

**TASKS AND CHARACTERISTICS OF END USERS DURING THE
OPEN INNOVATION PROCESSES ON THE SOCIAL WEB**

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PhD

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Declaration

While registered as a candidate for the degree of Doctor of Philosophy the author has not been registered for any other award with any other university or institution.

No part of the material in this thesis has been submitted for any degree or other qualification at any other institution by me or, to the best of my knowledge and belief, by any other person. The thesis describes my original work.

Abstract

The present thesis aims to deduce tasks and characteristics of end users during the open innovation process on the social web. The social web with its communities, forums and blogs affords new prospects as well as unknown challenges for companies, and at the same has increasingly influenced academic research during the last few years. Especially research regarding communication behaviour on the social web as well as social web technologies has currently progressed well. However, in innovation research, social web technologies are currently primarily used to integrate users into the company's innovation process, for example through company user toolkits or company innovation communities. In those cases users were excluded from their normal social web environment and integrated into a company's environment, a sort of laboratory environment. Despite this, the present research project will use the natural behaviour, comments and discussions of users within their social web environment to develop and apply a new mixed-method approach with the aim to deduce tasks and characteristics of innovative end users on the social web. To apply the mixed-method approach within a longitudinal case study and to deduce statements and regularities regarding the innovation process on the social web, it was possible to analyse the end user developer online forum of one of the leading open source CRM software technologies. Based on this analysis, the assumptions from an extensive literature analysis could be verified and extended: it could be shown that the expected single innovative user does not exist. In fact, the process from the initial idea to an innovation requires different users with different characteristics and different points of view. They will be deduced, explained and presented within the present thesis.

List of Thesis Pre-Publications

Plum, A. B. (2007): Identification and Evaluation of Lead Users-Ideas via Social Media Technologies: PhD-proposal discussed and presented at Teesside University.

Plum, A. B. (2009): Web-Monitoring – a provider-study – not published because of confidential content.

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Plum, A. B. (2010): Approaches of Web-Monitoring, in: Internet World Business Guide, Munich: Internet World Business – Neue Mediengesellschaft Ulm mbH.

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Abbreviations

CEO = Chief Executive Officer

CRM = Customer Relationship Management

CTO = Chief Technology Officer

INSNA = International Society of Social Network Analysis

SNA = Social Network Analyses

1. Introduction

1.1 Topic Relevance and Motivation

The present thesis aims to deduce tasks, motives and characteristics of end users during the open innovation process on the social web. The social web with its social networks, communities, forums and blogs affords new prospects as well as unknown challenges for companies. At the same time, more and more influence on academic research has been created in recent years.¹ These new online technologies for interaction and communication between people are interesting for market research, too, because of the opportunity to get novel insights into the target audience and to interact.² This also applies to the identification of innovative users and the interaction with this target audience for companies' innovation management and product development.³ In every industrial sector, some selected product users are qualified to give feedback and to support innovation management and product development. They often can not be retrieved by traditional methods of market research.

Generally speaking, there has been no controversy about the economic and strategic relevance of innovations for centuries.⁴ Growing dynamic and complexity in innovation processes, the reduction of "time to market", growing customer-needs, globalisation and the high failure rates of newly launched products have all motivated companies to forge new paths. This is especially evident in consumer goods and service markets. Therefore, it is very interesting for companies to identify innovative users in an efficient way and to integrate them into the companies' innovation management. Especially this concerns trendsetting industries like computer game development, software development or the mountain bike industry.

Every economic innovation is based on initial ideas from inside or outside the company. They are systematically assessed and evaluated within an innovation management process with the aim to deduce marketable products. In the past, ideas for innovation were mostly created by research and development departments from inside the company. The "innovative genii" was sought in separate organizational units, inter-

¹ Finin et al. (2008), Trier (2008), Chang et al. (2002), Welser et al. (2007), Haythornthwaite & Gruzd (2007), Gloor & Zhao (2006), Vilpponen et al. (2006)

² Kozinets (2002), Sinkovics et al. (2008)

³ Franke & Shah (2003), Chesbrough, (2001, 2003), Brown & Eisenhardt (1995), Freeman & Soete (1997), Laursen & Salter (2006), Lundvall (1992), Rosenberg (1982)

⁴ Schumpeter (1934)

nal project management, and design teams. As a first step, the companies' innovation management opened to cooperation with suppliers and retailers.⁵

Sporadically, the fact that innovation may stem from users and consumers outside the company has been already treated in science during the last centuries. Baker et al. already stated in 1967, that 75% of the researched 272 ideas are stimulated through (user-) need events and only 25% through means events.⁶ Keywords like “user-driven innovations” or “customer-centric innovations” have been researched since the 1960s and several theoretical concepts have been presented.⁷ These concepts can be divided into approaches where users actively take part in the innovation management process (active methods) and into approaches where users are passively observed (passive methods). In contrast to “closed innovation”, where companies only use internal ideas, the concept of user-driven innovation has been extended through a concept which is called “open innovation”.⁸ It discusses an interpretation of the innovation management process as interactive, distributed and open to different stakeholders; for example, customers and users.

In practice, leading international companies and initiatives like 3 M, Adidas, Amazon, Audi, Bayer AG, BMW, Café Press, Dell, Flickr, John Deere, German Telekom, Tchibo, Starbucks, LEGO, Linux, Loewe, Procter & Gamble, Personal Novell, The Oscar Project, Spreadshirt, Swarovski and Wikipedia integrate their customers and users into the innovation management process. During the ideas phase, personal product needs and experiences of so called “lead users” are collected.⁹ In the conception phase, consumers rank the concepts and give helpful suggestions. During the realisation phase, they get the opportunity of (mass-) customisation. These examples make clear that the selection of the right users for successful innovation management is vital. By applying methods of market research, for example, screening or snowball sampling, companies face obstacles and are given room for improvements.¹⁰ Customer bases are often in the 100,000s or even millions; companies do not have any direct contact with their customers or are not able to follow and to react on permanently changing customer needs.

⁵ Picot & Reichwald (1994), Zahn & Foschiani (2002)

⁶ Baker et al. (1967), p. 156

⁷ Enos (1962), Freeman (1968)

⁸ Chesbrough (2001, 2003)

⁹ von Hippel (1976)

¹⁰ von Hippel et al. (2000), Bilgram et al. (2008), Olson & Bakke (2001), Lilien et al. (2002), Prügl (2006)

During the recent years, the internet, especially the social web, is important for the integration of different stakeholders into business processes. The intensive discussion regarding the role of open innovation communities, communities of practice and online knowledge management are some examples of this.¹¹ This change invoked increased interest in observing, visualizing, analyzing and measuring the content and structure of the social web. Currently, there are a confusing number of new methods, approaches and techniques to analyse the social web. Generally, it can be assumed that they are partly qualified to support companies in identifying users with certain characteristics, in particular, innovative users for innovation management.

As a result of the diffusion of user-friendly online publishing technologies, the level of online-content and the social web, with its user-generated content, is growing. For example, the blogosphere, which characterises the entity of weblogs within the internet, continues to double every six months.¹² Social media networks in general are currently thought to produce up to one third of new web content.¹³ Offline social networks are closely connected with online social networks and behaviour and activities from the “offline world” are continued within the “online world”, and vice versa. The democratic and open nature of the social web as well as the changing communication behaviour, the presence of different cultures and consumer motivations show new opportunities to identify innovative users. This is currently only rudimentarily explored by science. By understanding and defining the tasks, motives and characteristics of innovative users collaborating within the internet, the knowledge can be used for the development of new metrics, algorithms and methods to analyse the social web.

1.2 Aim and Methodology

The aim of the thesis seeks to define, deduce and understand motives and characteristics of end users during the open innovation process on the internet, especially the social web, and to extend the already existing findings regarding innovation management and open innovation from the offline world to the online world. Therefore a theoretical model of motives and characteristics of end users will be developed and verified. Furthermore, existing typologies regarding innovativeness of end-users will be analysed and extrapolated to the social web. A longitudinal quantitative and quali-

¹¹ Wasko & Faraj (2000)

¹² Java (2008), p. 8

¹³ Finin et al. (2008), p. 1

tative study will be used to verify and extend the theoretical typologies and to build up a new theoretical model.

To analyse the social web, with its communities, blogs and forums, special methods and technologies of online market research has to be used. Literature analysis showed that a comprehensive scientific survey in context with Webmonitoring is currently missing. Existing literature often only treats certain methods or technologies of Webmonitoring and does not fulfil the requirements of the present thesis regarding a complete overview. Therefore, a comprehensive preparatory survey will be used to study and analyse methods, technologies and approaches of Webmonitoring. To meet the heterogeneity of the web monitoring market, a differentiated criteria system was used within an online-survey. Here, the CEO, Chief Analysts and/or Chief Scientists of fourteen web monitoring providers were asked detailed questions. After analyzing the data, the poll was evaluated through qualitative interviews with the attendees and supplemented by a comprehensive survey of press releases and technical papers. If the provider allowed insights into the technology, the answers were additionally verified by live tests. During a second step, the first results of analysis were presented to the participants and again verified.

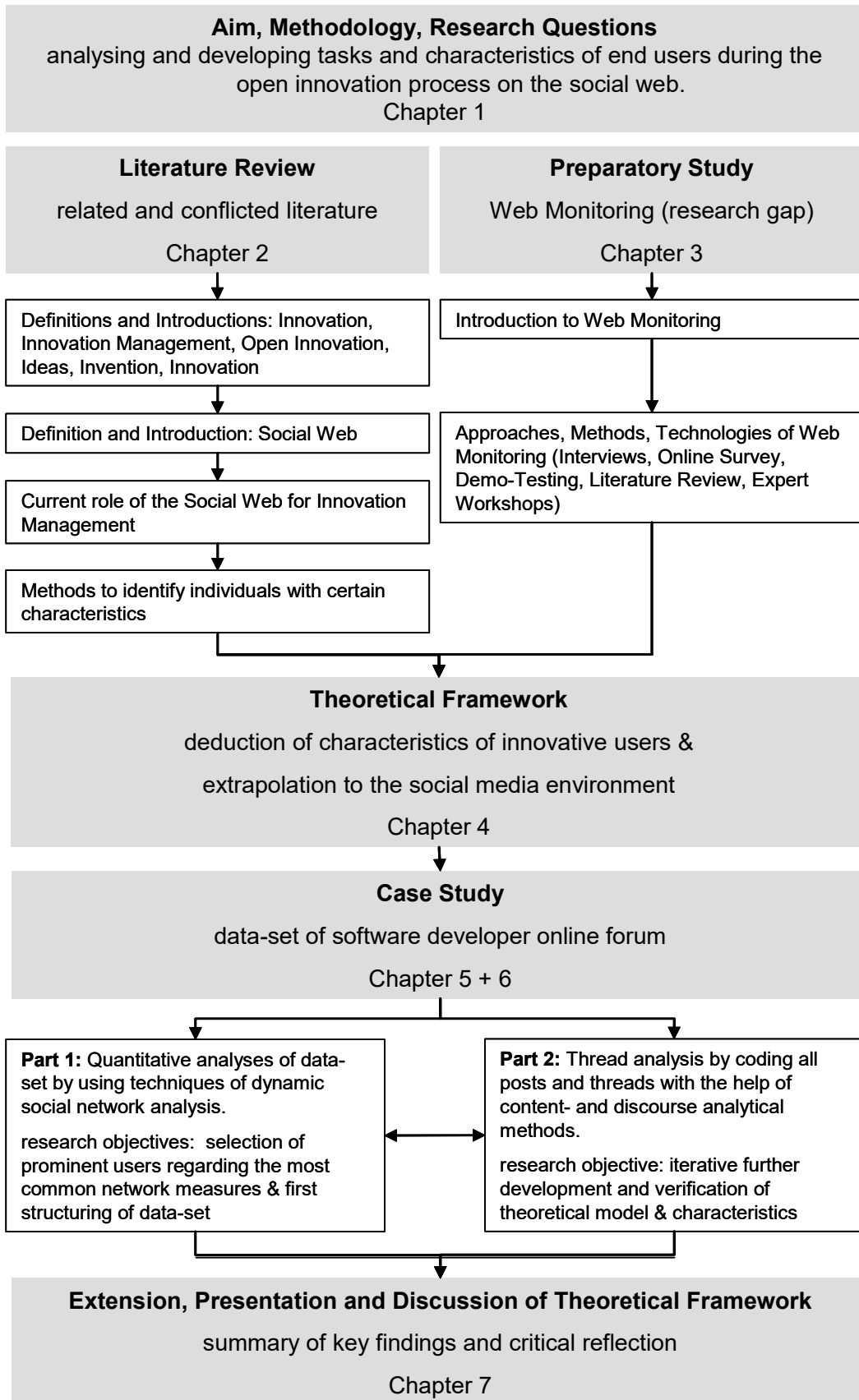


Figure 1: Thesis outline

The master study aims to develop a universal theoretical model of tasks, motives and characteristics of innovative users on the social web. Because of its complexity, a mixed method approach will be designed which mixes qualitative and quantitative methods as well as induction and deduction.

First, to strengthen the methodology approach, a literature review will be used to analyse existing methods and findings from different fields of research in context with the identification of users who have outstanding characteristics. To define and deduce the tasks, motivations and characteristics of innovative users, von Hippels' lead user approach will also be analysed as well as different methods and approaches regarding the integration of customers and users into the companies' innovation process. The results will be extrapolated to the social web environment and integrated into a comprehensive theoretical model describing tasks of innovation users within the social web.

A comprehensive case study will be used to verify the theoretical model. The data set will be taken from one of the leading end-user developer of online-forums. Because of its amount of data, the data set will firstly be structured and categorized by a quantitative dynamic social network analysis (SNA). Therefore, network positions of potential innovative users will be deduced from the aforementioned theoretical model. The SNA will result in some prominent forums' members, prominent regarding the most common network positions like "centrality", "position at the edge of a structural hole", "number of ties", "prestige" or "brokering activity". It is assumed that these types of network positions can quantify the hypothetical characteristics of innovative users within the social web, deduced from literature analysis.

In a second step, the findings from literature analysis and SNA will be verified by a thread analysis. Therefore an approach has to be developed which allows a structured content analysis of the online forum and to analyse and structure a large amount of textual data. To solve this challenge, and because of its synergistic view of evidence, a mixed method approach was chosen for thread analysis.¹⁴ Research in context with qualitative content and discourse analysis has shown that a combination of qualitative and quantitative methods is beneficial to analyse social web networks.¹⁵ On the one hand, the process for development and implementation of new categories of the coding agenda is qualitative orientated. On the other hand, for classification of these categories and data analyses, – for example, frequency analyses and correlational

¹⁴ Auer-Snrka (2008)

¹⁵ Mayring et al. (2007)

analyses – quantitative methods are more beneficial. The use of this mixed method approach can also be supported by the advantage of formulating universal statements regarding patterns of ideas, inventions and innovations in social web networks. The planned research design mixed quantitative and qualitative approaches as well as content analysis and discourse analysis. By analysing language and texts - like those in threads and online-posts - discourse analysis is normally closely connected to content analytical approaches. They aim to analyse the characteristics of language: on the level of content, content analysis is used and on the process related level, discourse analysis is relevant.

Afterwards, the results from the case study will be matched with the aforementioned theoretical model of tasks, motives and characteristics of innovative users on the social web and extend the research of innovation management.

1.3 Research Questions

The research objective of the thesis is to analyse and develop tasks, motives and characteristics of a specific species of innovative end-users which can be found on the social web. Therefore, a theoretical model will be developed, verified and extended.

Two hypotheses can be deduced from this aim. The first hypothesis assumes that there is a special species of innovative users interacting on the social web. The second hypothesis assumes that there are regularities regarding the development of ideas for the companies' innovation management on the social web. The related actors show special characteristics and take on different network positions.

The following research questions are deduced from these hypotheses:

1. In general, which user-types and/or user-groups are most important for the innovation process on the social web?
2. Which motives and characteristics could be deduced and generalised for their identification?
3. Which existing knowledge and methods are relevant to design a valid approach regarding their motives and characteristics?
4. What is a potential research design for the verification, operationalisation and generalisation of this theoretical approach?

2. Definitions and Terminology

2.1 Innovation

Schumpeter defined the term economic innovation in “The Theory of Economic Development”.¹⁶ There are various definitions and types of the notion “innovation” within literature. Hauschildt & Salomo have structured some definitions into groups of areas.¹⁷ According to that, the approaches of innovation can be categorized into:

- innovation in terms of novel products, solutions or processes, regarding the dimension of the novelty
- innovation in terms of novel products, solutions or processes, regarding the novelty
- innovation in terms of novel products, solutions or processes, regarding the perception
- innovation as the novel combination of ends and means
- innovation as process
- innovation as service

This gives an impression of the diversity of definitions for the notion innovation. It leads to the challenge that some scientific papers and contributions are not comparable because of different definitional sources. However, all definitions have in common that innovation is typically understood as the introduction of something new and useful, for example, new methods, techniques, or practices. It can also include new or altered products, solutions and services. Innovation involves creativity and provides the development of completely new products (or the extension of already existing products), processes, services and solutions. Schenk et al. define innovations as ideas, practices or objects, which are perceived as new by the relevant adoption-entities. Herewith, the acceptance of an innovation through individuals is called “adoption”. If an innovation is not accepted by relevant individuals it is called “rejection”.¹⁸ Brockhoff defines that a new product or process is only an innovation when

¹⁶ Schumpeter (1934)

¹⁷ Hauschildt & Salomo (2007), p. 4

¹⁸ Schenk et al. (1996), p. 21

it leads to a market success.¹⁹ Innovations can be divided into commercial and non-commercial innovations. Furthermore, innovation can be seen as the result of two processes. On the one hand, there is the potential change of availability, respectively through the offer of problem solutions based on new ideas, inventions and discoveries. On the other hand, there are needs and demands for something new or problem solving.²⁰

2.2 Innovation Management

Innovations are systematically developed within an innovation management process with the aims to solve present or future needs and to generate commercial successful innovations from ideas and inventions. The literature provides a range of models describing exemplary innovation management processes.²¹ Broadly speaking, they can be divided into “organizational approaches” and “interaction approaches”.

Organizational approaches divide innovation management in processes. Thom, for example, designs a model composed of three phases: extraction of ideas, acceptance of ideas and realisation of ideas.²² In contrast, the model of Brockhoff works with the opportunity of break-ups after each step.²³

Innovation management approaches can be divided into closed- and open-interaction-approaches. The approach of “closed innovation” follows the “manufacturer active paradigm” and is focused on innovation management inside the company. In contrast, the “open innovation approach” also considers external stakeholders, customers, users, suppliers and resellers as well as competitors. Both approaches will be presented and discussed within the following section.

Although all models differ in the level of detail²⁴, they all have some steps in common— among others, the generation of ideas from inside or outside the company.²⁵



Figure 2: Process of innovation management²⁶

¹⁹ Brockhoff (1999)

²⁰ Pfeiffer & Staudt (1975)

²¹ Vahs & Burmester (2005), p. 87

²² Thom (1980), p. 53

²³ Brockhoff (1999), p. 36

²⁴ Vahs, Burmester (2005), p. 92; Witt (1996), p. 10

²⁵ All considered models have following steps in common: kick-off, extraction of ideas, screening, evaluation, pre-selection, realisation and market launch.

²⁶ Source: own investigation

2.3 From Closed Innovation to Open Innovation

Like aforementioned in the last chapter, the “traditional” approach of innovation management is located inside the company; this implies the internal generation of inventions and ideas for the companies’ innovation management, too. This approach is often called closed innovation. It follows the “manufacturer active paradigm” and is focused on innovation management inside the company. According to this view, customers have needs which have to be satisfied by manufactures. On the one hand, manufacturers normally have to identify and satisfy the users needs based upon in-house-departments like “research & development” and “market research”. On the other hand, customers or users have to communicate their needs.

Over several years, the innovation management process has opened to companies external stakeholders like universities, competitors, start-ups, customer, supplier, reseller and individuals. As a result of the use of new information and production technologies, Schumpeter’s vision of the “isolated innovative employer” and the aforementioned “manufacturer-active paradigm” gave way to a more complex view of the innovation process. This all takes place within a network of internal and external members. Customers take a more active part into companies’ innovation management processes. This is called “customer active paradigm”.²⁷ In contrast to the “manufacturer-active paradigm”, it refers to a division of labour between customers and companies. Customers turn more and more into an active member within the process of development and production of products, solutions and services - involuntarily as well as voluntarily. Chapter 4 will show in detail why users are motivated to share their ideas and inventions, partly without any direct reward. Several theoretical concepts in context with the integration of consumers and users outside the company into innovation management – so called user driven innovation – were already presented since the 1960s.²⁸ The creative potential of external partners can be used for the development of new or better products, solutions or processes. In doing so, investment risks in innovative processes as well as new products and solutions could be reduced. Within the open innovation approach, the market is not only seen as a source for information about customer needs but also as a source to capture customer

²⁷ von Hippel (1978a, 1986, 1988a), Franke & Shah (2003), Füller et al. (2006), Lüthje (2000)

²⁸ Enos (1962), Freeman (1968), von Hippel (1976)

ideas, inventions as well as solutions.²⁹ “Companies should use external ideas as well as those from their own R&D departments, and both internal and external paths to the market, in order to advance their products”.³⁰

However, the transition between “open innovation” and “closed innovation” is continuous and can be divided into the dimensions of “listening”, “asking” and “taking part”.³¹

“Listening” means to use customer data from search portals, web-based-advisors, CRM-systems, patent-databases, literature, trade journals or product catalogues to identify customers’ needs. Herewith, customers are a passive part of observation and can be analysed by techniques from the field of classical desk research as well as web-monitoring-techniques. Surely, “listening” can be located within the closed innovation approach.

“Asking” means to initiate a dialogue between the company and the customer through techniques like “field tests”, “customer panels” or “usability tests”. Within this mode of interaction, the companies’ innovation management is more and more opened up to interaction with external stakeholders.

“Taking part” means to “allow and enable customers to design their own solution (at least partly)”.³² On the one hand, this could happen by initiating customer innovations platforms through the company. On the other hand, customers are often willing to generate ideas and inventions without an initial motivation through the manufacturer. This is especially true for online communities and forums like end-user developer-online-communities.

²⁹ Laursen & Salter (2004)

³⁰ Laursen & Salter (2004), p. 3

³¹ Reichwald & Piller (2005)

³² Reichwald & Piller (2005)

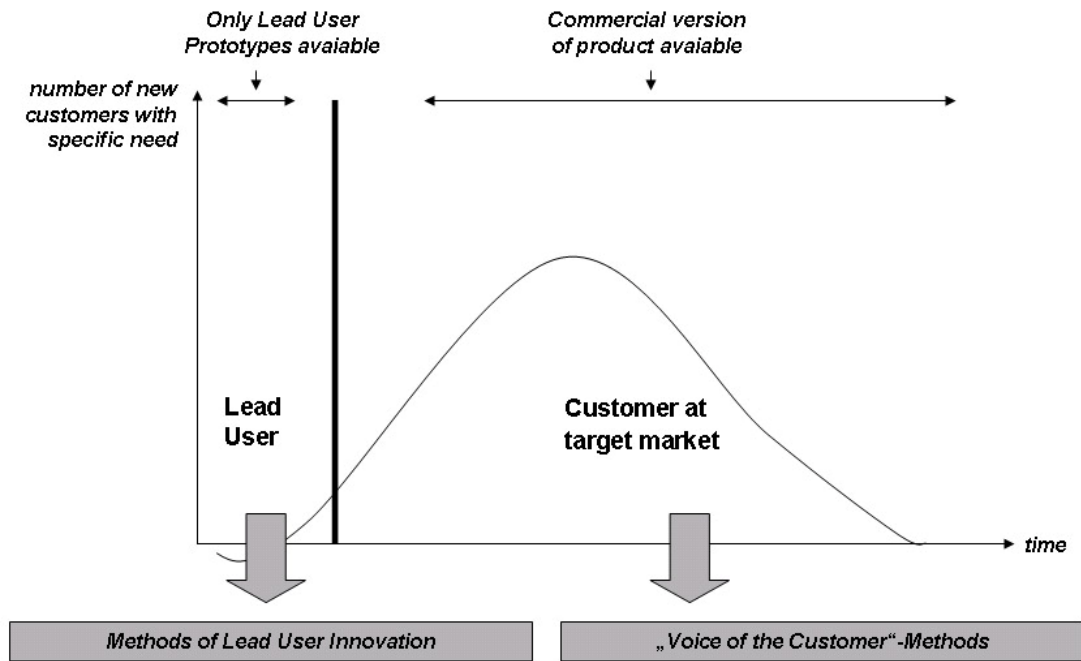


Figure 3: Lead user approach vs. voice of the customer approach³³

In open-innovation research, two approaches could be highlighted to describe the process of capturing ideas, user-needs, expectations, preferences and aversions of users: the “Voice of the Customer” methods and the “method of lead user innovations”.

The “Voice of the Customer” is a market research technique and is “deployed throughout the research and development, engineering, and manufacturing stages of product development”.³⁴ “Voice of the Customer” methods consider every customer - not only innovative customers - and produces a detailed set of customer wants and needs. Typically a “Voice of the Customer”-study consists of qualitative and quantitative research steps and combines many possible ways to gather the information: focus groups, individual interviews, contextual inquiry, ethnographic techniques as well as polls. Katz and Gerald reach the conclusion that there are various mixed methods approaches to analyse the voice of the customers and that there is no one right way until now.³⁵

In contrast, methods of lead user innovation identify and integrate only prominent innovative users – so called “lead users”. Von Hippels’ lead user approach provides essential characteristics regarding those users and is an important milestone of re-

³³ von Hippel (2005), p. 134, partly adopted by the author

³⁴ Griffin & Hauser (1993)

³⁵ Katz & Gerald (2001)

search in context with ideas from outside the company.³⁶ More than 30 years ago, Eric von Hippel found, based on ex-post studies, that many commercially important products had been first thought of and prototyped by product users. He had also explored that this was especially true for products that address functionally novel needs rather than simply providing improved solutions to known problems. In essence, he developed the lead user method, an idea generation process designed to collect both need and solution data with the help of leading users. Lead users are defined as “cutting edge” or the “avant-garde”, have own needs, own benefits from a new innovative solution and experience trends significantly earlier than the majority of users.³⁷ These characteristics are assessed by the level of own user investment and the level of user dissatisfaction with the existing solution or product. To systematically integrate the process into the companies’ innovation management, von Hippel divided the lead user approach into four phases: preparatory phase, identification of trends, identification of lead users and integration of leading users.

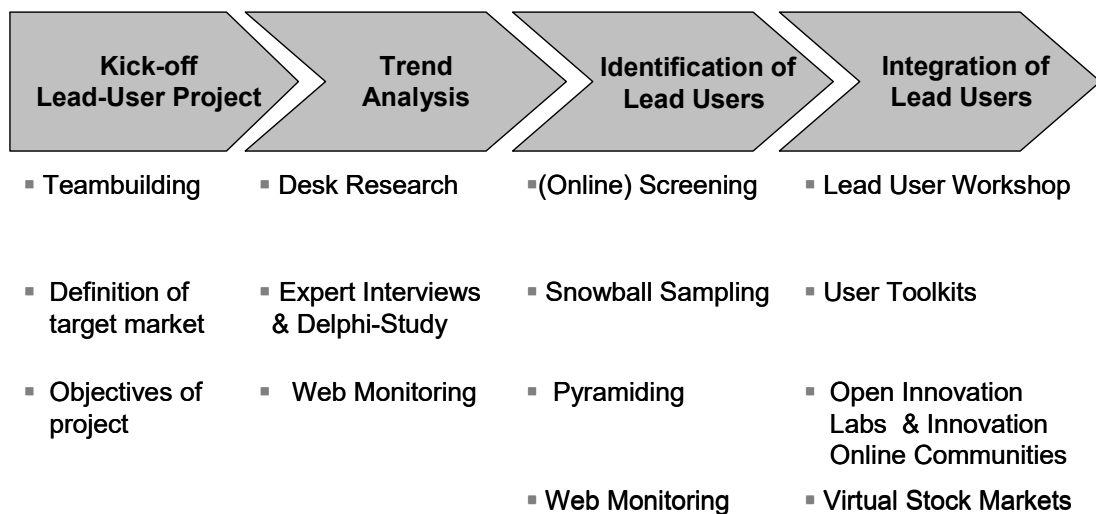


Figure 4: The lead user process³⁸

While the phase of lead user identification is important for the lead user process, this area shows huge deficiencies and room for improvements.³⁹ Lead users are currently

³⁶ von Hippel (1976)

³⁷ von Hippel et al. (2000)

³⁸ Source: own investigation

³⁹ Bilgram et al. (2008), Olson & Bakke (2001), Lilien et al. (2002), Prügl (2006)

identified by methods like pyramiding, broadcasting and screening⁴⁰, which normally result in face-to-face workshops. These costly methods are often time intensive and deliver complex data sets which are more or less selective. In practice, the identification of lead users is often based on relatively unstructured word-of-mouth techniques. During the last years, more and more users communicate and interact via the social web – lead users, too. Lead users are often widely known inside their online environment.⁴¹ Furthermore, they are often strongly interconnected within their peer group and are willing to exchange their experience in a more reliable, unadulterated and unfiltered way.⁴² Only the active integration and participation of lead users via the social web is currently widely explored. An example of this is the research of mass customization using toolkits for user innovation or virtual stock markets.⁴³ Furthermore, market research more and more makes use of online discussions, communities and chats in order to ask users their opinion on existing products and services. New methods and technologies of web monitoring could deliver new ways to identify innovative users for the companies' innovation management. Based on a comprehensive preparatory survey, chapter 3 will overview and analyse all current web monitoring approaches.

2.4 Ideas in Innovation Management

The starting point of an innovation process, including initiatives and first ideas, is difficult to define.⁴⁴ In practice, this period is often unstructured and based on impulses from different stakeholders, such as internal departments, customers, hobbyists, suppliers and retailers. The notion of “fuzzy front end” is often used within the literature to describe the starting period of innovation management, referring to the unstructured process of the first phase.⁴⁵ Other contributions call this period “idea generation”. Both notions have in common to subsume the “initiative”, the period where an initiator feels the motivational impulse of disappointment, and the actual “searching-process for problem-solving”. Hauschild and Salomo additionally inte-

⁴⁰ Please also notice the definitions of the methods „pyramiding“, „broadcasting“ and „screening“ in section 2.6, pp. 21, 22

⁴¹ Franke & Shah (2003)

⁴² Kozinets (2002), Pitta & Fowler (2005)

⁴³ Jeppesen & Molin (2003), von Hippel & Katz (2002), von Hippel (2001), Jeppesen (2007), Franke & von Hippel (2003), Franke et al. (2008), Schreier et al. (2006), Spann & Skiera (2003), Spann et al. (2006), Füller et al. (2006), Ernst et al. (2004), Pitta & Fowler (2005)

⁴⁴ Hauschild & Salomo (2007), p. 308

⁴⁵ Khurana & Rosenthal (1998), p. 59

grated the phase of “problem-definition”.⁴⁶ It has to be analysed within the given thesis if the later defined “innovative users” combine the idea generation or if different individuals, with different characteristics, are relevant for the ideas in innovation management.

Chapter 4 will also describe in great detail that ideas are based on (motivational) factors. These factors include information about existing trends, products and solutions, peer-reputation, prior-, technical- and product knowledge, intensive product experience with the existing product or solution, user expertise, achievement of an own benefit from a new product, dissatisfaction with the existing product and the motivation and competence to translate this dissatisfaction into ideas and/or innovations. This could be true for ideas from inside and outside a company. According to ideas from individuals from outside a company, different processes and methods of idea-identification, as well as the integration of external members, currently exist within the literature. They are collected and presented in figure 5 and could be located within the company, e.g. data from a customer relationship management system, or outside the company, e.g. from the field research. Regarding the integration of outstanding users into the process of idea-generation, it could be divided into the following four methods:

- The company does not directly interact with the specific customer;
- Non-interactive methods to integrate the customer into innovation management;
- The company actively involves the specific (outstanding) customer;
- Interactive methods to integrate the customer into innovation management.

In practice, different internal-, external-, non-interactive- as well as interactive-methods are often combined. It could be assumed that the incremental combination of different methods is the most promising approach.⁴⁷

⁴⁶ Hauschild & Salomo (2007), p. 311

⁴⁷ Hauschild & Salomo (2007), p. 463

Identification of innovative users	Internal sources, e.g. <ul style="list-style-type: none"> ▪ evaluation of customer complaints, -enquiries, -proposals and -comments ▪ evaluation of customer service- and sales-reports 	External sources, e.g. <ul style="list-style-type: none"> ▪ expert interviews ▪ questionnaires (“word of mouth”) ▪ analyses of external databases, e.g. patent application ▪ desk research, literature analyses, analyses of press releases
Integration of innovative users	Non-interactive methods, e.g. <ul style="list-style-type: none"> ▪ user observations ▪ user questionnaires 	Interactive methods, e.g. <ul style="list-style-type: none"> ▪ creativity workshops ▪ temporary exchange of individuals from inside and outside the company

Figure 5: Dimensions and sources of ideas⁴⁸

2.5 The Social Web and Innovation Management

The social web with its communities, forums and blogs affords new prospects for companies and, at the same time, new and unknown challenges. It is a dynamic and growing area that includes blogs, message boards, podcasts, micro blogs, life streams, bookmarks, social networks, social communities, wikis and vlogs, photo- and video-sharing sites.⁴⁹ Social web tools are currently thought to produce up to one third of new web content.⁵⁰ In figure 6 the current most common social media categories are structured regarding the “level of involvement” and the “level of interactivity”. The “level of interactivity” describes the degree of interaction between the members of a particular social media application. The “level of involvement” describes the degree of intensity that a member shows to produce content for a particular social media application.

⁴⁸ Source: own investigation

⁴⁹ O’Reilly (2008)

⁵⁰ Finin et al. (2008), p. 1

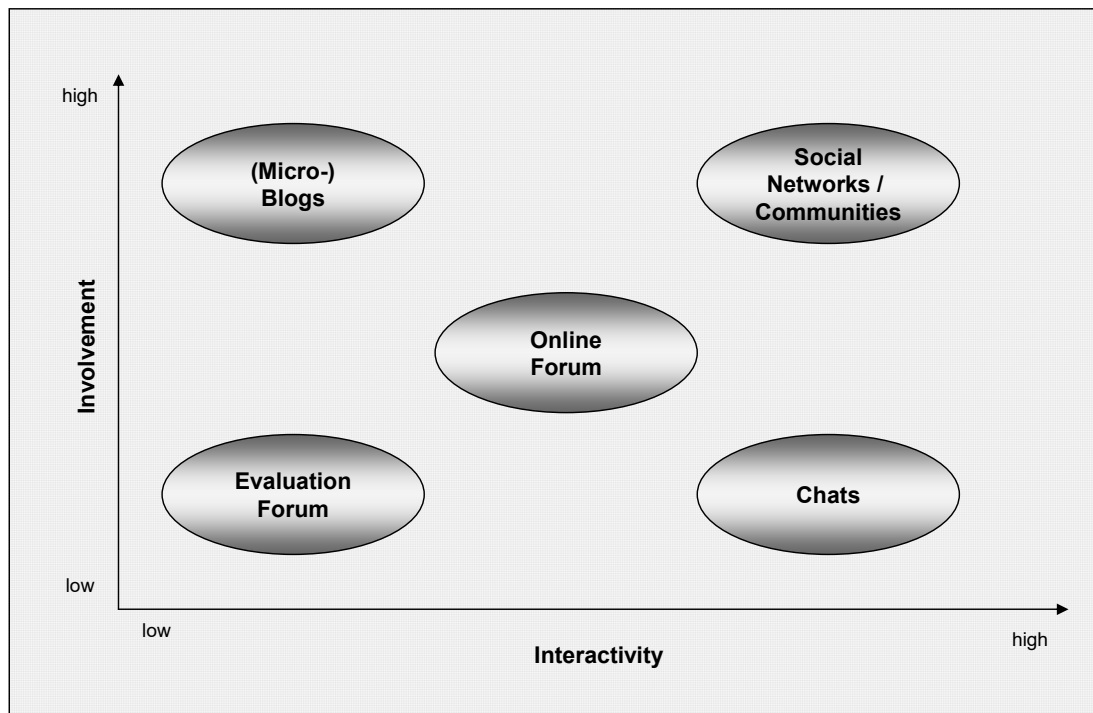


Figure 6: Social media regarding Involvement and Interactivity⁵¹

Solis describes social media as “online tools and platforms that people and groups use to share opinions, insights, experiences and perspectives between each other”.⁵² Social media connects people and it is a collection of open-source, interactive and user-controlled online applications. The social web could be named as the democratisation of content. It is important to understand the role people play in the process of not only reading and disseminating information, but also how they share and create content and views for others to participate and to form opinions. It is the shift from a broadcast mechanism (“one-to-many”-communication) and the classical dialog-communication (“one-to-one”) to a “many-to-many” model which is rooted in a conversational format between authors and people. “One-to-one communication” and “one-to-many communication” is a well known part of classical communication-channels like advertising, dialog-marketing or the web pages. Figure 7 outlined that by methods and channels of mass communication the companies send information about the product and the brand to their users and did not receive a direct response by the users. Users have the opportunity to respond by classical methods of market research, for example, focus groups or questionnaires. Using methods and channels of the cluster “one-to-one” communication, a company sends information to its users

⁵¹ Source: own investigation

⁵² Solis (2007)

and receives their comments via a direct backward channel. One novelty of the social web is called “one communication”. It describes the opportunity that many users talk to many users and that the brand, or the company, is a part of this communication process. Thus, communication could only partly be managed by the company itself. What sets the social web apart from traditional web pages is that there are standard links enriched by social networks, post-to-post links, comments, tags and trackbacks, which could be collected and analyzed.⁵³ The social web could (partly) automatically be searched by web monitoring algorithms and web monitoring metrics. Quantitative questions can be answered easily, e.g., the number of connections of a community member. However, it is still challenging to automatically measure qualitative criteria, e.g., the quality of a posting in comparison to another posting.

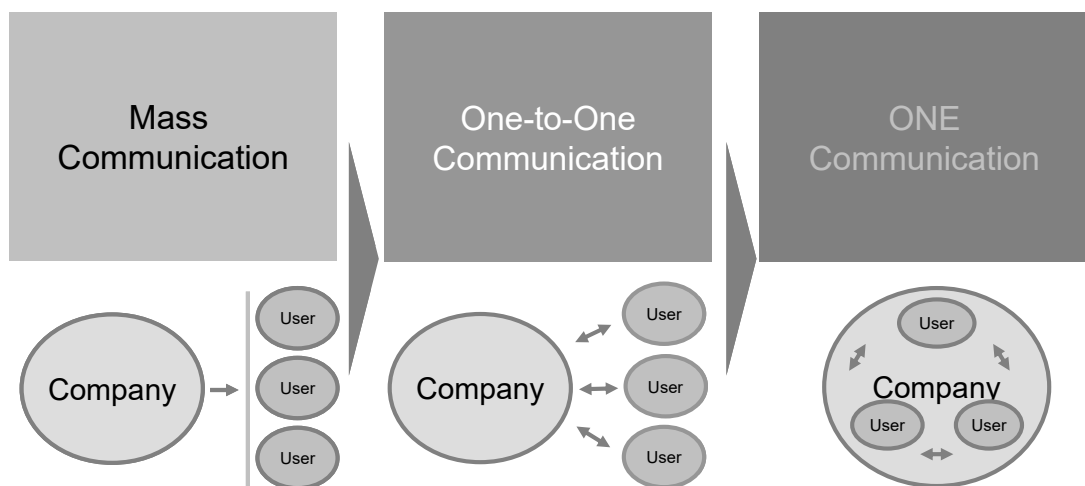


Figure 7: From Mass Communication to One Communication⁵⁴

Based on an extensive and novel research project, Chapter 3 will analyse currently used approaches, methods and technologies of web-monitoring. On the one hand, the question has to be answered how companies can deal with this new participative mode of communication. On the other hand, the complexity and the nearly unlimited number of social web contributions require new technical and methodical solutions. An effective use of the million-fold discussion, sentiments and percipience of consumers and experts for marketing, sales, public relations and innovation management will not be possible until then. Currently, relatively different processes, methods, instruments and technologies are in practical use. The present thesis shows the key

⁵³ Finin et al. (2008)

⁵⁴ Source: own investigation

findings of extensive research in this context. Web monitoring providers also have very different functional backgrounds. For example, they come from market research, business intelligence, public relations, integrated communication consulting, IT consulting or media monitoring. Therefore, the companies show different scopes of services, technology and methodological know-how, company sizes and thematic focuses.

