Master Thesis

Identification of Development Potentials Based on a Benchmarking Study for an Innovation Platform

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Statutory Declaration

I declare that I have authored this thesis independently, that I have not used other than the declared sources / resources, and that I have explicitly marked all material which has been quoted either literally or by content from the used sources.

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Abstract

This thesis deals with the technical and economical challenges of innovation platforms. In particular, the identification of current development potentials of the innovation platform *Neurovation.net* is the focus of attention.

The theoretical part of this thesis contains the relevant literature findings concerning the areas innovation management and knowledge management. The concepts of Closed- and Open Innovation as well as the crowdsourcing principle are covered by this part. Further, the relevance of knowledge management for innovation and supportive technical systems for knowledge management are the focus.

The practical part deals with the identification of development potentials based on a benchmarking study for the innovation platform *Neurovation.net*. First an internal analysis of Neurovation is accomplished. In a benchmark analysis concurring innovation platforms are investigated and benchmarks are determined. Current development potentials of Neurovation are outlined and solution concepts are introduced. Benefits and costs of the introduced solutions are estimated. Finally, future development opportunities for *Neurovation.net* are discussed.

Kurzfassung

Diese Arbeit beschäftigt sich mit den technischen und ökonomischen Herausforderungen von Innovationsplattformen. Insbesondere steht die Identifikation von aktuellen Entwicklungspotentialen der Innovationsplattform *Neurovation.net* im Fokus dieser Arbeit.

Im Rahmen des theoretischen Teils wird die einschlägige Literatur über die Bereiche Innovationsmanagement und Wissensmanagement systematisiert. Die Konzepte von Closed- und Open Innovation, sowie das Crowdsourcing Prinzip werden durch diesen Teil abgedeckt. Des Weiteren wird die Bedeutung von Wissensmanagement für Innovation und Möglichkeiten zur Unterstützung von Wissensmanagement durch technische Systeme behandelt.

Der praktische Teil befasst sich mit der Identifikation von Entwicklungspotentialen basierend auf einer Benchmarking Studie für die Innovationsplattform *Neurovation.net*. Zu Beginn wird eine interne Analyse von Neurovation durchgeführt. In einer Benchmark Analyse werden konkurrierende Innovationsplattformen untersucht und Benchmarks ermittelt. Es werden aktuelle Entwicklungspotentiale von Neurovation beschrieben und Lösungskonzepte vorgestellt. Nutzen und Kosten der vorgestellten Lösungen werden abgeschätzt. Schließlich werden zukünftige Entwicklungsmöglichkeiten für *Neurovation.net* diskutiert.

Acknowledgement

At this point I would like to warmly thank all those people who have contributed to this work.

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Special thanks to my entire family, especially my parents who always supported me during my time as a student and who allowed me to study. I would like to warmly thank my girlfriend, Hannah, for the moral support and for the love you give to me.

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1 Introduction

This chapter points out the initial situation and the objectives of this thesis. Subsequently it gives an overview about the structure of the thesis.

1.1 Initial Situation

Because innovation and creativity are key success factors in knowledge-based economies, companies must utilize knowledge from external (Open Innovation) as well as from internal sources (Closed Innovation). Shorter product life cycles, globally distributed enterprises and a changed knowledge landscape enforce the trend to use web platforms in order to accomplish efficient innovation management.

Modern innovation platforms, like *Neurovation.net*, offer customers technical solutions for innovation management. In Open Innovation thousands of innovators that are connected to the Internet develop ideas in a short period of time. This makes an efficient organisation of knowledge a major challenge on these platforms. Therefore, innovation platforms must provide technical solutions, which help to organise ideas and find the best innovators in order to be effective.

The size of the innovation community and outstanding platform technology play an important role for competitive advantage in the business. The demand for innovation platform services is currently increasing, which leads to stronger competition on the market. Neurovation is among the most influential providers of innovation platform services in Europe now but the competition is getting stronger and at the same time the customers are demanding more functionality. The rising technical requirements and the increasing competition for Neurovation are the key motivations for this master thesis.

