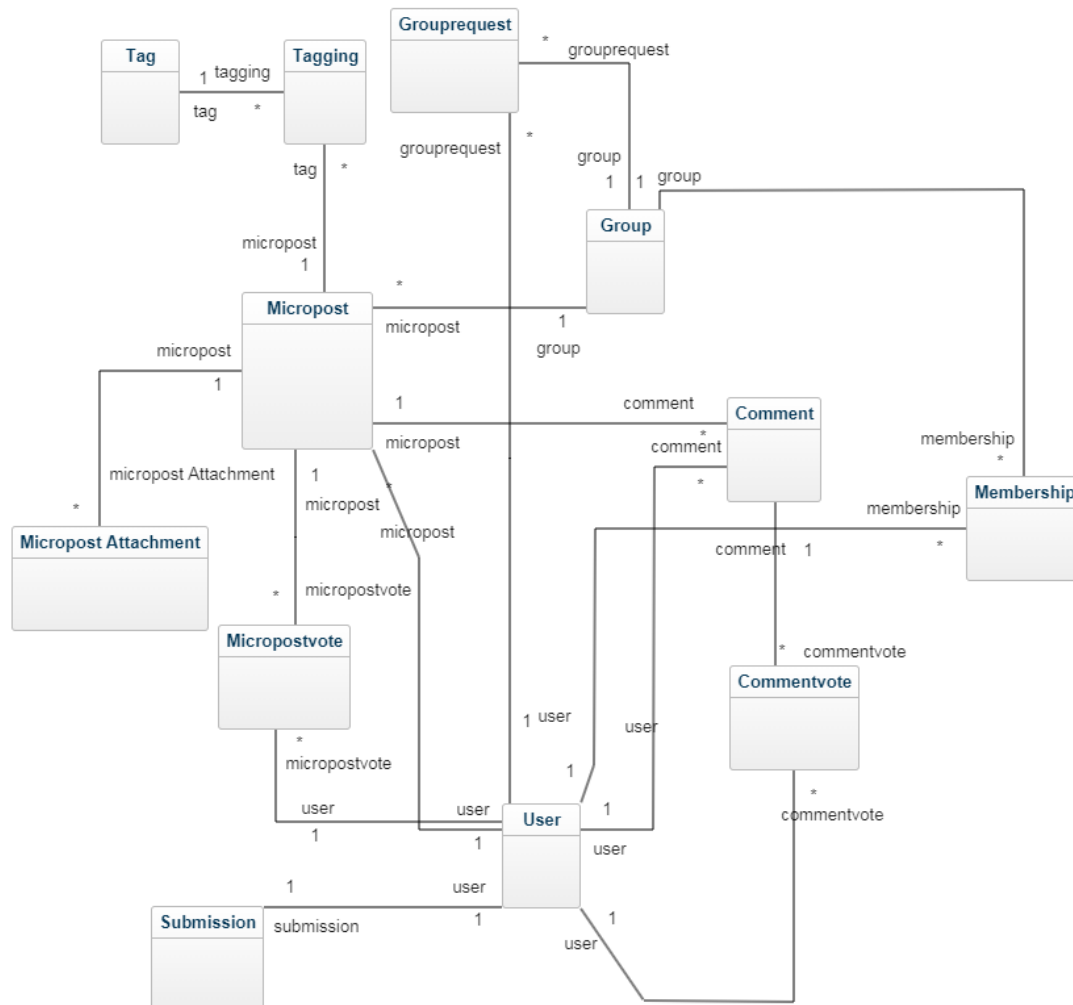


FIGURE 5.12: The Overall Database Relationships for Application Functionality (Source: Own Representation)

elements of the categories microposts, tags and users. Under the user category the user finds all users with a name that is containing the string entered in the search bar. Under the ‘Groups’ category the user finds all groups that contain the entered string either in the group’s name or in the group’s description. Under the ‘Tag’ category the user finds all the microposts attached to a tag that contains the search parameter. The results under the ‘Tag’ category, however, are limited to microposts that were posted in groups where the user is also a member of.

It has been requested by the Assist Team to have an analysis of where future implementation effort should be focused towards. This was supposed to be derived from where users had most problems and questions while developing through the Minerva Community. For this purpose we used the already implemented Tagging system. On a newly added website page that is only visible for Administrators, i.e. the Assist developers, can view how combinations of tags have been used (like, e.g. Minerva components) and their number of occurrence. The result can hint towards the most problematic areas. To analyze the problems further, they can simply click on one of the results to view all posts that have been made with the combination of these tags. Further statistics on this page show also the general popularity of tags, which can be another hint at problematic or popular features and influence where future improvements and implementations could be made. Under this statistics page more user statistics have then been added. Administrators can view which users create the most content, send out the most invitations and receive the most up-votes, i.e. being most helpful. Since it is recommended as a community building measure to implement some kind of member recognition and we are already collecting this user statistics that would be suited for a badge system, we implemented badges shown in posts user information. These badges are awarded to the Top 10 users in their category and titled ‘Top 10 Expert’ (most helpful users), ‘Top 10 Connector’ (user sending most invitations) and ‘Top 10 Creator’ (user creating most content).

Another request that had to be fulfilled was due to the fact that depending on different countries, different medical information systems, etc. slightly different versions of the Assist software (or Minerva extensions) have to be issued. Managing these different versions manually can lead to mistakes being made by team members and customers and should therefore be avoided. Showing every user only the implementations that he or she is allowed to download helps to avoid any of these issues and can be done automatically with a few changes to the database and system.