Web monitoring encompasses the key processes of data collection, data preparation, data analysis and interpretation of results. The results of surveys show that there are strong differences between the market members in every phase in the context of approaches and range of services. Thus, companies interested in web-monitoring services have to decide, with a view to specific project needs, which provider will fit the best. Therefore, the following research project aims to bring more transparency into methods, approaches and technologies of web monitoring.

During recent years, the use of the social web found its way into the innovation management research, in general, and into the interaction with innovative users during the innovation management process, in particular.⁵⁵

Figure 8 gives an overview of the current use of the social web in market research in general and innovation management in particular. It is divided into methods and applications for the identification of innovative users via the social web and into methods and applications for the integration of innovative users into the companies' innovation process via the social web. Both categories are divided again into approaches and applications, where users are passively observed, and into approaches and applications, where users actively take part into the innovation management process. The active identification and integration of users via the social web is currently more intensively explored scientifically than the passive monitoring of users via the social web. Like outlined in Figure 8, companies have developed online communities, online forums, online chats as well as online open innovation labs to address innovative users and to identify innovative users. It is clear by what is being presented that these online environments and websites are always motivated by the company itself. For example, one often finds the corporate design and the companies' brand, or the imprint, on the website. The Starbucks innovation-community "My Starbucks Idea" is an example for such an innovation community.⁵⁶ Those innovation communities, forums, open innovations labs and chats are not just developed to identify innovative

⁵⁵ Franke & Shah (2003)

⁵⁶ <http://mystarbucksidea.force.com/>, viewed on 31 October 2011

users. They are also administrated to integrate (innovative) users into companies' innovation management, to interact with them and to create customer loyalty towards the company and the brand. Besides the aforementioned applications, virtual stock markets are also used to identify innovative users and to integrate them into the innovation management process.⁵⁷ Spann explained the basic idea of a virtual stock market in market research by “formalizing the expectation of future market developments and making those expectations tradable by using virtual stocks”.⁵⁸ Passive methods and applications to monitor users are currently not widely explored. To identify users and to integrate them into the innovation process, online screening questionnaires or user feedback forms as well as methods of information retrieval are developed, arranged and analysed. Web information retrieval is the area of study concerned with searching for documents, searching for information within documents, and for metadata about documents as well as that of searching structured storage, relational databases, and the World Wide Web. For the passive integration of innovative users into the companies' innovation management web-based conjoint analyses are appropriate means. Conjoint analysis is a simulation model to extract consumer behaviour into an empirical or quantitative measurement in order to evaluate products and services and to predict consumer behaviour to product changes.

	Identification of innovative users	Integration of innovative users
Passive	online screening questionnaires, user feedback forms, web information retrieval	online screening questionnaires, user feedback forms, web-based conjoint analyses
Active	innovation communities, online open innovation labs, company forums, company chats, virtual stock markets and idea competitions	

Figure 8: Current use of the social web in innovation management⁵⁹

Thus, market research uses more and more online discussions, communities, forums and chats in order to ask users for their opinion on existing products and services. However, particularly during the pivotal phase of the user-identification, new meth-

⁵⁷ Spann (2002), Spann & Skiera (2003)

⁵⁸ Spann (2002), p. 13

⁵⁹ Jeppesen & Molin (2003), Thomke & von Hippel (2002), von Hippel & Katz (2002), von Hippel (2001), Jeppesen 2007, Franke & von Hippel (2003), Franke et al. (2008), Schreier et al. (2006), Spann & Skiera (2003), Füller et al. (2006), Ernst et al. (2004), Pitta & Fowler (2005b)

ods and technologies of web monitoring could be efficient and have not yet been researched.

2.6 Current Methods to Identify Individuals with Certain Characteristics

The phase of identification of the “right” users is crucial for successful open innovation management projects. Therefore, the “screening approach”, the “snowball sampling approach” as well as the “pyramiding approach” currently are used most often. Because of the growing relevance of the (social) web for the identification of individuals with certain characteristics, methods and approaches of web monitoring are more and more relevant.

The screening approach is a standard process of market research projects and focuses on defined questionnaires of a population with the aim to identify individuals with certain characteristics. Screening is advisable when the population is straightforward and a full screening is possible under justifiable cost-benefit criteria – mostly not given in online communities. Furthermore, the screening approach could be efficient if a community or network is only linked by weak ties and strong ties are missing, because individuals do not generate additional benefits through the interaction with other community members. The approach is suitable for various types of questionnaires and market research projects. It is qualified to specify the distribution and intensity of primarily defined characteristics of information within a community – for example, to get information about the degree of market penetration of a certain product. Within the framework of identification of individuals with certain characteristics, often existing in a limited number within the population – for example “innovative users” within an online community – the approach hits its limits. In this case, only the information about the outstanding users are relevant and not the information about the mass of “normal individuals” within the researched sample. Regarding the identification of innovative users, most of the screened information is useless.⁶⁰

Snowball sampling is a relatively efficient method to identify individuals with certain, rare and hardly identifiable characteristics.⁶¹ The iterative method, often used in marketing and sociology, is based on findings in context with the “small world phenomenon”, which describes and researches acquaintanceship networks within a population.⁶² These studies are based on the idea that every social individual in a

⁶⁰ Lüthje (2000)

⁶¹ Goodman (1961)

⁶² Milgram (1967), Dodds et al. (2003)

population – not absolutely isolated – is on average maximum six steps away from any other person on earth. Adding the assumption that individuals with certain characteristics know other individuals with similar characteristics, snowball sampling uses suitable individuals as reference persons to identify further individuals with similar characteristics by word-of-mouth. Different authors demonstrated that snowball sampling is an efficient alternative to the aforementioned screening approach, especially if the population is large.⁶³ Examples for successful research projects are (1) the identification of minorities in large populations as well as spatially scattered (2) elites.⁶⁴

The pyramiding approach is also developed to identify individuals with certain characteristics.⁶⁵ Similarly to the aforementioned snowball sampling method, the sequential pyramiding approach is based on word-of-mouth techniques and firstly identifies some “starting-individuals”. These individuals are used to converge to other individuals with certain characteristics through references – for example, innovative users. Similar to the screening approach, the method “relies on the fact that people with strong interest in a topic or field tend to know people more expert than themselves”.⁶⁶ In contrast to the snowball-sampling method, the direct acquaintance is not relevant. “Pyramiding” could be used more flexibly and used within incomparably larger populations as well as analogue markets. It is not limited to a certain group of people. The approach is more and more used within lead user projects.⁶⁷ But there are also some weaknesses. Firstly, the identification of “starting-persons” could be complicated and difficult through the use of the individuals’ transactive knowledge – “knowing what other people know”.⁶⁸ Herewith, isolated individuals and their ideas could hardly be identified, for example, in cases of proprietary inventions. Furthermore, the identified knowledge and data could hardly be verified because they are based on subjective statements.

⁶³ Sudman (1985)

⁶⁴ Atkinson & Flint (2001)

⁶⁵ Von Hippel et al. (1999)

⁶⁶ Lilien et al. (2002), p. 1045

⁶⁷ Lilien et al. (2002)

⁶⁸ Borgatti & Cross (2003)

3. Preparatory Survey: Approaches, Methods and Technologies of Web Monitoring

3.1 Key Processes of Web Monitoring

To harness countless consumer discussions, information from the media and information about internet competitors for a company, web monitoring projects mostly work with the standard key processes of data collection, data preparation, data analysis and interpretation of results.

Within the *data collection*, it is essential to find and store almost every published contribution about a theme, a brand, a company or person – independent of media channel and data format. For example, it is possible that key messages are hidden within podcasts or video podcasts. Therefore, a monitoring system should retrieve relevant data within video and audio data. Four of the questioned fourteen companies analyse audio files and five of them video files within their web-monitoring solutions. In addition to the observation of already known sources, it is also important to monitor the deep web regarding relevant content. Web-monitoring projects should also take into account databases that cannot be retrieved through search engines such as Google, bloglines, blogmonitor or Technorati. Often promising issues and trends are created within forums and micro-communities based on primarily small discussions. It should be decided within a specific project if a screening should be dependent or independent from sources.

The difference between “screening” and “monitoring” should be defined and outlined, too. There is still no consistent phrase for these terms. In the following, “screening” describes the form of data retrieval where relevant contributions are collected within the complete World Wide Web. However, the monitoring technique is focussed on previously defined sources.

Within the phase of *data preparation*, the recovered and retrieved contributions have to be separated from irrelevant documents like spam and doublets. On the one hand, this can be done manually by editors. On the other hand, it can be completed with the help of special software technologies. Partial automation of these often time-consuming processes will boost the efficiency of web-monitoring projects. The metadata of documents are extracted and stored – for example, author name or publi-

ation date – and the contributions are tagged to simplify and speed up data analysis. Some providers operate with classification tools or technologies of automatic indexing. Thus, the form of archiving has to be considered and makes a difference for depth and breadth of data analysis. It also makes a difference, if data is stored within a simple database or within a more complex and multidimensional analysis environment. If text mining techniques or the access to several contributions is required, a provider should be selected that is able to store the documents in a text-based manner. If the web-monitoring project requires an automated analysis with specialised mining techniques and text analysis software, the provider has to accomplish a so-called “pre-processing” which deletes stop words and sections the contribution into sentences and word groups.

Within the third phase of the web-monitoring process – the *data analysis* – project-relevant knowledge will be generated from the pre-processed data. Herewith and because of a broad possible spectrum of analysis variants, the providers use very different approaches. For example, special author and profiling analyses for the identification of opinion leaders and multipliers within the web are often used. Relevance and source analyses quarry relevant positions for special themes within the web and provide information about the range and the degree of powerful influence of the particular source or contribution. So called “buzz analyses” inform about the involvement of a target audience referring to a special theme and “tonality analyses” gives an impression about the target audiences’ spectrum of opinions. Last but not least, trend and issues analyses are relevant for the initial identification of weak signals, especially for the continuous development of themes and brands. These analyses are based on a wide repertoire of methods which are used and combined differently by the surveyed companies. The range of methods starts with methods from descriptive statistic and social network analysis all the way to quantitative and qualitative content analysis. With these methods alone, the daily increasing amount of data on the internet cannot be accommodated. Therefore, providers increasingly focus on methods of data, text and web mining because they are especially developed to process and analyse huge mounds of data. Another important method is called “semantic analysis”. Therewith, huge mounds of data can be made comprehensible and intelligent, for example, on the basis of theme networks, so that communication patterns can be recognised quickly and efficiently. For example, the negative context of a brand or a product within the web communications could be analysed without engag-

ing countless encoders and analysts to read and evaluate each contribution. Furthermore, the combination of theme and source networks has turned out to be an effective way for pattern recognition and therewith for understanding the complex web communications. Even qualitative methods from sociology are transferred to the online research to filter out market-relevant customer insights from the customer contributions on the internet. These methods are often called “netnography”. The word “netnography” is a mix of “internet” and “ethnography”. The approach extrapolates ethnographical approaches and methods to the online environment. Ethnography studies people, ethnic groups and other ethnic formations with the help of qualitative methods like participant observations, interviews, focus groups and questionnaires. Netnography provides information on the symbolism, meanings, and consumption patterns of online consumer groups and is focused on cultural insights. Within the interpretation of results – the last phase of a web-monitoring process – the efficient presentation of the findings is primarily important.

The web-monitoring solutions on the European market vary highly because of the different thematic backgrounds of the providers and the different needs of the consulted customer companies. Companies who have a background as technology providers often offer solutions for a continuous and thematically appropriate monitoring of the web. Detailed data analyses, as well as action-guiding data interpretation, are often not offered by these companies. Those with a background in communications and management consultancy mainly assume these services. Therefore, it should be pointed out that primarily the individual clients’ aim of analysis is responsible for the selection of web-monitoring providers. Furthermore, it is up to the project if the raw data material of the collection phase is relevant for later internal analysis. This implies the question of whether it is relevant for the specific project to verify the quality and significance of the data sets with the help of a company-internal analysis. In this way, consumers also have the possibility to conduct independent analyses with the help of their own familiar statistical software. This increases the customers’ flexibility in analysis and makes them autonomous from the competence of the specific web-monitoring provider. The result of the present extensive analysis of the providers’ company profiles is that some companies are quite non-transparent regarding the raw data as well as the procedural approach of data collection, preparation and analysis. While there are certainly clear causes for this behaviour, it significantly complicates the comparison of the different providers for interested companies.

Some web-monitoring companies provide web-based reporting interfaces called “dashboards” or “cockpits”. The performance of such cockpit solutions is based on an extensive state-of-the-art presentation of results. Also, the opportunity for an own data exploration could be profitable for a specific project. Of at least the same importance are search functions which allow the efficient generation of relevant information from huge mounds of data. Furthermore, a user-friendly and personalised customisation of the reporting interface is advantageous for the user. Moreover, the professionalism of a cockpit is characterised by multi-tenant software, the opportunity to integrate the software into the companies’ IT infrastructure and the existence of a demo-access. Even here individual project requirements are central. Should the cockpit be used for crisis and issues management, an alert function is even relevant. Herewith, the user will always be up-to-date regarding relevant events. Another important function is the opportunity to import external data into the web-monitoring system and to analyse it. Examples of this are the e-mail communication within the customer relationship management system, data from previous projects or from media observer services. Even here, for the evaluation of the specific web-monitoring software, it is crucial where the software will be used. For example, a basic cockpit solution could suffice for a small marketing department. Should the solution be integrated into the IT infrastructure of the company and should different company divisions be involved in the web-monitoring project, the requirements must be adjusted.

3.2 Survey Design, Data Set and Data Structure

The aim of the present provider study was to present a detailed and complete overview of approaches, methods and technologies of web monitoring for the first time. Due to the specific requirements regarding the different phases of the web-monitoring process, a differentiated criteria system was created to meet the heterogeneity of the market and to achieve comparability. Initially, it was determined with a standardised and personalised poll answering the question how the different providers will perform a task.

The following criteria were used to select and recruit the fourteen providers for the present survey:

- All selected providers run their own web-monitoring solution and have established their own department for web monitoring services.
- All selected providers act in the German-speaking market.
- To guarantee comparability, all analysed providers offer their services within all four key phases of the web-monitoring process: data collection, data preparation, data analysis, interpretation of results.
- To stay abreast of the changes in the web monitoring market and to overview the market as complete as possible, already established providers were surveyed as well as smaller newcomers.
- It was considered that the web monitoring market is dominated by providers which have their origins in different industries: public relation agencies, advertising agencies, communication agencies, press clipping, business intelligence analysis, search engine optimization (SEO), software development, online marketing agencies, market research agencies and market information providers. By surveying companies from all those industries, all different web monitoring approaches could be analysed. For example, this scope of research made it possible to consider more exotic approaches like “Netnography”, too,

- All selected providers have market-leadership which means that they have the largest market share or the highest profitability for web monitoring services.
- Because the survey covered a wide range of relatively detailed questions, it was exclusively addressed to the top management or the executive staff responsible for web monitoring within the company.

The poll was evaluated through qualitative interviews with the attendees. Here, open-ended questions were also answered. Furthermore, a comprehensive survey of the press releases also helped to verify the company's statements. If the provider allowed insights into technologies like cockpits and Web 2.0 search engines, the answers were additionally verified by live tests. During a second step, the first results of analysis were presented to the participants and again verified. This multi-level analysis should have prevented misunderstandings and mistakes.

Besides the general parameters of market presence and scope of services, the survey design was focussed on special categories of analysis that were adjusted to the character of web monitoring. Analysing technologies and processes that are used within the different phases of web monitoring; the know-how of the specific provider could be evaluated. The evaluations of the individual phases were integrated into an overall evaluation about the performance of the specific provider.

To identify the market presence of the provider, they were asked how long they have experience with the web-monitoring business, how many employees are engaged full time with web monitoring and in which countries they offer their web-monitoring services. Moreover, the amount of transaction volume achieved by the specific provider with web-monitoring services should be detected. With this criterion, the market size and the market share of the specific provider should be determined. Unfortunately, only a very few providers answered this question. This aspect could therefore only be documented by the available and published documents of the companies.

To evaluate the performance, not only the quality and quantity of processes and analyses are surveyed, but also the form and extent for presenting the results. The evaluation of the technology competence addressed the question whether providers had developed their own technologies and for which purposes they use them. For example, there is a difference between a provider arranging the data collection with its own spider and crawler technology or with the help of different free-ware tools like Technorati, Google Groups or Foren-User. Furthermore, presenting the results of

a web-monitoring project within a multi-tenancy cockpit or dashboard requires more technological know-how than providing some texts and data sheets. Besides, there are differences in technologies within the different dashboard solutions.

Methods know-how depends primarily on the form of analyses and processes used by web-monitoring projects as well as the form of data collection and processing. Therefore, it has also been surveyed how the providers succeed at the data processing, which types of analysis are used and which methodical processes are applied. Furthermore, the evaluation accounted for how the providers deal with the evaluation of the identified sources and contributions and how the text documents are pre-processed for further analysis.

Unfortunately, three of the surveyed fourteen providers did not agree with the publication of their company names in context with the present provider study. During the survey, and after comparing with all other surveyed providers, it became apparent that those providers did not have as much performance as their competitors or that they are simply not interested in so much transparency. The aim of the present study was to analyse methods, approaches and technologies of web monitoring. Due to the fact that the publication of detailed information about the companies is not relevant to achieve this aim, it was decided to renounce on the publication of the company names.

1. Market presence	Experience and number of full-time employees in the web-monitoring division; international presence of the solution
2. Scope of services	<p>Data collection: number of data collection procedures, the types of captured media channels and data formats, the frequency of data collection, the number of currently included languages</p> <p>Data preparation: number of data preparation procedures, such as clearing up spam and doublets and extraction of other irrelevant documents, extraction of metadata, pre-processing of text analysis (amongst others text fragmentation into sentences and words, clearing up stop words), opportunity and scope for archiving</p> <p>Data analysis: number of engaged analyses, quantification of the relevance of sources and contributions, quantification of buzz (classification of the capacity of documents)</p> <p>Presentation of findings: different forms of presentation, extent and form of delivered findings (for example, ratio quantitative vs. qualitative data, delivering of raw data), degree of information aggregation (empirical data vs. crucial knowledge)</p> <p>Accordance with web-based web-monitoring applications: for example, scale of indicated deliverables, individual setting options for users, import of external data, opportunity to process individual analysis, number of features to search information, alert function, demo-entry</p>
3. Technology competencies	<p>Type, requirements and complexity of the technology within the different phases, development and implementation of internal technology solutions</p> <p>Level of automating the processes of the specific web-monitoring approach: for example, type of technology solution, multi-client and integration capability, special features</p>
4. Methodology competencies	Diversity, methods, form and requirements of types of analysis, consideration of special methods in context with the challenges of the internet – especially the social web
5. Evaluation of the entire performance of the solution	A complete approach to solutions (technology provider, service provider, hybrid approach), generally regarding the area of application and industry, patenting of solutions, scope of services, know-how in technology and methodology

Figure 9: List of criteria for the provider evaluation⁶⁹

⁶⁹ Source: own investigation

3.3 Results

The present provider survey showed that web-monitoring services are especially in demand from market research, marketing, corporate communications and public relations departments. Particularly in public relations, the functionalities are relevant for early warning in the context of issues management. Furthermore, in innovation, trend and product management, a continuously growing demand for this new form of online market research currently exists as well. As aforementioned, the process of web monitoring could be divided into the phases of data collection, data preparation, data analysis and interpretation of results. The majority of the interviewed participants are focussed on the data analysis and the interpretation of results. On the contrary, the phase of (raw) data collection does not seem to be of primary interest. Below, the results of the survey are presented based on the single phases of web monitoring.

3.3.1 Part 1 of a Web Monitoring Project: Data Collection

Even within the data collection, the surveyed providers follow different approaches. The data collection can be divided basically into screening and monitoring. Screening means to search the complete web for relevant contributions. On the contrary, monitoring focuses on previously defined sources. Most of the surveyed providers offer both techniques. A plurality of providers offers daily monitors – hourly or shorter periods are an exception. On the other hand, most hourly providers can screen the web as well.

The majority of the attendees offer source-based as well as source-independent methods of data collection. Source-independent data collection means to search the whole internet for relevant sources. The source-based data collection is focussed on predefined sources. Twelve of fourteen attendees captured relevant contributions with an internal technical solution. One-third of the providers combine their own technical solutions with different commercial techniques of other providers. Six of the fourteen attendees work with open market tools like the web and blog search engines Google and Technorati.⁷⁰ However, five of these six companies use these tools as a supplement to their own solutions. Generally, the process of data collection depends on the focus of the specific provider. For example, communication consultan-

⁷⁰ www.google.com, www.technorati.com

cies and market research companies often prefer cooperation with technology partners, especially within the phases of data collection and preparation. These phases often need long-lasting professional IT know-how. On the other hand, providers with a strong technological focus have entered the market and are often cooperating with consulting partners. When analyzing social web tools, it is important to capture single contributions, although some providers do not offer this kind of data collection. In fact, they often only tap complete forum pages. In this case, an automated analysis could not generate valid data and had to be processed manually. Twelve of the surveyed companies make use of specially developed web-monitoring technologies like spider and crawler techniques. Some combine these techniques with subscribed feed services, like RSS feeds, or use a gateway to existing search engines and social bookmarking services. Furthermore, there are relatively new tracking technologies like “Memetracking”⁷¹ for blogs. Nearly every web-monitoring technique can monitor text contributions, blogs, forums and newsgroups, and comments on classical online media as well as entries of user-generated content at twitter, wikis, communities and portals. These techniques could be considered as standard available capacity. On the contrary, only one-third of the surveyed companies offer a monitoring of audio and video contributions as well as entries into patent databases and the comparison of prices. Monitoring services for more specialized websites like those for price comparisons are less frequently offered by the surveyed companies. Customer companies in Germany currently order monitoring services primarily in German and English, followed by French and Italian. Furthermore, there is a small but growing demand in Eastern European languages and Chinese.

3.3.2 Part 2 of a Web Monitoring Project: Data Preparation

The phase of data preparation includes data clearing from spam contributions, doublets and irrelevant documents, the extraction and archival storage of relevant information as well as pre-processing. Relevant information is, for instance, the creation date, authors, headlines, textual content, textual types as well as comments on contributions. At the pre-processing phase, texts are fragmented into sentences and words and adjusted from stop words for conducting an automated text analysis. Slightly more than half of the interviewed companies adjust the raw data from spam contributions. Eleven companies arrange doublet checks and ten attendees extract relevant

⁷¹ Memetracking means the arrangement of news from text, audio and video postings.

information from contributions.

Furthermore, all companies offer a function for archiving, mostly based on texts or databases. Here, users have to be involved and must read the contributions themselves or the contributions are automatically stored into a temporary or durable database. With the first alternative, the real-time search results are viewed – comparable with classic search engines. If users want to use a specific contribution for later analysis, it has to be integrated manually into an archive. This step can be taken over by solutions that are based on databases. Certainly some of these database solutions do not allow archiving data for more than 30 days. On the other hand, the metadata are extracted in every searched web-monitoring solution and are stored in a database. However, there are subtle distinctions between the present database solutions; these are often difficult to detect. For example, one provider offers the opportunity to store within a complex multi-dimensional environment through the development of an OLAP cube.⁷² Herewith, complete texts, as well as metadata, can be stored for an unlimited period of time. On the other hand, other attendees of the survey operate with less complex SQL databases.⁷³ Even here, the individual project objectives are crucial. If, for example, valid media impact or trend analyses extending over several years are requested within a project or if raw data needs to be integrated into free multivariate analyses, a more complex database structure is recommended.

In the context of data preparation, the surveyed companies can be simplified and divided into qualitative and quantitative approaches. Some companies, resulting from market research or media monitoring, tend towards qualitative, manual analysis, i.e., each contribution is reviewed and checked regarding theme relevance by editorial journalists. A high quality in data cleansing is guaranteed. Certainly, the number of handled contributions is limited. Therefore, companies coming from the IT industry have developed in the broadest sense techniques to (partly) automate this time-consuming work. Thereby, it should be noted, that the quality of an automated data cleansing should be checked and guaranteed by manual samples. The advantage is the quantity of analysed data. Some providers offer other services regarding the data preparation, for example, semantic analysis of freely defined categories and tonalities or of classification by categories, indexing and differentiating according to specific

⁷² OLAP = “Online Analytical Processing” is an approach to swiftly answer multi-dimensional analytical queries

⁷³ SQL = “Structured Query Language” is a programming language designed for managing data in relational database management systems

tonalities. These processes are, on the one hand, manual, but on the other hand, proceed with the help of technologies.

3.3.3 Part 3 of a Web Monitoring Project: Data Analysis

Data analysis can be seen as the core step of a web-monitoring project. The different approaches of the surveyed companies also clearly represent their primarily thematic background. Some companies originating from classical market research, for example, make use of descriptive and multivariate statistical methods. Other companies have their roots clearly in the fields of business intelligence or media monitoring. On the other hand, providers from the area of Netnographie use methods from qualitative market research and ethnography in a way that is not comparable with companies focussed on automated quantitative methods. Furthermore, the German-speaking area can be divided into companies with their roots in the North American market and companies from a European context. Due to the market size, the former companies often follow quantitative and mostly automated approaches with sporadic manual approaches. On the contrary, the European providers are faced with the challenge of culturally and linguistically diversified markets where qualitative analysis can be achieved with acceptable costs. Generally, only a few providers offer the complete spectrum of web-monitoring analysis.

The result of the survey showed that 90% of the attending companies work with automated quantitative and manual qualitative analyses. Half of the companies provide automated qualitative analyses. Manual quantitative analyses are rather rare within the portfolio of the companies and are probably impractical for the future. One reason is surely the permanent rising data volume on the internet. To identify which type of web-monitoring analysis is currently most frequently used and how they are processed, the attendees were presented with a list of possible types of analysis. Herewith, the attendees had to answer whether they conduct them manually or automatically. The following items are predefined as the possible types of analysis:

- *Author analysis*: Identification of certain typologies within the internet and revelation of their linking, for example, opinion leader, power poster, info spreader, innovative user.

- *Profiling analysis*: Profiling of certain target subjects or audiences within the internet. In practice these forms of analysis are especially used for the identification of innovative users within the management of innovation and for the profiling of opinion makers and leaders within the internet.
- *Relevance analysis*: Determination of the relevance of certain sources.
- *Buzz analysis*: Analysis of the relative share of a theme within the full-scale communication.
- *Tonality analysis*: Analysis of the distribution of negative, positive and neutral sentiments.
- *Trend analysis*: Identification of social dynamics and themes within the internet.
- *Search item analysis*: Analysis of the internet with the help of predefined key words.
- *Issues analysis*: Analysis of positions and requirements regarding a special theme. Issues analyses often present how quite different positions and arguments have found their way into the media.
- *Source analysis*: Identification of relevant sources for a special theme within the internet and presenting of a source network.
- *Product analysis*: Search for innovations and special strength and weaknesses of a product.

Figure 10 shows that every surveyed provider uses source, relevance and issues analyses. Furthermore, buzz, trend, author and tonality analyses are realised by nearly every provider as well.

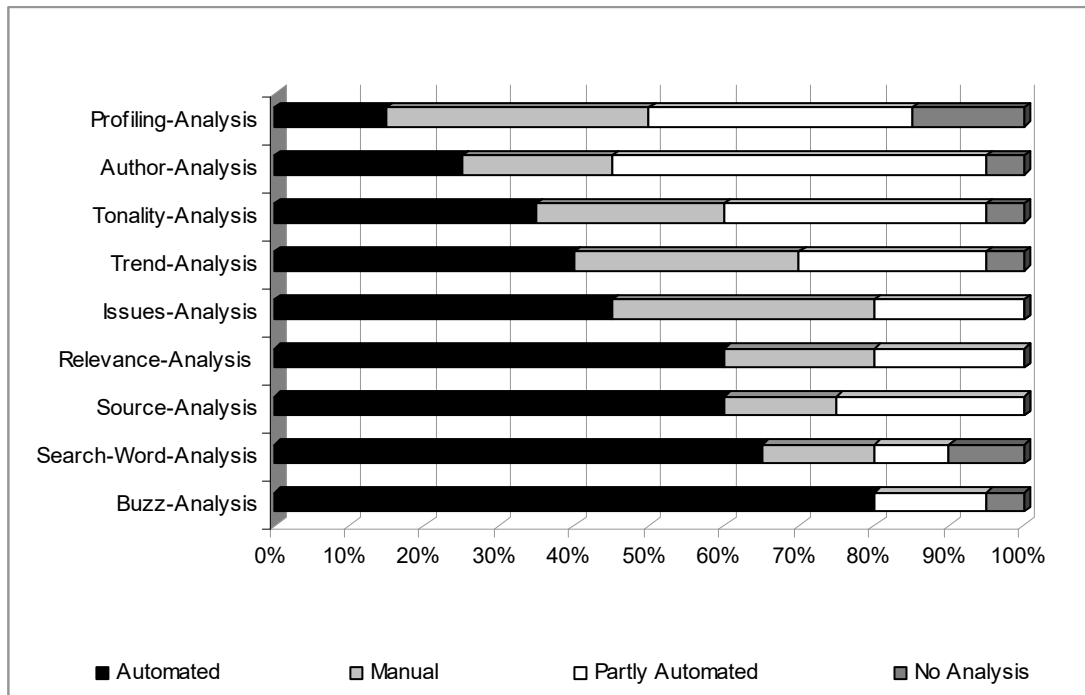


Figure 10: Frequency distribution of analyses⁷⁴

In contrast, profiling analyses are most frequently missing within the companies' portfolios. However, at least 85% of the surveyed companies offer such analyses. Figure 10 also makes clear that the aims of analyses are reached by rather different approaches. Manual and automated methods also can be found in the market as well as semi-automated methods. But a fully automated qualitative method is currently unknown. Quantitative analyses like buzz, search item and source analyses can currently be fully automated. A combination of automated and manual methods is normally used for complex analysis projects.

⁷⁴ Source: survey web monitoring

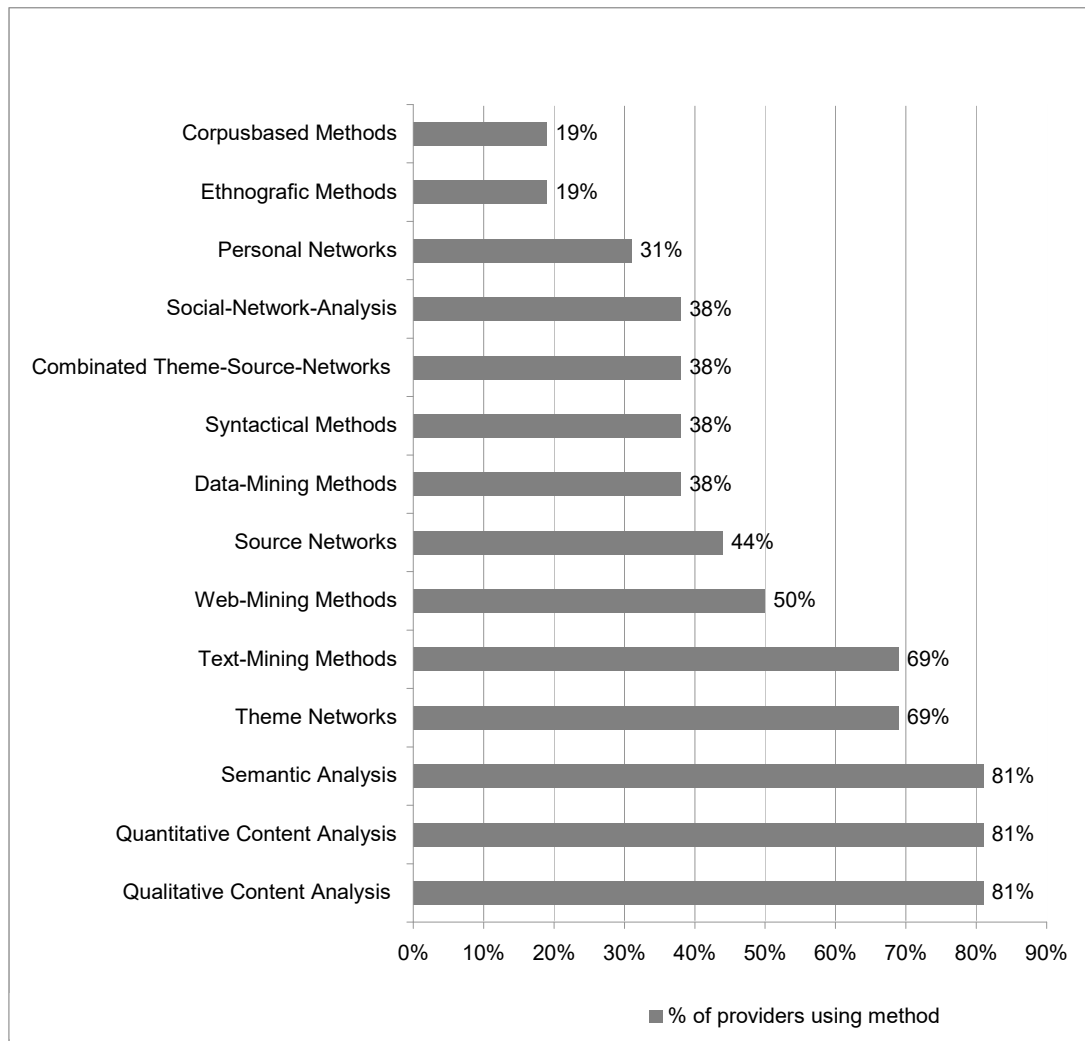


Figure 11: Frequency distribution of analysis methods within the provider survey⁷⁵

Figure 11 presents the frequency distribution of analysis methods for realising web-monitoring analyses. It is also noticeable that descriptive, quantitative statistical methods are most frequently used. Quantitative and qualitative content analyses, which have been part of classical media analyses for a long time, are used with the same frequency. Social networks are currently rarely analysed. These findings are also essential for author analyses as well as for the analysis of the linking structures of authors within the blogosphere and communities. The study could not assess whether there is simply no demand for these analyses on the customer side or whether there are other causes, such as a lack of know-how in this situation. Most of the providers use self-programmed text analysis software. In a few cases, it is supplemented by third-party developer software. Only two of the surveyed fourteen providers do not use any text analysis software.

⁷⁵ Source: survey web monitoring

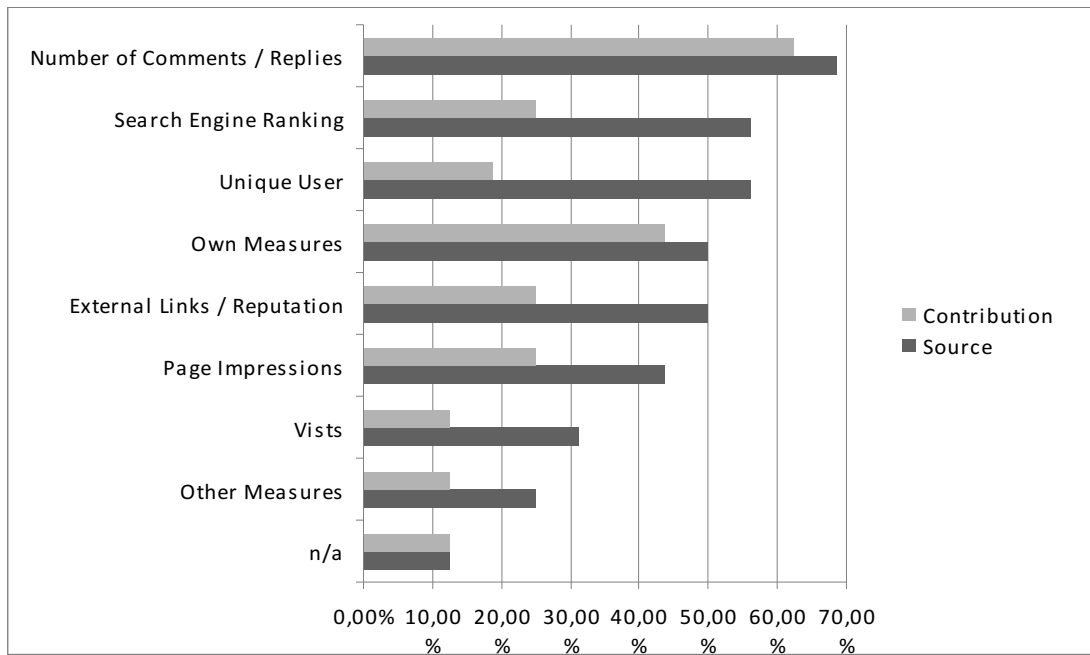


Figure 12: Used performance figures for measuring the relevance of sources⁷⁶

A specific characteristic is the highly influential potential of the social web. Performance figures such as “unique users”, “visits” or “page impressions”, currently used as key performance indicator in web analysis and media planning, only measure the actually realised traffic of a website. They neither inform about the cross-linking structure of a source nor do they state its potential influence. Therefore, there currently exists a rising interest in reliable performance criteria to measure the relevance of the social web and user-generated content. To answer this question, figure 12 shows the performance figures used by the surveyed companies. Herewith, it is important to differentiate between the relevance measurement of a source and the subsequently publicised contribution. The chart clarifies that search engine rankings, the number of unique users, the page impressions and the number of external links are more important for the measurement of source relevance than for relevance weighting. In the latter case, the number of comments is more relevant.

To measure the relevance of the source, half of the surveyed companies had developed their own metrics. To measure the relevance of the contribution, 44% of the surveyed companies had developed their own metrics. Herewith, an index for different performance figures is established. According to significance, each performance figure has to be included in the index with different weightings. Besides the performances figures, which are named in Figure 12, the surveyed providers use other performance figures, for example, the actuality of news or the content relevance of fo-

⁷⁶ Source: survey web monitoring

rums and communities within the overall context.

To evaluate the influence of contributions within the internet, buzz analyses are often demanded by customers in order to draw efficient conclusions regarding the relevance of a theme within the online communication. Herewith, measuring the quantity of a contribution capacity regarding a special theme is not by itself sufficient. This alone does not give an impression of the relevance of a discussion. Therefore, the providers were asked how they evaluate the relevance of the quantity of the captured documents. Herewith, about three-quarters of the surveyed companies operate with an internal benchmark database. The survey could not clarify which performance data, in respect to quality criteria, would be relevant to such databases. Thus, the evaluation of these internal databases is relatively complicated for potential customers. Doubtless, this is easier in open databases. Unfortunately, they are only used by one of the surveyed companies. In this context, the dynamic analyses of the relative change of buzz could be an interesting approach. However, the surveyed providers currently offer this type of analysis only sporadically.