1.2 Objectives

The goal of this thesis is to accomplish the identification of current development potentials based on a benchmarking study of the innovation platform *Neurovation.net*. Therefore in an internal analysis the strengths and

weaknesses of Neurovation as well as the opportunities and threats of the environment are uncovered. Subsequently the benchmarking criteria are formulated and a benchmarking analysis with the competition is accomplished. The benchmarking subjects are analysed and the gap between Neurovation and the competition is outlined. Based on the benchmarking analysis implementation recommendations for Neurovation are outlined and the economical benefits and costs for Neurovation are determined. Subsequently an outlook on further development opportunities is given.

Thus, the following questions will be answered in this thesis:

- What are the strengths and weaknesses of Neurovation and the innovation platform *Neurovation.net*?
- Which opportunities and threats arise from the environment for Neurovation?
- What are current development potentials of *Neurovation.net*?
- Who are the competitors and what are the strengths and weaknesses of them?
- What is the gap between Neurovation and the competition?
- What are recommended actions to close the gap?
- What are further development opportunities for *Neurovation.net*?

The goal is to introduce solutions for the identified development potentials on *Neurovation.net* and evaluate the economical benefits and costs for Neurovation. Furthermore, the differences of the current services of Neurovation compared to the competition should be outlined and potentially unique selling propositions should be identified.

1.3 Structure of the thesis

In order to answer the earlier defined research questions according to the stated objectives, this thesis is structured as follows:

Chapter 2 constitutes the first theoretical part, which is about innovation management providing definitions of the basic terms of an innovation, its

characteristics, operative and strategic innovation management as well as the Open Innovation paradigm and crowdsourcing.

In chapter 3 the definitions and characteristics of knowledge, the correlations between knowledge and innovations, the levels and components of knowledge management as well as the concept for knowledge management systems are pointed out in theory. Subsequently the purpose of semantic technologies for knowledge management is outlined.

Chapter 4 covers the theory about benchmarking. It includes the different types of benchmarking and the generic benchmarking process.

Chapter 5 constitutes the practical part of the thesis. The identification of current development potentials of *Neurovation.net* is accomplished. First an internal analysis of Neurovation is accomplished, which consists of a SWOT – Analysis and a formulation of the potentials for improvements on the current platform solution. In a benchmark analysis the current development potentials of Neurovation are determined. Based on the results of the benchmarking improved solutions for *Neurovation.net* are introduced and evaluated. The benefits and costs of the solutions are outlined and implementation recommendations are given. At last further development opportunities are introduced for *Neurovation.net*.

Chapter 6 concludes the results of this master thesis and gives an outlook on developments of innovation platforms in the future.

2 Innovation Management

This chapter constitutes the theoretical basis about innovation management. First, the basic concepts and characteristics of an innovation are introduced. Further aspects of innovation management on the normative, strategic and operative level are also outlined. Subsequently, the Open Innovation paradigm and the crowdsourcing principle are introduced.

2.1 Innovation

In this chapter the basic characteristics of innovations are described in order to give the interested reader an overview of the essential concepts of innovations.

2.1.1 Concepts

Innovation is based on the Latin word *innovatio,* which stands for renewal, or change. Consequently innovation generally describes change processes but gets further refined in economic science.

The Austrian economist Joseph A. Schumpeter first mentioned in his book *Theorie der wirtschaftlichen Entwicklung* fundamental considerations about conceptual innovation. Therein for Schumpeter, innovation is fundamental for economic growth and therefore needs to be an integral part of economic activities. Schumpeter also discusses the differences between innovations and inventions. Inventions are the obvious first step to a new product or service.[1]

Further, an invention in the patent sense is present if the following requirements are met:[2]

- The technology get's enriched.
- The change is rapid.
- The current state-of-the-art get's enriched unpredictably and rapidly.