Figure 5.13 shows the added tables employments and systems. System denotes any Medical Information System a user might be working under. It has been decided by CGM that this segmentation of users is sufficient to enable the goal described above, since the Medical Information Systems are only operating in their designated countries. The employment table is establishing a connection between a user and a system showing that the specified user is working under the specified Medical Information System. Since

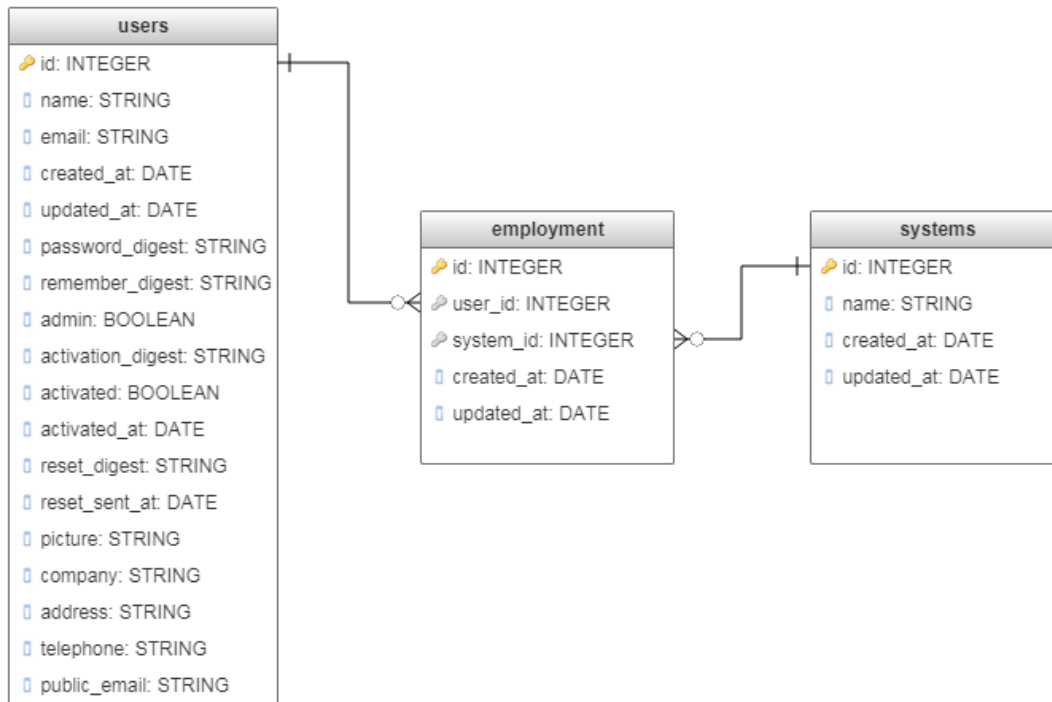


FIGURE 5.13: The Database Structure of an Employment Relationship (Source: Own Representation)

a user can work for multiple systems his/her user ID might appear in the employment table with multiple system IDs. These relationships are created upon user sign up to the community. Therefore, an input field has been added to the sign up form in which the user can select multiple of the existing systems. To fully implement the functionality described above the submission model also has to be extended accordingly as is shown in Figure 5.14.

The downloadable table links a Submission to a Medical Information System. This link means that users employed under the respective system can see the submission as an option in their Downloads page and can therefore view or download it. A Submission might have multiple system's employees that are allowed to view and download it. Users that do not belong to any of the specified systems will simply not be shown the submission in their Downloads page. CGM decided that the responsibility of selecting systems that can download the submission should not reside with the submission creator, but the Assist team. This implies that when a submission is being approved the reviewer has to select chosen Medical Information Systems. The review mechanism has been appropriately extended to allow this. Entries of the downloadables table will be created upon approval of an implementation.

To make the development process for customers easier an FAQ page was requested. This FAQ page should also be maintained and updated automatically as well as filled with

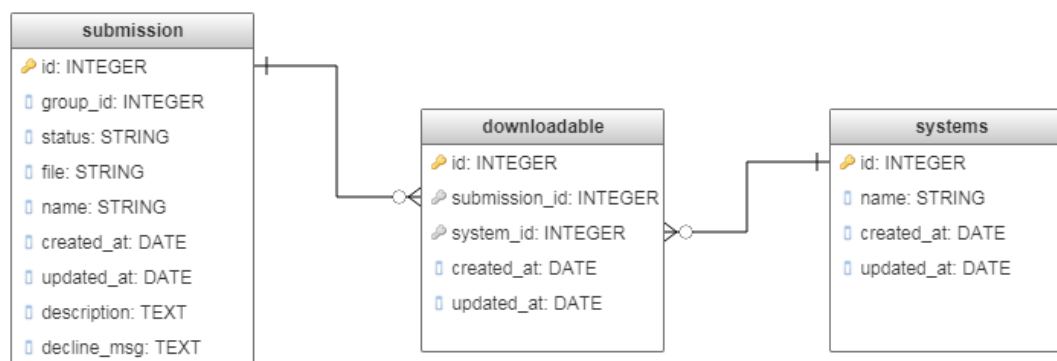


FIGURE 5.14: The Database Structure Submission Download Rules

the help of the user's created content. It is assumed that up-votes display when a post is a really helpful contribution. So it was decided that the FAQ page is supposed to consist of the most up-voted user posts. To give it more structure, we organized the posts based on their tags. It is possible to expand the top five most up-voted posts containing a certain tag by clicking on the menu item symbolizing this post. Through this users should be given early support without using any resources of the Assist team. To be in line with the group's security constraints it was necessary to ask the group creators for approval to publicly publish these post. If a post is so popular that it is selected by the algorithm to be displayed in the top five posts of a category, a request gets send to the respective group creator via notifications. The decision of the creator is then permanently saved with the post by the database fields `faq_allowed` and `faq_request` (e.g. Figure 5.8).

Since, during the implementation of the previous CRM mechanisms, it was necessary to make changes to our database structure and models we want to give an updated version of the Relationship UML Diagram of Figure 5.12 in Figure 5.15 .