3.3.4 Part 4 of a Web Monitoring Project: Interpretation of Results

The fourth and last part of a web-monitoring project is the interpretation, preparation and presentation of the analysis results. In this regard, the surveyed companies usually present the results to customers by PowerPoint presentations, customer cockpits or dashboards. Furthermore, about half of the companies use customer workshops, tables, text documents or simply e-mails. Social software applications like wikis and blogs are currently used infrequently for the interpretation of results. Conference calls and XML feeds are employed as well. Surely the market offer represents the customer demand. The result of the researched interviews is that cockpits and dashboards are currently not often used in practice. Because of the customers' limited time budget, they tend to use more often proactive notifications and presentations through the provider, for example, with a simple telephone call in combination with a direct procedure recommendation. Furthermore, specific analyses could only be presented in a limited way within a cockpit. However, it can be assumed that customers currently do not know the complete benefits of a reporting system. In contrast to other forms of presentation, dashboards provide the opportunity to draw on the results of web monitoring at any time without any help of the provider or consultancy. The follow-up costs of a continuous web-monitoring project are therefore often reduced.

Furthermore, the study detected cockpits in the German market that provide the opportunity to present results of special analyses like author, trend and issues analyses. Customers should be relieved of the work of interpretation because of a lack of time in day-to-day work. Therefore, the evaluation of tonality should be integrated by standard into the dashboards as a part of the basic functions. The survey showed that about two-thirds of the dashboards and cockpits are used in marketing, corporate communications and public relations. They are also used by product management, innovation and trend management, issues management and customer relationship management as well as market research. In a small way, dashboards are also used for human resources. It must be stated that only three of fourteen providers offer every listed form of presentation.

When a company plans to implement a cockpit or dashboard, functionalities, usability and opportunities for customisation should be accurately analysed and compared. A demo-access of the web-monitoring solution is most suitable for these analyses and is offered by half of the surveyed companies. Additionally, the technical product papers of the web-monitoring solutions can be compared.

One relevant point for selecting the right provider is the combination of a web-based and client-capable reporting interface with a complex backend architecture, which gives different users access to the same web-monitoring results for individual analyses. Altogether, six of eleven web-monitoring providers stated their software as multi-tenant. However, these statements could not be verified because complex tests were required. When users do not have the capabilities to evaluate the data on their own, contributions, figures and statistics within a dashboard should be completed by user-friendly reviews. Benchmarks, score cards, relevance reviews and business rankings help the customer to get a fast overview of the most relevant need for action. Furthermore, internal market researchers or other specialists should get the opportunity to export to different formats and to analyse the raw data with various software like Excel or SPSS.

To evaluate the benefit of a dashboard, it is also important to know the usual forms of presentation. Therefore, the providers were asked which analysis results they present to the customers. The following figure gives an overview of the answers:

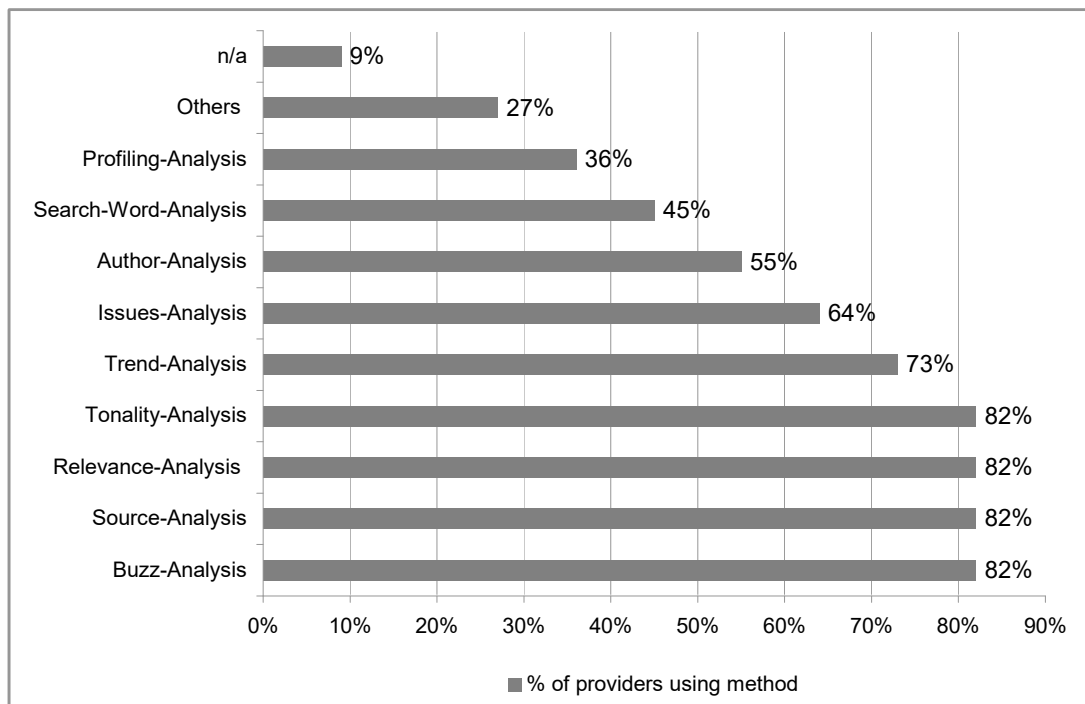


Figure 13: Frequency of the findings, presented within the cockpit⁷⁷

Of at least equal importance is the opportunity for users to realise their own analyses because only then it is possible to analyse new trends and issues efficiently and to acquire a deep understanding of the online discussion. Herewith, the feature of a real-time query - as self service application for end users - is an important function. Real-time query” means an hourly or daily screening of internet sources. Certainly, only half of the asked companies with cockpits provide this service for end users. In contrast, descriptive quantitative analysis methods and text mining methods are allocated to the customer more frequently. Theme networks could be, according to personal provider information, autonomously generated in five cockpit solutions – social networks in only three cases. Herewith, costs and benefits should be accurately analysed which means clearly assessing the importance of flexible and autonomous analyses. For some companies it will be sufficient to generate a monthly update of these special analyses through the web-monitoring provider. For example, agencies or media observing services, which produce such analyses for customers, rely on this special function because of otherwise exponential growing costs through the periodic consultancy work of the web-monitoring provider.

⁷⁷ Source: survey web monitoring

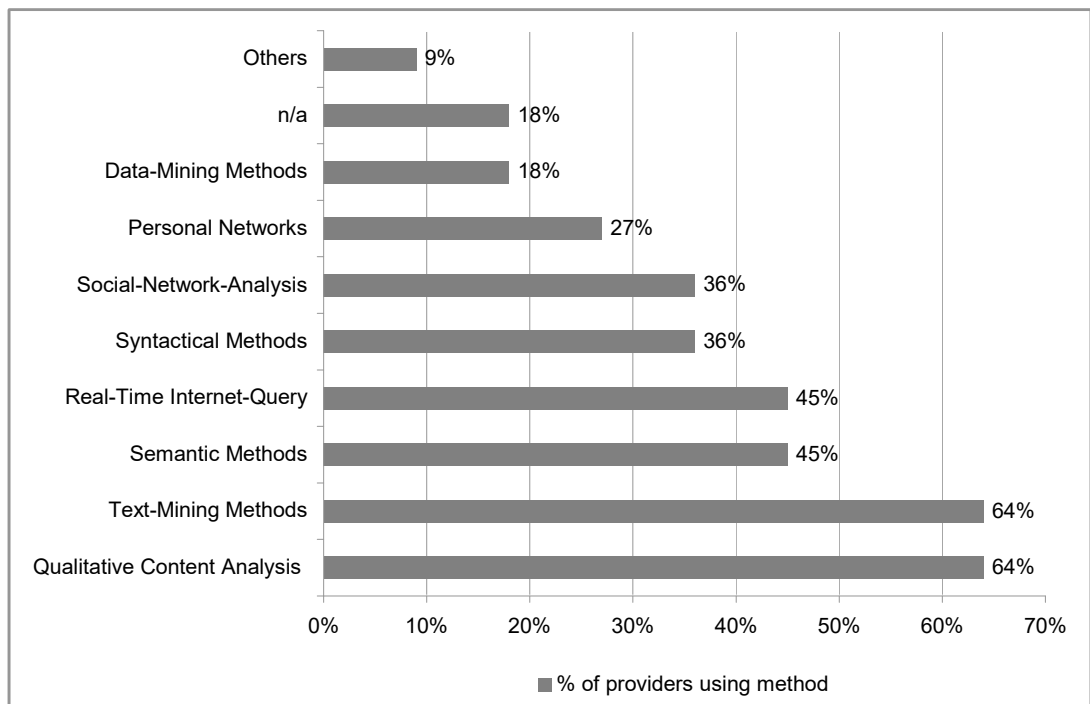


Figure 14: Frequency of analyses, autonomously conducted within the cockpit⁷⁸

Raw data are currently provided to the customer by ten of the fourteen companies. If required, the web-monitoring technology should be capable of being integrated into the IT infrastructure of the customer. This functionality as well as the opportunity to individually customise the presentation opportunities are currently offered by half of the surveyed companies. Maybe it is necessary to evaluate and to integrate further relevant internal data, like the internal e-mail communication, into the application. This option is provided by eight of the surveyed companies.

⁷⁸ Source: survey web monitoring

3.4 Discussion and Résumé

The present provider study presents a detailed and complete overview of approaches, methods and technologies of web monitoring for the first time. In addition to already established companies, which have been engaged in web monitoring for several years, large agency networks and media observation services increasingly come into the market with web-monitoring services. These new members often do not have internal methodical and technological know-how. In fact, they have to buy these competencies or they have to form strategic partnerships. Therefore, the long-lasting professional and applications know-how of web-monitoring specialists is crucial. During the last two years, communication agencies began to integrate web-monitoring services into product portfolios. These new players have primarily the advantage of being more competent within the area of communication consulting. Some web-monitoring specialists are especially lacking in this field. They focus more on technology than on consulting. But just the interpretation and detection of right results from web-monitoring projects generate key advantages and results for customers. The comparison of different web-monitoring approaches and providers makes clear that an integrated full-service offer is a particularly promising business model.

Differences in methods and technologies

The study confirmed that the providers surveyed varied in scope of services and approach. Regarding methods and technologies of data collection, preparation and analysis, essential differences can be detected. For example, high quality providers use a spider and crawler technology that is particularly developed for social web tools and often developed for long-term research work. Providers with less reputation often use only freeware tools. Another example of the diversity of offers is the spectrum of used methods and processes. Therefore, interested customers should pay close attention to different approaches, especially in the range of analysis. The study showed that not every web-monitoring service fits every application area. The complete range of methods is only used by a few providers and is often not necessary for a specific project. To decide which methods and competences are needed, the requirements of a project have to be specified accurately at the beginning.

Real-time screening only possible to a certain extent

Currently, transparency on the market regarding the frequency of data collection is widely lacking. In view of the rapid development of communication within the internet, providers are highly motivated to make important new messages, changes and players available to the customer. This is especially important when the web-monitoring solution is used as an early warning system in the context of issues management. Many providers therefore provide real-time screening as well as monitoring services. “Real-time” means an hourly or daily service identified by nearly all providers. Time and costs of real-time screening are rising exponentially with the number of internet sources being searched. It is perfectly possible to monitor a certain number of sources hourly. But given the current state of research, an hourly scan of the complete internet can be excluded.

Quantitative versus qualitative web-monitoring approaches

One of the core findings of the present study is the aspect that providers could be primarily differentiated by their focus on quantitative or qualitative web-monitoring approaches. The debate regarding the pros and cons of quantitative and qualitative research approaches has been heavily discussed for decades, especially in the social sciences. These discussions and views are also reflected in the relatively new field of online research. Some web-monitoring providers strike a balance between cons of both approaches through the combination of quantitative and qualitative analyses. This approach seems to be the most auspicious with regard to the challenge of filtering out significant and evaluated information from the huge amount of data on the internet.

Automating boosts efficiency

Another quite evident, distinctive feature is the use of automated methods. Few providers have the know-how to arrange different automated analyses. Because standardised software is missing, the providers have to develop their own software for individual types of analysis. This seems to be relatively trivial in cases of simple analyses, for example, the measurement of discussion quantity of a special theme. However, the subtlety of language makes it clear that the automated detection of the tonality of online contributions is not so trivial any more – especially in context with

jargon, slang and irony. The advantage of automating such time-intensive and monotone analyses is obvious: using software applications instead of human decoders and analysts saves time, human resources and costs can be greatly reduced. Beside the aspect of costs, the manual approach reaches its limits regarding the amount of data as well as the complexity of discussions. Especially in the context of issues and crisis management, where almost all new relevant information has to be found rapidly, a manual analysis is generally not suitable. Therefore, technology providers offer solutions that prepare and analyse huge amounts of data with the help of different mining approaches.

Not every solution is appropriate for every field of application

Another crucial finding from the survey is that the objectives, the application area as well as the internal resources are particularly relevant for evaluating a specific provider. Perhaps some companies do not want to retain internal human resource capacities for a web-monitoring project. Other companies want to provide the web-monitoring system to all employees, for example, within the intranet or their own software environment. Still others want to analyse the raw data of the web-monitoring project with Excel or SPSS. Therefore, the objectives and needs of a web-monitoring system have to be pre-determined. Every relevant department has to be involved in the definition of web-monitoring objectives and needs so that all relevant details are considered.

Finally, it must be stated that currently only 6 of the 14 analysed providers act as both web-monitoring service providers as well as technology providers on the German market. Furthermore, the combination of know-how in classical media monitoring with intelligent web-monitoring technologies seems to be a promising business model that could attract customer demand, especially from strategic decision-makers and persons responsible for communications and public relations. In the latter case in particular, the access to technology providers and market research companies is often missing. In terms of methodology, it must be stated that abdicating completely from human intelligence is hardly conceivable, especially in terms of sophisticated, semantic text analyses. But where artificial intelligence can simplify time-consuming processes with technology, it contains high potential for efficiency enhancement. Furthermore, the capacity of analysable data grows enormously so that analyses can be conducted with a substantiated empirical database.

The aforementioned approaches, methods and technologies of web monitoring could also be used to identify and analyse innovative users. Therefore, the characteristics of innovative users have to be analysed and (partly) quantified for a web monitoring analyses. The following chapter will deduce hypothetical characteristics of innovative users with the aim to identify them within the social web.

4. Literature Review: Theoretical Tasks, Motives and Characteristics of Users during the Open Innovation Processes on the Social Web

4.1 Design of Literature Research

The present literature research aims to deduce theoretical tasks, motives and characteristics of innovative users from the literature and to extrapolate these findings to the social web environment. Afterwards, a comprehensive case study will verify and extend the results from the literature analysis with the aim to develop a new model with tasks, motives and characteristics of those innovative users, motivated to provide and exchange ideas on the social web. Therefore, the following literature review will use literature from the following areas:

- lead user theory
- theory of open- and customer-innovation
- innovation-management

In this connection, characteristics from von Hippels' lead user theory, like "lead users are avant-garde and cutting edge" or "having own needs regarding a new solution", are also integrated into analyses as well as adjacent domains like characteristics regarding "opinion leader", "early adopters" or "lead use experts".

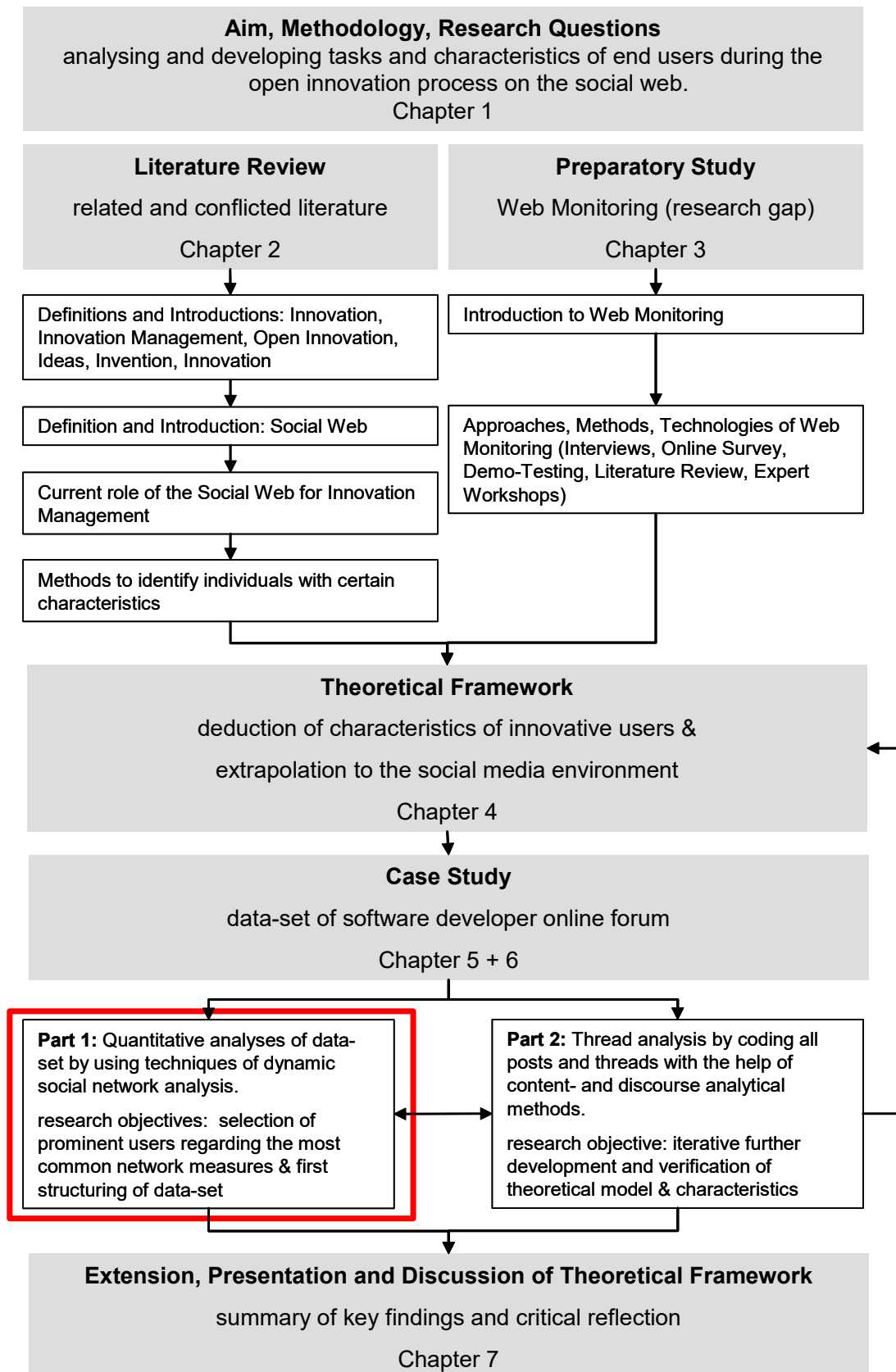


Figure 15: Thesis outline and status quo of research

4.2 Motivational Aspects – Characteristic 1

One key motivational feature of von Hippel's lead user definition is the existence and relevance of personal requirements of users for the development of ideas, inventions and innovations.⁷⁹ He demonstrated a positive correlation between the successful development of product-ideas and early personal requirements of user.⁸⁰ He distinguished between personal requirements regarding completely new products and needs regarding the development of already existing products. Lilien et al. showed that products which are based on lead-user-ideas are covering new needs better, and are therefore commercially more successful, than products developed under normal circumstances by the companies' research and development departments.⁸¹ Von Hippel also pointed out that lead user ideas are characterized by the aspect that the majority of users will have similar requirements at a later date.⁸² He firstly notices this behaviour, which he called "customer-active- paradigm", in context with industrial good markets and later in consumer good markets.⁸³ He also showed that product-ideas, which satisfy user-needs, are highly relevant for companies because they often show a high degree of novelty.⁸⁴

Franke and Shah analysed that lead-users are highly motivated to deduce ideas for new or better products which are satisfying their needs but that they are less motivated to communicate directly with the company or manufacturer.⁸⁵ Instead, they prefer to communicate and allocate the product free of charge within a community or they try to commercialize the invention as small-series on one's own initiative.⁸⁶

Thus, lead users are in both cases - development of completely new products and the further development of existing products - initially often less monetarily and more intrinsically motivated and are normally not very tied with the company.

Needs of users are closely related to their dissatisfaction with an existing product, or dissatisfaction with parts of the product, for example the usability.⁸⁷ They differ by the fact that "dissatisfaction on the whole" does not necessarily implicate first person

⁷⁹ von Hippel (1986), Soll (2006)

⁸⁰ von Hippel (1978a), p. 243

⁸¹ Lilien et al. (2002), p. 1055

⁸² von Hippel (1986), pp. 795-796

⁸³ von Hippel (1978b), p. 39 & 40, von Hippel (1978a), pp. 245-247

⁸⁴ von Hippel (1986), pp. 796-797

⁸⁵ Franke & Shah (2003)

⁸⁶ Shah (2000), p. 20 & 21

⁸⁷ Lüthje (2000), p. 149

experience with the use of the current product and can be also related to dissatisfaction with the product-branding or -image and missing confidence. If a product is not available at the market for the satisfaction of a special need, it could be assumed that users are feeling dissatisfied without using the product, too. Furthermore, it could be assumed that dissatisfaction triggers a problem-solving-process and activates (potential) users to communicate and swap ideas and needs with other users.⁸⁸ Thus, the existence of dissatisfaction of innovative users initially establishes a connection between needs and problem-solving-solutions.⁸⁹ Normally, needs are identified with the help of focus groups or by multi-attributive techniques.⁹⁰ Especially due to the growing use of the internet by users for the exchange of product-needs, -sentiments, -dissatisfaction, and -experiences⁹¹, methods and technologies of web monitoring are qualified for needs-analysis, too.

Lead users are positioned to be motivated because of an own notable benefit from the new product.⁹² In this connection, a distinction could be drawn between intrinsic, social and extrinsic motives. Extrinsic motives come from outside the individual. Money and trophies are the most obvious examples for extrinsic motivator. Like aforementioned and in context with customer innovation, one key-extrinsic motive is the expectation to take an own benefit from the innovation.⁹³

In contrast, intrinsic motives do not require an external stimulus for activation. They are satisfied through the task or activity itself. Social motives are defined as additives to intrinsic or extrinsic motives and appear when intrinsic and extrinsic motivated human behaviour is affected by others. Especially in environments like online communities or online-forums, where the individuals' commitment is transparent for the whole community, such social motives can be found. In these environments, individual ideas are ranked, commented and honoured by an often not countable number of community members. This leads to social effects and behaviour as well as rewards from community members for support and help.⁹⁴ Such incentives include the opportunity for rising social status and reputation, leading to a privileged access to new products or society circles. The phenomenon to provide ideas and products without monetary reward, also called "free revealing" or "pro-social behaviour", could be

⁸⁸ Lüthje (2004), p. 5

⁸⁹ Soll (2006), p. 116

⁹⁰ von Hippel (1986), p. 792 & 793

⁹¹ Hennig-Thurau & Hansen (2001), p. 564 & 565

⁹² von Hippel (1986), Lüthje (2000), Franke & Shah (2003), Herstatt & von Hippel (1992)

⁹³ Morrison et al. (2000)

⁹⁴ Harmon-Jones (2001), Hemetsberger (2001), Kollock & Smith (1999)

particularly noticed within the social web.⁹⁵ Nambisan provides the example of a privileged and attractive access of individuals to a closed software developer community.⁹⁶ Also other authors researched external social rewards which, combined with individual gain of knowledge, constitute a “self sustaining system of exchange”.⁹⁷

From an economic point of view, the expectation of community acceptance and reciprocity is often categorised as extrinsic motive.⁹⁸ Besides the aforementioned contributions of von Hippel, the correlation between incentives and innovativeness is widely discussed within literature in the field of customer-innovation and lead users, too. Lüthje for example - as well as explorative studies from other authors⁹⁹ - could not detect evidence for the effectiveness of extrinsic motivation, especially monetary, onto innovative behaviour and lead usersness.¹⁰⁰ Schulz stated that rational individuals will not participate in and contribute to social communities and online forums unless they perceive an own net benefit and leverage their own network.¹⁰¹ Traditional economic interpretations of interactions between individuals assume rational, self-interested behaviour, affected minimally by social relations and primarily motivated by monetary rewards as well as secure copy- and exclusivity-rights.¹⁰² Generally, it could be stated that individuals who believe that certain outcomes are, for the most part, a result of their own actions tend to show high motivation and creativity.¹⁰³ The analysis of the behaviour within online communities suggests that consumers’ desire for social interaction, their concern for other consumers and the potential to enhance their own self-worth are the primary driving factors.¹⁰⁴

Theoretical Characteristic 1:

Innovative users have personal requirements regarding a product, service or solution. They are highly motivated and have the ability to communicate and/or to translate these needs into new or further developed products. Dissatisfaction establishes a

⁹⁵ Jeppesen (2001), p. 22, Franke & Shah (2003), Harhoff et al. (2003), von Hippel (2002)

⁹⁶ Nambisan (2002), Belk & Coon (1993), Ozinga (1999), Haas & Deseran (1981)

⁹⁷ Jeppesen (2001), pp. 20-22, Sawhney & Prandelli (2000), p. 264

⁹⁸ Harhoff et al. (2003)

⁹⁹ Franke & Shah (2003), pp. 18-19

¹⁰⁰ Lüthje (2000), Reichwald et al. (2004), Lettl (2004), Amabile (1997), Frey (1997)

¹⁰¹ Schulz (2006), p. 27

¹⁰² Schumpeter (1934)

¹⁰³ Rotter (1966), Leone & Burns (2000), Schreier et al. (2006)

¹⁰⁴ Henning-Thurau et al. (2004)

connection between needs and processes of problem-solving as well as community-communication. They are motivated to share their own ideas because they benefit notably from the new and innovative product. Within the social web, the motivation to share ideas and to innovate are often connected to intrinsic, altruistic motivational factors like free-revealing, growing community-status and peer-reputation, high community-acceptance and confidence. Based on the literature research, it could be assumed that extrinsic motivational incentives – especially monetary incentives – are not crucial to motivate innovative users within the social web environment. Furthermore, monetary incentives do not have an implication onto the number and quality of user ideas.¹⁰⁵

4.3 Time Based Concepts - Characteristics 2

Von Hippel found that lead users identify trends significantly earlier than the majority of users. They seem to live in the future, show high affinity and adopt new products and ideas earlier than other users.¹⁰⁶ Several papers and articles use such a time-based concept for the measurement of innovativeness. For example, Rogers and Shoemarkers measure "the degree to which an individual is relatively earlier in adopting an innovation than other members of this system".¹⁰⁷

The theory of diffusion of innovations named such users "leading innovators". They are highly interested in novelties, have more knowledge about the product area, are more exposed to information about the product area, are competent to talk to others about new ideas and gain new products and services directly after launching.¹⁰⁸ The theory of diffusion is strongly connected to the articles of Rogers, who assumed that this behaviour is a stable characteristic which is developed more or less within each person.¹⁰⁹ Herewith, the period between product-launch and -purchase is called "time of adoption".¹¹⁰

Midgley and Dowling criticised this strong focus on time-based aspects and disagreed with the direct relation between innovativeness and purchase decision. They defined innovativeness as "the degree to which an individual makes innovation deci-

¹⁰⁵ Amabile (1997), Franke & Shah (2003), Frey (1997), Henning-Thurau et al., Lettl (2004), Lüthje (2000), Reichwald et al. (2004), Schulz (2006)

¹⁰⁶ Von Hippel (1976)

¹⁰⁷ Rogers & Shoemarkers (1971), p. 27

¹⁰⁸ Goldsmith & Hofacker (1991), p. 284

¹⁰⁹ Rogers (1963), Midgley & Dowling (1978)

¹¹⁰ Goldsmith, Hofacker (1991), p. 209

sions independently of the communicated experience of others".¹¹¹ They highlight the dependency of adoption decisions on factors regarding the situation and the specific product.¹¹² Generally, it is a moot point whether the research regarding the innovativeness of a user, focussing on his adoption behaviour, is a reliable indicator for his qualification to generate innovative ideas.

Theoretical Characteristic 2:

Innovative users have the ability to identify needs, products and trends earlier than the majority of users within their social web environment.

4.4 Product Related Abilities and Knowledge - Characteristics 3

Von Hippels' classical lead user characteristics primarily concentrate on motivational aspects. The actual product related abilities, knowledge and user expertise of innovative users are not explicitly included in von Hippels' lead user concept. For that reason several approaches have been taken to expand the classical lead user theory.¹¹³ They found out that innovative users have higher quality product related knowledge than the majority of the users. Duncker called this aspect "functional fixedness".¹¹⁴ Their innovative potential is often based on previous first person product user-experience which leads to user expertise.¹¹⁵ Thus, user experience and product related knowledge are both components of user expertise. They are developed by the repeated use of a product and therefore a matter of the users' time resources. Innovative users are often hobbyists, an attribute that can be assumed to affect innovators' willingness to spend time.¹¹⁶ Product related knowledge enables users to translate their dissatisfaction with products currently available on the market into specified requirements and functional ideas for new products by analyzing problems and trying new products and solutions. At the most elemental level, this knowledge includes basic skills regarding the product category or related categories, a shared language and knowledge of the most recent scientific or technological developments and innovations in the given- or related fields. For example, Anderson et al. found out that students with basic skills in the programming language Pascal learn other program-

¹¹¹ Midgley & Dowling (1978), p. 235

¹¹² Midgley & Dowling (1978), p. 240

¹¹³ Lüthje (2004), Lettl (2004), Lüthje et al. (2005)

¹¹⁴ Duncker (1945), Füller et al. (2006), Lüthje (2004), Schreier & Prügl (2006)

¹¹⁵ von Hippel (1986)

¹¹⁶ Jeppesen & Frederiksen (2006)

ming languages much more effectively than students without this knowledge.¹¹⁷ In this connection, learning capabilities involve the development of the capacity to assimilate existing knowledge, while problem-solving skills represent a capacity to create new knowledge.

Ernst et al. doubt the relevance of prior related knowledge for most consumer goods category groups.¹¹⁸ Expert knowledge is indeed no necessary criteria for prosperous ideas, but it could support the individuals' creativity. It confers an ability to recognize the value of new information, assimilate it, and apply it to commercial ends. These abilities collectively constitute what is called "absorptive capacity".¹¹⁹

Hienerth et al. showed that users with a high level of direct use experience make better contributions than do equally qualified users without such experience.¹²⁰ The level of prior related knowledge an individual has directly accumulated largely influences their ability to absorb information, evaluate it and utilise the knowledge for problem solving ideas and/or potential new products. They also found that, on the one hand, users from analogous markets contribute products that are significantly more novel than those from users from target markets. On the other hand, the level of technical distance has a negative influence on the novelty of the product. Lüthje subsumes as technical knowledge skills regarding material, processes and other technical requirements.¹²¹ Brockhoff argues that a typical consumer normally has a high practical- and a relatively low technical product-knowledge.¹²² On the contrary, Lüthje argues that consumers with a high technical knowledge definitely exist, for example, in context with hobbies.¹²³ This argument is covered through Shahs' case study that discovered consumers in the field of surfing, snowboarding and mountaineering.¹²⁴ However, it is arguable that technical knowledge is actually relevant to generate radical new product ideas. It could be assumed that consumers generate ideas through the product use.¹²⁵ In consumer markets, it often seems more relevant and interesting to identify unsatisfied needs through consumers than to generate ideas for technical sophisticated products or to develop these products in house.

¹¹⁷ Anderson & King (1995)

¹¹⁸ Ernst et al. (2004), pp. 124-126

¹¹⁹ Cohen & Levinthal (1990)

¹²⁰ Hienerth et al. (2007)

¹²¹ Lüthje (2000)

¹²² Brockhoff (1999)

¹²³ Lüthje (2000)

¹²⁴ Shah (2000)

¹²⁵ Habermeier (1990), pp. 271-273

An approach from social psychology, the theory of social perception, underlines the relevance of prior related knowledge.¹²⁶ Thus, the perception of an individual is needed by a set of hypotheses which the individual has developed through experience, i.e. former perceptions and cognitions. If the hypotheses are confirmed by use and experience, the individual will corroborate his set of hypotheses. Otherwise, the perceptual set might be modified. The set of hypotheses that is constantly reconsidered and adapted also dominates the environment that is perceived by the individual. In addition to the aforementioned research regarding von Hippel's lead user concept, the literature mentioned the notion of so called "lead use experts".¹²⁷ These "lead use experts" are not to be mistaken with "lead users" and are defined as individuals who are professionals and leading within a given area of expertise. In contrast to lead users, they are not cutting edge or avant-garde and do not identify trends earlier than the majority of users. Experts are very open for new products and technologies and show high knowledge and competence regarding the existing product. Up to now, the relevant literature does not explicitly deal with the question if lead use experts could be relevant for the identification and generation of new ideas and innovations, too. Taking into account the definitional closeness of lead use experts as well as innovative users, the following case studies will also consider lead use experts.

Theoretical Characteristic 3:

Innovative users take on prominent positions within their social web environments because they show higher product knowledge and expertise than the majority of users. Based on their product and technical knowledge, innovative users have high community-acceptance and peer-reputation within their social web environment. The knowledge is often based on prior first person product user experience, which also leads to user expertise. Product- and prior-related knowledge enables users to translate their dissatisfaction with solutions currently available on the market into specified requirements and ideas for new products. This product-related knowledge is based on basic skills regarding the product category or related categories, a shared language, knowledge of the most recent scientific or technological innovations and developments in the given field as well as learning capabilities and highly developed problem-solving skills.

¹²⁶ Smith & Mackie (2000), p. 20

¹²⁷ f.e. von Hippel et al. (2000)

4.5 Innovative users and Opinion Leadership

Opinion leaders are senders of information in a word-of-mouth process, the oral communication and the passing of information from person to person. They are positioned to influence other individuals.¹²⁸ There is a dissent regarding the connection of opinion leadership and innovativeness: On the one hand, the concept of opinion leadership has been strongly connected to innovativeness. This connectivity was already presented within early research and has been verified by newer surveys.¹²⁹ On the other hand, authors stated that communication in terms of opinion leadership is not relevant for innovativeness.¹³⁰

Allen found that “opinion leaders were found to be highly exposed to sources of information [...] outside their immediate community” while at the same time it is the set of people “who attract organizational colleagues to them for consultation” – a potential characteristic of innovative users.¹³¹ This implies that people turn to a person with the expectation that he or she has the needed information and/or that this person, who obtains information from the outside, gains a reputation for “knowing the answers” and thereby attracts colleagues for consultation. Thus, it could be assumed, that an opinion leader has a lot of knowledge within a special product category resulting from efficient information and knowledge management as well as huge affinity for innovations and new products – characteristics of innovative users.¹³² However, it has to be pointed out that innovativeness of innovative users and opinion leadership are not coexistent.¹³³

Different contributions studied whether individual’s opinion leadership is monomorphic, a general characteristic or overlapping for different product categories. Initially, research assumed only a slight overlapping between different product categories.¹³⁴ King and Summers show that the existence of a general opinion leader is possible.¹³⁵ Furthermore, it could be assumed that opinion leadership – in contrast to the characteristics of innovative users - is a widespread characteristic. Kroeber-Riehl and Weinberg found that between 20 and 25 percent of all communicators are opinion

¹²⁸ de Valck (2005), Anderson et al. (2008)

¹²⁹ Robertson (1971), pp. 176-178, Gatignon & Robertson (1985), Goldsmith & Hofacker (1991)

¹³⁰ Robertson (1971), p. 175

¹³¹ Allen (1977), p. 159

¹³² Trommsdorf (1993), p. 217, Goldsmith & Hofacker (1991), p. 14, Kroeber-Riehl & Weinberg (1999), p. 644 & 645

¹³³ Robertson (1971), p. 184

¹³⁴ Robertson (1971), pp. 180 - 184

¹³⁵ King & Summers (1970)

leaders.¹³⁶ Influences of the opinion leader model can be found today in the discussion for brokerage and gatekeeper positions in social network structures. In context with lead-user research, Prügl and Schreier found that lead users demonstrate stronger opinion leadership and weaker opinion seeking tendencies.¹³⁷ This is also confirmed by studies that lead users and users' innovative activities are positively correlated to a users' leadership.¹³⁸

During recent years, different techniques and methods have been developed to identify opinion leaders on the social web. Often, epidemic-based models like linear threshold and cascade models are used to find a small set of individuals who are most influential in social networks.¹³⁹ In the linear threshold model, each node has a certain threshold for adopting an idea or being influenced. In the linear cascade model, a node gets a single chance to activate each of its neighbouring nodes and it succeeds with a certain probability. In selecting the order of activation nodes, the simplest method is to use the number of inlinks which is in line with the page rank algorithm, today used by search machines. Another indicator for influence is readership. For example, a blog that is relatively low ranked by link analyses can be highly influential in a small community of interest.¹⁴⁰ Katz & Lazarsfeld stated that a large number of social contacts within the online community generally appear to be indispensable for opinion leadership.¹⁴¹ These direct member-contacts have to be matched with the size of the complete network and the growth rate. Studies on influence in social networks and opinion leadership are currently based purely on link analysis. Java noted that these techniques have been found to be effective in performing analysis at an aggregate level and to identify key individuals who play an important role in propagating information. In fact, influence on the web must often be a function of topic. A blog like "Daily Kos" for example, that is influential in politics, is less likely to have an impact on the technology related blogs.¹⁴² Therefore, Java researched the notion of "topical influence" and extended existing web research techniques.¹⁴³ The source of changes in opinions, aggregated over many users, can be a predictor for the existence of innovative users. One form of evaluation could be a simple questionnaire

¹³⁶ Kroeber-Riehl & Weinberg (1999), p. 507

¹³⁷ Prügl & Schreier (2008)

¹³⁸ Franke & Shah (2003), Morrison et al. (2004), Schreier et al (2006)

¹³⁹ Kempe, Kleinberg & Tardos (2003), Leskovec et al. (2007)

¹⁴⁰ Finin et al. (2008), p. 2

¹⁴¹ Katz & Lazarsfeld (2006)

¹⁴² <http://dailykos.com/>, viewed on 6 November 2011

¹⁴³ Java (2006), p. 2

where individuals have the opportunity to point out what they are influenced by. This could be done by utilizing their blog rolls or their feed subscription.

In summary, an accurate model of measuring influence and opinion leadership must analyse and combine many contributing factors, including topic, social structure, opinions, biases, information about the source of the writer and time stamps.¹⁴⁴ If the writer is better known to a reader, his message is likely to have more influence.¹⁴⁵

Tracking communities and blogs over a period of time, for example by social network analysis, can generate profiles and lists of topics and users, including their ties, generating the most numerous conversations and discussions. Certain topics, categorized in subtopics, are often more influential than others.

Theoretical Characteristic 4:

Opinion leaders are not necessarily innovative users. However, some characteristics of innovative users and opinion leaders overlap: they influence other people and they are early adopters, open for new products and innovations, they are highly efficient in gaining new information earlier than the majority of the community and have a high reputation within the community. But there are some differences: Innovative users communicate less, often have less social contacts, their decisions and innovative behaviour is somewhat independent from the collective opinion. Furthermore, it could be assumed, that the proportion of opinion leaders within a community is larger than the proportion of innovative users.¹⁴⁶ It should point out that – in contrast to opinion leader - innovative users have new ideas for radical new innovations and opinion leaders are only open for new, existing products. This is may be the major difference between both groups.