[1] cf. SCHUMPETER, J. (1911) pp.103-179

[2] cf. WOHINZ, J. W. (2011) chapter 1 p.4

Innovations are only those inventions that lead to economic success.[3] A detailed definition of the innovation term will be given in the next section, where the characteristics of innovations will be outlined in detail.

2.1.2 Characteristics of an Innovation

In order to define an innovation Thom depicts four essential characteristics of an innovation. According to Thom an innovation must have the following characteristics:[4]

- Degree of novelty
- Uncertainty and Risk
- Complexity
- Conflicts

Figure 1 shows the correlations between the four characteristics of an innovation.

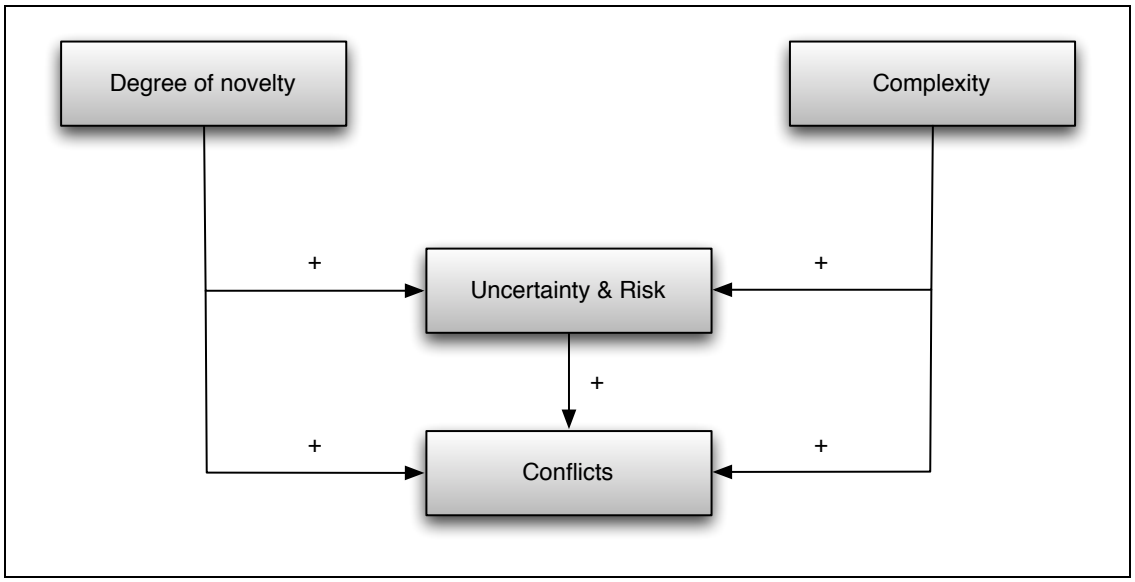

Figure 1: Characteristics of an innovation according to Thom[5]

[3] cf. SCHUMPETER, J. (1911) pp.103-179

[4] cf. THOM, N. (1980) pp.23-31

[5] cf. THOM, N. (1980) p.31

The four characteristics will be pointed out in detail now.

Degree of novelty

An innovation always has to have a certain degree of novelty. If this is not the case, the renewal is characterised either as a modification of an existing product, or a replication of a product.

Uncertainty and Risk

An uncertain situation prevails if subjective (based on experience) nor objective (statistical) probabilities can be given that a particular event occurs, which is in contradiction to a safe situation in which all information about future trends are available.[6] In innovation with the increasing degree of novelty also the risk of failure also increases.