5.4.3 Identified Work-flows and Roles

The identified requirements and implementation lead to the main user's work-flows and access rights which will be discussed in this section. Discussing the main use cases and roles and access rights is important for future testing of the software as test cases can be directly derived from them. The two work-flows shown here are supposed to represent the main functionality of the application. Smaller work-flows in using the website exist but are purposely disregarded here. The standard flowchart terminology is used. Figure 5.16 shows the work-flow of a typical user, which we are trying to achieve with the finished product. As can be seen the registered user is either a developer seeking to support others in implementing an extension or a user that seeks to have an extension developed. Ideally the user, who has a request would first check the download-able implementations on the

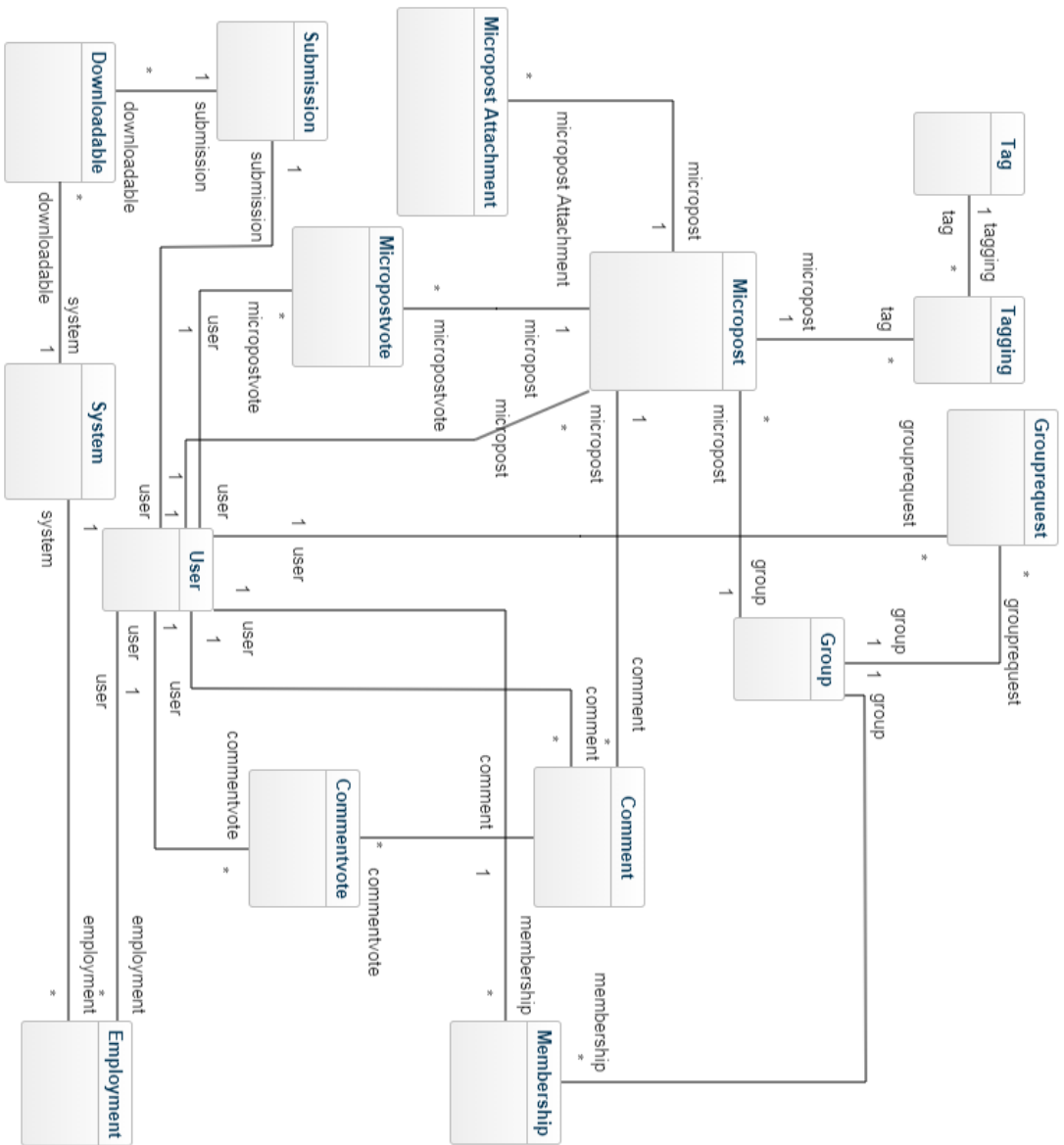


FIGURE 5.15: The Overall Database Relationships including CRM Analysis (Source: Own Representation)