¹⁴⁴ Java (2006), p. 6

¹⁴⁵ Brown & Reingen (1987)

¹⁴⁶ Kroeber-Riehl & Weinberg (1999), p. 507

4.6 Introduction into Social Network Research

During the 1970s, several network concepts emerged in sociology: most notably, Granovetter on the strength of weak ties, Freeman on betweenness centrality, Cook and Emerson on the benefits of having exclusive exchange partners, and Burt on the structural autonomy created by complex networks.¹⁴⁷ They all share the theory that social networks have a certain degree of structure.¹⁴⁸

Mitchel defined a social network as “(...) a specific set of linkages among a defined set of persons (nodes) with the additional property that the characteristics of these linkages as a whole may be used to interpret the social behaviour of the persons involved”.¹⁴⁹

Rogers defined a social system as “a set of interrelated units that are engaged in joint problem solving to accomplish a common goal. The members or units of a social system are individuals, informal groups, organizations and/or subsystems”.¹⁵⁰ Because not every member of a social system is identical, a structure is needed to give stability. This structure could be divided into the extrinsic social structure and intrinsic communication structure between the individuals of a network. Crucial for the communication structure of a network are the individual characteristics of their members. The more homogenous they are, the easier the communication and interaction, for example, the diffusion of innovations within a social network.

Members of a social network are called “nodes” and their relationships are “ties”.¹⁵¹ Members perform activities and control resources that are transferred between the network members. Members can be individuals, a group of people, an organization or organizational unit, an industrial sector or a societal sphere. Among a variety of typologies in network research, the roles that are commonly distinguished are (1) group member, (2) group linker, and (3) isolate member. Often the role of a “star” or “opinion leader” is added.¹⁵² Both describe a network member who has significantly more linkages than all others in a network. Another typology of network roles, con-

¹⁴⁷ Granovetter (1973), Freeman (1977), Cook and Emerson (1978), Burt (1980)

¹⁴⁸ Rogers (2003)

¹⁴⁹ Mitchel (1969), p. 2

¹⁵⁰ Rogers (2003), p. 23

¹⁵¹ Farace & Mabee (1980), Monge & Eisenberg (1987)

¹⁵² c.f. section 4.5, pp. 56-58

centrating especially on the various kinds of brokerage roles, is the distinction between so-called gatekeepers, liaisons, opinion leaders, and cosmopolites.¹⁵³

Within a network, pairs of members are connected through ties. These ties can be directed or undirected, dichotomous or valued. A set of ties of a given type constitutes a binary social relation. Each relation defines a network from a given type. Scott and Barnes introduced the distinction of two approaches to social network analysis: ego-centric versus socio-centric concepts.¹⁵⁴ The analysis of ego-networks puts its focus on a single focal member ("ego") and his or her ties to other members ("alteri"). This approach seeks to "anchor social networks around particular points of reference".¹⁵⁵ Socio-centric concepts put their focus on the pattern of relationships in the network as a whole - also known as "whole-network analysis". Networks are visualized through different notations:

- graph notation
- matrix notation
- algebraic notation

The graph notation is the simplest form of notation and based on sociograms and simple rules.¹⁵⁶ For example, if a relationship between member A and member B could be identified, this relationship is visualized by a line with a one-way-arrowhead. Colours are used to rank different relationships and members are presented by dots. Style, size, position and colour of these dots define the members in characteristics like relevance, number of contacts, centrality and number of sent messages. However, presenting already few members, sociograms often get unclear what is a drawback of this visualization.

The matrix notation is another method of visualization and also suited for computer based analyses. Generally, members are presented on the basis of rows and columns. Normally, members within columns are receivers and members within rows are senders. Multivariate relations, where different relations between two members have to be presented, could unfortunately not be visualized within only one matrix. In fact, every relation has to be presented in a separate binary-matrix.¹⁵⁷

¹⁵³ Rogers & Agarwala-Rogers (1976), pp.133-140

¹⁵⁴ Scott (1991), Barnes (1974)

¹⁵⁵ Scott (1991), p. 75

¹⁵⁶ Moreno (1934)

¹⁵⁷ Jansen (2006), Wassermann & Faust (2008)

The algebraic notation is primarily used for multivariate network-structures. The different relations are presented through characters. For example, a friendship-relation between member “a” and member “b” is quoted as “aFb”. The directions of these relations are presented through the indices of the related members.

4.7 Social Network Analysis as a Method to Identify Users

During the late 1970s and early 1980s, social network analysis (SNA) had become an established method and was strongly influenced by the work of Barry Wellman and his journals “Connections” and “Social Networks” as well as the International Society of Social Network Analysis (INSNA). Empirical analysis of social networks started with the collection of small numbers of separate waves of relationships data with a primary focus on aggregated interim states of a network.¹⁵⁸ Basically, SNA is a method to undertake empirical analysis of the structural patterns of social relationships of network members.¹⁵⁹ SNA gives a view on individuals in which the attributes of individuals are less important than their relationships with other actors within the network. SNA aims to understand and to explain how the structural properties of a network affect social behaviour.¹⁶⁰ SNA typically builds a network of members as nodes and their mutual relationships as ties.¹⁶¹ SNA is based on measures like density, clique and centrality and can provide answers to questions such as¹⁶²:

- Are people within a team or any organizational unit well connected to each other?
- Which members have how many strong and weak ties?
- How many linkevents are sent and received within the network?
- Which members have positions at the edge of a structural hole?
- Who is excluded and, thus, does not allow for the exploitation of his or her knowledge for the other network members?
- Who has central position(s) within the network?
- Are there any sub-groups or mafia-networks within the network?
- Are there any components of the network that are not connected with the larger network?

¹⁵⁸ Freeman (1977)

¹⁵⁹ Scott (1991), Wassermann & Faust (2008), Wellman (1988)

¹⁶⁰ Wellmann (1988)

¹⁶¹ Webster & Morrison (2004)

¹⁶² Mueller-Prothmann (2005)

- What kind of connections are there between the organizational networks to external resources?

SNA developed from a sociological approach to an interdisciplinary method, influenced by different disciplines. Following Scott, SNA has its origins in Lewin's field theory, Moreno's sociometry, the "gestalt-theory" of Köhler, the exploration of patterns of interpersonal configurations and the formation of "cliques" developed by Harvard University during the 1930s and 1940s, the work of Barnes and Mitchell as well as approaches of communication sciences.¹⁶³ Some approaches and findings from SNA in the field of communication sciences are interesting for the present thesis. Origins of network analysis in communication sciences include Katz and Lazarsfeld's model of the two-step-flow of communication.¹⁶⁴ They found that interpersonal communication plays an important role for the diffusion of information by opinion leaders.¹⁶⁵ Until today, influences of this opinion leader model can be found in the discussions regarding brokerage and gatekeeper positions in network structures. It shows the adequacy of SNA for the identification of individuals with certain characteristics – for example "innovative users".

SNA can be divided into the process steps (1) data collection (2) quantitative analysis (3) visualisation and (4) interpretation. Structures and positions of members are presented from a network perspective on a mostly descriptive level. Nevertheless, the methodical steps of SNA often go beyond a merely descriptive position of a neutral passive observer. Suggestions are provided for practical interventions and follow-up activities to influence network members, their relationships, and network structure to identify innovative users.

¹⁶³ Scott (1991), Lewin (1934, 1951), Moreno (1934), Köhler (1951, 1925), Radcliffe-Brown (1965, 1952), Lazarsfeld et al. (1965, 1944)

¹⁶⁴ Katz & Lazarsfeld et al. (1965, 1944)

¹⁶⁵ c.f. section 4.5, pp. 56-58

4.8 Social Network Analysis as a Method to Analyse the Social Web

In the course of this thesis, SNA is used to analyse the data-set of an end-user online developer forum. The analysis aims to structure the data-set, to identify prominent network members – prominent regarding the most common network measures – and to recognize first patterns of tasks, motives and characteristics of innovation users on the social web. Therefore, SNA has to translate a social structure from social web networks into network data.

SNA has been developed to describe and explain the structural patterns of social relationships. For this reason, the methodical body of SNA is frequently applied to observe and analyse social web networks.¹⁶⁶ The capabilities offered by social media networks are leading to the evolution of new network structures that are grounded in communication patterns.¹⁶⁷ Social networks within the social web can be characterized by the degree of involvement as well as interactivity and tie strength of the involved members. As with social networks, involvement is a degree for the intensity of members regarding a special topic.¹⁶⁸ Interactivity is a degree for the quantity of interaction and communication between the members and therefore a degree for tie strength. Generally, it should be considered that the transfer of information via online applications is different than the transfer by face-to-face communication. Information and communication are basically free in online networks, pseudonyms are often used and the behaviour is less personal than in face-to-face communication. Thus, tie strength gets another role in comparison to offline networks.

Vilpponen et al. explored network structures.¹⁶⁹ In particular, they found that online networks are loose-knit networks with weak ties. The strength of a tie and the cultural similarities between two individuals built up and connected via online applications may not be as intensive as in face-to-face situations. Therefore, it could be assumed that there are relatively many cliques with weak ties in online networks. However, one way to assess the user's online network in terms of weak and strong ties could be a list of contacts which is featured by most online communities. This list usually does not differentiate between the strength of ties which remain to be evaluated by the degree of interaction of two members.

¹⁶⁶ Garton et al. (1997), Cho et al. (2005)

¹⁶⁷ Trier (2008), p. 2

¹⁶⁸ Moser & Schulder (1993), p. 27

¹⁶⁹ Vilpponen et al. (2006)

Simple networks within the social web are, for example, price-comparison-portals or blogs with a relatively low degree of interaction between the involved members. The degree of interactivity and involvement rises with forums where users often have to register to participate within the social web network, a process leading to a self-selection. Chat-rooms as well as online- and social-networking-communities mostly show a high degree of involvement and interaction between the different users. Here, users often systematically register to the network with other users, supported by technology, and guided by norms and policies.¹⁷⁰ The case study within this present thesis will focus on the analysis of online-forums to deduce and verify characteristics of innovative users, because they show an average interaction as well as an average involvement.¹⁷¹ Furthermore, the monitoring of online forums is less complex regarding privacy laws. Due to the asynchronous style of communication within online forums, data sets for SNA are easy to extract.¹⁷²

Besides Vilpponen et al., numerous research regarding social networks within the social web has been taking place during the last years. The presentation of the following research-contributions aims to give a short impression of the status quo. In their article “Visualizing the Signatures of Social Roles in Online Discussion Groups”, Welser et al. researched social roles in online-forums and characteristics of so called “Answer-People”, individuals highly motivated to answer questions within online-forums.¹⁷³ With the help of a regression analysis, they show that social roles and structural communication patterns are highly correlated. Within the paper “Browsing Newsgroups with Social Network Analyzer”, Chang et al. also use the methods of SNA.¹⁷⁴ They aimed to develop an analyzer for the prioritization of authors and contributions in newsgroups. Within their article “A Noun Phrase Analysis Tool for Mining Online Community Conversations”, Haythornthwaite and Gruzd analysed online conversation.¹⁷⁵ In contrast to the aforementioned authors, they did not focus on structural analysis, but aimed to develop a text-mining-software for analyses of conversation. Gloor and Zhao also analysed online conversations in their paper “Analyzing Actors on Their Discussion Topics by Semantic Social Network

¹⁷⁰ Preece (2000)

¹⁷¹ c.f. figure 6

¹⁷² Welser et al. (2007)

¹⁷³ Welser et al. (2007)

¹⁷⁴ Chang et al. (2002)

¹⁷⁵ Haythornthwaite & Gruzd (2007)

Analysis”.¹⁷⁶ They amended the structural analyses through content analyses and text-mining. Trier focuses his research on the dynamic analysis of online communication networks.¹⁷⁷ A methodological weakness of SNA is that the analysis is often static and does not identify the current prominent members. “SNA researchers frequently generate lists of central members without knowing which important persons came into a position or if their status is already declining” – an essential requirement for highly dynamic networks like social web networks.¹⁷⁸ Currently, some dynamic approaches of SNA exist which are qualified to present network change.¹⁷⁹ Focussed on the analyses of highly dynamic social web networks, Trier proposed an event-based approach of dynamic SNA – the starting point for the development of the software framework “Commetrix”.¹⁸⁰ Generally, the method provides multiple integrated levels of analysis by linking member’s attributes, member’s activity patterns and the resulting impact on general network structures.

The aforementioned researches have in common that they deal with the interaction and communication of social networks within the social web. However, Welser et al. (2007) as well as Chang et al. (2002) focus with their research a structural analysis to visualize network structures. On the contrary, Haythornwhite and Gruzd (2007) study the content of conversations. Gloor and Zhao (2006) as well as Trier (2008) combine both approaches.

¹⁷⁶ Gloor & Zhao (2006)

¹⁷⁷ Trier (2008)

¹⁷⁸ Trier (2008), p. 3

¹⁷⁹ Moody et al. (2005), p. 1207

¹⁸⁰ c.f. www.commetrix.de, viewed on 20 January 2010, Commetrix is a Software Framework for Dynamic Network Visualization and Analysis.

	Research Topic	Approach	Aim of Research
Welser et al. (2007)	Online Forums	SNA	visualisation of social roles in online forums
Chang et. al. (2002)	Newsgroups	SNA	visualisation of authors in newsgroups
Haythornthwaite & Gruzd (2007)	Online Communication	Text-Mining	software-development
Gloor & Zhao (2006)	Online Communication	SNA + Text-Mining	visualisation of online communication networks, trend prediction
Vilpponen et al. (2006)	Structure of Online Networks	SNA	diffusion of innovation in online networks
Trier (2008)	Communication Networks	SNA	dynamic network visualization and analysis of online networks

Figure 16: Research in the field of interaction on the social web¹⁸¹

¹⁸¹ Source: literature analysis

5. Case Study Part 1: Quantitative and Dynamic Social Network Analysis to filter and analyse Outstanding Network Members

5.1 Research Design and Selection of Case Study

The literature review in chapter 4 extrapolated theoretical tasks, motives and characteristics of innovative users from the “offline world” to the social web environment. The present SNA will deduce hypothetical network positions of innovative users from these theoretical tasks, motives and characteristics of innovative users and verify by the thread analysis in part 2 of the case study. For example, it is thinkable to possibly assume an interrelation between the theoretical characteristic “early adopter” with the network position “high degrees in closeness centrality”. The SNA will result in a number of identified prominent members. If those members are innovative users, they will be verified by a thread analysis within the second part of the case study.¹⁸²

A dynamic SNA will be chosen because it prevents a general methodical pitfall of static social network analysis; Although measures and roles of static social network analysis provide elaborated methods to analyze networks, they often only concentrate on structural issues. The snapshot of a network does not describe how central members achieved their final positions or if the network and its clusters experience stability or decay. In short, static social network analysis would not be able to consider the iterative changes of a network structure. However, these iterative changes are essential for the aimed analysis of theoretical tasks, motives and characteristics of innovative users. The company Commetrix developed an approach of dynamic SNA which combines dynamic analysis of incremental network changes and animation of the resulting network evolution.¹⁸³ The approach takes into account that after each specified period in time, messages and resulting relationships are added or have decayed. Dynamic SNA gives a visual impression of networking speed and helps to understand who contacts whom to actually establish the network. Based on such

¹⁸² c.f. chapter 6, pp. 103-128

¹⁸³ Trier, Brobrik (2007), p. 4

process oriented analysis of individual activities and their structural impact, the identification of relevant players on the social web can be improved.

The research methodology “case study” was chosen for the present research project because the method is qualified to differentiate, extend on the social web, support and verify the already existing and verified theory regarding tasks, motives and characteristics of innovative users. Knowledge regarding processes of ideas, invention and innovations and general tasks, motives and characteristics of their actors already exists and was presented in the last chapters. However, this knowledge had not been verified regarding the social web environment until now. It is aimed to close this research gap. To identify a useful data set for the case study, different selection criteria are developed. A theoretically useful data-set primarily aims to extend a theory by filling conceptual categories. Because of its aforementioned identified research gap within the social web, the data-set should be generally retrieved from this environment. These preliminary theoretical considerations lead to the following selection criteria for a use case data set:

- It can be assumed that social web tools are generally in common use within the industry.
- End-users are integrated into the companies’ product development and are generally accepted as part of an innovation process in the industry.
- End-users are disproportionately strongly interacting on the social web in general and, in particular, are discussing and exchanging product related knowledge, trends, innovations and developments.
- To provide valid research results within an adequate period of time, the researched industry has relatively short innovation-cycles.
- Like most of the networks on the social web, the analysed social network is relatively large and open, with many weak ties, some structural bridges and many social connections. Research has shown that networks with many weak ties are more likely to introduce new ideas to their members than closed (friendship-) networks with a few strong ties.¹⁸⁴ A group of individuals with connections to other social worlds is likely to have access to a wider range of information.¹⁸⁵

¹⁸⁴ Granovetter (1983)

¹⁸⁵ Scott (1991)

To acquire an adequate database for the case study, 60 international companies from different industries and countries were selected and targeted. They all suit with the aforementioned criteria. During a structured acquisition process, an e-mail was sent to all companies' Chief Executive Officers and/or Chief Marketing Officers, explaining the research project, the basic framework as well as the aim of thesis. During a second step, all contact persons were called. The acquisition resulted in three companies interested in participating and delivering their online forums' database for the research project. Finally, an open source IT-company, with its headquarters in California, USA, was identified and selected for the present case study. The conditions and framework of this company and of the company's online forum suited best with the aforementioned criteria. Currently, the IT-company is one of the world's leading providers of open source customer relationship management (CRM) software – a product developed by end-users, too. The company is strongly innovative regarding usability, flexibility and interaction with end-users. More than 6,000 customers and more than half a million users work with their CRM software. The company successfully runs an end-user open developer online forum, which is open to every user interested in the software. The data set of this developer forum will be the source for the present case study.

The social media type “online forum” was consciously chosen for the present study because users in online forums normally show an average interaction as well as an average involvement.¹⁸⁶ In contrast to other social-media types, for example communities, bulletin boards and social networks, it is less problematic regarding data protection laws to analyse online forums. Due to the asynchronous style of communication within online forums, their data sets are also relatively easy to extract.¹⁸⁷ The homepage of online forums normally contains an overview-page where forum-members could set up threads and new themes, presented by hierarchical tree-structures.

Every member of the present developer online forum will be analysed by the SNA-software Commetrix. SNA-software is used to represent the nodes (members) and edges (relationships) in a network and to analyze the network data. It allows researchers to investigate large networks like the internet or diseases, for example in-

¹⁸⁶ c.f. figure 6

¹⁸⁷ Welser et al. (2007)

fluenza or HIV, and provide mathematical functions that can be applied to a network model. Furthermore, networks could be visually presented by SNA-software. The number of SNA tools has been growing fast – at about 250% per year over the past five years. A search on published patent applications mentioning “social network” within the US patent database resulted in currently over 2000 published applications. According to the needs of the present research questions, a tool for event based dynamic social network analysis was chosen for the present case study – the software “Commetrix”. The datasets of one of the leading end-user developer online-forums are extracted and formatted for the special scheme of this software-framework. Commetrix is an exploratory java based software-tool for event based dynamic social network analysis. It offers a comprehensive set of software-based methods for exploratory static and dynamic visualization and analysis of social network measures. Its connectors can conveniently read all sources of accessible network data, like co-authorship or business process networks. The general software-approach of Commetrix focuses on analyzing evolving communication of digital networks, including e-mails, discussions, voice over IP and instant messaging. It is therefore very appropriate for the dynamic analysis of the present developer online-forum. Technically, Commetrix extends current SNA methods by blending social network analysis, dynamic graph visualization, gestalt theory and text mining with combinable search and filter algorithms to achieve a social network intelligence tool. This combination enables users of Commetrix to do exploratory social network analysis, identify communities, elicit core structures, observe evolving important members, study the stability or fragility of the network at hand, or observe how two networks integrate (e.g. after a merger of discussion groups or organizations). With the text mining features, users can search a large network for topics and their authors, filter out ego-networks, or watch animations of topics spreading through parts of customer communities. With Commetrix, the detailed lifecycle of a communication network of thousands of simultaneously changing relationships becomes observable.¹⁸⁸

¹⁸⁸ www.commetrix.de, viewed on 4th March 2010

Within the present case study of the end-user developer online-forum, relationships within the forum are analysed regarding the following social network metrics:

- Position of all forum members at the edge of a structural hole
- Degree of centrality of all forum members
- Number of weak ties of all forum members
- Number of linkevents of all forum members
- Pulsetaker and Core Group Member positions within the forum

The results from this SNA are verified by a thread analysis in chapter 6.

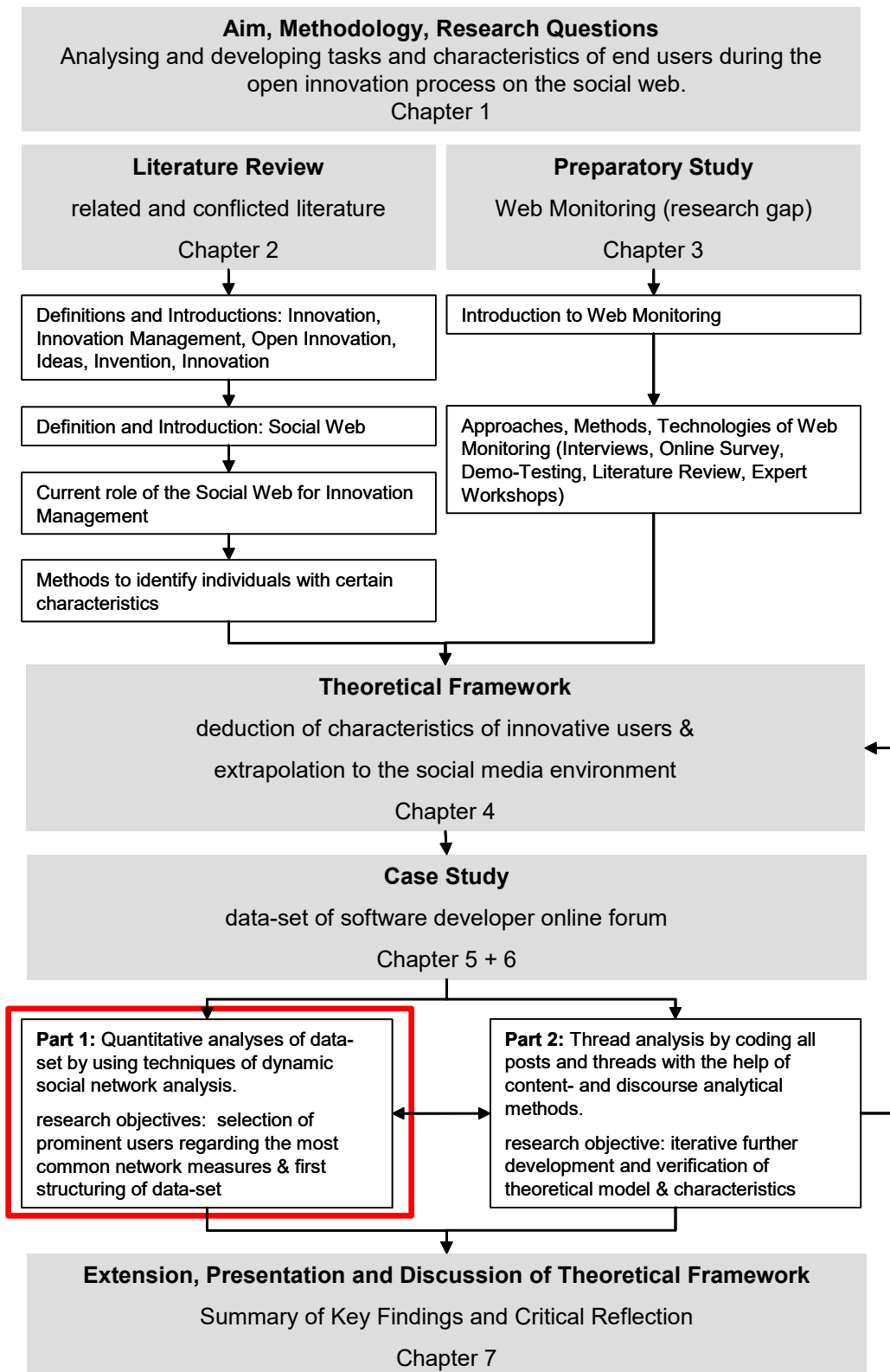


Figure 17: Thesis outline and status quo of research

5.2 Data Set and Data Structure

As derived in the last section, the end-user developer online-forum of one of the leading open source CRM companies was selected as data set for the present case study. In the period of research, during July 2004 and September 2004, the online-forum recorded a population of 839 members (nodes) as well as 1,864 interactions (linkevents) and 3,431 links – the number of relationships between two nodes. A relationship between two nodes emerges when the two nodes share a linkevent. During the examined period, the average interactivity of the online-forum was 4.77. This value is assessed as

$$y = \frac{\text{Posts}}{\text{Users}}$$

$y = 1 \rightarrow$ number of post = number of users = no interactivity

<u>Data Set</u>	<u>Nodes</u>	<u>Number of Posts</u>	<u>Average Density</u>	<u>Average Interactivity</u>	<u>First Post</u>	<u>Last Post</u>
End-User Developer Online Forum Software	839	1,864	0.89	4.77	4 July 2004 8:32	13 September 2004 9:52

Table 1: Overview data set and data structure of case study¹⁸⁹

To get an overview about the network on the whole, some collective metrics of the present online forum will be calculated and discussed. On the one hand, these average measures are essential to put the individual measures into an overall context. On the other hand, their results are relevant as input to calculate some individual measures, e.g. prestige measures. On a collective level, the measure “degree centralization” C_D capture certain members within a network, having disproportionately more contacts than the average of the network members. The measure only considers the direct connections between network members. It is calculated on the basis of the absolute degree centralities $C_D(n_i)$ of each network member:

¹⁸⁹ Source: data set of online developer forum, generated with SNA-software Commetrix

$$C_D = \frac{\sum_{i=1}^n [C_D(n^*) - C_D(n_i)]}{\max \sum_{i=1}^n [C_D(n^*) - C_D(n_i)]} = \frac{\sum_{i=1}^n [C_D(n^*) - C_D(n_i)]}{n^2 - 3n + 2}$$

The sum of the differences between the members with highest centrality n^* and the value n_i will be related to the theoretically highest possible centralization $n^2 - 3n + 2$.¹⁹⁰ The degree centralization of the present developer online-forum is 2.15.

In contrast to “degree centralization”, the measure “closeness centralization” also considers the indirect relationships between two network members. Therefore, the ratio is defined as a measure for the potential autonomy of members within a network.¹⁹¹ Instead of the measure “absolute closeness centrality”, the standardized closeness centrality $C_C'(n_i)$ of each member will be used to calculate “closeness centralization”:

$$C_C = \frac{\sum_{i=1}^n [C_C'(n^*) - C_C'(n_i)]}{\max \sum_{i=1}^n [C_C'(n^*) - C_C'(n_i)]} = \frac{\sum_{i=1}^n [C_C(n^*) - C_C(n_i)]}{(n^2 - 3n + 2)/(2n - 3)}$$

The sum of the differences between the members with highest centrality n^* and the value n_i will be related to the theoretically highest possible centralization $(n^2 - 3n + 2)/(2n - 3)$.¹⁹² The closeness centralization of the present developer online-forum is 41.18.

Betweenness centralization is defined as the mean deviation between the relative centrality of the most central member $C_B'(n^*)$ and the centrality of all other members of a specific network.¹⁹³

$$C_B = \frac{\sum_{i=1}^n [C_B'(n^*) - C_B'(n_i)]}{\max \sum_{i=1}^n [C_B'(n^*) - C_B'(n_i)]} = \frac{\sum_{i=1}^n [C_B(n^*) - C_B(n_i)]}{(n^2 - 3n + 2)/(2n - 3)}$$

¹⁹⁰ Freemann (1977)

¹⁹¹ Jansen (2006)

¹⁹² Freemann (1977)

¹⁹³ Freemann (1977)

The ratio has been standardized regarding the theoretically highest possible centralisation $n-1$. The measure could be used to present the monopolization of information control through very central network members.¹⁹⁴ The betweenness centralization of the present developer online-forum is 0.32.

Another collective measure of SNA is “density”. It is a measure of network cohesion and defined as the actually occurring relationships in a network divided by the maximum possible relationships. Density is one of the most commonly used ratios to analyse social networks¹⁹⁵:

$$\Delta_k = \frac{\sum_{i,j} x_{ijk}}{N * (N - 1)}$$

Density shows how tightly knit the network is and how many direct relationships between nodes are actually formed.¹⁹⁶ It is an appropriate measure to understand the density of the messages in any given networks and is needed to understand the communication flow of a network. Increased density indicates that nodes establish more direct connections to each other, thus increasing their own connectedness to others, which, in turn, makes a smooth flow of information more likely. This leads to more solidarity and confidence, established by group specific norms.¹⁹⁷ Assistances in dense networks are more reciprocal.

Gouldner defines reciprocity-norms as a “tit-for-tat”-strategy, where service is directly recompensed by service in return.¹⁹⁸ In fact, he defines reciprocity as general norm, where compensation is taking place in the course of time: “I’ll do this for you now, knowing that somewhere down the road you’ll do something for me.”¹⁹⁹ On the other hand, dense networks with social closure are often relatively less open for innovations and trends because the strongly connected members tend to share similar opinions and to discriminate other groups. They often tend to miss processes of modernisation.²⁰⁰

¹⁹⁴ Jansen (2006)

¹⁹⁵ Wassermann & Faust (2008)

¹⁹⁶ Knoke & Kuklinski (1982)

¹⁹⁷ Coleman (1988), Sparrowe et al. (2001)

¹⁹⁸ Gouldner (1960)

¹⁹⁹ Putnam (1993)

²⁰⁰ Grabher (1993), Gambetta (1988)

The density of the present online forum is 0.89 – thus, it is a relatively dense network. This strong density is supplemented by the fact that only 4 forum-members from 839 nodes are isolated. Thus, nearly the complete network is linked. Isolated nodes have no relationships to other nodes in the network and the number of isolated nodes indicates the connectedness of the relationship network, the likelihood to receive answers on requests and the integration of new nodes. This results in an average reach of the online-forum of 97.93. The measure “average reach” is based on the fact that each node reaches a percentage of other nodes through its connections. In a large network, usually nodes reach all other nodes if the network is completely connected and no islands exist. The average then computes how many nodes can be reached by a node. The “average path length” of the present online-forum is 2.52 and is relatively low compared to other online networks. This measure computes the length of all paths found in the network and then derives an average of that length. A low value indicates that nodes can interact with each other via short routes. According to the theory of six degrees of separation, average path length typically should have a range from one to six.²⁰¹ Besides the high interactivity, the low number of isolated nodes also strongly qualifies the present online-forum because a strong interaction and exchange of ideas, solutions and innovations of nearly all network members is guaranteed.

²⁰¹ Milgram (1967)

5.3 Dynamic Social Network Analysis

In the theory of social network analyses, different measures were deduced from mathematical graph-theory to accomplish quantitative analyses. Results of social network analysis are normally of a descriptive nature. Formal methods allow for precise measures, visualizations allow for illustrative description. The following section will present and define some of these social network measures focussing on innovative users.

5.3.1 Position at the Edge of a Structural Hole

Structural holes are static holes that can be filled by connecting one or more links to link together other points. It is linked to the concept of social capital: if one member links two members who are not linked, he can control their communication. A structural hole is not directly measurable. It is indirectly conceptualized through different measures: the effective size of the network, the efficiency, the hierarchical and structural constraint.²⁰² Networks with structural holes are characterized through a low cohesiveness and missing overlapping of contacts.²⁰³ Ego in figure 18 shows such integration into a network. The broken lines represent weak ties to the members A and C. He gets information about the outside world and has the opportunity to initiate negotiations. Furthermore, Ego is imbedded into a cluster of strong ties, by which he is protected against intrigues and attacks of other network members. Due to Ego's position at the edge of a structural hole, he has advantages regarding the control of communication between A and C. Generally, a user at the edge of a structural hole is qualified to arrange the knowledge transfer between two (normally) separate groups. He is the "head of knowledge" between normally separate groups.²⁰⁴ As he also has an early access to different knowledge fields and therefore time advantages in comparison to normal members within the network the second theoretical characteristic of innovative user, deduced from the literature research, is true. In innovation management, new products are often contributed by such outsiders who could select alternative ideas and mindsets from different knowledge areas. In other words, it is better for individual innovation success to have connections to a variety of networks rather than many connections within a single network. Thus, individuals can exercise

²⁰² Burt (1995)

²⁰³ Burt (1995)

²⁰⁴ Burt (1995)

influence or act as knowledge brokers by bridging two networks that are not directly linked.²⁰⁵

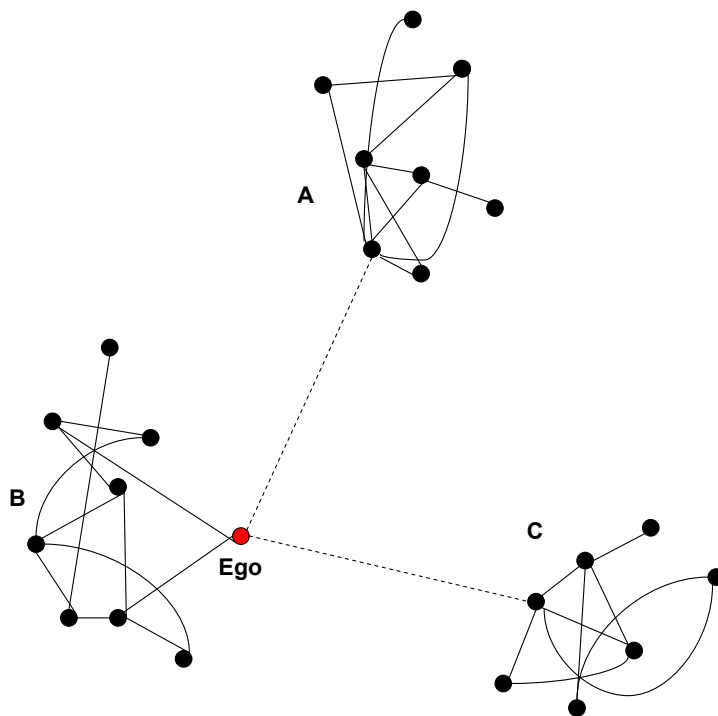


Figure 18: Structural holes within a network²⁰⁶

In the last section, the second theoretical characteristic of innovative users, deduced from the literature, was defined as “cutting edge” and “have the ability to identify certain needs and trends earlier than the majority of users” within their social web environment. It could be assumed that such users can often be found at the edge of a structural hole within a network. Therefore, the first hypothesis reads as follows:

Hypothesis 1: There is a positive correlation between the characteristic “being avant-garde”, the “ability to identify certain needs earlier than the average of the network” and the position of the potential innovative user at the edge of a structural hole within his social media network.

Explanation: A member at the edge of a structural hole is qualified to control and arrange the knowledge transfer and communication between at least two normally separated groups. He has an early access and the ability to link different consumer-

²⁰⁵ Scott (1991)

²⁰⁶ Burt (1995)

knowledge fields, an important requirement for valuable user ideas. Because of his early access to different knowledge fields, he has an ability to identify certain needs earlier than the average of the network.

The SNA of the present end user developer forum identified four members with a position at the edge of a structural hole. Within the time frame of the case study, user with the nodeID 269 showed a structural bridge between the network with the central hubs 66 and 65 (nodeID). A second member at the edge of a structural hole has the nodeID 731. He showed a structural bridge between the network with the central hub 63 and the network with the central hub 65. Furthermore, the members 721 (between 65 and 1168) and 2221 (between 65 and 1168) also show positions at the edge of a structural hole. It could be assumed that those users have the ability to identify certain needs earlier than the average of the community members and are cutting edge. To make a statement about the quality of their contributions and similarly to evaluate their qualification as innovative user, their posts and threads will be analysed in chapter 6.

	Top 1	Top 2	Top 3	Top 4
Structural Bridge	269 (nodeID)	731 (nodeID)	721 (nodeID)	2221 (nodeID)

Table 2: Top 4 forum members regarding measure “structural bridge”²⁰⁷

²⁰⁷ Source: data set of online developer forum, generated with SNA-software Commetrix

5.3.2 Centrality

Centrality describes a certain position of an individual within a social network. A central member has relatively many strong and weak ties. It is assumed that the more links, connections and contacts an individual within a network has, the more powerful it is. Central members have better access to resources, information and knowledge and “typically can control the flow of resources throughout the network”.²⁰⁸ They could contribute more ideas regarding the collective problem solving of the specific social network. All of these aspects make centrality appropriate as one measure to detect innovative users. Studies within the open source computer gaming environment found out that innovative developers were often centralized community members with a high level of engagement in communities and chats and widely accepted as problem solvers.²⁰⁹ Czepiel has found that centrality is associated with early adoption behaviour.²¹⁰ Also Webster & Morrison found a positive correlation between centrality and time of adoption.²¹¹

Centrality can also be an indicator for the satisfaction of members within a network.²¹² The most extreme forms are star- and cycle-structures. In the case of a star structure, the member at the middle of the star shows maximum centrality. In contrast, the degree of centrality of all members within a cycle-structure is equal and consequently minimum.²¹³ In online networks, centrality can be measured by the amount of incoming and outgoing links from a node or a clique. As in the aforementioned dynamic social network, analysis has shown that in digital communication networks central positions can be very volatile due to the ease with which new relationships are created.²¹⁴ Central members are not constantly maintaining their position, but quickly rise and fall in their centrality ranking. Trier stated that “centrality (...) depends on time, reflecting a temporal utilization of the network by individuals to carry out organizational tasks. Network sections emerge and decay and are not necessarily a persistent structural element.”²¹⁵ Currently, there are different centrality measures existing. According to Freeman, they should generally fulfil the following

²⁰⁸ Webster & Morrison (2004)

²⁰⁹ Jeppesen & Molin (2003)

²¹⁰ Czepiel (1974)

²¹¹ Webster & Morrison (2004)

²¹² Brass (1984)

²¹³ Wassermann & Faust (2008)

²¹⁴ Trier (2008)

²¹⁵ Trier (2008)

requirements: (1) they should illustrate how much the most central members exceed the centrality of the other members and (2) should be related to the maximum value of all considered members.

Degree Centrality

Degree Centrality is a simple centrality measure counting the number of ties to other members in a network (outdegree) and the number of ties of other members to the specific member (indegree).²¹⁶ This measure gives information about the level of involvement of members within a network. In a network graph, direct contacts are given when two nodes are linked through a line. If a node is linked to 50% of all nodes, then degree centrality is 50%. In the case of an edge-weighted degree centrality, the entries of an adjacency a_{ij} matrix describe the numeric weights of a connection from node i to j . A weighted diagraph describes how often a member called another one, or how many short messages or e-mails he sent to other members.