Complexity

Innovations are complex actions that are never isolated. Embst characterizes complexity with the following five characteristics:[7]

- Lack of transparency
- Multitude
- Diversity
- Dynamics
- Interdependencies

Conflicts

Wohinz defines a conflict as incompatible states of objects or action-tendencies between persons. Conflicts can be justified objectively or personally, like conflicts to define and reach a goal, to evaluate information, enforce a meaning or conflicts that emerge because of different attitudes and values. In practice it is hard to define all sort of conflicts that can emerge in innovation projects but it is essential for the creative business to be aware of conflicts and handle them. Conflicts are not necessarily negative; on the contrary conflicts are mandatory for change. Creative ideas emerge out of conflicts and dissatisfaction with a certain situation in order to drive change.[8]

[6] cf. VAHS, D.; SCHÄFER-KUNZ, J. (2005) pp.25-28

[7] cf. EMBST, S. (2010) pp.27-42

[8] cf. WOHINZ, J. (2011) chapter 1 p.8

2.1.3 Creativity and Innovation

"The development of knowledge requires creativity and an environment, in which creativity can flourish. The outcome of creativity is an idea that, if economically utilized ideally becomes an innovation."[9]

Hany defines creative ideas as new, relevant and effective ideas.[10] Creative ideas often emerge randomly (e.g. in the case of artists) but in the organisational context often a dissatisfying situation and the wish to change is the trigger for creative ideas. Creativity tools can be supportive to develop ideas methodically. One of the most widespread creativity tools was developed by Alex F. Osborn and is called *brainstorming.*[11] Creativity tools like brainstorming define rules for the collaborative idea generation in order to increase the effectiveness. Creativity tools can support persons in the creative process but also the personal motivation, the creative environment and the cognitive skills are important factors for creative ideas.[12] The three major cognitive skills of creative persons are:[13]

- Divergent thinking
- Intelligence
- Expertise

They are described in more detail below.

Divergent thinking

"Divergent thinking is the ability to produce various and unusual solutions for a given problem. It stands in contrast to convergent thinking, where you are looking for a single correct solution."[14]

[9] WILLFORT, R. et at. (2007) p.11

[10] cf. HANY, E. A. (2001) pp.261-291

[11] cf. OSBORN, A. F. (1953, 1963) pp.315f.

[12] cf. WILLFORT, R. et at. (2007) p.33

[13] cf. WILLFORT, R. et at. (2007) pp.30-33

[14] WILLFORT, R. et at. (2007) p.31

Divergent thinking is an important measure for creativity, which is also utilized by creativity tests.[15]

Intelligence

Intelligence is a measure for the ability of convergent thinking. The opinions are diverse if intelligence is important for creativity as well. It is also important to mention that for most problems, intelligence and creativity are needed in order to achieve a solution.[16]

Expertise

Expertise is important to achieve outstanding creative performance in special Domains, on the other hand, the literature depicts that every person is capable of outstanding creative performance in general. One golden rule says that for outstanding performance in a domain a minimum of ten years of experience or 10.000 hours work in the domain is necessary.[17]

Creative persons with the above-described cognitive skills are necessary to create creative ideas and innovations. How innovations are created and which innovation strategies a company pursues is part of innovation management, which will be described in the next chapter.

2.2 Innovation Management

"Companies that do not innovate die."[18]

Innovations are essential for gaining competitive advantages and therefore need to be managed integrally inside of organisations. To manage innovations successfully it is essential to integrate innovation management at all management levels: the normative, strategic and operative level of a company.[19]

[15] cf. WILLFORT, R. et at. (2007) p.31

[16] cf. WILLFORT, R. et at. (2007) p.32

[17] cf. WILLFORT, R. et at. (2007) pp.32-33

[18] CHESBROUGH, H. (2003) p.xvii

[19] cf. GASSMANN, O.; SUTTER, P. (2011) p.7

Gassmann described the levels of integral innovation management as follows:[20]

- On the normative level visions, the mission and the core values need to be set.
- On the operative level the structuring and the leading of the innovation process is essential.
- The strategic management of innovation needs to include messages about the resources, technologies, knowledge and competences of the company.

First in this chapter the innovation management on the normative level will be introduced. Subsequently, the operative innovation management will be described by introducing two different models of an innovation process. Later, strategic innovation management is introduced in order to give the interested reader an overview on various innovation strategies. The focus in this chapter lies on the operative and strategic innovation management.