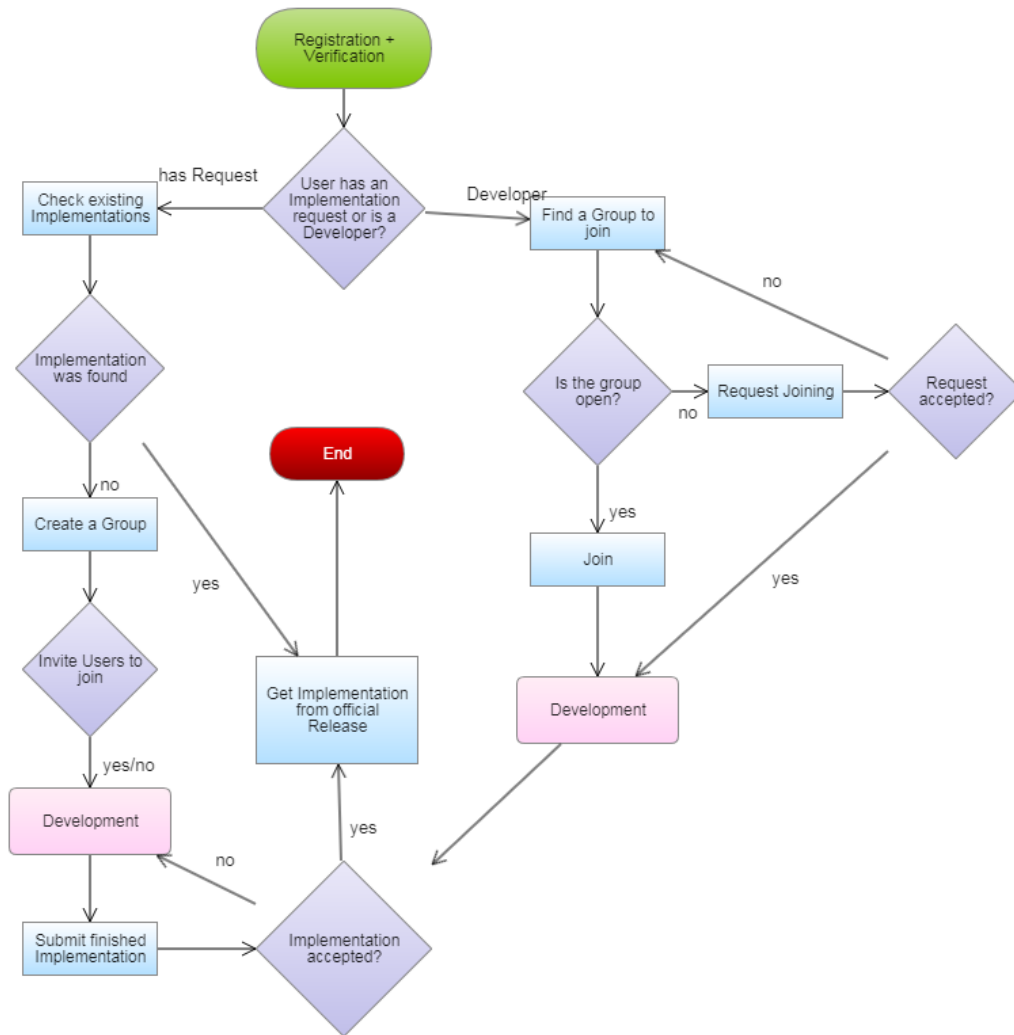


FIGURE 5.16: Workflow for Basic Users (Source: Own Representation)

website to see if his/her request has already been implemented. On the other hand, this also means for the Assist team that the user should be able to trust the completeness and correctness of the download page. If the user does not find the required implementation he creates a development group himself, invites developers or wait for developers to join and start the development himself. Groups can be open for anyone to join or join requests have to be accepted by the group creator. The group creator is also responsible for the submission of the finalized implementation. The evaluation process of an implementation can be seen in Figure 5.17. Is the implementation not accepted the development continues until an accepted implementation is produced. To ensure correctness the implementation should only be downloaded and used through the official release on the website.

As mentioned, in Figure 5.17 you can find the main use case of a user who has the admin role, i.e. an Assist member. The Administrators have to periodically check the newly submitted implementations. These then should be downloaded and integrated in

the Minerva testing environment. Before a submission gets accepted it has to be reviewed for the described purpose and pass the standard Minerva test suite, to make sure it does not interfere with the existing system. If the submission is causing any problems, it will be rejected with information about the error that occurred. If it passes, the administrator has to select the user groups which will be able to download the implementation before publishing it to the download page.

Group creators have the right to delete content posted by other users in their groups, therefore fulfilling the identified requirement of self-administration. Administrators can delete any content posted. However, no user has the right to edit another user's posts or comments. They can only be removed completely. The user rights displayed in this table will be implemented in the application and are checked by the conducted Quality Assurance.

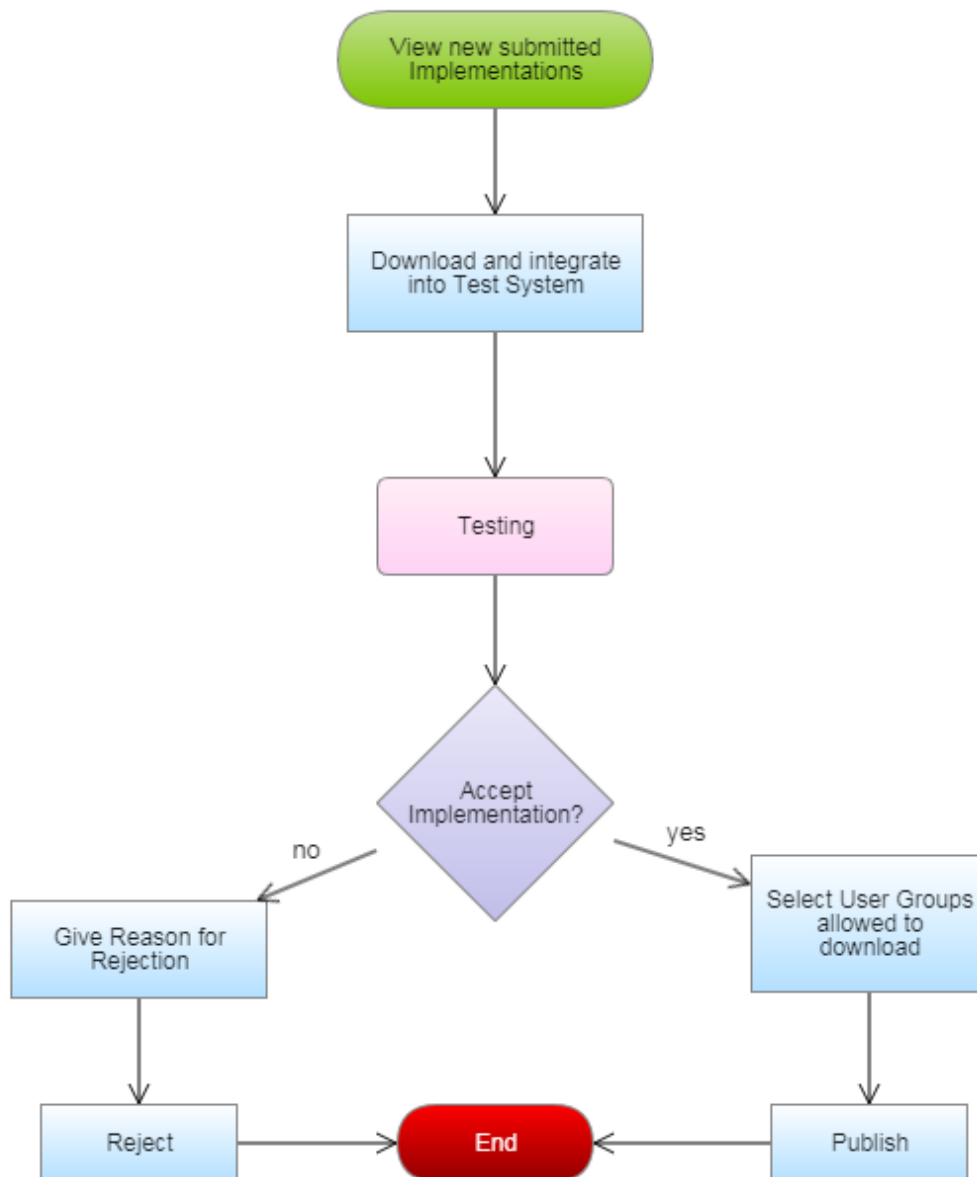


FIGURE 5.17: Workflow for Administrators (Source: Own Representation)