Degree centrality can be displayed by the following formula²¹⁷:

$$C_D(n_i) = od_i = \sum_j x_{ji}$$

x_{ji} represents the specific values within a sociomatrix x - the members. The output-degree od_i of a member j can be assessed through adding the relations from row j . For networks where the edges between the nodes are directional, it has to be distinguished between indegree- and outdegree-centrality. An unconnected node has consequently a degree of 0. To have the opportunity to compare the results regarding degree centrality of one network with the results from another network, they have to be standardized through putting them in relation to the dimension of the complete network²¹⁸:

$$C_D(n_i) = \frac{od_i}{n-1}$$

Betweenness Centrality

²¹⁶ Wassermann & Faust (2008)

²¹⁷ Wassermann & Faust (2008)

²¹⁸ Freeman (1977)

Betweenness centrality is the extent to which a node lies between other nodes in a network. It takes into account the connectivity of the node's neighbours, giving a higher value for nodes which bridge clusters. It is a measure of network- and information-control and for a members' potential to exert influence on interactions between other network members. A member is betweenness central when he checks on information flow of the network.²¹⁹ The key figure of betweenness centrality thus presents the dependency from the surveyed members on other network members. It is computed as the number of shortest paths between pairs of nodes, the so called "geodesic", which run through the observed node. Interactions between two non-adjacent nodes might depend on the other nodes in the set of nodes, especially those nodes which lie on the path between the two. The node between the other nodes can therefore control the interaction between the two non-adjacent nodes. The idea is that a node is betweenness central if it lies between other nodes on their geodesics, implying that, in order to have a large betweenness centrality, the node must be between many of the nodes via their geodesics. In an online-forum, a betweenness central person could be a person who stands at the edge of a structural hole and has the opportunity to check on the information flow of two normally separated groups and thus, is important for the information transfer between the pairs of members. This can be an important network position but is also critical for information transfer in a communication setting. To determine betweenness centrality, the probability $b_{jk}(n_i)$ of member n_i lying on the shortest path between two other members has been assessed.²²⁰ For this purpose, Freeman puts the number of geodesics of member n_i in relation to the number of all geodesics between two members n_i and n [g_{jk}].

$$b_{jk}(n_i) = \frac{g_{jk}(n_i)}{g_{jk}}$$

From this it follows that betweenness centrality is the amount of the probabilities of all member-tuosomes within a network:

$$C_B(n_i) = \sum_{j < k} b_{jk}(n_i)$$

²¹⁹ Wassermann & Faust (2008)

²²⁰ Freeman (1977)

Closeness Centrality

Closeness centrality quantifies the direct or indirect distance of a member i to all other members j within a network measured with the path distances d_j . The path distance $d(n_i; n_j)$ is the number of shortest ties, “geodesics”, between member i and member j . This measure indicates how fast or efficient a node can interact within the network and how likely it is that information reaches the node. As noted by Beauchamp, members occupying closeness central locations can be very productive in communicating information to other members.²²¹ Closeness reflects the ability to access information through the “grapevine” of network members. It is particularly appropriate for the evaluation of communication flows between two members. Closeness centrality can also be interpreted as measure for the degree of independence of other members within a network.²²²

Closeness centrality can be displayed by adding all path distances to the members j ²²³. To get a measure for closeness, the reciprocal value of the sum will be generated:

$$C_c(n_i) = \left(\sum_{j=1}^n d(n_i; n_j) \right)^{-1}$$

Through the standardization of the key figure, it is possible to compare this measure with those from other network analyses. Therefore, a relation between the key figure and the size of the complete network will be established:

$$C'_c(n) = \left(\sum_{j=1}^n d(n_i, n_j) \right)^{-1} * (n - 1)$$

Like the aforementioned, the measure “centrality” seems to be highly suitable for the identification of innovative users. Central members seem to be qualified to be cutting edge and seem to have the ability to identify certain needs earlier than the average of the community-members. This leads to the following hypotheses:

Hypothesis 2: There is a positive correlation between the ability to identify certain needs earlier than the average and high values in "degree centrality" of the member within his social web network.

²²¹ Beauchamp (1965)

²²² Jansen (2006)

²²³ Freeman (1977), Wassermann & Faust (2008)

Explanation: The measure “degree centrality” is a simple measure, counting the relative share of direct contacts of a node in a network and the number of direct contacts of other nodes to the specific node. It gives information about the level of involvement of a specific member. The hypothesis assumed that high values in degree centrality could be a measure for the first hypothetical characteristic of innovative users: being the “avant-garde” and “having the ability to identify certain needs earlier than the average within the network”. In case of being verified through the case studies, the measure “degree centrality” is too simple to be used independently. In fact, it has to combine with other network-measures. To be quantitative highly involved does not give information about the quality of this involvement.

Hypothesis 3: Being “avant-garde” and high values in "closeness centrality" of a member within his social web network has a positive correlation with the ability to identify certain needs earlier than the average.

Hypothesis 4: There is a positive interrelation between the flow of information, communication and knowledge in a network and the number of members in a network with high values in "closeness-centrality".

Explanation: The measure “closeness centrality” quantifies the distance of a member to all other members within a network. The node with the shortest ties to other members within the network is most central. It indicates how fast or efficient a node can interact between two other members. Members with higher closeness are essential for an efficient flow of information, communication and knowledge within a network.

The two aforementioned hypotheses are supporting the measure “closeness-centrality”. On the one hand, closeness centrality can be a measure for the first characteristic of innovative users – being “avant-garde”. On the other hand, it is qualified to deliver information about the fourth characteristic of innovative users – “product knowledge”. Close members normally have earlier access to information and knowledge than less close members. Close members are qualified to identify certain trends earlier than the average of the network. However, they are not only gaining earlier but also more information and knowledge than the average of the network. Close

members have direct access to relevant resources and more direct connections to relevant members within the network.

Hypothesis 5: There is an interrelation between the ability to identify certain needs earlier than the average and high values in "betweenness centrality" of the member within his social web network.

Explanation: Betweenness centrality is a measure of network- and information-control. It shows a member's potential to exert influence on interactions between other network members.²²⁴ "Network- and information-control" refers to the first potential characteristic of innovative users - "being the avant-garde". Nodes with a large betweenness centrality must be between many of the nodes. They have the opportunity to dispose information and knowledge earlier than the average of the network or to exclusively combine information and knowledge from different sub networks.

In the time frame of the social network analysis of the developer forum, the members with the nodeID 66 and 1168 have the highest values in degree-, closeness- and betweenness-centrality. They were followed by 6345 (degree centrality), 65 (betweenness centrality), 254 (degree centrality and closeness centrality) and 882 (closeness centrality). 66, 1168 and 65 are employers of the software company and are acting as moderators and helpers within the developer online forum.

²²⁴ Wassermann & Faust (2008)

	Top 1	Top 2	Top 3	Top 4
Degree Centrality	1168 (nodeID)	66 (nodeID)	254 (nodeID)	6345 (nodeID)
Closeness Centrality	81.25	73.96	53.13	44.79
Betweenness Centrality	1168 (nodeID)	66 (nodeID)	254 (nodeID)	882 (nodeID)
Centrality	90.10	86.46	76.04	75.00
Betweenness Centrality	66 (nodeID)	1168 (nodeID)	65 (nodeID)	254 & 6345 (nodeID)
Centrality	39.67	16.56	6.10	2.79

Table 3: Top 4 forum members regarding centrality measures²²⁵

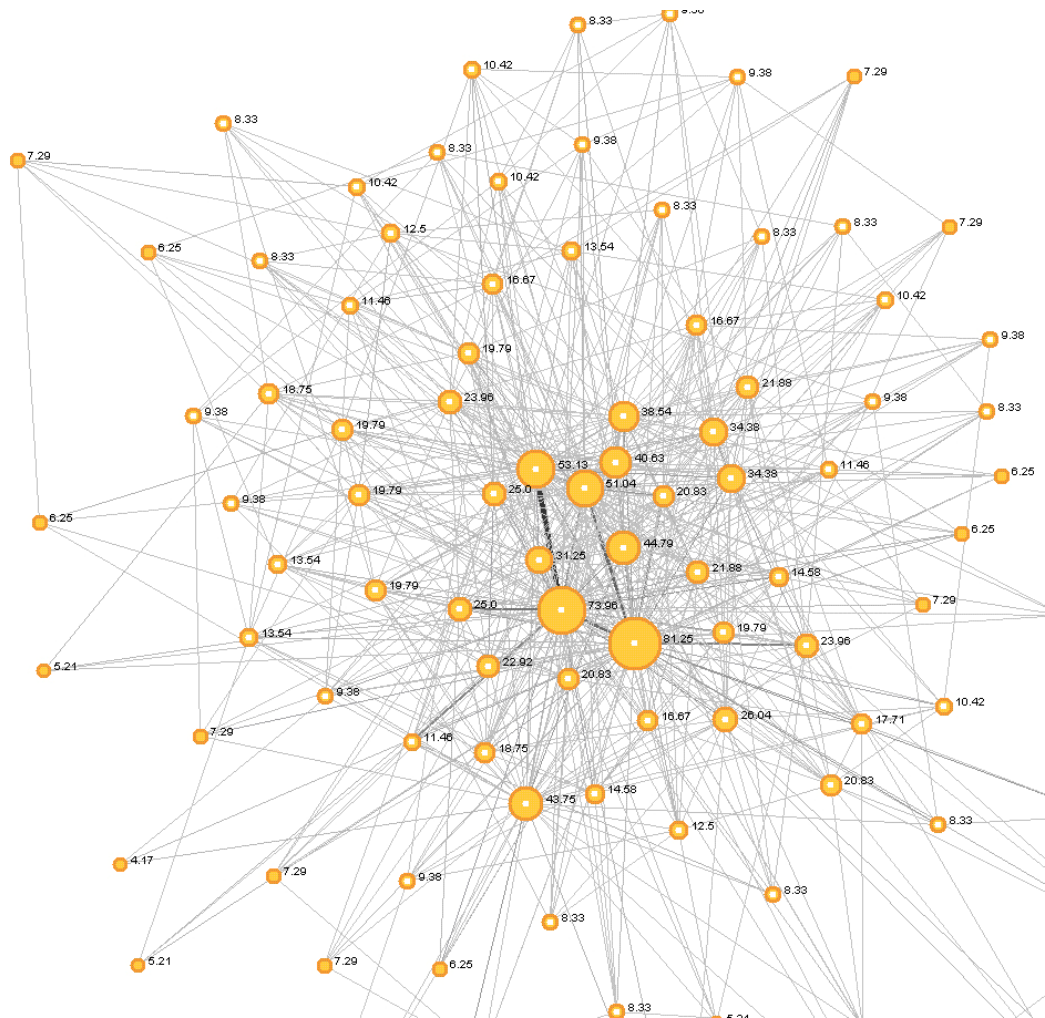


Figure 19: Degree centrality of developer forum as SNA diagram²²⁶

²²⁵ Source: data set of online developer forum, generated with Commetrix

²²⁶ Source: data set of online developer forum, generated with Commetrix

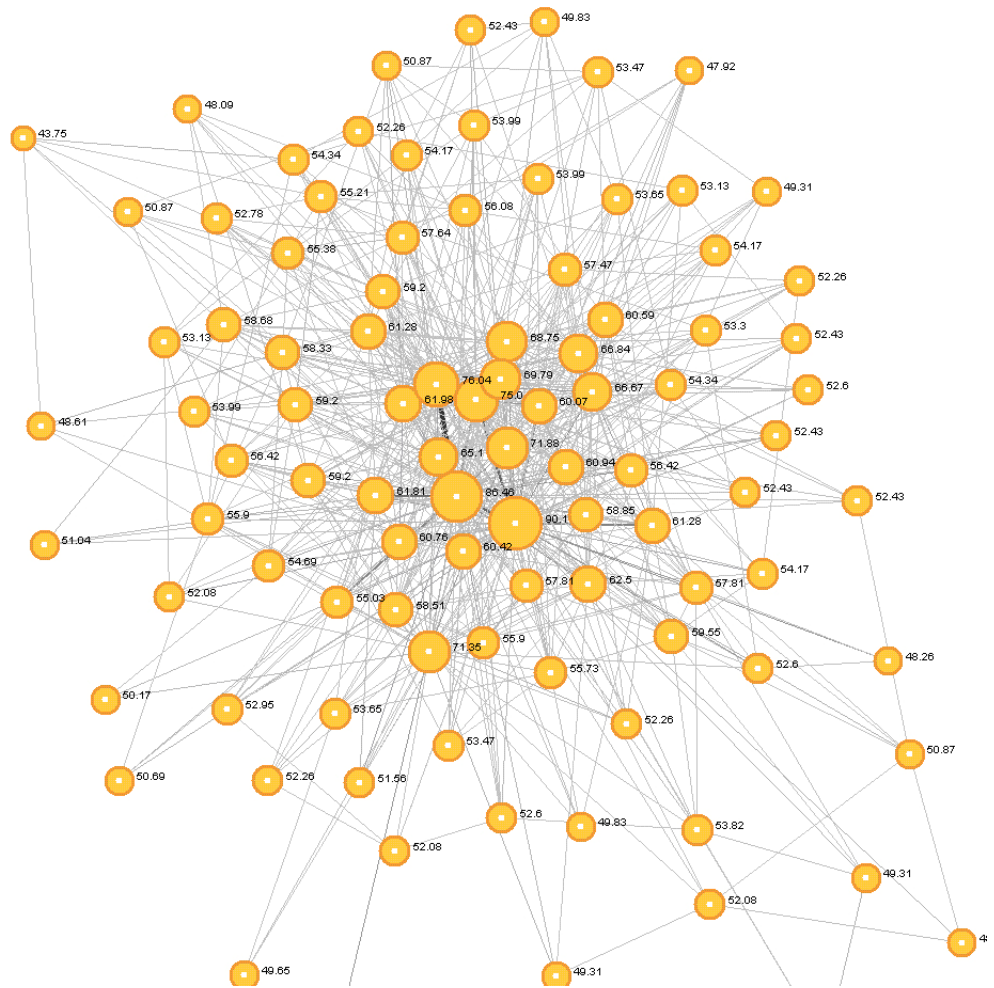


Figure 20: Closeness centrality of developer forum as SNA diagram²²⁷

²²⁷ Source: data set of online developer forum, generated with Commetrix

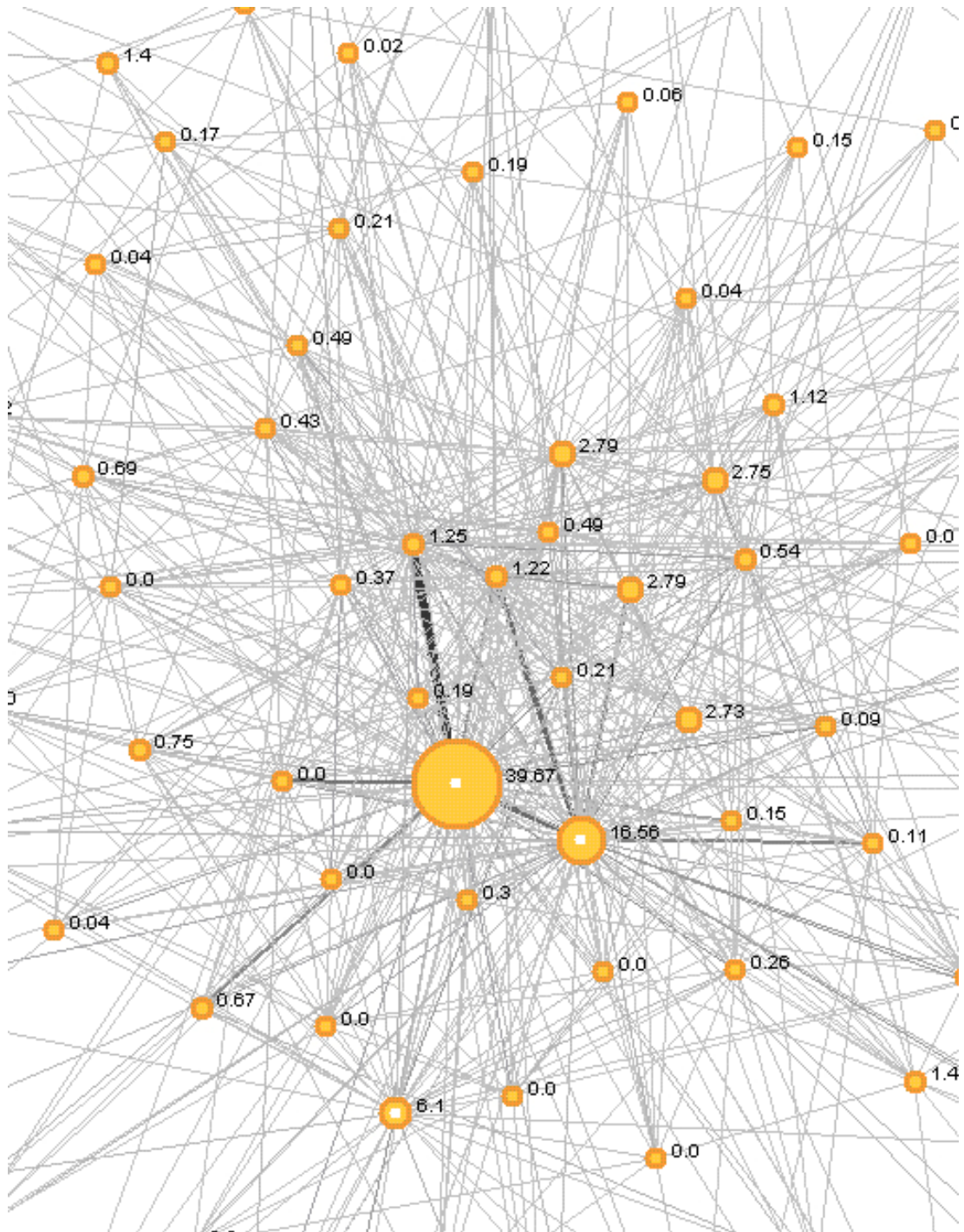


Figure 21: Betweenness centrality of developer forum as SNA diagram²²⁸

²²⁸ Source: data set of online developer forum, generated with Commetrix

5.3.3 Number of Weak Ties

The conception of weak and strong ties explores the social ties and the strength of relationships between members in a network. The strength of social ties between individuals is developed on the basis of several measures like the time invested to maintain social relationships, the emotional intensity, the frequency and the degree of intimacy in relationships and the level of mutual services.²²⁹ Furthermore, relationship strength differs across communication media. For example, instant messages have much higher frequency of interaction than e-mails.²³⁰ Large, heterogeneous networks are more likely to exhibit weak ties to different social circles, which are beneficial for obtaining more diverse information and maybe therewith ideas for innovations.²³¹

Ties of two individuals have an effect on their innovative behaviour and are basically responsible for the functioning and structure of a network. Information or resources that have been transferred via strong ties have been acquired more easily and tend to be more detailed and reliable. Weak ties, on the other hand, distribute information and knowledge more efficiently because it gives individuals access to information and resources beyond an individual's social circle, e.g. a community the individual is not a member of. Granovetter found that networks with many weak ties and social connections can be important in seeking information and innovation.²³² He called it "the strength of weak ties": Cliques have a tendency to have more homogeneous opinions and they share many common traits. To find new information, ideas and innovations, members of cliques will have to look beyond the clique to its other friends and acquaintances. Furthermore, each member of a clique knows more or less what the other members know. In other words, a group of friends who only interact with each other already share the same knowledge and opportunities. A group of individuals with connections to other social worlds is likely to have access to a wider range of information. Hansen found that weak ties help project teams search for useful knowledge in other communities and subunits but impede transfer to complex knowledge.²³³ During a research project, Burt compared two individuals – Robert

²²⁹ Granovetter (1973)

²³⁰ Trier (2008), p. 5

²³¹ Granovetter (1973), Garton et.al (1997)

²³² Granovetter (1983)

²³³ Hansen (1999)

and James - with the same connections, six strong ties and one weak tie.²³⁴ James is tied to people within one group – group B – and he is well informed about activities and knowledge transfer of this group. Robert is also tied through friends of friends to everyone in group B, but in addition, has a strong relationship with one person who is a conduit for information on group A, and another person, who is a conduit for information on group C. Consequently, Robert has two “network bridges” of weak ties to other groups of strong ties.²³⁵ Being part of different subgroups, and compared with James, he is a broker in the network and therefore, maybe qualified as an innovative user.

Hypothesis 6: There is a positive interrelation between the ability to identify certain needs earlier than the average and the quantity and quality of weak ties of the member within his social web network.

Explanation: Weak ties distribute information and knowledge very efficiently. Based on this advantage, hypothesis 6 assumes that members with large numbers of weak ties have more and earlier access to information and knowledge than the majority of the users. Those members are at the avant-garde – the second theoretical characteristic of innovative users. This is even more the case for members connected to different subgroups. They get information and knowledge from different fields, a strong source of innovative ideas.

Hypothesis 7: There is a positive interrelation between product knowledge and quantity and quality of weak ties of the member within his social web network.

Explanation: Members with a large number of weak ties have the advantage of getting and combining information and knowledge from different network sources. Furthermore, the flow of information between members with weak ties is relatively efficient. Hence, they are qualified to gain relatively better or more detailed product knowledge – the fourth characteristic of innovative users.

To quantify weak ties, the dynamic SNA of the end-user developer online-forum took an ego-view of the present social network. The members with largest numbers

²³⁴ Burt (1995)

²³⁵ Granovetter (1973)

of direct contacts within the network were selected and it was analysed, how many direct messages they exchange with each connected network-member. If a highly connected member only exchanges two or three messages with a contact, a weak tie between these members was assumed.

Within the time frame of the case study, the members with the nodeID 1168, 66, 254 and 4762 had the largest numbers of weak ties. All these members are central nodes, too. This is with regard to all of the researched centrality-measures - degree centrality, betweenness centrality and closeness centrality. Thus, there seems to be a positive interrelation between the number of weak ties and the grade of centrality. The thread analysis in chapter 6 will verify if these members are really innovative users. However, the second assumption made in section 5.6.1 could not be verified – a positive interrelation between the number of weak ties and the position of the member at the edge of a structural hole. The identified members at the edge of a structural hole do not have significantly larger numbers of weak ties within the researched network. This finding corresponds with the studies of Burt according to members at the edge of a structural hole.²³⁶

	Top 1	Top 2	Top 3	Top 4
Weak Ties	1168 (nodeID)	66 (nodeID)	254 (nodeID)	4762 (nodeID)

Table 4: Top 4 forum members regarding weak ties²³⁷

5.3.4 Linkevents

The term linkevent is defined as an action of a member within his network. In a forums-discussion, this could be a message sent by one member to another member. The number of linkevents initiated by a selected member is called “linkevents sent”, (for example in forums-discussion: “message sent”). Corresponding to this, “linkevents received” shows the number of linkevents received by the selected member (for example in forums-discussion: “messages received”). In online communities, Jeppesen and Laursen found that users inside communities are active in both giving and taking knowledge. This means they also send and receive linkevents.²³⁸ They also found that as users build up experience, they tend to give more knowledge than they receive.

²³⁶ Burt (1995)

²³⁷ Source: data set of online developer forum, generated with Commetrix

²³⁸ Jeppesen & Laursen (2007)

The measure “direct contacts” shows the number of other nodes, with which the selected member is in direct contact via linkevents. Thus, “linkevents sent per direct contact” shows the average linkevents sent by a member to its direct contacts. This measure is relevant because it shows “the proxy for the average relationship strength of the selected member”.²³⁹ Some will have a lot of weak contacts, and some will have a few intense contacts. In Commetrix, a linkevent of a member automatically leads to an entry into the database of the software.²⁴⁰

Hypothesis 8: There is a positive interrelation between the quality of the members’ contributions and the quantity of linkevents received by the member within his social web network.

Explanation: The hypothesis assumes that certain network-members, showing more product knowledge and expertise than the majority of network-members, are accepted as experts and problem-solvers within their social media environment and therefore gain high confidence and peer-reputation. They communicate this knowledge by high quality articles and contributions. Therefore, it can be assumed that they are receiving more linkevents than they are sending. Unfortunately, so called “lead use experts”, not to be mistaken with “innovative users”, often show these characteristics, too. Lead use experts are professionals and leading within a given area of expertise; they are not at the cutting edge and do not identify trends earlier than the majority of the forum-members.

The quantity of the received linkevents of each member within the end-user developer online-forum was synthesized by the software Commetrix. The members with the nodeID 66, 1168, 254 and 6345 received most of the linkevents. All of them received more linkevents, for example messagens, than they sent. All of them are also most central and have the highest number of weak ties. In chapter 6 it will be verified if the aforementioned members are innovative users or not. The following chart gives an overview about the members with the highest values in “linkevents received”.

²³⁹ Trilexis (2009)

²⁴⁰ Trilexis (2009)

	Top 1	Top 2	Top 3	Top 4
Linkevents received	66 (nodeID)	1168 (nodeID)	254 (nodeID)	6345 (nodeID)
	358	244	115	74

Table 5: Top 4 forum members regarding linkevents received²⁴¹

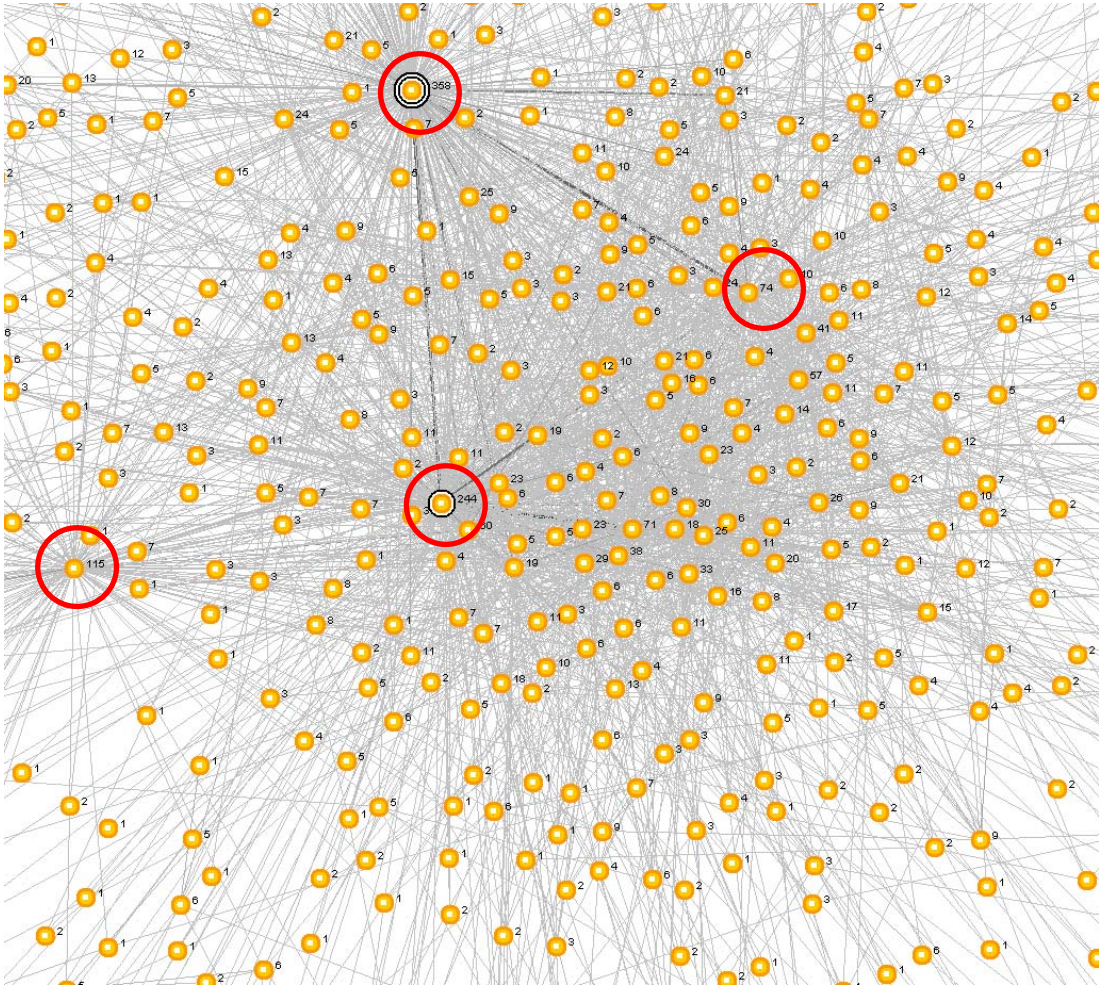


Figure 22: Quantity of linkevents received as SNA diagram²⁴²

5.3.5 Prestige

Just like “centrality”, the term “prestige” presents a network-analytical-concept which analyzes the relevance and popularity of members or groups within a certain network. The measure “centrality” is based on an undirected graph, which means that the member is central because he is involved in several relationships and therefore

²⁴¹ Source: data set of online developer forum, generated with Commetrix

²⁴² Source: data set of online developer forum, generated with Commetrix

visibly. In contrast, the term “prestige” requires a directed graph. A member has high levels of “prestige” when he is directly focussed by as many as possible other members within a network. For example, an author can cite a lot of other authors, but not be cited by them. This author can have high levels in centrality but maybe low prestige levels. In this context, it is a key research question whether high values in “centrality” and/or high values in “prestige” are more relevant for innovative users. The qualitative content analysis in chapter 7 will answer this question.

The term “degree prestige” takes the quantity of incoming connections into account – so called “indegrees”. The measure assumes that members who are addressed more frequently, and therefore have high numbers of indegrees, are more popular than other network-members.²⁴³ Like the aforementioned, degree prestige considers only the indegree id_i and not the outdegree. The metric degree prestige can be determined by adding up the values x_{ij} within the columns of a sociomatrix x :

$$P'_D(n_i) = id_i \sum_{j=1}^n x_{ij}$$

Hypothesis 9: There is a positive interrelation between high acceptance and confidence of the member within his social web environment and high values in degree prestige.

Explanation: Like aforementioned, the term “degree prestige” focuses on the number of indegrees. It assumes that a member with high degree prestige is more popular than other network-members. This popularity could result from a disproportionately high level of product knowledge and product experience of the user leading to high acceptance and confidence of the member within his social web network. Due to the fact of high numbers of indegrees, it can be assumed that users with high values in degree prestige can have direct access to diverse and different scope of knowledge within a certain network and link knowledge from different areas.

Within the time frame of the dynamic social network analysis of the end-user developer online-forum, the members with the nodeID 1168, 66, 254 and 4762 showed high values in “degree prestige”. It can be assumed that these members are the most popular members within the online developer forum because they have the highest

²⁴³ Wassermann & Faust (2008)

numbers of indegrees and are addressed more frequently. As presented within the last sections, these members also have high values in degree-, closeness- and betweenness-centrality. They have high numbers of weak ties and received the highest numbers of linkevents as well as references on linkevents within the given research period. It can be assumed that they are the most influential members within the online-forum.

	Top 1	Top 2	Top 3	Top 4
Degree Prestige	1168 (nodeID)	66 (nodeID)	254 (nodeID)	4762 (nodeID)
	259	198	115	99

Table 6: Top 4 forum members regarding degree prestige²⁴⁴

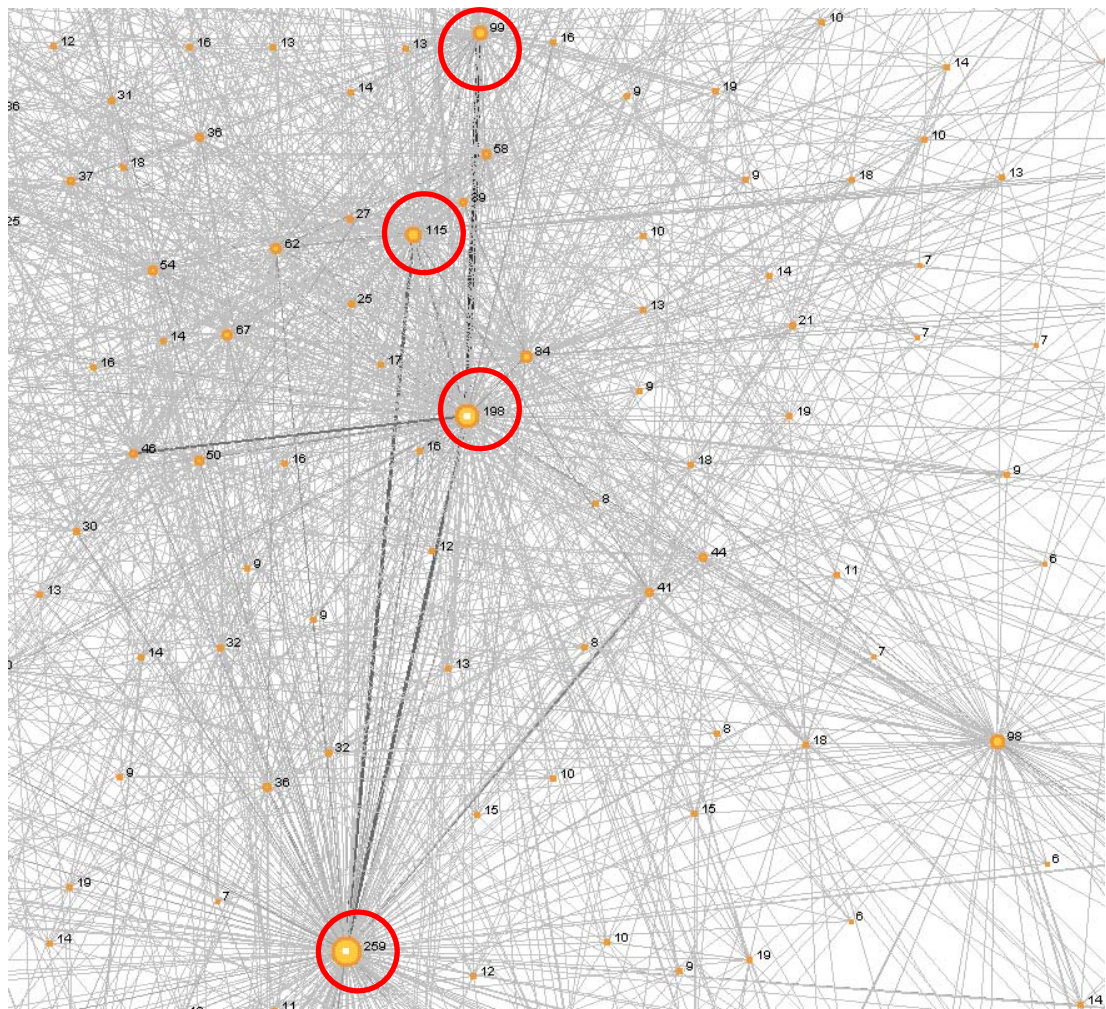


Figure 23: Degree prestige of developer forum as SNA diagram²⁴⁵

²⁴⁴ Source: data set of online developer forum, generated with Commetrix

²⁴⁵ Source: data set of online developer forum, generated with Commetrix

5.3.6 Core Group Member and Brokering Activity

The next chapter will deal with two further potential characteristics of innovative users: brokering activity as well as core group membership. The following explanation will clarify why these different views on networks can be highly relevant for the identification of innovative users within social web networks.

A core group member is belonging to the inner circle of a social network. Within the terminology of the dynamic social network analysis with the software Commetrix, this indicator is set “yes” if the selected member is belonging to the core group of the network. Coregroup membership is determined by ranking the nodes with the highest level of activity in a specific expert network. The term “highest activity” is measured through counting linkevents sent. Then, in descending rank order, they are added to the core group until this group accounts for 80 percent of the network activity. All nodes which are in this group are in the core group of active nodes, the others are in the less active non-core-group.²⁴⁶ If this number is set into relation to the total number of network-members, this results in the core group’s share. It is defined as the size of the core group divided by the total number of available members in the networks. This measure shows if the core group is either very small compared to the rest, showing that there is a “tall peak” in the networking activity with only a small but very active nucleus, or if the activity is distributed within the network.

The networking measure “brokering activity” is qualified to extract further information on the quantification of certain individuals as innovative users within social web networks. Trier and Brobrik formally defined “brokering activity” as “the number of new connections or shorter paths between other members generated or shortened in one time window by a member’s activity”.²⁴⁷ It is computed by eliminating the node and computing the increase in path length.

$$BA = \sum_{j>}^g \sum_k^g b(p'_{jk} > P_{jk}) \quad \text{with } i \neq j \neq k$$

P_{jk} shortest path between j and k in the path matrix of i

p'_{jk} shortest path between j and k in the path matrix without i

$b(p'_{jk} > P_{jk}) \in [0;1]$ Bollean value

g number of nodes in the network

²⁴⁶ Trilexis (2009), p. 19

²⁴⁷ Trier & Bobrik (2007), p. 9

The approach assumes that an activity of a member is beneficial if it results in improved network connectedness or, to be more specific, in reduced path length between the network's nodes.

The identification and analyses of cliques, subgroups and core group members as well as the identification of connections between these groups and members by bridges or overlapping members seems to be highly relevant for the identification of innovative users. Webster and Morrison define a clique as a “subset of members who all have direct connections to one another and no additional network member can be added who also has direct connections to everyone in the subset”.²⁴⁸ Typical networks consist of a relatively large number of cliques that are small in size. Studying cliques can be an effective way to understand connectedness in the network and to identify innovative users within a social web network. Prior research has made evident that individuals generally prefer innovating in groups rather than in isolation.²⁴⁹ The interrelation between users' innovativeness is supported by research in offline communities that showed that innovating users spend 32% more time with other members than non-innovating users.²⁵⁰ There is a positive relationship between the size of a community and the efficiency of information searched within that network.²⁵¹ This correlation can be explained by the powerful collective effects and the higher probability of identifying users with an exceptionally high innovativeness in larger communities. If a user, for example, has profound knowledge in a certain area, he is often not able to cope with all the information as a consequence of restricted capacity and resources of the human memory.²⁵² Then, it can be expected that they will strive to reduce the complexity of the environment by concentrating on selective domains and networking with other individuals – finding a satisfactory solution or decision. Social interaction, different past experience and diverse social and cultural factors play a major role for these collaborative innovating processes.²⁵³ Jeppesen & Molin stated that the presence of certain consumer types plays a vital role for innovation management processes.²⁵⁴ Innovative users are often already committed to existing social web tools as active members and normally integrated into a community with a similar member-culture and a trustful collaboration. People prefer to deal and

²⁴⁸ Webster & Morrison (2004), p. 13

²⁴⁹ Füller et al. (2007); Frank & Shah (2003), Lettl (2004); Lüthje et al. (2005)

²⁵⁰ Franke & Shan (2003)

²⁵¹ Baldwin et al. (2006), Hienerth & Pötz (2006)

²⁵² Lipman (1995)

²⁵³ Java (2006), p. 41

²⁵⁴ Jeppesen & Molin (2003)

collaborate with individuals they trust.²⁵⁵ Research in the field of social psychology found that information circulates more within a well known group than between groups or within new groups.²⁵⁶ However, Schindler et al. highlighted the independence of the online community as an important factor for authentic community behaviour, which is fundamental for innovations, because community members do not feel to be under supervision by a company or institution.²⁵⁷ It thus appears to be more difficult to induce potential innovative users to join another network, e.g. company communities.

Hypothesis 10: There is a positive correlation between the level of own benefit from the new solution and high values as “core group member”.

Hypothesis 11: There is a positive correlation between the level of own needs and dissatisfaction with the existing solution and high values as “core group member”.

Explanation:

Hypothesis 10 and hypothesis 11 both treat the measure “core group member”. Core group members are members with the highest activities within their networks. They are measured by counting their “link events sent” (for example “messages sent”). Then, in descending rank order, they are added to the core group until this group accounts for 80 percent of the network activity. Literature showed that different motivations for core group members can be assumed. The aforementioned hypotheses assume that the motivation to act as core group member results from anticipated own benefits from the potential new solution and a relatively high level of needs and dissatisfaction with the existing solution.

Hypothesis 12: There is a positive interrelation between the level of product experience and product knowledge and the level of brokering activity.

Explanation:

Hypothesis 12 connects the levels of product experience and product knowledge of a specific network-member and his level of brokering activity. Brokering activity is

²⁵⁵ Granovetter (1985)

²⁵⁶ Burt (1995)

²⁵⁷ Schindler et al. (2005)

defined as the “number of new connections or shorter paths between other members, generated or shortened in one time window by the member’s activity”. The approach assumes that an activity is beneficial if it results in improved network connectedness or in reduced path length between the network’s members. Thus, hypothesis 12 assumes that members with high levels of brokering activity gain this position through showing outstanding product experience as well as product knowledge within the social network. Therefore they are qualified as innovative users. Based on their outstanding experience and knowledge, they are popular and highly valued within their social network and therefore generate a disproportionate number of new connections or shorter paths within a certain time window.