2.2.1 Normative Innovation Management

On the normative level an innovation culture needs to be established. The innovation culture is prerequisite for organisational innovation.[21] The following factors are the essential influences for the innovation culture of a company[22]

- Corporate culture
- Leadership
- Behaviour towards innovators
- Structure and process organisation
- Planning processes
- Attitude towards implementation mechanisms
- Organisational framework

[20] cf. GASSMANN, O.; SUTTER, P. (2011) pp.7-9

[21] cf. WILLFORT, R. (2001) p.30

[22] cf. SERVATIUS, H.-G. (1988) p.165

Depending on the above factors the innovation culture defines the framework for the ability to innovate. Managers can influence the innovation ability through personal management, business process optimisation and knowledge management.[23]

2.2.2 Operative Innovation Management - The Innovation Process

The innovation process accomplishes the management of innovations on the operative level. Numerous authors described the innovation process in slightly different ways. Two widespread models are Cooper's stage-gate process and Thom's linear process that will be introduced in this chapter.

2.2.2.1 A Stage-Gate Process According to Cooper

In the English-speaking literature the stage-gate process according to Cooper is the most relevant definition of the innovation process. First the definition of a stage-gate-process should be cleared:

"A stage-gate process is divided into a number of stages or workstations. Between each work station there is a quality control checkpoint or a gate."[24]

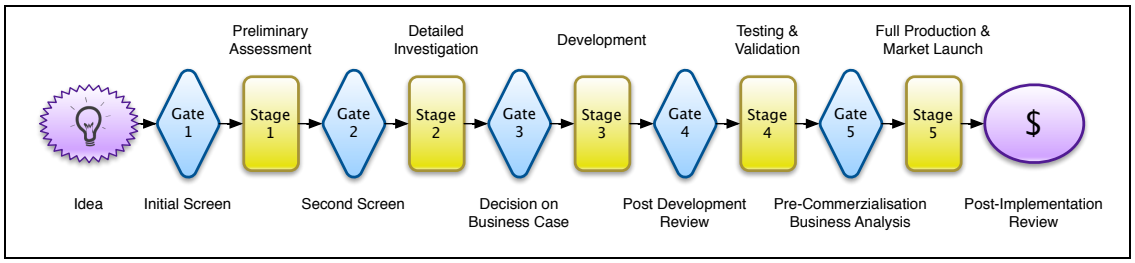

Figure 2: Stage-Gate Process according to Cooper[25]

Figure 2 shows the five stages and gates of Cooper's model. The obvious first step of an innovation is always an idea, which is submitted to the Initial Screen, where the innovation project is born. The Preliminary Assessment, which is done in Stage 1 includes the determination of the technical and market merits, which is followed by a Second Screen. In Stage 2, the project

[23] cf. WILKE, H. (1998) p.64

[24] COOPER, R.G. (1990) p.46

[25] cf. COOPER, R.G. (1990) p.46

gets clearly defined and verified until the final decision for the development is made. In Stage 3, the development of the product or service takes place and subsequently a check on the on-going attractiveness of the product or service and the project is done. In Stage 4, the whole project gets tested and validated, which includes the product or service, the production process, the customer acceptance as well as the economics of the project. After developing a market plan the actual market launch finishes the process.[26]

Gassmann splits the process into a creative phase ("cloud-phase") and a productive phase ("building-block-phase"). In the cloud-phase (the first half of Cooper's process) ideas and knowledge, creativity and people management are dominating in order to create a culture in which new ideas can be created and developed. Starting from the development stage of Cooper's model engineering, structuring and process management are the dominating aspects ("building-block-phase") in order to create products out of the ideas.[27]

2.2.2.2 A Linear Process According to Thom

In the German-speaking literature the innovation process of Thom is the most important to mention. Thom differentiates between the following three phases:[28]

- Idea Generation
- Idea Acceptance
- Idea Realisation

Figure 3 illustrates the three phases of the innovation process according to Thom.