	Administrator	Basic Verified User	Basic Unverified User	Group Creator	Group Member
Log in	X	X		X	X
Create Group	X	X		X	X
Create Post/Comment in joined Groups	X	X		X	X
Create Post/Comment in not joined Groups	X				
Edit/Delete own Post/Comment	X	X		X	X
Delete Posts/Comments of Others	X			X	
Submit Implementation	X	X			
Evaluate unpublished Implementation	X				
Open Implementation for User Group	X				
See published Implementation, opened for other User Groups	X				
Invite other Users to Group	X			X	X
View Group Members	X	X		X	X
View Group Description	X	X		X	X
View About/Impressum/TOS/ Privacy Policy	X	X	X	X	X
View User Statistics	X				
View FAQ	X	X		X	X
Accept/Decline Group Join Requests				X	
View Profiles of Users	X	X		X	X

FIGURE 5.18: Role-Access-Matrix (Source: Own Representation)

Feature	Most voted Category
Q1	Attractive
Q2	Indifferent
Q3	One-dimensional
Q4	One-Dimensional
Q5	One-Dimensional
Q6	Indifferent
Q7	Attractive
Q8	Indifferent
Q9	One-Dimensional
Q10	One-Dimensional/Indifferent
Q11	Attractive
Q12	Indifferent
Q13	Indifferent

TABLE 5.3: Results of the User Survey (Source: Own Representation)

Chapter 6

Evaluation

6.1 Company-based Evaluation

We defined the goals of CGM in chapter 5.1 as well as discussed goals identified by the proposed research frameworks (chapter 4.2). One goal of CGM is for customers to be supported proactively and reactively in snippet development. By the community development we provided the means to do this. Since it was decided to use a single-channel approach and development support through a community the communication effort for the team was reduced. What is not possible to assess in the scope of this study is the effectiveness of the community to be useful for requirement analysis since this is only possible after a longer usage period. Aspects of Customer satisfaction, however, can be evaluated already during the first testing period and has been done in the next chapter 6.2. An effect on market share is not necessary to be assessed since our product is not on the open market. The last thing that can be evaluated is a possible cost reduction, which is analyzed by CGM. According to the estimation they provided the platform can save development costs of approx. 30.000 euros per year.

6.2 Customer-based Evaluation

Like it was already mentioned in the course of our study, the customer-based evaluation will be conducted with the help of the WebQual evaluation survey. The Webqual methodology has been iteratively developed and refined by Barnes and Vidgen (e.g. Barnes and Vidgen (2001) and Barnes and Vidgen (2002)). We use the 4.0 version in this evaluation which uses which uses the categories usability, information and service interaction. The WebQual was developed based on and is often used with the concepts of Quality Function Deployment, VOC (Shia et al., 2016) and the Technology Acceptance Model (Loiacono, Watson, and Goodhue, 2007). Therefore, the result gives an indication of the customers intention to reuse the website and a company's customer retention. The questionnaire used in this thesis can be found in the attached documents. The average scores for importance and satisfaction of a category along with the standard deviation can be found in the tables 6.1 and 6.2. The full results of the WebQual survey are part of the appendix.

Question	Average Score	Standard Deviation
Usability Q1	5,125	0,991
Usability Q2	4,875	0,641
Usability Q3	5	0,756
Usability Q4	5,25	0,886
Usability Q5	4,125	0,835
Usability Q6	4,25	0,463
Usability Q7	4,5	0,463
Usability Q8	5	0,756
Information Q1	5	0,926
Information Q2	5,125	0,835
Information Q3	4,625	0,916
Information Q4	5,25	0,886
Information Q5	4,5	0,756
Information Q6	4,375	1,060
Information Q7	4,625	0,744
Information Q8	5,135	1,126
Service Interaction Q1	3,875	1,356
Service Interaction Q2	4,625	1,06
Service Interaction Q3	4,875	0,835
Service Interaction Q4	4,875	0,991

TABLE 6.1: WebQual Results Importance (Source: Own Representation)

8 users participated in the final evaluation of the community. Based on the results we could position the indicators on an Importance-Performance Analysis Matrix (Slack, 1994). The IPA matrix is divided into four quadrants based on the average performance and average importance score. The average performance score identified was 4,47 while the average importance score was 4,75. The meaning of the quadrants is as follows:

- Quadrant 1 - High Importance/High Performance: The goal is to maintain the performance in these areas.
- Quadrant 2 - High Importance/Low Performance: The identified issues should be a priority for improvements.

- Quadrant 3 - Low Importance/Low Performance: Management does not need to prioritize these factors
- Quadrant 4 - Low Importance/High Performance: Resources can possibly be re-allocated to prioritized factors

The IPA Matrix of our results can be found in figure 6.1.

Since the current user base during the testing phase of the community and, therefore, the survey participation is relatively small, the results of the survey are more influenced by single answers than with a larger participation. However, it can still be used to show overall trends and potential problems before opening up the community to the full user base. We can also see that for high priority factors in 6.1 the standard deviation among users is relatively small 6.2 further indicating validity of the results. We identified the following factors as high priority:

- **Information Q8 - Security of personal information**

This factor received the lowest score in comparison to all other factors. An easy explanation for this could be that it was not possible for CGM to fill the About, Impressum and Privacy Policy pages yet. The missing information has been noticed by users and given to us as a feedback. Furthermore, notification emails of the platform are not yet send via an internal email server, which results in some emails being pushed into the spam filter by the companies email client. These issues were already known to us, but can not be resolved in the time frame of this thesis. Section 3.3 can be revisited to further help alleviate privacy concerns. As mentioned in this chapter, the concerns might be resolved at a later stage, when the community is more active and familiar to users.

- **Service Interaction Q3 - Ease of communication with organisation**

As we mentioned in chapter 5.4 we actively decided against direct communication channels to the CGM Assist team.