1168	878	5380
66	5401	2367
65	2319	12281
4762	11675	383
254	8908	9397
6345	11420	1655

Table 7: Core group members of developer online forum (nodeID)²⁵⁸

In total, 18 core group members from 839 forums members could be identified in the end user developer online-forum in the time frame 4 July 2004 until 13 September 2004. During a second analysis in the time frame 6 August 2009 until 28 October 2009, 93 core group members and 1,930 members in total could be identified. Thus, the number of core group members rises over time but is always relatively small (in both time frames), i.e. there is a tall peak in the networking activity with only a small, but very active, nucleus. Table 8 presents the top 4 forum members of the present online-forum regarding the ratios analysed during the above dates. They are specified if they are part of the core group of the forum.

²⁵⁸ Source: own investigation

	Top 1	Top 2	Top 3	Top 4
Structural Bridge	269 (nodeID)	731 (nodeID)	721 (nodeID)	2221 (nodeID)
Core Group Member	NO	NO	NO	NO
Degree Centrality	1168 (nodeID) 0.8125	66 (nodeID) 0.7396	254 (nodeID) 0.5313	6345 (nodeID) 0.4479
Core Group Member	YES	YES	YES	YES
Closeness Centrality	1168 (nodeID) 0.901	66 (nodeID) 0.8646	254 (nodeID) 0.7604	882 (nodeID) 0.7500
Core Group Member	YES	YES	YES	NO
Betweenness Centrality	66 (nodeID) 0.367	1168 (nodeID) 0.1656	65 (nodeID) 0.064	254 (nodeID) 0.0546
Core Group Member	YES	YES	YES	YES
Weak Ties	1168 (nodeID)	66 (nodeID)	254 (nodeID)	4762 (nodeID)
Core Group Member	YES	YES	YES	YES
Linkevents received	66 (nodeID) 307	1168 (nodeID) 260	254 (nodeID) 184	6345 (nodeID) 142
Core Group Member	YES	YES	YES	YES
References on linkevents received	66 (nodeID) 307	1168 (nodeID) 260	254 (nodeID) 184	6345 (nodeID) 142
Core Group Member	YES	YES	YES	YES
Degree Prestige /	1168 (nodeID) 78	66 (nodeID) 71	254 (nodeID) 51	4762 (nodeID) 49
Core Group Member	YES	YES	YES	YES
Brokering Activity	1168 (nodeID)	66 (nodeID)	65 (nodeID)	4762 (nodeID)
Core Group Member	YES	YES	YES	YES

Table 8: Top 4 forum members regarding Core Group Membership²⁵⁹

The members with the nodeID 1168, 66, 65 and 4762 show the highest values in brokering activity within the aforementioned time frame. These members show high values regarding other network-measures: degree-prestige, high number of indegrees and linkevents received, degree- and betweenness centrality. They are all core group members, too. The thread analysis in chapter 6 will give more insights and information about the quality and content of their contributions as well as the causes for their forum-popularity. According to hypothesis 12, it can be assumed that these 4 members show the highest level of product experience as well as outstanding product knowledge. Because they are part of the forum's core group, it can be assumed that

²⁵⁹ Source: own investigation

they also show characteristics from hypotheses 10 and 11: they are intrinsically motivated because of their anticipated own benefits from the new solution (hypothesis 10) and they have personal requirements and personal dissatisfaction with the existing solution (hypothesis 11).

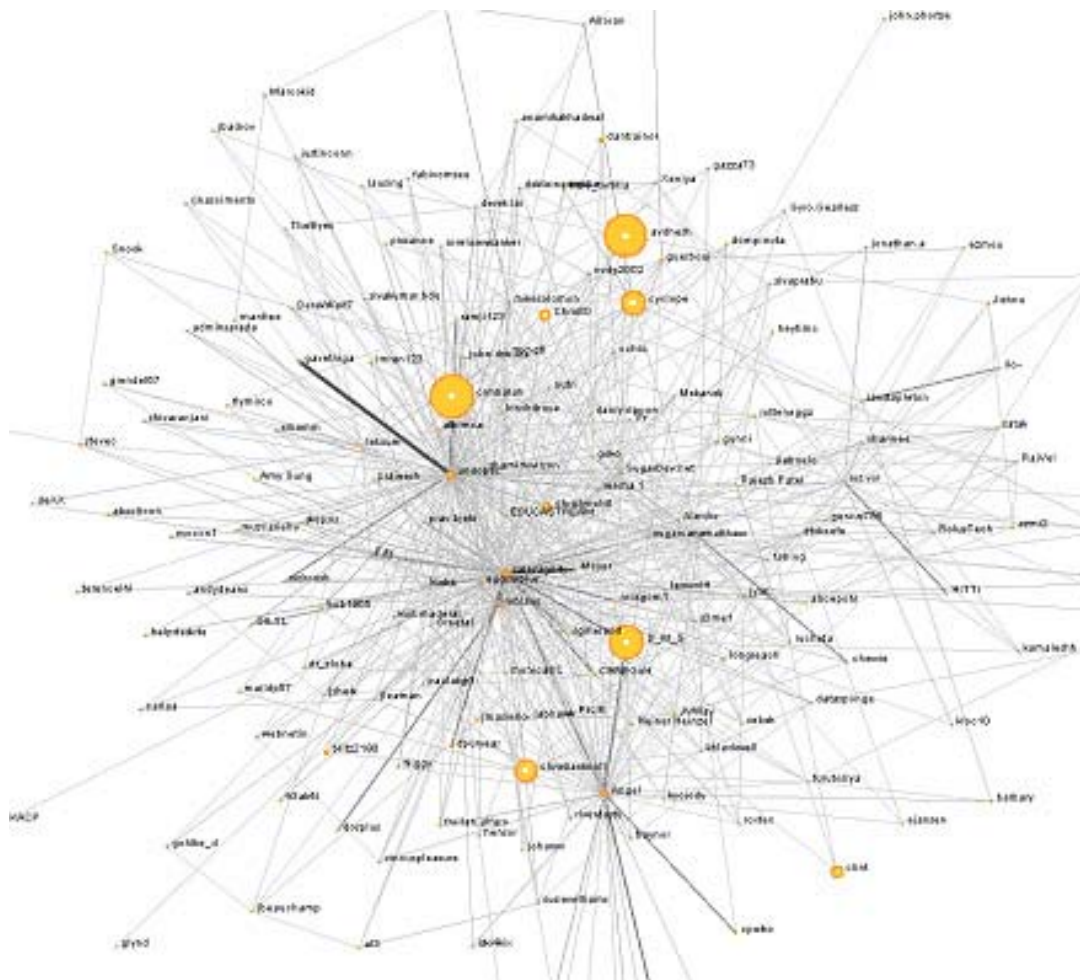


Figure 24: Brokering activity of developer forum as SNA diagram²⁶⁰

5.4 Discussion and Résumé

The present SNA aimed to quantitatively structure the data set, to deduce hypothetically network positions of innovative users from their theoretical tasks, motives and characteristics and to identify prominent network members. Therefore, hypotheses regarding the position of innovative users within social web networks were deduced from the theoretical characteristics of innovative users. These characteristics were based on an extensive literature research regarding the characteristics of innovative users within the “offline world” and extrapolated to the online environment.

²⁶⁰ Source: data set of online developer forum, generated with Commetrix

The present SNA took 839 members into account. As outlined in table 9, a relatively small group of outstanding members is highly notable. Relating to nearly all network-measures, members with the nodeID 66, 1168,254 and 4762 are the most prominent members of the online forum. However, the analysis was not able to indicate and analyse the causes and sources of their popularity.

	Top 1	Top 2	Top 3	Top 4
Structural Bridge	269 (nodeID)	731 (nodeID)	721 (nodeID)	2221 (nodeID)
Core Group Member	NO	NO	NO	NO
Degree Centrality	1168 (nodeID) 0.8125	66 (nodeID) 0.7396	254 (nodeID) 0.5313	6345 (nodeID) 0.4479
Core Group Member	YES	YES	YES	YES
Closeness Centrality	1168 (nodeID) 0.901	66 (nodeID) 0.8646	254 (nodeID) 0.7604	882 (nodeID) 0.7500
Core Group Member	YES	YES	YES	NO
Betweenness Centrality	66 (nodeID) 0.367	1168 (nodeID) 0.1656	65 (nodeID) 0.064	254 (nodeID) 0.0546
Core Group Member	YES	YES	YES	YES
Weak Ties	1168 (nodeID)	66 (nodeID)	254 (nodeID)	4762 (nodeID)
Core Group Member	YES	YES	YES	YES
Linkevents received	66 (nodeID) 307	1168 (nodeID) 260	254 (nodeID) 184	6345 (nodeID) 142
Core Group Member	YES	YES	YES	YES
References on linkevents received	66 (nodeID) 307	1168 (nodeID) 260	254 (nodeID) 184	6345 (nodeID) 142
Core Group Member	YES	YES	YES	YES
Degree Prestige /	1168 (nodeID) 78	66 (nodeID) 71	254 (nodeID) 51	4762 (nodeID) 49
Core Group Member	YES	YES	YES	YES
Brokering Activity	1168 (nodeID)	66 (nodeID)	65 (nodeID)	4762 (nodeID)
Core Group Member	YES	YES	YES	YES

Table 9: Summary Top 4 forum members²⁶¹

²⁶¹ time frame: 4 July 2004 until 13 September 2004

6. Case Study Part 2: Verification and Thread Analysis by a Mixed Method Approach

6.1 Research Objectives

The quantitative social network analysis of the developer online forum in chapter 5 identified and described outstanding members within the online forum regarding the network measures “centrality”, “position at the edge of a structural hole”, “number of weak ties”, “link events”, “prestige”, “core group membership” and “brokering activity”. It was assumed that these types of network positions could quantify characteristics of innovative users within the social web deduced from literature analysis.

These results are now extended by an approach that allows a structured analysis of the content of the present online forum. This means, at the same time, to analyse and structure a large amount of content-data. The following analysis of posts and threads of the present developer online forum is based on this previous knowledge from literature research, the quantitative social network analysis as well as the survey results regarding current methods, technologies and approaches of web monitoring.²⁶² Thus, the following analysis is based on a serious fundament of knowledge, research and orientation, resulting in a strong methodological concept.²⁶³ Because of this previous knowledge and in order to systematically structure research, it is feasible to pose the following research objectives for the thread analysis – including descriptive and explorative advantages – without formulating research hypotheses:

- Verification and operationalization of the existing hypothetical categories regarding processes, concepts and motivational aspects to post inventions and innovations such as ideas and new or further developed products, deduced in chapter 4.
- Deduction and operationalization of new categories regarding processes, concepts and motivational aspects to post ideas, inventions or complete new or further developed products within social web networks.
- Development and categorization of patterns and interrelations regarding the process of invention and innovation within social web networks. Wherever

²⁶² Meinefeld (2004), p. 273

²⁶³ Witzel (1982)

applicable, deduction of hypotheses for later theses and/or research projects.²⁶⁴

- Reliable extraction of universal statements regarding invention and innovation in social web networks, as well as the involved actors.
- Analysis and verification of the outstanding network members, identified during the dynamic social network analysis in chapter 5, regarding their roles in generating ideas, inventions and innovations in social web networks.
- Analysis and discussion of possible patterns regarding the network position of innovative users – considering the outstanding network members as well as other users.

Some challenges should be considered during the development of the research design and coding agenda to analyse threads and posts in online forums:

- Reliable analyses of a large amount of textual data, including relatively short and varying posts.
- It has to be ensured that single posts are not taken out of context and that comments regarding the posts are also considered.
- Consideration of the emotional connotation and the situational context of posts as well as chronological connections to other posts and behaviours within the forum. Posts could not be analysed without screening the direct contexts.
- Human language normally is metaphorical, i.e., an “interpretative level” has to be considered.
- The use of emoticons and cynicism, which have to be interpreted and categorized by the coder or researcher.
- Personal attributes become less relevant on the internet. To quote a cartoon from the magazine “The New Yorker”: “On the Internet, nobody knows you’re a dog.”²⁶⁵
- Consideration of the explorative style of an online forum, i.e., not every statement and behaviour can be known ex ante.
- Like other textual documents, a post is not a discrete whole but contains several irreconcilable and contradictory meanings and has more than one inter-

²⁶⁴ Lamnek (1995)

²⁶⁵ Steiner (1993)

pretation. Meaning necessarily involves some degree of interpretation, negotiation or translation, and the text itself links these interpretations inextricably, i.e., words are not self-sufficiently meaningful but only meaningful as part of a larger structure that makes meaning possible.²⁶⁶

6.2 Research Design and Research Methodology

To address the aforementioned methodological challenges and because of the synergistic view of evidence, a mixed-method approach was chosen for thread analysis.²⁶⁷ Research, in context with qualitative content and discourse analysis, has shown that a combination of qualitative and quantitative methods is beneficial to analyse social media networks.²⁶⁸

On the one hand, the process for the development and implementation of new categories of the coding schema is qualitative orientated. The basic goal of qualitative data analysis is understanding, i.e., the search for coherence, order and conflict. Generally speaking, qualitative approaches focus the analysis of structures and concepts by integrating prior knowledge and are highly qualified for the development of these new categories.²⁶⁹ Therefore, they often follow the basic iterative principles of hermeneutics, i.e., aimed to gain additional knowledge by deeper understanding of the research phenomenon.²⁷⁰ Especially in this stage of orientation and complexity reduction within a currently uninvestigated field, it can be expected that qualitative methods are appropriate. Qualitative research allows an integrated research process regarding time, content and research practices, which is beneficial for the present research assignment.²⁷¹

On the other hand, for classification of these categories and data analyses – for example frequency analyses and correlational analyses – quantitative methods are more beneficial. Quantitative approaches normally support the sequential research process of (a) deduction of hypotheses from a strong theory, (b) falsification and (c) inferential statistics.

The use of a mixed-method approach is also supported by the advantage of formulating universal statements regarding patterns of ideas, inventions and innovations in a

²⁶⁶ Ogden & Richards (1923), Derrida (1978)

²⁶⁷ Auer-Smka (2008), Smka 2007)

²⁶⁸ Mayring et al. (2007)

²⁶⁹ Stiles (2003)

²⁷⁰ Holbrook & Shaughnessy (1988), Durgee (1986)

²⁷¹ Strauss (1991), p. 46, cf. for example the “Grounded Theory Approach”, Kepper (1996)

social web network. The research design not only mixed quantitative and qualitative approaches, but also the methods of content analysis and discourse analysis. Both aim to analyse the characteristics of language. On the level of content, content analysis is used. On the process-related level, discourse analysis is relevant. The approaches as well as their qualification for the present thread analysis will be presented in the following chapters.

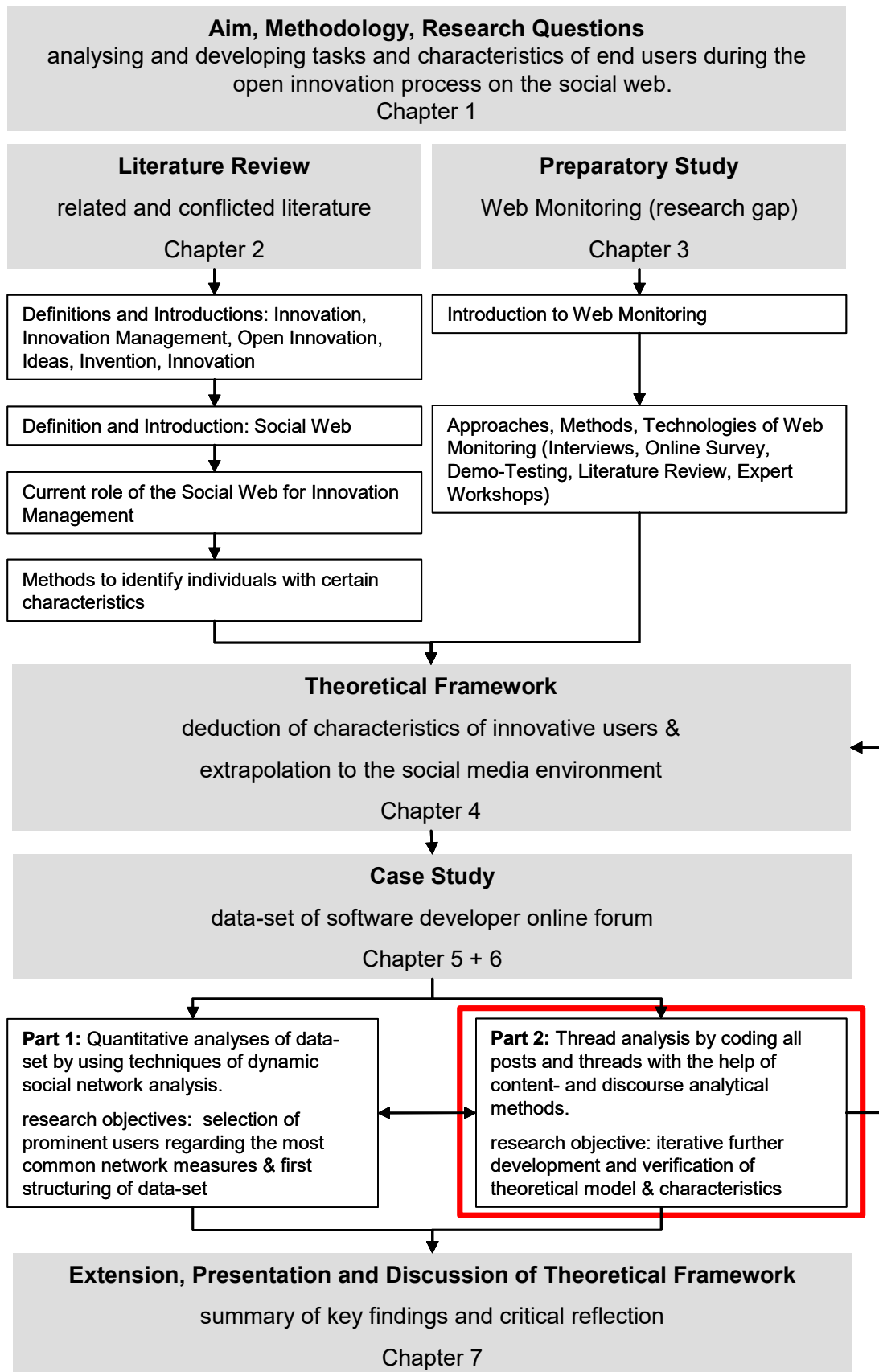


Figure 25: Thesis outline and status quo of research

6.2.1 Discourse Analysis

The study of discourse consists of “analysing traces left by communicative practices by means of various semiotic artefacts” such as transcriptions or online posts.²⁷² It has been taken up in a variety of social science disciplines, including linguistics, sociology, anthropology, social work, cognitive psychology, social psychology, international relations, human geography, communication studies and translation studies. Following the mainstream of discourse analysis, the underlying “Geneva model” focuses on the study of naturally occurring talk and texts – a category in which the analysis of posts and threads within the social web is included.²⁷³

Discourse analysis is related to different communicative practices in larger social and economic contexts and not only focused on the description of data. Linguists working at the University of Geneva showed that the construction of any verbal interaction or written text reflects a process of negotiation in which speakers recursively initiate, react to, or ratify propositions by means of semiotic constitutes belonging to various hierarchical levels: exchanges, moves and acts.²⁷⁴ The primary aim was to combine classical pragmatic categories such as speech acts with both a unified theory of the structure of human behaviour, and an inquiry into discourse relations and discourse markers.²⁷⁵ The Geneva approach assumes that language use entails (a) a cognitive dimension, (b) a social and psycho dimension and (c) a semiological dimension. Thus, the central features of contextual discourse analysis are: (a) the mutual nature of inquiry, (b) the balance between the researcher’s involvement and distance, (c) the notion that knowledge is created through a process of making rather than discovered through a process of knowing, (d) the importance of the situational and multifaceted character of meanings in research settings and (e) the holistic study of emergent processes in particular and changing contexts.²⁷⁶

In the context of the present research project, discourse analysis is used to identify, categorize and analyse the characteristics of language as a communication process. Discourse-analytical categories are used to discover communicative patterns and social roles of the forum members, to analyse and categorize the role of a post within a thread and to draw conclusions on the meaning of a post.²⁷⁷ Taking into account the

²⁷² Filliettaz, Roulet (2002), p. 371

²⁷³ Filliettaz, Roulet (2002), p. 371

²⁷⁴ Filliettaz, Roulet (2002), p. 369

²⁷⁵ Pike (1967), Ducrot et al. (1980)

²⁷⁶ Pettigrew (1985)

²⁷⁷ Hardy (2004)

hermeneutic origin of discourse analysis, it will not be focused just on the text per se but also its context and meaning. Furthermore, the situational context as well as the life-immanent context has to be considered within this analysis.

As aforementioned, the approach of discourse analysis has also been chosen because of its consideration that analysing texts does not consist of a projection of intuitive interpretations, but predominantly calls for an examination of the discursive properties underlying such interpretations.

6.2.2 Content Analysis

Content analysis, as it is presented and used within the following chapters, was developed in a longitudinal study about psycho-social consequences of unemployment and is a bundle of techniques for systematic text analysis.²⁷⁸ Here, the strengths of quantitative content analysis – theory of reference, step models, model of communication, category led, criteria of validity and reliability – were transferred and further developed to a qualitative-interpretative step of analysis. Content analysis is defined as an approach of empirical, methodologically controlled systematic analysis of texts within their context of communication following content-analytical rules and step-by-step models, without rash quantification. Following the approach of Mayring, the textual material will be fitted into a structured model of communication and rules for analysis so that the material can be analysed step by step by dividing the material into content-analytical units.²⁷⁹ Furthermore, content analysis aims to translate research findings into categories which are carefully founded and revised within the process of analysis. This method is reliable and provides the opportunity to compare the results with other studies which are based on different methodical approaches.²⁸⁰ In terms of the degree of prior related knowledge, differences can be identified between three basic principles regarding the analysis of qualitative data:²⁸¹

- inductive – following the grounded theory approach
- deductive – normally used for quantitative content analysis²⁸²

²⁷⁸ Ulrich et al. (1985), Mayring (2000a)

²⁷⁹ Mayring (2000a), p. 3

²⁸⁰ Mayring (2000a), p. 3

²⁸¹ Mayring (2002), p. 109

²⁸² Merten (1995)

- combination of “deduction and induction” or “induction and deduction” – with the aim to develop new knowledge by an interplay of inductive and deductive steps²⁸³

This combination is also called “open-minded grounded theory” and will be used for the present research project.²⁸⁴ Therefore, a combined deductive-inductive research process seems to be most suitable. This process is often called “qualitative content analysis” and has become widely accepted in marketing research:²⁸⁵

- First, the researcher has to identify the prior related knowledge within a deductive step and has to subsume this knowledge into a preliminary coding scheme.²⁸⁶
- Second, this “start-coding scheme” has been inductively and iteratively extended by using the investigated data set until every element of the data set can be attributed to one category of the aforementioned coding scheme.

This deductive-inductive research process requires the researcher to be willing to adapt and rethink already accepted concepts. There are some scientific publications on the content analysis of online-generated text.²⁸⁷ In the present research project, content analysis is used to analyse the data set of the present developer online forum. A coding scheme has to be developed and iteratively extended – the concept of posting and the motivation to post have to be translated into coding categories. Afterwards, threads and posts have to be analysed. Therefore, essential data, i.e., threads and posts including content regarding ideas, inventions and innovations, have to be separated from non-essential data. This process of developing a coding sheet achieves validity by following specific theoretical guidelines.

6.3 Deduction of Coding Scheme, Data Collection and Data Analysis

The aforementioned considerations regarding research methods and the approaches of “discourse analysis” and “content analysis” lead to a coding scheme which needs:

²⁸³ Köckeis-Stangl (1980)

²⁸⁴ Frank & Riedl (2004)

²⁸⁵ Mayring (2000a)

²⁸⁶ cf. the literature analysis of this thesis

²⁸⁷ di Gregorio (2007), Kuckartz (2007), Sinkovics & Penz (2007), Mayring et al. (2007), Sinkovics et al. (2008)

- to build up and operationalize a systematic research structure with categories for the analysis and categorization of online threads and posts, with the aim of extending and developing the theory²⁸⁸ of ideas, inventions and innovations within the internet,
- to detect, separate and analyse threads and posts of the present developer online forum which contain indications for ideas, inventions and innovations of forum members regarding new solutions and/or the development of the existing solution,
- to verify the prior related research results,
- to recognize patterns of ideas, inventions and innovations.

Following Pettigrew's requirements for good contextual research, the coding sheet should be well-grounded regarding statements and experiences of its target audience and the measurement technique of the coding scheme should be precise and generalizable.²⁸⁹ Generally speaking, a coding scheme with different coding categories and coding rules has to be developed with the aim to build up a structure for content and discourse analyses and to determine exactly under what circumstances a post can be coded.²⁹⁰ In summary, the coding scheme will determine the level of description, the level of detail and the level of abstraction and follow the basic principles of grounding interpretive research methodology.²⁹¹

- **The Fundamental Principle of the Hermeneutic Circle:** This principle suggests that all human understanding is achieved by iterating between considering the independent meaning of parts and the whole that they form. This principle of human understanding is fundamental to all the other principles.
- **The Principle of Contextualization:** requires critical reflection of the social and historical background of the research setting so that the intended audience can see how the current situation under investigation emerged.
- **The Principle of Abstraction and Generalization:** requires relating the ideographic details revealed by the data interpretation through the application

²⁸⁸ Glaser (1978), p. 57

²⁸⁹ Pettigrew (1985)

²⁹⁰ Mayring (2000a)

²⁹¹ Klein & Myers (1999)

of principles one and two to general theoretical concepts that describe the nature of human understanding and social action.

- **The Principle of Dialogical Reasoning:** requires sensitivity to possible contradictions between the theoretical preconceptions guiding the research design and actual findings (“the story which the data tell”) with subsequent cycles of revision.
- **The Principle of Multiple Interpretations:** requires sensitivity to possible differences in interpretations among the participants as are typically expressed in multiple narratives or stories of the same sequence of events under study. Similar to multiple witness accounts even if all tell it as they read it.
- **The Principle of Suspicion:** requires sensitivity to possible biases and systematic distortions in the narratives collected from the participants.

As defined within the last chapter, the approach will combine inductive and deductive processes by deductively translating the already existing knowledge into categories and iteratively extending these categories by inductive post analyses – also called “axial coding”²⁹².

Deductive step – preliminary coding scheme from prior related knowledge: The development of the coding scheme will be started by using existing theory. This prior related knowledge from the literature research in chapter 4 regarding characteristics of innovative users will be translated into a preliminary coding scheme.

Inductive step – decontextualization and transformation of data set: To shape the theoretical and hypothetical original coding scheme and to bring the present posts into a more general and theoretical language for a “scientific transformation process”, the coding scheme will be further developed by selecting and coding approximately 300 posts from the present online developer forum. Herewith, the aim is to extend the categories and the data collection plans until every element of this sample data set can be attributed to one category of the aforementioned coding scheme. During this extension of the coding scheme, the initial research problem will always be recalled: to recognize patterns of innovative users within the social web and respectively to recognize patterns from the process of generating ideas and inventions for

²⁹² Strauss & Corbin (1990), Charmaz (2006)

innovations within the social web. This iterative process derives from the key feature of theory-creating case research, i.e. the freedom to make adjustments during the process of data collection and data analysis. Thus, theory and data will be constantly compared – iterating towards a theory which closely fits the data.

Coding complete data set regarding the “concept of post” category: Based on this coding scheme, all available posts of the present developer online forum data set will be coded and categorized to threads regarding the “concept of post” category. Thus, to make further (qualitative) analyses easier, the large population will be divided into different disjoint subpopulations – also called “stratums”.²⁹³

Selection of posts regarding the relevant “concept of post” sub-categories: Afterwards, threads including posts with the following “concepts of post” will be selected for further analysis: (a) ideas for the development of the existing product, (b) ideas for new products, (c) help seeking, problem formulation and bug addressing, (d) new knowledge and ideas from other areas and products.

Detailed analyses of selected posts: These categories will be analysed in detail regarding generalizable patterns for ideas, inventions and innovations within the social web and the characteristics of innovative users within the social web. Besides the aforementioned “concept of post”, a discourse analysis will be used within to identify, categorize and analyse the characteristics of language as a communication process. In this respect, discourse analysis aims to discover communicative patterns and social roles of forum members and draw conclusions on the meaning of their contributions. Taking into account the hermeneutic origin of discourse analysis, it will not be focused just on the text per se, but also its context and meaning. Therefore, the forum posts will be classified regarding the hierarchical levels “exchange”, “moves” and “acts”.

Besides this discourse analysis, the chosen “innovation threads” will be analysed regarding the “motivation of each member to post”, “the evaluation of the post by other members”, “the evaluation of other posts by the member” and “the numeric position of a specific post within a thread”. To secure intra-coder reliability, the posts are coded by one and the same coder at different dates.

²⁹³ Decker & Wagner (2002), p. 193

Match with results from the qualitative and dynamic social network analysis:

Afterwards, the results from these thread analyses will be matched with the results from the dynamic social network analysis. Here, the question will be answered if the detected outstanding members from the dynamic social network analysis – outstanding in respect to the most common social network measures – are taking on a specific role within the processes of ideas, invention and innovation. Furthermore, the match with this quantitative social network analysis will quarry information about network positions of other potential innovative users, not assuming outstanding network roles. Maybe there are also patterns to identify. For the present thread analysis, the same data set and period, as for the dynamic social network analysis in chapter 5, is used:

<u>Data Set</u>	<u>Nodes</u>	<u>Number of Posts</u>	<u>Average Density</u>	<u>Average Interactivity</u>	<u>First Post</u>	<u>Last Post</u>
End-User Developer Online Forum Software	839	1,864	0.89	4.77	4 July 2004 8:32	13 September 2004 9:52

Table 10: Overview data set and data structure of thread analysis²⁹⁴

Deduction of coding categories: This approach of content analysis is called “open-minded grounded theory” and leads to the following categories.²⁹⁵

(a) Claim and subject of post

This category is comparable to an e-mail subject and subsumes the content of a specific post, written by a forum member.

(b) Link text

This category covers the complete content of a specific post, written by a forum member.

²⁹⁴ Source: data set of online developer forum, generated with SNA-software Commetrix

²⁹⁵ Frank & Riedl (2004)

(c) Concept of post

The category “concept of post” was developed to analyse and classify all posts regarding their aim:

- help seeking, problem formulation, bug addressing
- help giving, follow-up inquiry, feature request
- general information, new, thanking, etc.
- ideas for new products
- ideas for the extension of existing products
- adoption of new ideas and products
- knowledge and ideas from other areas and products
- presentation of a finished product and bug fixing
- moderation
- unrelated

(d) Motivation to post new products or to develop the existing product

The category “motivation to post” was developed to analyse and classify the individual motivation to interact within a developer online forum:

- member is satisfied with the existing product
- member is dissatisfied with the existing product
- member has own needs or benefits regarding a potential new product
- member has own needs or benefits regarding the existing product
- pro-social behaviour: member gives information and help without direct advantage
- member is dissatisfied with another existing product
- member shows behaviour of “direct reciprocity”: pseudo altruism or reciprocal altruism, member gives information or help with indirect expectation of direct advantages
- empathy altruism: help or information is based on empathy for the enquirer
- member has commercial aims and/or direct company aims
- the member post is based on gratitude, for example, because of recent help by other members
- member shows no clear motivation to post

(e) Discourse move

As part of the aforementioned discourse analysis, “discourse moves” are the move functions of discourse analysis. They normally invite a response. Discourse moves are in fact mostly the starting points within threads. They can be divided into:

- Suggest Action
 - the highest discourse move
 - often corresponds to the input function in the decision routine
 - often “suggest actions” are the start of a conversation or thread
 - example: A: Where should we travel to? B: Hawaii!? (= suggest action)
- Request Action
 - utterances that propose behaviours in the speech event
 - often corresponds to the output function in the decision routine
 - most interactions included requests or appeals
 - examples: “Write it in activities” or “Well, list your two down there”
- Request Validation
 - seeks confirmation or verification of information provided in the discourse
- Request Information
 - seeks information not already provided in the discourse
- Elaborate Repeats
 - serve as a catch-all for utterances with comprehensible content that do not serve any other move or response
 - frequently these are repetitions and utterances that support or comment on suggestions

(f) Discourse response and other discourses

Discourse responses generally are the second parts within threads. Other discourses combine categories designed to reflect discourse management strategies as well as categories included to assess affective functions:

- Agree Response
 - the routine continuation of suggestion with the direction “agree with suggestion”

- Disagree Response
 - refusals to comply with the suggest or request
- Acknowledges Only
 - restricted to forms like “yeah” that acknowledge previous utterances and repeat the partner’s previous utterance
- Complies with Suggest, Request or Validation
 - identifies utterances that indicate compliance regarding any other type of request and delivers afterwards a new discourse move
- Contradicts with Suggest, Request or Validation
 - identifies utterances that indicate contradiction regarding any other type of request and delivers afterwards a new discourse move
- Discourse Marker
 - they are used for a limited set of forms
 - “OK”, “well”, “anyway”, “so”, “now”, “let’s see”, “and”, alright” are the forms coded as discourse markers
- Metalinguage
 - is used to code utterances about the talk
 - is used for repairs, to manage closings, to orient suggestions
 - examples: “Ready to do the next problem?” or “I think we are finished” or “We have two afternoons to fill up”
- Orients Suggestion
 - orientations expressed as interrogatives are coded as request information in the move class and as orients in the other class
 - orientations are also structured in adjacency pairs by a less frequently-used strategy of expressing orientations in indirect requests
 - examples: “Where are we going to go?” or “What would you want to do in London, Rob, if this was your choice?”
- Personal Information
 - identifies utterances in which participants discuss personal information or make other personal comments not required to complete the task
- Jokes, etc.
 - include utterances that inject humour
- No other clear function

(g) Evaluation of post by other users

- Evaluation of post by other users has positive tonality, i.e. the post has been supported by other users.
- Evaluation of post by other users has negative tonality, i.e. the content of the post has been criticised by other users.

(h) Evaluation of parent post by user

- Evaluating a parent post by using a positive tonality, i.e. the user supports the parent post.
- Evaluating a parent by using a negative tonality, i.e. the user criticised the parent post.

(i) Node ID

- Individual identification number of each user in the present online forum.

(j) Link ID

- Individual identification number of each linkevent in the present online forum, i.e. the identification number of one post.

(k) Parent link ID

- Individual identification number of a parent linkevent in the present online forum, i.e. the identification number of a parent post.

U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
ModelID	Alias	LinkID	ParentLinkID	MsgDate	Claim / Subject	LinkText	(Von Hippel, Rogers, Shoemakers)	Evaluation of post (positive, negative, neutral, no evaluation)	Discourse Move (London, 1998)	Other Discourses (London, 1998)	Motivation to post (new products / existing products)	Evaluating parent post (positive, neutral, negative, no evaluation)	New thread / Position of post
63		3	3	2004-07-04 08:32	User Interface Design	Question - what are the most important usability features sales reps want in a user interface? .mad. Alexandar Plun: we - we will do it by john. at: 07/07/04 rs. The bur best to am. 17 moderation / general questions	17 moderation / general questions	1 13 Requests Validation	3 6 No other function / response	19 commercial aims / direct company aims	Evaluating parent post (positive, neutral, negative, no evaluation)	1	
63		4	4	2004-07-04 10:02	General developer help.	17 moderation / general questions	17 moderation / general questions	1 14 Requests	3 6 No other function / response	17 direct-reciprocity (pseudo-altruism, reciprocal-altruism)		1	
63		5	5	2004-07-04 10:12	Installation support	17 moderation / general questions	17 moderation / general questions	-1 12 Requests Action	3 6 No other function / response	19 commercial aims / direct company aims		1	
63		6	6	2004-07-04 10:17	Feature Requests?	12 help giving / follow-up inquiry / feature request	12 help giving / follow-up inquiry / feature request	1 12 Requests Action	3 6 No other function / response	17 direct-reciprocity (pseudo-altruism, reciprocal-altruism)		1	
66		8	3	2004-07-04 11:24		16 ideas for extension of existing product's solution	16 ideas for extension of existing product's solution	none 11 Suggests Action		14 own needs/benefits regarding existing solution		0	
63		9	9	2004-07-05 06:05		10 Presentation of finished/developed product, solution, bug fixing	10 Presentation of finished/developed product, solution, bug fixing	1 14 Requests	3 4 Personal information	19 commercial aims / direct company aims		1	
106		10	3	2004-07-05 06:26		16 ideas for extension of existing product's solution	16 ideas for extension of existing product's solution	1 11 Suggests Action	2 4 Complex with validation	14 own needs/benefits regarding existing solution		1	
106		11	9	2004-07-05 06:33		11 help-seeking / problem formulation / bug addressing	11 help-seeking / problem formulation / bug addressing	1 14 Requests	3 3 Clients Suggestion	11 satisfaction with existing solution / parent answer within thread		1	
268		12	12	2004-07-05 10:51		14 general information / news / thanking s.o.	14 general information / news / thanking s.o.	1 16 No Move	2 1 Agree Response	11 satisfaction with existing solution / parent answer within thread		1	
268		13	9	2004-07-05 10:56		14 general information / news / thanking s.o.	14 general information / news / thanking s.o.	none 13 Requests Validation	2 3 Acknowledges only	11 satisfaction with existing solution / parent answer within thread		0	
269		14	4	2004-07-05 11:49		11 help-seeking / problem formulation / bug addressing	11 help-seeking / problem formulation / bug addressing	0 14 Requests	3 3 Clients Suggestion	14 own needs/benefits regarding existing solution		2	
236		15	9	2004-07-05 19:27		14 general information / news / thanking s.o.	14 general information / news / thanking s.o.	none 13 Requests Validation	2 3 Acknowledges only	11 satisfaction with existing solution / parent answer within thread		0	
281		16	12	2004-07-06 07:06		12 help going / follow-up inquiry / feature request	12 help going / follow-up inquiry / feature request	none 12 Requests Action	3 6 No other function / response	15 pro-social behaviour (information, help without direct advantage)		0	
301		17	17	2004-07-06 15:27		16 ideas for extension of existing product's solution	16 ideas for extension of existing product's solution	0 11 Suggests Action	3 3 Clients Suggestion	14 own needs/benefits regarding existing solution		1	
224		18	18	2004-07-06 19:44		11 help-seeking / problem formulation / bug addressing	11 help-seeking / problem formulation / bug addressing	0 11 Suggests Action	3 6 No other function / response	14 own needs/benefits regarding existing solution		1	
306		19	19	2004-07-06 21:17		16 ideas for extension of existing product's solution	16 ideas for extension of existing product's solution	0 11 Suggests Action	3 4 Personal information	14 own needs/benefits regarding existing solution		1	
307		20	9	2004-07-06 23:28		14 general information / news / thanking s.o.	14 general information / news / thanking s.o.	none 16 No Move	2 1 Agree Response	16 dissatisfaction with other existing solution		1	
224		21	18	2004-07-06 23:49		10 Presentation of finished/developed product, solution, bug fixing	10 Presentation of finished/developed product, solution, bug fixing	1 13 Requests Validation	3 6 No other function / response	15 pro-social behaviour (information, help without direct advantage)		0	
224		22	18	2004-07-06 23:49		10 Presentation of finished/developed product, solution, bug fixing	10 Presentation of finished/developed product, solution, bug fixing	1 13 Requests Validation	3 6 No other function / response	15 pro-social behaviour (information, help without direct advantage)		0	

Figure 26: Example of Coding Sheet²⁹⁶

²⁹⁶ Source: own investigation

6.4 Results from the Thread Analysis

As aforementioned, the developed categories were applied by first coding all threads regarding “the concept of post”. In a second step, these threads with utterances in context with ideas, inventions and innovations were subject to an in-depth analysis. The results are documented (a) by the coding sheet and (b) in research memos to guarantee the most possible transparency and intersubjectivity and to reflect meaning as well as the research results by a specific filter. To ensure that external observers can reach an independent judgement regarding the merits of the analysis, the memos present sufficient quotes. Reliability will be generated by coding the same posts by the same coder during different dates. Coding sheets and research memos can be retrieved in the appendix of this thesis. The following section will summarize the regularities which were observed during (a) coding and filtering all 1,864 posts regarding the “concept of post” category and afterwards (b) the further investigation of these threads with relevant “concepts of posts” categories. Those categories are chosen because they include posts with possibly relevant content for inventions or innovations:

- ideas for the extension of the existing product
- ideas for new products
- help seeking, problem formulation and bug addressing
- new knowledge and ideas from other areas and products

Threads with these aforementioned concepts of posts were analysed regarding all other categories of the underlying coding scheme, i.e., the motivation to post as well as the discourse-analytical categories.