An initial action, caused either by a stakeholder, the own research department, the market or other parties, triggers the innovation process.[29] The idea generation, acceptance and realisation phases are following.[30]

[26] cf. COOPER, R.G. (1990) pp.52-53

[27] cf. GASSMANN, O.; SUTTER, P. (2011) p.45

[28] cf. THOM, N. (1980) p.53

[29] cf. WOHINZ, J. (2011) chapter 1 p.25

The corporate strategy builds the strategic framework around the innovation process. The outcome of the innovation process is either a new product or service, which has certain effects on the social, political, ecological, economical and technological aspects of the environment, depending on the substance of the innovation. Vice versa the environment has a major influence of the corporate strategy of the company.[31]

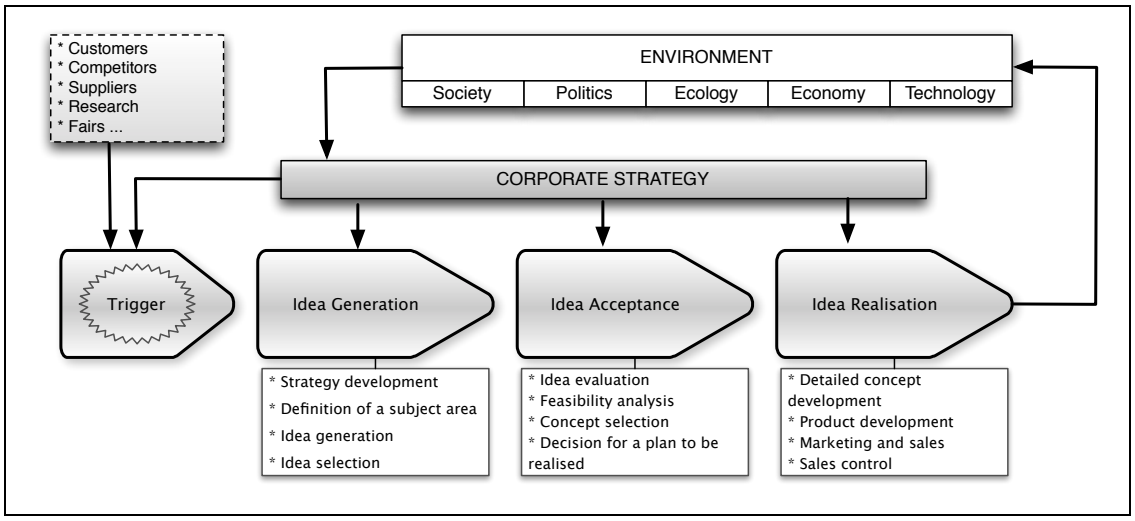

Figure 3: The innovation process according to Thom[32]

The three phases of the innovation process according to Thom are described in detail below:

Idea Generation

After the strategic framework is set (see chapter 2.2.3) new ideas are generated often with the help of creativity tools (see chapter 2.1.3) and finally a selection of idea proposals is accomplished.[33] Thereby the number of ideas can be seen as the quantitative efficiency criterion while the amount of usable ideas is defined as the qualitative efficiency criterion.[34]

[30] cf. THOM, N. (1980) p.53

[31] cf. WOHINZ, J. (2011) chapter 1 p.25

[32] cf. THOM, N. (1980) p.53

[33] cf. THOM, N. (1980) p.53

[34] THOM, N. (1980) pp.77-78

Idea Acceptance

In the idea acceptance phase the ideas get evaluated, feasibility studies are accomplished and later the selected ideas are refined and worked out to implementation concepts. The phase ends with a decision for a particular concept that should be realized in the next step.[35]

Idea Realisation

This phase includes the technical implementation and the introduction of the new service or product on the market, ending the phase with an acceptance inspection and continues sales control. [36]

2.2.3 Strategic Innovation Management

Every creative company needs to define its innovation strategy before innovation activities on the operative level can take place. A strategy defines a goal and the direction for the innovation activities while the innovation process defines a sequence of actions how to reach these goals (see chapter 2.2.2). [37]

Before developing an innovation strategy it's important to know the actual situation of the company and its environment. Therefore the SWOT – Analysis is a popular management tool, which should now be introduced. Figure 4 shows the two parts of the SWOT – Analysis:[38] The internal analysis, figuring out the strengths and weaknesses of the company and an external analysis, analysing the chances and risks of the environment. Therefore SWOT stands for **S**trengths, **W**eaknesses, **O**pportunities and **T**hreats.