- **Usability Q3 - Ease of navigation**

Further testing needs to be done on how users can be supported in navigation and this issue can be resolved. From the received feedback we can for example gather that users felt the naming of the 'FAQ' site to be not reflecting the actual pages content. Possibly the UX department of the company can also be contacted for this issue.

- **Usability Q8 - Providing a positive experience & Service Interaction Q4 - Services provided as advertised**

Both of these factors are with a high probability connected to the previously identified issues and the fact that the community is still relatively low in content, which made it difficult for users to evaluate its effectiveness yet.

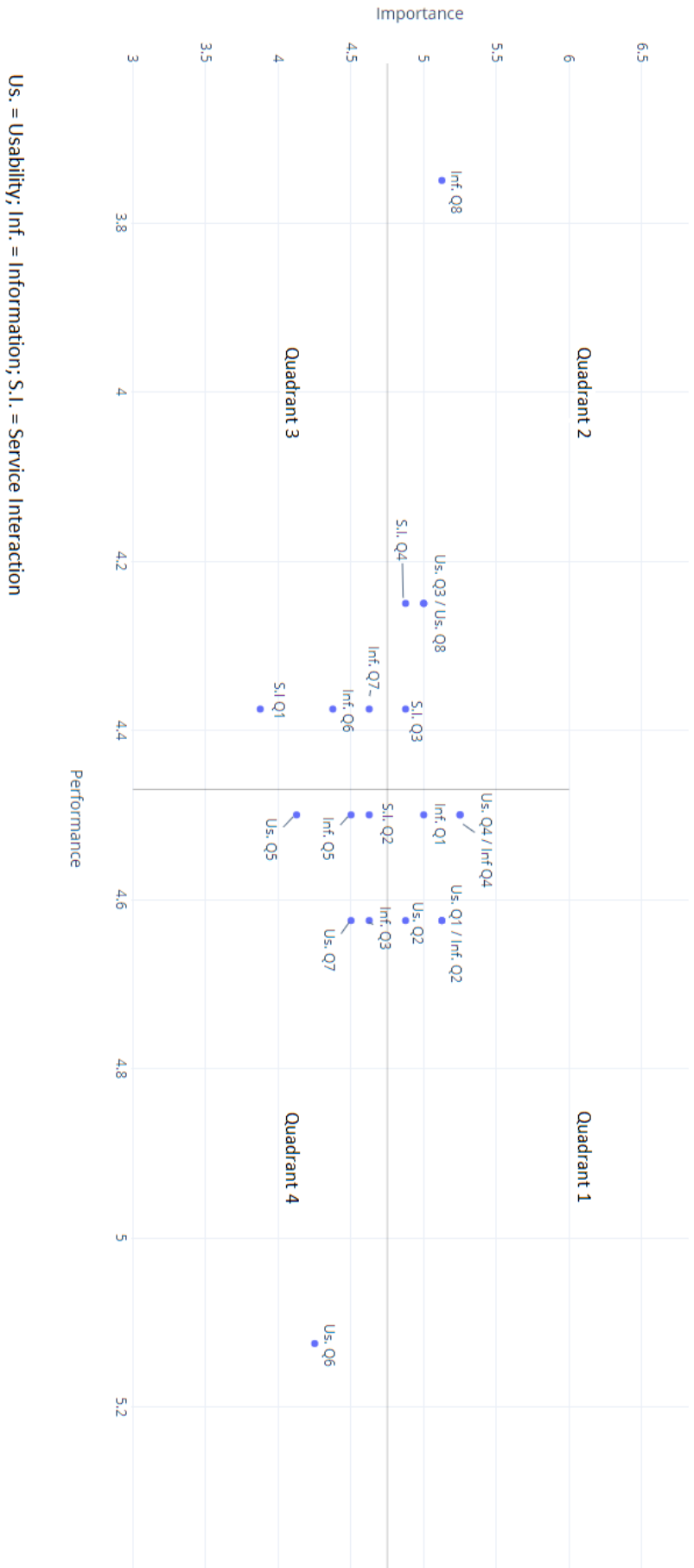


FIGURE 6.1 : Diagram Importance-Performance Analysis (IPA) (Source: Own Representation)

In general, we could see that the users were already content with the website in many aspects, also shown in the satisfaction of the performance in general, which was rated with an average score of 4,625 out of 6. However, with the help of the Webqual and the IPA matrix we could also identify were to focus further implementation efforts. These were not only our already known future to-dos (like mentioned for Information Q8), but also aspects we were not aware of (Usability Q3).

Question	Average Score	Standard Deviation
Usability Q1	4,625	0,744
Usability Q2	4,625	1,06
Usability Q3	4,25	0,429
Usability Q4	4,5	0,926
Usability Q5	4,5	0,756
Usability Q6	5,125	0,991
Usability Q7	4,625	1,061
Usability Q8	4,25	0,707
Information Q1	4,5	1,069
Information Q2	4,625	1,188
Information Q3	4,625	1,188
Information Q4	4,5	1,309
Information Q5	4,5	0,926
Information Q6	4,375	0,9161
Information Q7	4,375	0,9161
Information Q8	3,75	0,707
Service Interaction Q1	4,375	0,744
Service Interaction Q2	4,5	0,756
Service Interaction Q3	4,375	0,744
Service Interaction Q4	4,25	0,463
General Q1	4,625	0,916

TABLE 6.2: WebQual Results Satisfaction (Source: Own Representation)

Chapter 7

Conclusion

In the course of this paper we have answered our introductory questions from 1.2.3. We investigated how an efficient Customer Relationship Management system and social network should be constructed by exploring the relevant research in these fields in chapters 2 and 3. Based on the analysed literature, we designed and developed a novel integrated solution fitted to the issues identified for CGM Assist. During this process we followed the design science principles introduced in chapter 4. This included an evaluation of the system as a final step. As it has been mentioned before, company requirements and the time limit of this academic work imposed limitations on this study. Due to this limitations, but also the nature of the introduced life cycle of online communities the development of the Minerva Community should not be considered finalized. Rather, we propose as future work that development and evaluation should be continued as an iterative process. This will allow for the community to be best fitted to the evolving users' needs. For this process, the methods introduced in this thesis can be reused as supporting instruments.