6.4.1 “Concept of Post” Category

Generally speaking, the detailed analysis of 1,864 threads and posts, including 207 threads with ideas, of the developer online forum found out that ideas have mostly not been implemented and developed further by the initial source of the idea only. 18 of the analysed 207 ideas were developed further by the initial source. Thus, the source of the initial idea is mostly not the source of the final innovation. The thread analysis showed that the innovation process from an initial idea to a finished or enhanced product is mostly a collaborative iterative process with different actors from

inside and outside the company. The “single and independent innovative actor”, creating new ideas, and at the same time, transferring these ideas to finished products could not be detected. In fact, ideas were often seized upon and further developed by companies’ employers or other internal or external experts – mostly software engineers. These experts are mostly not the most creative minds. There are other sources and situations for creative and initial ideas:

- Ideas from new forum members which are often missing some additional features in context with the new software: 63 of the analysed 207 ideas are contributed by new forum members. These features normally result (a) from previous experience with competing products or (b) from previous market checks of competing products and solutions in context with a decision-making process regarding a new software solution.
- Knowledge, analogies and ideas from other areas and products: Against all expectations, the thread analysis showed that only 13 of the analysed 207 ideas resulted from ideas from other areas and products. Nevertheless, these ideas show a high degree of novelty and could be defined as “breakthrough ideas”.
- Ideas and analogies from problems with the product: 89 of the 207 analysed ideas could be attributed to problems with the product. Nearly all 89 ideas are suggestions for the development of the existing software. The ideas could be divided into (a) problems during the processes of installation and upgrading of the software (60 of 87 threads regarding problems and bugs) and (b) detecting and addressing system bugs (27 of 87 threads regarding problems and bugs). These ideas disproportionately result in the extension or further development of the existing product.
- Ideas resulting from own needs and benefits regarding the existing product (184 of 207 ideas) or a new product (17 of 207 ideas). The sources of these ideas often show no expert knowledge in software engineering or related fields. In fact, they come from other disciplines and industries and use the software in their daily business. Thus, those sources deduce new ideas from their daily practical work, for example, as a sales manager.

If an idea is ranked by the forum members as promising, in general, it is often posted as “feature request” (112 of 207 ideas) in the first instance with the aim to integrate the suggestion into the next software release and/or to discuss the idea within the forum. Thus, posting the idea as “feature request” could be seen as the highest accolade from the community as well as the forum moderator for promising ideas. If an idea gets an outstanding forum ranking and/or the company recognizes a special need, the forum moderator categorized this idea with highest priority for development and the integration into the next release. Herewith, the moderator mostly addresses the company’s software engineers or other experts, being versed in software engineering. Infrequently, the posted idea is directly transformed to extend the existing product or develop a new product without being discussed and verified in the forum (2 of 207 ideas). More frequently, the software engineers from the company and forum members with expertise in software engineering present semi-final products based on an initial idea from forum members (63 of 207 ideas). Presenting a product (extension) different aims could be identified by the thread analysis:

- adopting, bug fixing and usability testing
- verifying the semi-final product or getting comments from forum members
- turning the product over to the forum community for further development or extension
- setting the new or further developed product on the agenda for the next software release

6.4.2 “Motivation to Post” Category

After coding all posts regarding the “concept of post” category, threads including posts with the following conceptual categories (“concept of post”) were selected for further analysis:

- ideas for the extension of the existing product
- ideas for new products
- help seeking, problem formulation and bug addressing
- knowledge and ideas from other areas and products

These conceptual categories only covered threads with ideas. These selected threads were analysed regarding the “motivation to post” category. As already described in

the introduction to this chapter, eleven sub-categories could be iteratively developed and extended for the “motivation to post” category by coding 300 posts from the present online developer online forum:

- member is satisfied with the existing product
- member is dissatisfied with the existing product
- member has own needs or benefits regarding a potential new product
- member has own needs or benefits regarding the existing product
- pro-social behaviour: member gives information and help without direct advantage; this behaviour is often named as “altruism”
- member is dissatisfied with another existing product
- member shows behaviour of “direct reciprocity”: pseudo altruism or reciprocal altruism, member gives information or help with indirect expectation of direct advantages
- empathy altruism: help or information is based on empathy for the enquirer
- member has commercial aims and/or direct company aims
- the member post is based on gratitude, for example because of recent help by other members
- member shows no clear motivation to post

The motivation to communicate ideas often results from (a) own needs regarding the existing product (70 percent of all ideas) or (b) dissatisfaction with the existing product (18 percent of all ideas). Six percent of all ideas could be traced back to direct commercial aims.

63 of the 145 threads, motivated by own needs, were ideas for the extension of the existing product. The rest, 82 threads, primarily focused on problems with the existing product and led to ideas in a second instance. 30 of the 39 threads relating to dissatisfaction were also primarily motivated by problems with existing products and led to ideas in a second step. Only nine threads directly communicated ideas. Von Hippel pointed out that lead user ideas are characterized by the finding that the majority of users will have similar needs at a later date, too.²⁹⁷ This finding is supported by the case study: approximately 20 percent of the analysed ideas were ranked by

²⁹⁷ von Hippel (1986), p. 795 & 796

other users directly in the same thread with comments like “I have the same need” or “It’s a great idea and we could imagine using this idea, too”.

In 74 percent of all ideas, own needs result from experience with the specific product or a competing product. Dissatisfaction can be traced back to problems and bugs during the practical use of the product or a competing product. It can be assumed that there has to be an intrinsic stimulus for the satisfaction of personal requirements and/or dissatisfaction with the specific product or a competing product to communicate an idea. Altruistic categories like pro-social behaviour, without a direct connection to a valuable reward, empathy altruism and direct reciprocity could not be verified for the phase of giving ideas by the case study.²⁹⁸ The case study showed that instrumental and commercial motivation is not a primary stimulus of giving ideas on the social web and seven percent of the ideas could be traced back to this.

Analysing the “motivation to help”, different categories could be identified. It was found that members help other members by solving their problems or transforming their ideas into new products basically because of:

- commercial or direct company aims: 143 posts of 1,864 posts
- pro-social behaviour or information and help without direct advantage, apart from community advantages like prestige and credibility: 127 posts of 1,864 posts
- own needs regarding a new or the existing product: 109 posts of 1,864 posts
- own dissatisfaction with the existing product and motivation to satisfy own needs and to get benefits from a better or new product: 34 posts of 1,864 posts

6.4.3 Discourse Analysis

Discourse-analytical categories are used in the present case study to discover communicative patterns and social roles of the forum members, to analyse and categorize the role of a post within a thread and to draw conclusions on the meaning of a post. Taking into account the hermeneutic origin of discourse analysis, it not only focuses on the text, per se, but also its context and meaning. Furthermore, the situational context is considered within this analysis.

²⁹⁸ Belk & Coon (1993), Ozinga (1999), Haas & Deseran (1981)

Following the mainstream, the present discourse analysis is based on the “Geneva model”. This approach focused on the study of naturally occurring talk and texts which reflects a process of negotiation in which speakers recursively initiate, react to, or ratify propositions by means of semiotic constitutes belonging to various hierarchical levels and functions: exchanges, moves and acts.²⁹⁹

As with the analysis of the “motivation to post” category, the discourse analysis only covered those threads concerning ideas for the extension of the existing product as well as ideas for new products. In the following, we will call these specific threads “idea threads”.

It can be shown that the move function “Suggest Action” often acts as a starting point in those relevant threads (72 threads of 207 threads): one creative member communicates and suggests an idea, for example, a new application extending the existing software.

The middle sections of these “idea threads” are mostly characterized by another move function: “Request Validation” (184 threads of 207 threads). Here, the thread participants seek and exchange confirmation or verification of the suggested idea provided in the discourse. Some forum members discuss and negotiate the idea. Besides the aforementioned move function “Request Validation”, the request functions (a) “Complies with Suggest, Request or Validation”, (b) “Contradicts with Suggest, Request or Validation” or (c) “Agree Response” are used in these middle sections of the relevant threads. In the first case, the sender generally complies with the idea. However, he/she has additional input, suggestions or requests for the specific idea, i.e., he/she wants to develop the idea. In the second case, the sender generally contradicts the suggested idea. In fact, he/she describes the reasons for his/her contradiction and presents own ideas for the specific product. In the last case, the sender agrees and supports the idea. Actors, posting an “Agree Response” in the middle section of an idea thread, are often first adopters of the new idea. The request function “Disagree Response” could only be detected in one case. In context with the verification, discussion and development of an idea, “Disagree Responses” are not used. This could be explained by the common opinion that “wrong ideas” generally do not exist and therefore no disagreement is needed. At the end of the “idea thread”, the following options of move and request functions could be detected:

²⁹⁹ Filliettaz, Roulet (2002), p. 369

- Move function “Request Validation”: In this case, a semi-final product which needs to be validated or further developed by internal or external experts is the result of the thread.
- Move function “Suggest Action”: In this case, a new or extended product is the result of the thread and often the starting point of a new thread, discussing this new product. In other cases, the presented new solution again leads to new ideas and suggestions. Thus, new needs arise from the new product and solution.
- Request function “Complies with Suggest”: In this case, the thread ends with a feature request to integrate the new idea into the next software release.

6.5 Discussion and Résumé

Chapter 6 focused on the combined inductive-deductive analyses of posts and threads of the present developer online forum. The analyses were based on previous knowledge regarding characteristics of innovative users from the literature research, results from the web monitoring survey as well as the results from the dynamic social network analysis regarding network positions of the outstanding users. 1,864 posts were analysed regarding the following research objectives:

- Verification and operationalization of the existing hypothetical categories regarding processes, concepts and motivational aspects to post inventions and innovations like ideas and new or further developed products, deduced in chapter 4.
- Deduction and operationalization of new categories regarding processes, concepts and motivational aspects to post ideas, inventions or complete new or further developed products and solutions within social web networks.
- Development and categorization of patterns and interrelations regarding the process of invention and innovation within social web networks. If applicable, deduction of hypotheses for later theses and/or research projects.³⁰⁰
- Reliable extraction of statements regarding the development of inventions and innovation in social web networks, as well as the involved actors.

³⁰⁰ Lamnek (1995)

- Identification of outstanding network members, identified during the dynamic social network analysis in chapter 5, regarding their roles in generating ideas, inventions and innovations in social web networks.

At this point, it can be summarized that the thread analysis shows some significant patterns regarding concepts, characteristics and motivation to post ideas within the online forum. One key aspect is the finding that the source of the initial idea is mostly not the source of the final innovation, i.e., innovation is mostly a collaborative and iterative process. Ideas often do not result from the best (technical) experts but rather from end users, for example, sales managers who have problems with the existing solutions or have needs regarding the extension of the solution or a new solution. The other dominant part of users with ideas, especially for new products, is new forum members with knowledge from other areas or competing products. However, the single “innovative user” could not be detected.

In a majority of the cases, users are motivated to post new ideas because of (a) own needs regarding a new or existing solution and (b) dissatisfaction and problems with the existing solution. The communication of new ideas is infrequently altruistically motivated. In contrast to the communication of ideas, the transformation of an idea seems to be dominated by indirect advantages, for example, peer reputation and rising social status within the online forum. These findings are supported by the literature research in chapter 4: friendship, fun, exploration, community building, creative freedom, peer reputation, skill improvement and the opportunity to influence as well as external feedback provided by a global user community were identified as motivational aspects to interact within the social web.³⁰¹

The discourse analyses of the selected “idea threads” led to the assumption that initial ideas mostly could be coded as the move function “Suggest Action”. Afterwards, these ideas were validated, discussed or further developed by the forum members. Here, the members initially agree or disagree with the idea and, in the majority of the cases, directly respond. Actors posting a simple “Agree Response” in the middle section of an idea thread are often first adopters or first users motivated to communicate their initial experiences to the online forum. The idea threads end (a) with a feature request to integrate the new idea into the next software release, (b) with a disagree response that the idea could not be transformed into an innovation, (c) in a

³⁰¹ Hemetsberger (2001), Kollock & Smith (1999)

completely new or further developed product or (d) in semi-final products which have to be verified by the forum members.

Taking into account the already known theoretical categories from the literature analysis in chapter 4 as well as the research results from the dynamic social network analysis, the theoretical model of open innovation on the social web will be extended in chapter 7.

7. Conclusion: Extension of Theoretical Tasks and Characteristics of Users during the Open Innovation Process on the Social Web

The chapter aims to extend the theoretical findings from the literature analysis regarding the role of users during the initial idea phase in innovation management to the social web environment. Therefore, the research findings from the aforementioned dynamic social network analysis, as well as the thread analysis, were used. They are based on an extensive case study with emphasis on the data set of one of the leading open source online developer forums. The initial in-depth literature analysis revealed the following characteristics of users with ideas for inventions or innovations:

- Innovative users are at the edge of the market and have the ability to identify and adopt certain needs, products and trends earlier than the majority of users within their social web environment.
- Innovative users have personal requirements regarding products or solutions. They are highly motivated and have the ability to communicate and/or to translate these needs into new or further developed products or solutions. Dissatisfaction could establish a connection between needs and processes of problem solving as well as community communication, but are a necessary characteristic for innovativeness.
- Innovative users are motivated to share their own ideas because they benefit notably from the new and innovative solution or product. Within the social web, the motivation to share ideas and to innovate is often connected to intrinsic or altruistic motivational factors like growing community status and reputation, high community acceptance and confidence. Based on the literature research, it could be assumed that extrinsic motivational incentives – especially monetary incentives – are not crucial to motivate innovative users within the social web environment. Furthermore, monetary incentives do not have an implication for the number and quality of user ideas.³⁰²

³⁰² Lüthje (2004), p. 17 & 18, Franke & Shah (2003), p. 18 & 19

- Innovative users take outstanding positions within their social web environments because they show higher product knowledge and expertise than the majority of users. For example, they presented this knowledge within publications of high quality articles and contributions. Based on their product and technical knowledge, innovative users have a high community acceptance and confidence within their social web environment. This knowledge is often based on prior first-person product user experience which also leads to user expertise. They often gain their knowledge as hobbyists and are motivated to spend a considerable time period to develop new products and solutions. Product- and prior related knowledge enables users to translate their dissatisfaction with solutions currently available on the market into specified requirements and ideas for new products.

Considering these theoretical categories from the literature research, a number of hypotheses regarding the positions of those innovative users within social networks were deduced:

- There is a positive interrelation between the characteristic “being at the edge of the market”, the “ability to identify certain needs earlier than the average of the network” and the position of the potential innovative user at the edge of a structural hole within his/her social media network.
- There is a positive interrelation between the ability to identify certain needs earlier than the average and high values in “degree centrality” of the member within his/her social web network.
- There is a positive interrelation between the ability to identify certain needs earlier than the average, being at the edge of the market and high values in “closeness centrality” of the member within his/her social web network.
- There is a positive interrelation between the quality of expert knowledge of a certain member and high values in “closeness centrality” of the member within his/her social web network.
- There is an interrelation between the ability to identify certain needs earlier than the average and high values in “betweenness centrality” of the member within his/her social web network.

- There is a positive interrelation between the ability to identify certain needs earlier than the average and the quantity of weak ties of the member within his/her social web network.
- There is a positive interrelation between product knowledge and quantity of weak ties of the member within his/her social web network.
- There is a positive interrelation between the quality of the member's contributions and the quantity of link events received by the member within his/her social web network.
- There is a positive interrelation between high acceptance and confidence of the member within his/her social web network and high values in degree prestige.
- There is a positive interrelation between the level of own benefit from the new solution and high values as a "core group member".
- There is a positive interrelation between the level of personal requirements and personal dissatisfaction with the existing solution and high values as a "core group member".
- There is a positive interrelation between the level of product experience and product knowledge and the level of brokering activity.

These hypotheses were used to carry out a dynamic social network analysis. As the data set and basis of the case study, one of the leading open source software developer online forums was chosen. According to the hypotheses, the analysis aimed to select forum members with noticeable (a) position at the edge of a structural hole (b) centrality positions (c) number of weak ties (d) link events (e) prestige positions and (f) brokering activity. Furthermore, core group members of the forum were analysed. The results of this analysis showed that a number of forum users were each outstanding in one of the aforementioned network positions. Afterwards, the categories from the literature analysis as well as outstanding network members from the first part of the case study, the social network analysis, were extended and verified by a detailed structural analysis of the online forum content (posts). To guarantee reliable and generalizable results and because of its synergistic view of evidence, a mixed-method approach was chosen for this thread analysis:

- combination of discourse analysis and content analysis

- deductive-inductive research process with the aim to develop new knowledge by an interplay of inductive and deductive steps
- qualitative and iterative development and extension of the theoretical categories from the literature analysis
- deployment of categories in a quantitative discourse and content analysis of all posts and threads

First, a random sample of 300 posts was coded to develop a reliable coding scheme. In a second step, all forum posts were classified regarding the “concept of post” category. In a third step, all posts with ideas for new products or ideas for the extension of the existing product were selected and analysed in detail. In the following, the results of this discourse and content analysis will be compared with the results from the social network and the literature analyses. This comparison will also demonstrate contribution to knowledge of the present thesis. This could primarily be deduced by the number of theoretical categories, falsified, verified or newly developed by the case study.

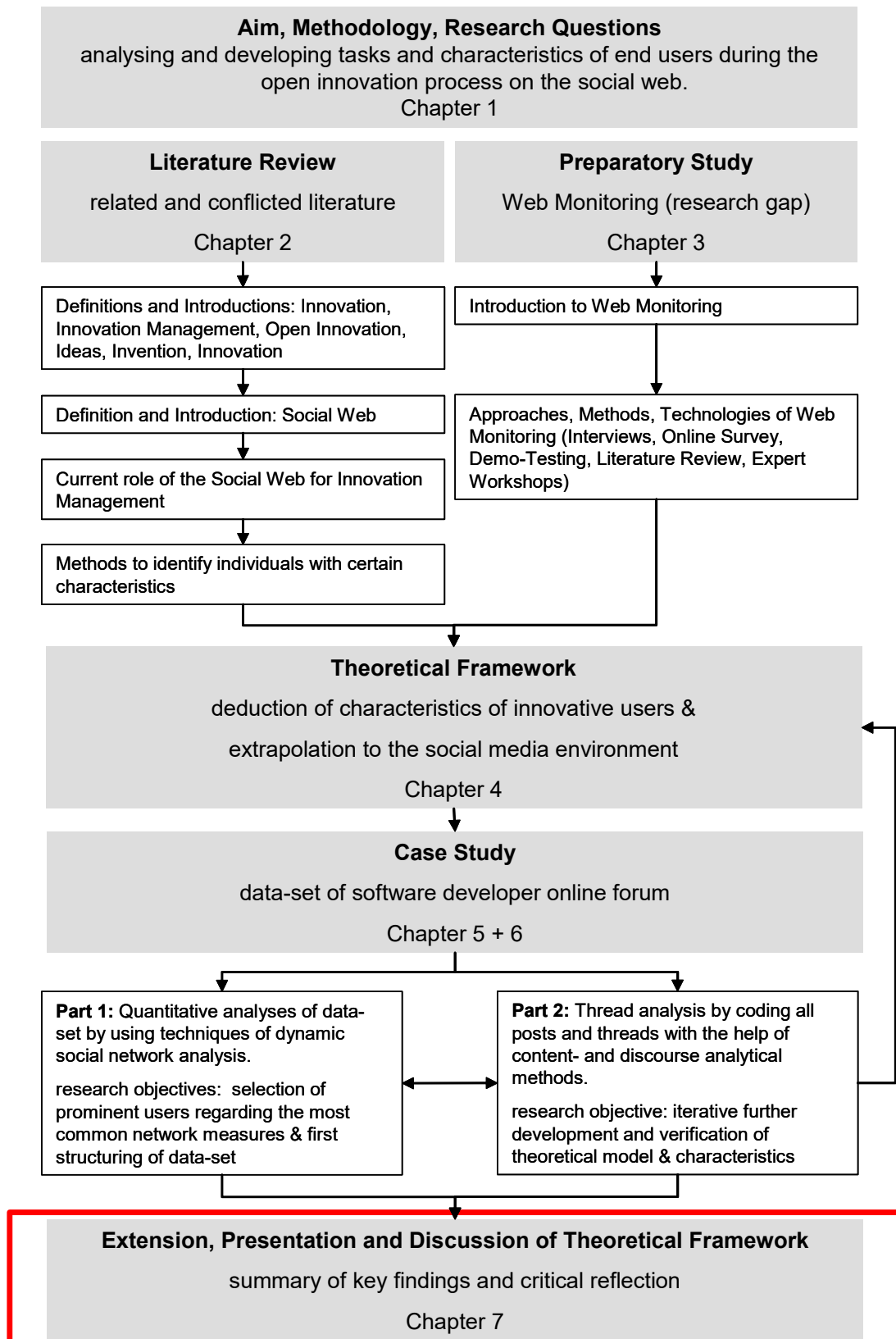


Figure 27: Thesis outline and status quo of research

7.1 Personal Requirements, Dissatisfaction and other Motivation

The case study showed that own needs regarding the existing solution are the most common motivational source to communicate ideas. Herewith, a key learning from different surveys and authors could be verified.³⁰³ They demonstrated a positive correlation between the successful development of product ideas and personal requirements as well as individual benefits of a user.³⁰⁴ The social network analysis showed that members communicating ideas from own needs are not leading in nearly all network measures. Only members with a “position at the edge of a structural hole” deduce ideas from own needs. This finding is not significant, because most of the members with ideas from own needs do not have any outstanding network position like centrality, prestige or the number of weak ties.

Moreover, the case study showed that less frequently the motivation was initiated by own needs regarding a completely new solution. The assumption that ideas which are satisfying new user needs have a high degree of novelty could not be verified by the case study.³⁰⁵ Rather, the case study showed that ideas and analogies from other areas had high degrees of novelty. The next section will discuss these findings in detail. Like aforementioned, von Hippel pointed out that lead user ideas are characterized by the aspect that the majority of users will have similar needs at a later date, too.³⁰⁶ This finding could also be supported by the case study: approximately 20 percent of the analysed ideas were ranked by other users directly in the same thread with comments like “I have the same need” or “It’s a great idea and we could imagine using this idea, too”.

In the case study, the category “own needs regarding the existing solution” was quantitatively followed by the category “dissatisfaction with the existing solution”. The case study showed that very dissatisfied individuals are motivated to develop and communicate ideas. Analogous to the findings regarding “own needs”, members deducing ideas from dissatisfaction are also not very noticeable within the social network. This could be shown by cross analysing “ideas deduced from dissatisfaction” and “members with outstanding network positions”.

³⁰³ von Hippel (1986), Soll (2006), Lüthje (2000), Franke & Shah (2003), Herstatt & von Hippel (1992), Morrison et al. (2000)

³⁰⁴ von Hippel (1978a), p. 243

³⁰⁵ von Hippel (1986), Franke & Shah (2003)

³⁰⁶ von Hippel (1986), p. 795 & 796

Lüthje found that needs of innovative users are very closely related to dissatisfaction with an existing product on the whole and dissatisfaction with the usability in particular.³⁰⁷ The level of dissatisfaction with a product is also one of von Hippel's indicators to assess the level of own benefits of users. The thread analysis of the case study supported these results: in almost every post, the category "own needs" in combination with a stimulus of "problem solving" followed on "dissatisfaction with the product" on the whole or in particular. This could inversely be supported by the result that "satisfaction with the specific product or a competing product" was not a stimulus for producing ideas. Less frequently, "dissatisfaction with other solutions" was a stimulus to communicate ideas within the online forum.

Altruistic categories like pro-social behaviour, without a direct connection to a valuable reward, empathy altruism and direct reciprocity could not be verified for the phase of giving ideas by the case study.³⁰⁸ The case study showed that instrumental and commercial motivation is not a primary stimulus for giving ideas on the social web and seven percent of the ideas could be traced back to commercial aims. These results support the findings of Franke and Shah that innovative users are, on the one hand, highly motivated to deduce ideas for products which are satisfying their needs, but, on the other hand, are primarily not driven by monetary incentives.³⁰⁹ Other explorative studies could also not detect evidence for the effectiveness of extrinsic motivational benefits, especially monetary, in innovative behaviour.³¹⁰ Thus, the primary motive to innovate within a social web forum, "own needs and benefits", does not require an external stimulus for activation. These findings contradict the traditional economic interpretations of interaction between individuals which assume rational, self-interested behaviour, affected minimally by social relations and motivated by monetary rewards as well as exclusivity rights of an idea.³¹¹ In fact, users seem to be satisfied through needs, tasks and activities themselves. A special relevance of social motives like friendship, fun, rising community status and peer reputation could not be verified by the case study.³¹² In social network analysis, these social motives were quantified by the measures "prestige" and "core group member". From this point of view, the findings from the thread analysis are supported by the results of

³⁰⁷ Lüthje (2000), Soll (2006), Singh (1990)

³⁰⁸ Belk & Coon (1993), Ozinga (1999), Haas & Deseran (1981)

³⁰⁹ Franke & Shah (2003)

³¹⁰ cf. Franke & Shah (2003), p. 18 & 19

³¹¹ Schumpeter (1934)

³¹² Harmon-Jones (2001), Hemetsberger (2001), Kollock & Smith (1999)

the social network analysis: no core group members, or members with high prestige values, could be identified by producing notable ideas within the online forum. One explanation could be the special aim of the category “developer online forum” in collaborating and finding solutions for specific problems and needs. It seems that social motives are less relevant in such technically oriented forums.

Pro-social behaviour could rather be found in analysing the motivation to help and to verify the ideas. Besides the commercial motivation of the software company itself to help, pro-social behaviour – help without direct observable advantage – was the key motivational category in the case study for members to help other community members. It could be assumed that this pro-social motivation does not include a direct, quantifiable part of social motives like the honour and prestige of other community members.

Contrary to the aforementioned findings regarding the development and communication of ideas, members motivated to help could be identified by social network analysis: company members and community moderators were highly motivated to help and show high values in the network measures “centrality”, “number of weak ties”, “prestige”, “link events received”, “references on link events received” and “brokering activity”. Furthermore, they are all core group members. For example, two community moderators show with 167 and 61 respectively helping answers - the highest number of answers in total within the network. Because helping is one of their key roles within the online forum and their motivation to help is commercially orientated, company members, in general, and community moderators, in particular, were excluded from the analysis. The case study showed that the more forum members, end users or directly from the software company, are motivated to help or to develop further ideas from other members, the higher their values in “centrality”, “number of weak ties”, “prestige” and “brokering activity”. Furthermore, all intensive helpers are core group members within the researched online forum and sent significantly more link events than they received. Though members at the edge of a structural hole are highly motivated to develop and communicate ideas, the case study showed that they are not helping to develop these ideas.

A consolidated view of all these factors indicates the following points:

- Innovative users are primarily motivated to develop and communicate ideas within online forums, because of own needs or dissatisfaction. Herewith, the findings from literature analysis could be verified.
- It could be shown that monetary incentives as well as social motives are not motivational factors to develop an initial idea. However, both motives are relevant for the motivation to help other members in the online forum.
- The users with high motivation to develop and communicate ideas could not be directly identified by the social network analysis. They are not prominent in all common network measures. Only with the help of a thread analysis, it was possible to identify users with ideas.

7.2 Early Identification of Needs and Early Adoption

The literature review assumed that innovative users experience certain needs significantly earlier than the majority of users and adopt new products and ideas earlier than other users.³¹³ Adoption behaviour could be identified in the case study, too: 20 percent of all threads with ideas entailed user posts with the same need, problem or dissatisfaction at a later time. Furthermore, it could be assumed that all ideas in the case study with positive ratings from other forum members, or the forum moderators, are the early communication of future needs. In the case of the present online forum, these positive ratings were demonstrated by posting a “feature request” to develop the idea further by the company itself or by the community or to integrate the idea into the next software release. From this point of view, the findings from the literature review regarding the adequacy of time-based concepts to measure the degree of innovativeness of a user could be verified by the case study: on the social web, suitable ideas are characterized and rated by the time of adoption by other users. However, the interrelation between a “time-based concept” and the virtual source of an idea, assumed in the literature, could not be verified by the case study.³¹⁴ In the present online forum, prominent early adopters were not the initial sources of ideas. In fact, early adopters are mostly the forum experts, competent and motivated to rate and adopt new ideas. The “leading innovators” from the theory of diffusion could only be allocated to the characteristics of the forum experts.³¹⁵ They are highly interested in novelties, have more technical knowledge about the product and are moti-

³¹³ von Hippel (1976), Craig & Ginter (1975)

³¹⁴ Rogers & Schoemarkers (1971), p. 27

³¹⁵ Goldsmith & Hofacker (1991), p. 284

vated to talk to others about the innovation and their ideas. Thus, the assumption of the literature analysis that the period between product launch and purchase is an indicator of the degree of innovativeness of a user – the “time of adoption” – could not be verified by the case study. These findings were supported by Midgley and Dowling, criticizing the strong focus on time-based aspects. They defined innovativeness as “the degree to which an individual makes innovation decisions independently of the communicated experience of others”.³¹⁶ This point of view could be supported by the findings of the case study: the social network analysis showed that members of the online forum characterized as “the initial source of idea” were more or less independent from other forum members. Users with ideas, especially radical ideas, do not take any prominent position regarding the network measures centrality, number of weak ties, link events or prestige in the online forum. Content analysis showed that these members are often coming from non-technical fields, for example, sales managers, and do not show any notable technical expert knowledge. The relevance of product experience, technical expertise and product knowledge will be discussed in the next section.

7.3 Product Experience and Product Knowledge

One finding from the literature research was the assumption that innovative users have prominent positions within their social web environment because they show higher product knowledge or expertise than the majority of the users of the network, what Duncker called “functional fixedness”.³¹⁷ The thread analysis showed that 54 percent of the analysed ideas could be directly traced back to product experience with the present product.³¹⁸ Only one percent of all ideas came from knowledge with competing products or products from other areas. At this point, the findings from Hienerth et al. could not be verified. They found that, on the one hand, users from analogous markets, particularly those reflecting higher market distances, contribute solutions that are significantly more novel than those from users from target markets. On the other hand, the level of technical distance has a negative influence on the novelty of the solution.³¹⁹ In contrast to the present case study of an open source software developer online forum, Hienerth et al. studied consumer goods. There is no

³¹⁶ Midgley & Dowling (1978), p. 235

³¹⁷ Duncker (1945), Füller et al. (2006), p. 65, Lüthje (2004), Schreier & Prügler (2006)

³¹⁸ c.f. section 6.4.2, pp. 122-124

³¹⁹ Hienerth et al. (2007)

evidence whether the industrial sector has any effect on the role of market distance or not.

However, the thread analysis showed that this product experience was mostly not linked to higher product or expert product knowledge and was deduced by the daily needs regarding the product. This was especially true for users with radical ideas. Their posts never showed higher product knowledge and their ideas were rather developed in a more naive way. They were mostly inspired by the daily use of the product or other experience, for example, as sales managers, than by in-depth technical examination of the product. At this point, the assumption from literature analysis could not be verified by the case study.

However, the case study could show that helping users, seizing these ideas and developing the ideas further indeed showed high product knowledge. Those helpers showed an in-depth knowledge regarding content and technology. As mentioned in the last chapter, they also show high values in “centrality”, “number of weak ties”, “prestige” and “brokering activity”. Furthermore, all helpers are core group members and sent significantly more link events than they received. Most of them could be characterized as expert users, mastering the technology. Thus, the innovating actors in the present case study could be divided into members with radical ideas and end user experience, not showing prominent social network values, and members without end user experience but with technical expert knowledge and prominent social network values. It could be assumed that both groups are highly relevant for the process of innovation management. Independent actors, producing initial ideas and simultaneously deducing an innovation from these ideas, could not be found in the case study.

Another finding from literature research was the assumption that users with in-depth product and technical knowledge have high community acceptance and confidence within their social web environment. The case study could specify these findings: on the one hand, core group members and users with high prestige values, both measures of the social network analysis in context with the community acceptance of a specific user, were the experts of the community. They have in-depth expert knowledge but were not the initial source of ideas. On the other hand, the users with initial ideas show no prominent network status. In isolated cases these users have a position at the edge of a structural hole, but most of these users show no special network positions and are not outstandingly accepted within the community. They could be identi-

fied rather by analysing their postings. Therefore, the assumption of the literature analysis could only be verified for experts developing further the initial idea, and not for the initial source of ideas.

Furthermore, it was assumed in the literature analysis that innovative users are qualified to translate findings from their product experience into specified requirements and ideas for new products. This product-related knowledge should be based on basic skills regarding the product category or related categories, a shared language, knowledge of the most recent scientific or technological innovations and developments in the given field as well as learning capabilities and highly pronounced problem-solving skills. Contrary to these findings, the case study showed that initial ideas do not necessarily require these skills: in some cases experience in the daily use of the product was more sufficient than other skills to produce ideas. If a user was not qualified to translate his/her experience and needs regarding a product into ideas, for example, a sales manager without technical background, a technically experienced user was involved, for example, the system administrator of the company, to post the idea into the online forum. Ernst et al. supported the findings from the case study, especially for the consumer goods sector.³²⁰ They stated that product knowledge is indeed not a necessary criterion for prosperous ideas, but it could support the individual's creativity. It confers an ability to recognize the value of new information, assimilate it, and apply it to commercial ends. Cohen and Levinthal called this ability "absorptive capacity".³²¹ Hienerth et al. supported the findings, too. They found that users with a high level of direct product experience make better contributions than do equally qualified users without such experience.³²² Brockhoff argues that a typical consumer normally has a high practical and a relatively low technical product knowledge.³²³ On the contrary, Lüthje argues that consumers with a high technical knowledge definitely exist; for example, in the context of hobbies.³²⁴ This argument is covered in the use case from Shah who discovered consumers in the field of surfing, snowboarding and mountaineering.³²⁵ However, it is arguable if technical knowledge is actually relevant to the generation of radical new product ideas. It

³²⁰ Ernst et al. (2004), p. 124-126

³²¹ Cohen & Levinthal (1990)

³²² Hienerth et al. (2007)

³²³ Brockhoff (1985), p. 626

³²⁴ Lüthje (2000), p. 39

³²⁵ Shah (2000)

could be assumed that consumers generate ideas only through product use.³²⁶ An approach from social psychology, the theory of social perception, underlines the relevance of prior related knowledge. Thus, the perception of an individual is determined by a set of hypotheses which the individual has developed through experience, i.e., former perceptions and cognitions. If the hypotheses are confirmed by use and experience, the individual will corroborate his set of hypotheses. Otherwise, the perceptual set might be modified.

Regarding the role of product experience and product knowledge during the innovation process on the social web, the following aspects could be summarized:

- The case study showed that actors involved in the innovation process on the social web are divided in two groups: on the one hand, actors producing breakthrough ideas normally do not have in-depth expert knowledge regarding the present product or a competing product. They rather have first-person product experience from their daily business, mostly not linked to expert knowledge. They deduce ideas from their daily needs regarding the product. On the other hand, actors seizing these ideas and deducing the ideas in innovations and products showed higher technical product knowledge without having experience with the daily use of the product. Both groups were highly relevant for the innovation management process. The relevance of product experience and technical product knowledge for the development of ideas is controversial and is disputed in the literature.
- In the case study, knowledge from other areas was not relevant for the production of ideas.
- On the one hand, experts enjoyed peer reputation, prestige and high community acceptance in the case study. On the other hand, the initial sources of ideas did not have any prominent network positions within the online forum.

7.4 Innovative Users and Opinion Leadership

Opinion leaders are defined as senders of information in a word-of-mouth process and are positioned to influence other individuals.³²⁷ The question if there is an interrelation between opinion leadership and innovativeness is also controversial and dis-

³²⁶ Habermeier (1990), p. 271-273

³²⁷ de Valck (2005), Andersson et al. (2007)

puted in literature.³²⁸ The case study found that there is no direct interrelation. The social network analysis showed that users with ideas do not have any prominent community status. They do not show high numbers of weak ties, are not the most central members and do not have core group member status. These social network measures all characterize opinion leaders. The case study could also identify some similarities between opinion leaders and innovative users: they influence other people and they are both early adaptors, open for new products and innovation. At this point, the assumptions from literature research could be verified. However, the thread analysis in the case study showed that opinion leaders are relevant for the diffusion of innovation: they are first adaptors of new ideas and are willing to spread these ideas within their community. In this respect, the high prestige values and the prominent community status of opinion leaders are highly beneficial for the diffusion of innovation.³²⁹

³²⁸ Robertson (1971), Gatignon & Robertson (1985), Goldsmith & Hofacker (1991)

³²⁹ Allen (1977), p. 159

7.5 Summary and Discussion of Key Findings, Extension of Framework

During the course of research, the hypotheses, deduced from literature research, had been tested by analysing one of the world's largest end-user open source software developer online forums. The hypotheses could be summarized as follows:

- The hypothetic existence of innovative geniuses.³³⁰
- Hypothetical motivations to develop and communicate ideas in social media networks based on:³³¹
 - own needs regarding the existing product
 - dissatisfaction with the existing product
 - own needs regarding a potential new product
 - dissatisfaction with another product
 - commercial aims
 - pro-social behaviour
 - direct reciprocity
- Hypothetical social network positions of innovative geniuses in social media networks:³³²
 - at the edge of a structural hole (structural bridge)
 - degree centrality
 - closeness centrality
 - betweenness centrality
 - prestige measure
 - number of weak ties
 - number of linkevents received
 - core group member

The existence of an innovative genius was deduced from literature analysis. It was assumed that this single user is essential for the complete product development process, creates initial ideas and develops these ideas further to new commercially relevant and marketable products. This hypothesis could not be validated by the present

³³⁰ c.f. section 1.3, p. 7

³³¹ c.f. section 4.1, pp. 49-52

³³² c.f. section 5.3, pp. 77-102

case study. Rather, the case study pointed out that two separated innovative groups are relevant for the open innovation process within the online forum. They were called “innovative users” and “expert users”.