Even though this thesis is based on the example case of the CGM Assist team, the followed structure and given methodologies are independent of the case study. This means that the proposed course of action can be followed as a guideline for future projects seeking to implement a combined solution of CRM and virtual community.

Appendix A

Minerva Community Features Survey

A.1 Question Catalogues

A.1.1 German Catalogue

1. Q1p: Was halten Sie davon, wenn die Entwicklung in einzelnen geschlossenen Gruppen diskutiert wird (d.h. Gruppenbeitritt muss zuerst angefragt und bestätigt werden)?
2. Q1n: Was halten Sie davon, wenn die Entwicklung in einzelnen offenen Gruppen diskutiert wird?
3. Q2p: Was halten Sie davon, wenn die Gruppenverwaltung vom Ersteller der Gruppe übernommen wird?
4. Q2n: Was halten Sie davon, wenn die Gruppenverwaltung vom Assist Team übernommen wird?
5. Q3p: Was halten Sie davon, wenn neue Posts Ihrer beigetretenen Gruppen nach einloggen als News Feed angezeigt werden?
6. Q3n: Was halten Sie davon, wenn es keinen News Feed gibt, der neue Posts Ihrer beigetretenen Gruppen anzeigt?
7. Q4p: Was halten Sie davon, wenn es möglich ist Nutzer zu Gruppen einzuladen?
8. Q4n: Was halten Sie davon, wenn es nicht möglich ist Nutzer zu Gruppen einzuladen?
9. Q5p: Was halten Sie davon, wenn es möglich ist Dateien an Gruppenposts anzuhängen?
10. Q5n: Was halten Sie davon, wenn es nicht möglich ist Dateien an Gruppenposts anzuhängen?

11. Q6p: Was halten Sie davon, wenn die Webseite auch auf Mobiltelefonen unterstützt wird?
12. Q6n: Was halten Sie davon, wenn die Webseite auf Mobiltelefonen nicht unterstützt wird?
13. Q7p: Was halten Sie davon, wenn es möglich ist von der Webseite Feature Anfragen und Fehler Reports an das Assist Team zu senden?
14. Q7n: Was halten Sie davon, wenn es nicht möglich ist von der Webseite Feature Anfragen und Fehler Reports an das Assist Team zu senden?
15. Q8p: Was halten Sie davon, wenn es Email Benachrichtigungen, z.B. für neue Gruppenposts oder Nachrichten, gibt?
16. Q8n: Was halten Sie davon, wenn es keine Email Benachrichtigungen für Community Inhalte gibt?
17. Q9p: Was halten Sie davon, wenn es ein Feedback-Formular für Anmerkungen zur Webseite gibt?
18. Q9n: Was halten Sie davon, wenn es kein Feedback-Formular für Anmerkungen zur Webseite gibt?
19. Q10p: Was halten Sie davon, wenn für die Kommunikation zwischen Nutzern eine Chat Funktion implementiert ist?
20. Q10n: Was halten Sie davon, wenn keine Chat Funktion implementiert ist?
21. Q11p: Was halten Sie davon, wenn es möglich ist das Assist Team direkt über die Webseite (z.B via Chat) zu kontaktieren?
22. Q11n: Was halten Sie davon, wenn es nicht möglich ist das Assist Team über die Webseite zu kontaktieren?
23. Q12p: Was halten Sie davon, wenn hilfreiche Nutzer mit Punkten/Auszeichnungen/etc. belohnt werden?
24. Q12n: Was halten Sie davon, wenn es kein Belohnungssystem gibt?
25. Q13p: Was halten Sie davon, wenn Posts positiv/negativ bewertet werden können?
26. Q13n: Was halten Sie davon, wenn Posts nicht bewertet werden können?

A.1.2 English Catalogue

1. Q1p: If development is discussed in separated closed groups (i.e. joining a group has to be requested and approved first), how do you feel about it?
2. Q1n: If development is discussed in separated open groups, how do you feel about it?
3. Q2p: If groups are administered by the group creator, how do you feel about it?
4. Q2n: If groups are administered by the Assist team, how do you feel about it?
5. Q3p: If new posts in your joined groups are shown as a news feed after logging in, how do you feel about it?
6. Q3n: If there is no news feed showing new posts of your joined groups, how do you feel about it?
7. Q4p: If it is possible to invite users to groups, how do you feel about it?
8. Q4n: If it is not possible to invite users to groups, how do you feel about it?
9. Q5p: If it is possible to attach files to group posts, how do you feel about it?
10. Q5n: If it is not possible to attach files to group posts, how do you feel about it?
11. Q6p: If the website is supported on mobile phones, how do you feel about it?
12. Q6n: If the website is not supported on mobile phones, how do you feel about it?
13. Q7p: If it's possible to issue feature requests and bug reports to the Assist team through the website, how do you feel about it?
14. Q7n: If it's not possible to issue feature requests and bug reports to the Assist team through the website, how do you feel about it?
15. Q8p: If there are email notifications e.g. for new group posts or messages, how do you feel about it?
16. Q8n: If there are no email notifications regarding the community content, how do you feel about it?
17. Q9p: If there is a feedback form to give suggestions for the development of Minerva community, how do you feel about it?
18. Q9n: If there is no feedback form to give suggestions for the development of Minerva community, how do you feel about it?

Feature / Question Pair	Attractive	One-dimensional	Must-Be	Indifferent	Reverse	Questionable
Q1	5	0	0	4	4	0
Q2	2	4	1	5	1	0
Q3	5	6	1	1	0	0
Q4	1	7	2	3	0	0
Q5	5	6	1	1	0	0
Q6	3	1	0	9	0	0
Q7	5	3	1	2	1	1
Q8	3	4	0	5	1	0
Q9	3	5	1	4	0	0
Q10	2	4	1	4	2	0
Q11	4	3	1	2	3	0
Q12	3	0	0	10	0	0
Q13	0	0	0	12	1	0

TABLE A.1: Results of the Minerva Features Survey (Source: Own Representation)

19. Q10p: If there is a chat functionality for user communication implemented, how do you feel about it?
20. Q10n: If there is no chat functionality implemented, how do you feel about it?
21. Q11p: If there is the possibility to directly contact the Assist team via the website (i.e chat), how do you feel about it?
22. Q11n: If it is not possible to directly contact the Assist team via the website (i.e chat), how do you feel about it?
23. Q12p: If users will be rewarded with points/badges/etc. for being helpful, how do you feel about it?
24. Q12n: If there is no reward system, how do you feel about it?
25. Q13p: If it is possible to give user posts up- or downvotes, how do you feel about it?
26. Q13n: If there is no up- or downvoting of user posts, how do you feel about it?