The first group, innovative users, are the initial source of an idea. Their individual motivations to communicate ideas in social media networks are very different and correlate with the complete concept and focus of the specific network and the expectations involved. The detailed analysis of each post of the online forum found that nearly all ideas, communicated within the online forum, led to incremental innovations and the development of the existing solution. Ideas for radical or revolutionary innovations were missing. It could be assumed that other online environments, like crowd sourcing communities or open innovation communities, are more qualified to produce radical ideas and innovations.³³³ They are often focussed on the development of existing solutions. In fact, their concepts, as well as the usability of their interfaces, supported the development of ideas for new products and more radical innovations. These platforms need further research and analysis. However, the whole concept of the analysed online forum is strongly solution and help oriented and hardly invention oriented. In fact, it is an online forum to discuss issues and problems in context with the development and implementation of special and already existing open source software products. Based on this focus, two most common motivations to develop and communicate ideas could be identified during the analysis of the present end-user developer online forum:

- motivation based on own needs regarding the existing product
- motivation based on dissatisfaction with the existing product

The analysis showed that innovative users did not have the deepest technical product knowledge. In fact, they often came from other, non-technical areas and analogous markets. Thus, it could be concluded that diversity in knowledge, background and thematic focus is beneficial for the idea generation phase of a product development process. Furthermore, the identified innovative users did not show any prominent position regarding the social network measures centrality, prestige, number of weak ties, linkevents received, core group member and brokering activity. Innovative users

³³³ Examples for open innovation communities or mass collaboration platforms are “Jovoto” (www.jovoto.com, viewed on 2 December 2011) or “Brainrack” (www.brainrack.com, viewed on 2 December 2011)

only show a network-position at the edge of a structural hole - a strategic relevant position between two normally separated groups. This finding underlines the relevance for the product development of multidisciplinary combining knowledge from different areas.

The second group, identified during the case study, were called expert users. As well as innovative users, expert users are also essential for the process of product development. Expert users are seizing ideas from the innovative users and developing the ideas to commercial relevant and marketable product versions. They were the most prominent early adopters of the analysed online forum, competent and motivated to rate and adopt new ideas. Expert users are highly interested in novelties and have more technical product knowledge and experience than other network members. Furthermore, they show high degrees in nearly all social network measures:

- most central positions in their network
- highest prestige measures
- highest number of weak ties
- highest community acceptance and confidence
- highest level of product experience
- highest level of link events received
- all expert users are core group members

To visualize the extension from the single “innovative genius” to a combination of “innovative users and expert users” and to point out their specific relevance for the process of product development, the innovation life cycle model of figure 3 has been expanded in figure 28. This model could be generalized for all social media environments which are focussed on incremental innovations. Further research has to analyse social media environments for more radical and revolutionary ideas and innovations.

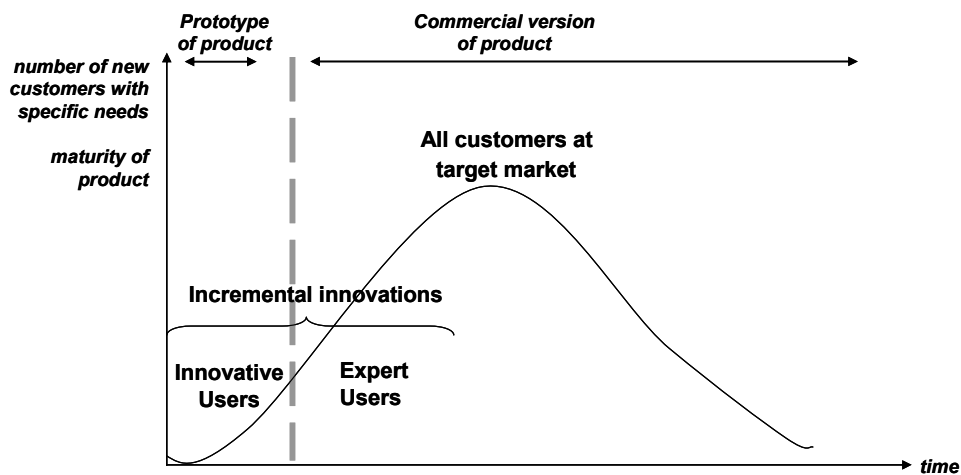


Figure 28: Expansion of innovation life cycle model for incremental innovations³³⁴

To generalize the case study results and to guarantee comparability, some factors were predefined and divided into the categories of cultural context, company context and market context.

From the cultural point of view, the results from the case study could be generalized for the following social media environments:

- Aim and concept of the social media environment is to solve problems and to support other members by answering questions and executing change requests.
- To guarantee valid and comparable results, the structure of the social media environment is a large and open social network with many weak ties between the members, some hubs and structural bridges, many interactions, intensive discussions and communication threads and a culture to help other forum members.
- The findings from the present case study could be generalised for nearly all countries and cultures because of the international character of the internet, in general, and the analysed online forum, in particular, without any national boundaries and with a strong focus on the forum's issues.

From the company's point of view, the following factors should be chosen to guarantee comparability and generalisation of further case studies:

³³⁴ Source: own investigation and key findings from the case study

- Willingness of each company to interact with end users during the initial phases of the product development process and to integrate their ideas into products. This willingness often implies changes in the traditional product development process of the company.
- Interest of the company to discuss and exchange information and ideas regarding the development of existing products or new product development with customers.
- Online channels, especially social media applications like online forums and social networks, are a common practice to communicate with end users.

Looking at the market context, industries and products with short innovation cycles should be chosen for further research. Here, valid research results are guaranteed within an adequate period of time and the future case studies are comparable with the analysis of the present thesis. Principally, the results are generalisable for all digital and non-digital industries where the aforementioned factors are met. The thesis presented and validated a new and original mixed method approach to analyse individuals in social media networks in an efficient and reliable way. Finally, it could be summarized that, based on the present findings, the theory of innovation management and open innovation on the internet and the theory of the initial phase of idea generation in product development could be extended.

7.6 Areas Requiring Further Research

The present thesis validated and extended tasks and characteristics of innovative users on the social web by a longitudinal case study. The case was taken from the open source software industry because it was assumed that:

- social web applications are in common use in this industry
- end users are naturally integrated into the innovation process of the industries' companies
- the interaction of the companies within social web communities is disproportionately strong
- short innovation cycles of the industry provide valid research results within an adequate period of time

To get reliable results, a relatively large and open social network was chosen with many weak ties, some structural bridges, and many social interactions and social connections. To enhance the present theory, longitudinal case studies from other industries will be advisable using the same mixed-theory approach as the present case study. In the last section, it was demonstrated and discussed that the findings of the present use case could be generalized for all social media environments which are focussed on incremental and solution oriented ideas and innovations. The analysed open source developer online forum was used to discuss problems and solutions regarding the development and implementation of an already existing open source software product. Further research is needed to use the same mixed method approach for the analysis of social media environments where more radical and revolutionary ideas and innovations could be assumed, for example, crowd sourcing communities or open innovation communities.³³⁵ In analysing such online applications, it should be considered that, regarding data protection rights, community rights, netiquette and ethics, it is easier to analyse online forums than social communities like Facebook, GooglePlus or LinkedIn, because providers of online forums often use user permis-

³³⁵ Examples for open innovation communities or mass collaboration platforms are “Jovoto” (www.jovoto.com, viewed on 2 December 2011) or “Brainrack” (www.brainrack.com, viewed on 2 December 2011)

sions.³³⁶ To recognize special patterns in product development with social media applications, all results have to be matched with the results of the present thesis. Regarding the generation of ideas in analogous markets, the present case study cannot deliver any new knowledge; this requires further research. This could be traced back to special characteristics of the open source software industry and the special concept and focus of the analysed online forum. Furthermore, the development of the online market has to be monitored and analysed permanently to carefully validate trends and changes and to redefine the present approach and scope for further research.

³³⁶ www.facebook.com, www.linkedin.com, www.google.com viewed on 7 December 2011

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9. Appendices

Appendix A: Questionnaire of Survey “Web Monitoring”

1. Since when do your company offer Web Monitoring services?
2. How many employers do you currently involve full-time with Web Monitoring?
3. How much transaction volume did you achieve with Web Monitoring in 2008?
4. In which countries do you distribute your Web Monitoring solution?
 - a. Germany
 - b. Austria, Switzerland
 - c. South-West Europe
 - d. Eastern Europe
 - e. North Europe
 - f. Russia
 - g. Asia
 - h. North America
 - i. South America
 - j. Africa
 - k. I do not know
 - l. n.a.
5. The market for Web Monitoring services is very heterogeneously regarding the origin of its players. What is primarily the origin of your company?
 - a. IT Company
 - b. Consultancy
 - c. Market Research
 - d. Advertising Agency
 - e. Other / Which?

6. Are you specialized in one of the following areas?
 - a. Data collection
 - b. Data preparation
 - c. Data analysis
 - d. Interpretation of results
 - e. Consultancy and recommended processes
 - f. Implementation

7. How many languages are you able to monitor?

8. Which languages are primarily requested by your customers?
 - a. German
 - b. English
 - c. Spanish
 - d. French
 - e. Italian
 - f. Turkish
 - g. Russian
 - h. Chinese
 - i. Other / Which?

9. How do you act during the data collection?
 - a. Source based (focussing predefined sources)
 - b. Source independent (searching the whole internet for relevant sources)
 - c. Other / Which?
 - d. I do not know
 - e. no answer

10. There are different approaches during the data collection. How do act concretely to identify and collect relevant contributions within the internet?
 - a. Internal technical solution
 - b. Commercial solutions and technologies of other providers

- c. Open market tools (for example Google search, Technoratie or other web and blog search engines)
- d. Raw data provided by co-operation partner.
- e. Other / Which?
- f. I do not know
- g. no answer

11. Please give the name of your co-operation partner.

12. Which technologies do you use for data collection?

- a. Special Spider- und Crawler-technologies, developed for web monitoring
- b. Feed services (for example Atom, RSS, ...)
- c. Gateway (API) to existing search engines and social bookmarking services
- d. Other / Which?
- e. I do not know
- f. no answer

13. Generally, there are two different ways of data collection: screening and monitoring. Screening means to search the complete web for relevant contributions. Monitoring focuses on previously defined sources.

- a. Screening
- b. Monitoring
- c. Other / Which?
- d. I do not know
- e. no answer

14. How often do you normally screen and monitor the web during one mandate (language and theme)?

- a. Frequency of screening
- b. Frequency of monitoring

15. Which types of content could you integrate into your Web Monitoring?

- a. Textual contributions
- b. Audio contributions
- c. Patent data sets
- d. Pricing data sets
- e. Blogs
- f. Forums
- g. Newsgroups
- h. Comments within classical online-media
- i. Audio contributions in social media
- j. Video contributions in social media
- k. Micro Blogs (for example Twitter)
- l. Communities
- m. Portales with User Generated Content
- n. Wikipedia
- o. Other Wikis / Which?
- p. Social Bookmarking Services
- q. Other / Which?
- r. I do not know
- s. no answer

16. Which methods do you use to prepare the collected data?

17. How do you prepare the data?

- a. Clearing from spam contributions
- b. Clearing from doublets
- c. Clearing from irrelevant documents
- d. Extraction of relevant information from the documents (for instance, the creation date, authors, headlines, textual content, textual types, comments on contributions).
- e. Pre-processing of text analysis (fragmentation of texts into sentences and words, adjustment from stop words)
- f. Other / Which?
- g. I do not know
- h. no answer

18. Do you offer a function for archiving?
- Yes
 - No
19. How do you offer the function for archiving?
- Based on databases – only URL of documents
 - Based on databases – all metadata of documents
 - Text based
 - Other / Which?
 - I do not know
 - no answer
20. How often do you use the following methods of analysis for projects of Web Monitoring?
- Automated quantitative analysis
 - Manual quantitative analysis
 - Automated qualitative analysis
 - Manual qualitative analysis
21. Which specific analysis do you use to monitor opinions and discussions within the social web in context with brands, products, solutions or issues?
- Author-analysis: Identification of certain typologies within the internet and revelation of their linking, for example, opinion leader, power poster, info spreader, innovative user.
 - Profiling-analysis: Profiling of certain target subjects or audiences within the internet. In practice these forms of analysis are especially used for the identification of innovative users within the management of innovation and for the profiling of opinion leaders within the internet.
 - Buzz-analysis: Analysis of the relative share of a theme within the full-scale communication.
 - Relevance-analysis: Determination of the relevance of certain sources.
 - Tonality-analysis: Analysis of the distribution of negative, positive and neutral sentiments.

- f. Trend-analysis: Identification of social dynamics and themes within the internet.
- g. Search-item-analysis: Analysis of the internet with the help of predefined key words.
- h. Issues-analysis: Analysis of positions and requirements regarding a special theme. Issues analyses often present how quite different positions and arguments have found their way into the media.
- i. Source-analysis: Identification of relevant sources for a special theme within the internet and presenting of a source network.
- j. Product analysis: Search for innovations and special strength and weaknesses of a product.
- k. Others / Which?

22. Do you use other methods of analyses? Which other methods do you use and do you process them automatically or manually?

23. Which methods do you use for analysis?

- a. Descriptive quantitative analysis (statistical approaches)
- b. Social-Network-Analysis
- c. Combined theme-source-networks
- d. Personal-networks
- e. Theme-networks
- f. Source-networks
- g. Quantitative content analysis
- h. Qualitative content analysis
- i. Semantically methods
- j. Syntactical methods
- k. Text-mining methods
- l. Data-mining methods
- m. Web-mining methods
- n. Corpus based methods
- o. Ethnographical methods
- p. Other / Which?

24. How do you process the text analysis of the collected contributions?
- a. Use of a special software for text analysis
 - b. Use of a special software for text analysis of other providers (for example SPSS)
 - c. No use of any software for text analysis
 - d. I do not know
 - e. no answer
25. Which software do you use for text analysis?
26. Which metrics do you use to evaluate the relevance of identified contributions and sources?
- a. Page Impressions (source)
 - b. Page Impressions (contribution)
 - c. Unique User (source)
 - d. Unique User (contribution)
 - e. Visits (source)
 - f. Visits (contribution)
 - g. Number of comments & replies (source)
 - h. Number of comments & replies (contribution)
 - i. External links & reputation (source)
 - j. External links & reputation (contribution)
 - k. Search engine ranking (source)
 - l. Search engine ranking (contribution)
 - m. Own metrics (source)
 - n. Own metrics (contribution)
 - o. Other KPI (source)
 - p. Other KPI (contribution)
 - q. I do not know (source)
 - r. I do not know (contribution)
 - s. no answer(source)
 - t. no answer (contribution)

27. Do you use other metrics to evaluate the relevance of own sources and contributions?
- a. Other metrics
 - b. Own metrics
28. Often, it has to be asked how to evaluate the buzz of a theme, brand, product or company could be evaluated. How do you answer this question?
- a. Comparison with internal benchmark data set
 - b. Comparison with external benchmark data set
 - c. We do not take up this evaluation
 - d. Other evaluations
 - e. I do not know
 - f. no answer
29. How do you present the results to you customers?
- a. E-Mail
 - b. Other text documents (for example Word document)
 - c. Spreadsheet
 - d. presentation (for example PowerPoint)
 - e. Workshop
 - f. Cockpit, Dashboard or other customized platform
 - g. Social Software Application (Wiki, Blog, etc.)
 - h. Other / Which?
 - i. I do not know
 - j. no answer
30. In which percentage do you deliver quantitative results (for example frequency distribution of positive and negative contributions; verified by data) and qualitative insights (for example analysis of sentiments and discussions)?
31. Do you offer the raw data to your customers?
32. Do you offer the presentation of results within a cockpit, dashboard or other customized platform?

33. Where do you already have integrated your Web Monitoring application and where are you planning to integrate you application?

- a. Marketing (already integrated)
- b. Marketing (in planning stage)
- c. Public Relations / Corporate Communications (already integrated)
- d. Public Relations / Corporate Communications (in planning stage)
- e. Product Management (already integrated)
- f. Product Management (in planning stage)
- g. Human Resource Management (already integrated)
- h. Human Resource Management (in planning stage)
- i. Innovation and Trend Management (already integrated)
- j. Innovation and Trend Management (in planning stage)
- k. Customer Relationship Management (already integrated)
- l. Customer Relationship Management (in planning stage)
- m. Issues Management (already integrated)
- n. Issues Management (in planning stage)
- o. Market Research (already integrated)
- p. Market Research (in planning stage)
- q. Advertising Agencies (already integrated)
- r. Advertising Agencies (in planning stage)
- s. Others (already integrated)
- t. Others (in planning stage)
- u. I do not know (already integrated)
- v. I do not know (in planning stage)
- w. No answer (already integrated)
- x. No answer (in planning stage)
- y. Other areas

34. Do your Web Monitoring application offers multi-client-functionality?

35. Which results could be shown by the customers?

- a. Issues analysis
- b. Source analysis
- c. Author analysis

- d. Profiling analysis
- e. Relevance analysis
- f. Buzz analysis
- g. Tonality analysis
- h. Trend analysis
- i. Search word analysis
- j. Other / Which?
- k. I do not know
- l. no answer

36. Which methods could be used by the customer itself to process own analysis?

- a. Real-time internet-query
- b. Descriptive quantitative methods
- c. Methods of SNA
- d. Semantical methods (f.e. theme networks)
- e. Corpus based methods
- f. Personal networks
- g. Syntactical methods
- h. Methods of Text Mining
- i. Methods of Data Mining
- j. Other
- k. I do not know
- l. no answer

37. Do you offer individual settings regarding the presentation of special user respectively user groups?

38. Do you offer the opportunity of uploading and analysing other internal sources (for example unstructured and structured data from Word documents or e-mails)?

39. Which features do you offer regarding the information search within the stored web contributions?

- a. Tagging by user

- b. Automated tagging
 - c. Tagclouds
 - d. Social Bookmarking
 - e. Full-text search
 - f. Flexible filtering
 - g. Other
 - h. I do not know
 - i. no answer
40. Do you offer an alert function, informing your customers about relevant issues and events?
41. How do you send these alerts to your customers?
- a. E-Mail
 - b. RSS-Feed
 - c. SMS
 - d. Within the Web Monitoring Application
 - e. Other
 - f. I do not know
 - g. no answer
42. In which cases do you use the alert function?
- a. Information regarding new relevant contributions
 - b. Changes regarding the quantity of relevant contributions
 - c. Identification of issues and trends
 - d. Information regarding new members within threads
 - e. Other
 - f. I do not know
 - g. no answer
43. Do you offer a demo-access for your Web Monitoring Application?
44. In which areas do you make use of you Web Monitoring service?
- a. Market Research
 - b. Marketing
 - c. Public Relations / Corporate Communications
 - d. Product Manager
 - e. Service Provider for Advertising Agencies
 - f. Human Resource Management

- g. Innovations- and Trend Management
- h. Customer Relationship Management
- i. Issues Management
- j. Other
- k. I do not know
- l. no answer

45. In which industries do you already process Web Monitoring?

- a. Banking Industry
- b. Consumer Electronics Industry
- c. Automotive Industry
- d. B-2-B Industry
- e. Energy Industry
- f. Food / Cosmetics Industry
- g. Fashion Industry
- h. Information Technology
- i. Telecommunication Industry
- j. Consultancy
- k. Media Industry
- l. Sports
- m. Pharma Industry
- n. Touristic Industry
- o. Service Industry
- p. Education / Science
- q. Building Industry
- r. Public Authorities / Associations
- s. Other
- t. I do not know
- u. no answer

46. Did you already take out a patent for a Web Monitoring technology?

47. Area for open feedback.

Appendix B: Extracts from user-posts from the case study

Example 1 (Thread 73): process: “ideas for extension of existing product & solution” (161 threads within 1,379 data-set) / “own needs & benefits regarding existing solution” / presentation of finished developed product / ideas for the extension of this product

Link Text	Concept of post (Von Hippel, Rogers, Shoemarkers)	Discourse Move (Condon, 1996)	Discourse Response & Other Discourses (Condon, 1996)	Motivation to post new products / development of existing products only (Von Hippel, Pareto, Schroeder et al., Batson)
<i>“Add a java calendar that allows users to select a date where ever a date choice is required”</i>	ideas for extension of existing product & solution	Suggests Action	No other function / response	own needs/benefits regarding existing solution
<i>“This is definitely a need. We hope to be able to do this soon.”</i>	general information / news / thanking s.o.	Requests Action	Complies with suggest, request, validation	commercial aims / direct company aims
<i>“Might I recommend [url]http://sourceforge.net/projects/jscalendar/[url] as a simple drop-in calendar widget? Works on all platforms and is simple to use.”</i>	Presentation of finished/developed product, solution, bug fixing	Requests Validation	Complies with suggest, request, validation	Pro-social behaviour (information, help without direct advantage)
<i>“Besides the popup calendar to select the date, would be great a calendar at the home or dashboard modules showing the tasks in a month or week view.”</i>	ideas for extension of existing product & solution	Suggests Action	No other function / response	own needs/benefits regarding existing solution

Example 2 (Thread 76): process: “ideas for new products & solutions” (22 threads within 1,379 data-set) / “own needs/benefits regarding new solution” / “posting of feature request” / presentation of finished products & bug fixing / further development of this product / “editing feature request”

Link Text	Concept of post (Von Hippel, Rogers, Shoemarkers)	Discourse Move (Condon, 1996)	Discourse Response & Other Discourses (Condon, 1996)	Motivation to post new products / development of existing products only (Von Hippel, Pareto, Schroeder et al., Batson)
<i>“might to add document management”</i>	ideas for new products & solutions	Suggests Action	No other function / response	own needs/benefits regarding new solution
<i>“Hello wawu, Ive created a feature request on your behalf. It can be viewed here: http://sourceforge.net/tracker/...”</i>	help giving / follow-up inquiry / feature request	Requests Validation	Complies with suggest, request, validation	pro-social behaviour (information, help without direct advantage)
<i>Can you expand on what you are looking for? I have a module that I will be finishing this week that allows users to upload documents, MP3s, PDFs, web addresses whatever. I am thinking about making it so that you can relate these 'documents' to an account/opportunity or whatever.</i>	Presentation of finished/developed product, solution, bug fixing	Requests Validation	Complies with suggest, request, validation	pro-social behaviour (information, help without direct advantage)
<i>This would be an essential feature for our sales group - the ability to save/upload and recall documents (and external web links) from a web-based repository like this - e.g. PDF's of sales brochures, white papers, etc. Would you consider an enhancement to permit version-control and peer-review for these documents? (see PHPCol-</i>	ideas for extension of existing product & solution	Requests Validation	Complies with suggest, request, validation	own needs/benefits regarding existing solution

<p><i>lab application - they have a simple but workable document upload facility).</i></p> <p><i>This would be useful (and some new ideas) in two areas:</i></p> <p><i>1 - The ability to append any number of documents (or external web links) to any of the levels in the application - Accounts, Contacts, Opportunities, Cases, Notes, Calls, Meetings and Tasks (maybe not so much for emails, except as a repository for an attachment to go with an email, so maybe it is useful at the email level after all)</i></p> <p><i>2 - Ability to store/version-control and retrieve documents which are "general purpose", like a directory of brochures, white papers, articles which can be searched and indexed by such things as Product Line, Market Segment, Customer Size, the list could go on and I'm sure other readers could provide more ideas. This could be a really useful way to control where sales assist-staff could retrieve the "right" version of a given document to send to a potential customer.</i></p> <p><i>To build on that idea, if the product could be enhanced to permit staff to draft and then send emails (or cut-and-paste the pertinent parts of received emails into the email repository to track email conversations with customers) and keep-</i></p>				
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<p><i>ing a log of each email sent and to whom, then it could be fairly easy to determine which customers have been sent which documents.</i></p> <p><i>Food for thought - looks like this crackerjack application is just going to get better and better. Well done!</i></p> <p><i>Hal</i></p>				
<p><i>“Hello halhagen, Ive posted an addition to the original feature request, adding your comments. Thank you!”</i></p>	<p>help giving / follow-up inquiry / feature request</p>	<p>Requests Validation</p>	<p>Complies with suggest, request, validation</p>	<p>pro-social behaviour (information, help without direct advantage)</p>

Example 3 (Thread 282): process: “ideas for new products & solutions” (22 threads within 1,379 data-set) / “own needs & benefits regarding existing solution” / adoption of new ideas and solutions

Link Text	Concept of post (Von Hippel, Rogers, Shoemarkers)	Discourse Move (Condon, 1996)	Discourse Response & Other Discourses (Condon, 1996)	Motivation to post new products / development of existing products only (Von Hippel, Pareto, Schroeder et al., Batson)
<i>Is there a plan of putting in Multi Org model in the application? I am a CRM consultant and would like to evaluate its use for ASP model. Thanks Rasesh</i>	ideas for new products & solutions	Suggests Action	No other function / response	own needs/benefits regarding new solution
<p><i>If you are talking about linking accounts to accounts, this feature already exists in</i></p> <p><i>If you are talking about multi-level sales organizations including territory mgmt, we agree that this is an important feature. We are targeting our November release for delivering it.</i></p> <p><i>If there is anybody in the development community who would like to tackle this feature sooner, we would be interested in collaborating on it.</i></p> <p><i>Regards, Clint</i></p>	help giving / follow-up inquiry / feature request	Requests Validation	Complies with suggest, request, validation	commercial aims / direct company aims
<i>hi clint,</i>	help giving / follow-up inquiry /	Requests Validation	Complies with suggest, re-	pro-social behaviour (infor-

<p><i>We are hacking the system to be able to handle multi-level users.</i></p> <p><i>We will be happy to help you with that 😊</i></p> <p><i>Hadas.</i></p>	feature request		quest, validation	mation, help without direct advantage)
<p><i>Hello ...</i> <i>CRM Dev Team</i></p> <p><i>I have been reviewing the product, but now that you here are mentioning the multilevel user feature. I would like to ask you something regarding this issue</i></p> <p><i>I got the normal Admin user, but I create an user called Peter, and Peter being a normal user can delete what the Admin user does, is that correct?</i></p> <p><i>On the other hand, I am not an CRM expert, but I think that you already thought on different layers of rights? I mean who can do what and where, according to a type of users and which group that user may belong. I think I made myself understand when asking this?</i></p> <p><i>Because, if a "normal user" or "sales team manager" creates a "client" there should be some data that should not be able for certain users to be able to delete it, Am I right on that?</i> <i>I do really look forward to hear comments regarding this issue</i></p> <p><i>Regards</i></p> <p><i>fachtopia 🌐</i></p>	adoption of new idea or solution	Requests Validation	Complies with suggest, request, validation	own needs/benefits regarding existing solution

<p><i>The potential here is great. However most sales organization will not take this seriously until you have multi-level access controls. It's one thing to allow all users to view all accounts, info, etc but without the ability for a sales manager to set account controls/rules on a group or sales person level it is not useful in any but the smallest company. I have come up with a few ways to incorporate this functionality but without knowing your plans for it I don't think it is wise for me to hack this in.</i></p> <p><i>Any insight into your plans for access controls? BTW I love the framework!</i></p>	<p>adoption of new idea or solution</p>	<p>Suggests Action</p>	<p>Complies with suggest, request, validation</p>	<p>own needs/benefits regarding existing solution</p>
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Example 4: (Thread 258) process: “help seeking, problem formulation and bug addressing” (373 threads within 1,379 data-set) / “own needs & benefits regarding existing solution” (188 threads within 1,379 data-set) / solution motivated by “commercial aims”

Link Text	Concept of post (Von Hippel, Rogers, Shoemarkers)	Discourse Move (Condon, 1996)	Discourse Response & Other Discourses (Condon, 1996)	Motivation to post new products / development of existing products only (Von Hippel, Pareto, Schroeder et al., Batson)
<i>Is it possible to set up recurring meetings? I have looked for documentation to no avail. thanks.</i>	help seeking / problem formulation / bug addressing	Suggests Action	No other function / response	own needs/benefits regarding existing solution
<i>Or recurring Tasks, Calls, ... All events can be impacted!</i>	help seeking / problem formulation / bug addressing	Requests Validation	Complies with suggest, request, validation	own needs/benefits regarding existing solution
<i>Currently it is not possible to do this. We will put it on the list of things to build. Thanks, Jacob</i>	general information / news / thanking s.o.	Requests Validation	Complies with suggest, request, validation	commercial aims / direct company aims

Example 5: process: “help seeking, problem formulation and **bug addressing**” (373 threads within 1,379 data-set) / “dissatisfaction with existing solution” (42 threads within 1,379 data-set) / feature request

Link Text	Concept of post (Von Hippel, Rogers, Shoemarkers)	Discourse Move (Condon, 1996)	Discourse Response & Other Discourses (Condon, 1996)	Motivation to post new products / development of existing products only (Von Hippel, Pareto, Schroeder et al., Batson)
<p><i>There has a bug in Account Details View.</i></p> <p><i>After you select "Accounts" tab, in the detail list view there has a table call "Cases" and have two button [New] & [Select], when you click on the [Select] button, a new window pop-up for you to select which case, but when you click on the selected case a 404 error wil display</i></p>	<p>help seeking / problem formulation / bug addressing</p>	<p>Suggests Action</p>	<p>No other function / response</p>	<p>dissatisfaction with existing solution</p>
<p><i>I have reproduced this issue. Thanks for reporting it. It should hopefully be fixed shortly.</i></p> <p><i>Jacob</i></p> <p><i>Post edited by: jacob, at: 2004/07/23 06:44</i></p>	<p>help giving / follow-up inquiry / feature request</p>	<p>Requests Validation</p>	<p>Complies with suggest, request, validation</p>	<p>commercial aims / direct company aims</p>

Example 6: process: “help seeking, problem formulation and **bug addressing**” (373 threads within 1,379 data-set) / “own needs & benefits regarding existing solution” (188 threads within 1,379 data-set) / direct bug-fixing by user / integration and reporting by company

Link Text	Concept of post (Von Hippel, Rogers, Shoemarkers)	Discourse Move (Condon, 1996)	Discourse Response & Other Discourses (Condon, 1996)	Motivation to post new products / development of existing products only (Von Hippel, Pareto, Schroeder et al., Batson)
<p>When in [Notes], [Calls], [Emails] tabs, there is a table field call "Related to", it suppost jump into details when click on it , but now give a blank screen. Seem it have-n't passing the "module" pram. I have do some modification and it work fine now.</p> <p>1 Edit [SurgarCRM Directory]\modules\Notes\ListView.php</p> <p>Find : ====</p> <pre>[code:1]\$oddRow = true; foreach(\$noteList as \$note) {[/code:1]</pre> <p>Add: ====</p> <pre>[code:1]if (\$note-&gt;parent_type=="Opportunity"«») { \$DT_Parent_Module = "Opportunities"; } else { \$DT_Parent_Module = \$note-&gt;parent_type."s"; }[/code:1]</pre>	<p>help seeking / problem formulation / bug addressing</p>	<p>Suggests Action</p>	<p>No other function / response</p>	<p>dissatisfaction with existing solution</p>

<pre> Find : ===== [code:1]'CONTACT_ID' => \$note- &contact_id,[/code:1] Add : ===== [code:1]'PARENT_MODULE' => \$DT_Parent_Module,[/code:1] 2 Edit [SurgarCRM Direc- tory]\modules\Calls\ListView.php Find : ===== [code:1]\$oddRow = true; foreach(\$callList as \$call) {[/code:1] Add: ===== [code:1]if (\$call-&parent_type=="Opportunity"«») { \$DT_Parent_Module = "Opportunities"; } else { \$DT_Parent_Module = \$call-&parent_type."s"; }[/code:1] Find : ===== [code:1]'CONTACT_ID' => \$call- &contact_id,[/code:1] Add : ===== [code:1]'PARENT_MODULE' => </pre>				
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<pre> \$DT_Parent_Module,[/code:1] 3 Edit [SurgarCRM Directory]\modules\Emails\ListView.php Find : ==== [code:1]\$oddRow = true; foreach(\$emailList as \$email) {[/code:1] Add: ===== </pre>				
<p>Thank you for fixing this issue and giving us the fix.</p> <p>It is appreciated.</p> <p>We will look into fixing it soon.</p> <p>Jacob</p>	<p>general information / news / thanking s.o.</p>	<p>Requests Validation</p>	<p>Complies with suggest, request, validation</p>	<p>commercial aims / direct company aims</p>
<p>I created a new parameter to enable making module names plural in index.php.</p> <p>Then I added the parameter to the URLs in question.</p> <p>Thanks for the suggestion. This bug should be fixed in the next release.</p>	<p>general information / news / thanking s.o.</p>	<p>Requests Validation</p>	<p>Complies with suggest, request, validation</p>	<p>commercial aims / direct company aims</p>

Example 6: process: “ideas for the extension of existing product” / “own needs & benefits regarding existing solution” (188 threads within 1,379 data-set) / **knowledge & ideas from other areas, solutions, products** / adoption by company

Link Text	Concept of post (Von Hippel, Rogers, Shoemarkers)	Discourse Move (Condon, 1996)	Discourse Response & Other Discourses (Condon, 1996)	Motivation to post new products / development of existing products only (Von Hippel, Pareto, Schroeder et al., Batson)
<i>do you plan the synchronisation of databases e.g. the central MySQL database in the intranet and the databases of travelling sales people who are not linked to the intranet database ?</i>	ideas for extension of existing product & solution	Suggests Action	No other function / response	own needs/benefits regarding existing solution
<i>mhaberl, This is not currently a feature we support. Ive added this as a feature request on SourceForge which you can track here: [url]http://sourceforge.net/tracker/index.php?func=detail&a</i>	help giving / follow-up inquiry / feature request	Requests Action	Complies with suggest, request, validation	commercial aims / direct company aims
<i>after some research I found a tool called MySync (http://www.mysync.de/index_en.html). I havent tried it, cause I am more into sales then in technical issues. Is it worth a try? Post edited by: mhab</i>	knowledge & ideas from other areas, solutions, products	Requests Validation	Complies with suggest, request, validation	pro-social behaviour (information, help without direct advantage)
<i>mhaberl, Ill forward that URL to the engineering team. Thank you!</i>	general information / news / thanking s.o	Requests Validation	Complies with suggest, request, validation	commercial aims / direct company aims

Appendix C: Example-Coding-Sheet with sub-categories from the case study

	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
5														
6	ModelID	Alias	LinkID	ParentLinkID	MsgDate	Claim / Subject	LinkText	Concept of post (Von Hippel, Requests, Shoemarkers)	Evaluation of post by other users (positive, negative, neutral, no evaluation)	Discourse Move (London, 1996)	Discourse Responses Other Discourses (London, 1996)	Motivation to post new products / development of existing products only (Von Hippel, Pareto, Spence et al., Batson)	Evaluating parent post (positive, negative, neutral, evaluation)	New thread / Position of post / Join thread
7	63		3	3	2004-07-04 08:32:00	User Interface Design	Question - what are the most important usability features sales reps want in a user interface? :mad:	1.7 moderation / general questions	1	1.3 Requests Validation	3.6 No other function / response	1.3 commercial aims / direct company aims	none	1
8	63		4	4	2004-07-04 10:02:00	General developer help.	Feel our product is not as good as the competition. Please suggest improvements.	1.7 moderation / general questions	1	1.4 Requests Information	3.6 No other function / response	1.7 direct-reciprocity (pseudo-altruism, reciprocal-altruism)	none	1
9	63		5	5	2004-07-04 10:12:11	Installation support questions?	Please help me with the installation.	1.7 moderation / general questions	-1	1.2 Requests Action	3.6 No other function / response	1.3 commercial aims / direct company aims	none	1
10	63		6	6	2004-07-04 10:17:11	Feature Requests?	Please include the following features in the next version:	1.2 help giving / follow-up inquiry / feature request	1	1.2 Requests Action	3.6 No other function / response	1.7 direct-reciprocity (pseudo-altruism, reciprocal-altruism)	none	1
11	66		8	3	2004-07-04 11:24:20	Fast. Over the last few years, it has become easier to click on a button. I would like to see a button that is more like a button on a computer screen.	1.6 ideas for extension of existing product & solution	none	1.1 Suggests Action	2.4 Complies with suggest, request, validation	1.4 own needs/benefits regarding existing solution	none	0	2
12	63		9	9	2004-07-05 06:05:00	Easy to click on a button.	It would be nice to have a button that is more like a button on a computer screen.	1.10 Presentation of finished/developed product, solution, bug fixing	1	1.4 Requests Information	3.4 Personal Information	1.3 commercial aims / direct company aims	none	1
13	108		10	3	2004-07-05 06:26:00	Fast. Over the last few years, it has become easier to click on a button. I would like to see a button that is more like a button on a computer screen.	1.6 ideas for extension of existing product & solution	1	1.1 Suggests Action	2.4 Complies with suggest, request, validation	1.4 own needs/benefits regarding existing solution	none	1	3
14	108		11	9	2004-07-05 06:33:00	Fast. Over the last few years, it has become easier to click on a button. I would like to see a button that is more like a button on a computer screen.	1.1 help seeking / problem formulation / bug addressing	0	1.4 Requests Information	3.3 Orients Suggestion	1.1 satisfaction with existing solution / parent answer within thread	none	1	2
15	268		12	12	2004-07-05 10:51:50	Fast. Over the last few years, it has become easier to click on a button. I would like to see a button that is more like a button on a computer screen.	1.4 general information / news / thanking s.o.	1	1.6 No Move	2.1 Agree Response	1.1 satisfaction with existing solution / parent answer within thread	none	1	1
16	268		13	9	2004-07-05 10:56:50	Fast. Over the last few years, it has become easier to click on a button. I would like to see a button that is more like a button on a computer screen.	1.4 general information / news / thanking s.o.	none	1.3 Requests Validation	2.3 Acknowledges only	1.1 satisfaction with existing solution / parent answer within thread	none	0	3
17	269		14	4	2004-07-05 11:49:40	Fast. Over the last few years, it has become easier to click on a button. I would like to see a button that is more like a button on a computer screen.	1.1 help seeking / problem formulation / bug addressing	0	1.4 Requests Information	3.3 Orients Suggestion	1.4 own needs/benefits regarding existing solution	none	1	2
18	236		15	9	2004-07-05 19:27:20	Fast. Over the last few years, it has become easier to click on a button. I would like to see a button that is more like a button on a computer screen.	1.4 general information / news / thanking s.o.	none	1.3 Requests Validation	2.3 Acknowledges only	1.1 satisfaction with existing solution / parent answer within thread	none	0	4
19	281		16	12	2004-07-06 07:06:00	Fast. Over the last few years, it has become easier to click on a button. I would like to see a button that is more like a button on a computer screen.	1.2 help giving / follow-up inquiry / feature request	none	1.2 Requests Action	3.6 No other function / response	1.5 pro-social behaviour (information, help without direct advantage)	none	0	2
20	301		17	17	2004-07-06 15:27:20	Fast. Over the last few years, it has become easier to click on a button. I would like to see a button that is more like a button on a computer screen.	1.6 ideas for extension of existing product & solution	0	1.1 Suggests Action	3.3 Orients Suggestion	1.4 own needs/benefits regarding existing solution	none	1	1
21	224		18	18	2004-07-06 19:44:00	Fast. Over the last few years, it has become easier to click on a button. I would like to see a button that is more like a button on a computer screen.	1.1 help seeking / problem formulation / bug addressing	0	1.1 Suggests Action	3.6 No other function / response	1.4 own needs/benefits regarding existing solution	none	1	1
22	306		19	19	2004-07-06 21:17:11	Fast. Over the last few years, it has become easier to click on a button. I would like to see a button that is more like a button on a computer screen.	1.6 ideas for extension of existing product & solution	0	1.1 Suggests Action	3.4 Personal Information	1.4 own needs/benefits regarding existing solution	none	1	1
23	307		20	9	2004-07-06 23:28:00	Fast. Over the last few years, it has become easier to click on a button. I would like to see a button that is more like a button on a computer screen.	1.4 general information / news / thanking s.o.	none	1.6 No Move	2.1 Agree Response	1.6 dissatisfaction with other existing solution	none	1	5
24	224		21	18	2004-07-06 23:49:00	Fast. Over the last few years, it has become easier to click on a button. I would like to see a button that is more like a button on a computer screen.	1.10 Presentation of finished/developed product, solution, bug fixing	1	1.3 Requests Validation	3.6 No other function / response	1.5 pro-social behaviour (information, help without direct advantage)	none	0	2

MainCoding / Feature Request / SNA Motivation to help / SNA Dissatisfaction / SNA Prestige / SNA Individuals_Needs / help seeking / ideas for extension