A.2 Results

Appendix B

Minerva Community WebQual Survey

B.1 Question Catalogues

B.1.1 German Catalogue

- Bitte wählen Sie aus für wie wichtig sie die folgenden Qualitätsmerkmale erachten.
(ausg. Frage 21)
- Bitte wählen Sie aus wie zufrieden Sie mit den folgenden Qualitätsmerkmalen im Bezug auf die Minerva Community sind?
 1. Usability Q1: Ich finde die Seite einfach zu erlernen und zu benutzen
 2. Usability Q2: Meine Interaktion mit der Seite ist klar und verständlich
 3. Usability Q3: Ich finde die Seite einfach zu navigieren
 4. Usability Q4: Ich finde die Seite einfach zu benutzen
 5. Usability Q5: Die Seite hat eine attraktive Gestaltung
 6. Usability Q6: Das Design ist dem Seitentyp angemessen
 7. Usability Q7: Die Seite vermittelt Kompetenz
 8. Usability Q8: Die Seite schafft eine positive Erfahrung für mich
 9. Information Q1: Die Seite liefert akkurate Informationen
 10. Information Q2: Die Seite liefert glaubhafte Informationen
 11. Information Q3: Die Seite liefert aktuelle Informationen
 12. Information Q4: Die Seite liefert relevante Informationen
 13. Information Q5: Die Seite liefert einfach zu verstehende Informationen

14. Information Q6: Die Seite liefert Informationen mit dem richtigen Detaillierungsgrad
15. Information Q7: Die Seite präsentiert Informationen im geeigneten Format
16. Information Q8: Meine Persönlichen Informationen fühlen sich sicher an
17. Service Interaction Q1: Die Seite fühlt sich auf mich personalisiert an
18. Service Interaction Q2: Die Seite vermittelt ein Gefühl von Gemeinschaft
19. Service Interaction Q3: Die Seite macht es einfach mit der Organisation zu kommunizieren
20. Service Interaction Q4: Ich bin überzeugt das Services wie beworben geliefert werden
21. General Q1: Wie zufrieden sind Sie mit der Qualität der Seite im Allgemeinen?

B.1.2 English Catalogue

- Please rate how important the following website qualities are for you. (exc. Question 21)
 - Please rate how satisfied you are with the following website qualities in regards to the Minerva Community.
1. Usability Q1: I find the site easy to learn to operate
 2. Usability Q2: My interaction with the site is clear and understandable
 3. Usability Q3: I find the site easy to navigate
 4. Usability Q4: I find the site easy to use
 5. Usability Q5: The site has an attractive appearance
 6. Usability Q6: The design is appropriate to the type of site
 7. Usability Q7: The site conveys a sense of competency
 8. Usability Q8: The site creates a positive experience for me
 9. Information Q1: Provides accurate information
 10. Information Q2: Provides believable information
 11. Information Q3: Provides timely information

12. Information Q4: Provides relevant information
13. Information Q5: Provides easy to understand information
14. Information Q6: Provides information at the right level of detail
15. Information Q7: Presents the information in an appropriate format
16. Information Q8: My personal information feels secure
17. Service Interaction Q1: Creates a sense of personalization
18. Service Interaction Q2: Conveys a sense of community
19. Service Interaction Q3: Makes it easy to communicate with the organization
20. Service Interaction Q4: I feel confident that goods/services will be delivered as promised
21. General Q1: Satisfaction of overall website quality

B.2 Results

Score / Question	1	2	3	4	5	6
Usability Q1	0	0	0	3	1	4
Usability Q2	0	0	0	2	5	1
Usability Q3	0	0	0	2	4	2
Usability Q4	0	0	0	2	2	4
Usability Q5	0	0	2	3	3	0
Usability Q6	0	0	0	6	2	0
Usability Q7	0	0	1	2	5	0
Usability Q8	0	0	0	2	4	2
Information Q1	0	0	0	3	2	3
Information Q2	0	0	0	2	3	3
Information Q3	0	0	0	5	1	2
Information Q4	0	0	0	2	2	4
Information Q5	0	0	0	5	2	1
Information Q6	0	0	1	5	0	2
Information Q7	0	0	0	4	2	1
Information Q8	0	0	1	1	2	4
Service Interaction Q1	0	1	3	1	2	1
Service Interaction Q2	0	0	1	3	2	2
Service Interaction Q3	0	0	0	3	3	2
Service Interaction Q4	0	0	0	4	1	3

TABLE B.1: Results of the Webqual Importance (Source: Own Representation)

Score / Question	1	2	3	4	5	6
Usability Q1	0	0	1	1	6	0
Usability Q2	0	0	1	3	2	2
Usability Q3	0	0	0	6	2	0
Usability Q4	0	0	1	3	3	1
Usability Q5	0	0	0	5	2	1
Usability Q6	0	0	0	3	1	4
Usability Q7	0	0	1	3	2	2
Usability Q8	0	0	1	4	3	0
Information Q1	0	0	1	4	1	2
Information Q2	0	0	1	4	0	3
Information Q3	0	0	1	4	0	3
Information Q4	0	0	2	3	0	3
Information Q5	0	0	1	3	3	1
Information Q6	0	0	1	4	2	1
Information Q7	0	0	1	4	2	1
Information Q8	0	0	3	4	1	0
Service Interaction Q1	0	0	0	6	1	1
Service Interaction Q2	0	0	0	5	2	1
Service Interaction Q3	0	0	1	3	4	0
Service Interaction Q4	0	0	0	6	2	0
General Q1	0	0	1	2	4	1

TABLE B.2: Results of the Webqual Satisfaction (Source: Own Representation)

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