[35] cf. THOM, N. (1980) p.53

[36] cf. THOM, N. (1980) p.53

[37] cf. GASSMANN, O.; SUTTER, P. (2011) pp.8-9

[38] cf. WOHINZ, J. (2011) chapter 1 p.27

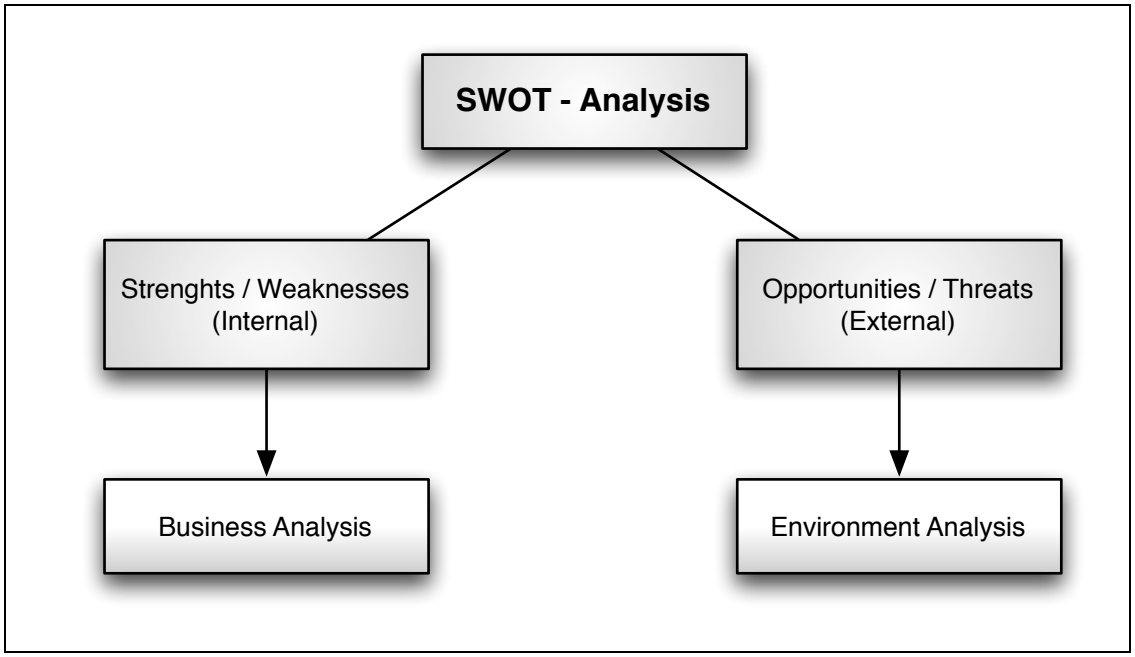

Figure 4: SWOT – Analysis

In strategic management the SWOT – Analysis is a common management tool. In the following section innovation strategies that define target markets, a market orientation and the origin of ideas will be introduced.

2.2.3.1 Market Strategies

An important strategic decision in innovation management is about choosing the market strategy for a new product or service. Porter defines three successful strategies for competitive markets:[39]

- Overall-Differentiation, which means to offer an excellent benefit for that customers are even willing to pay more.
- Overall-Cost-Leadership, which means to have a cost advantage compared to the competitors and therefore be able to offer the lowest price on the market.
- Focus on a market segment instead of the whole market.

If a company fails to develop its strategy in one of the mentioned directions, Porter defines this unsuccessful position as *stuck in the middle*.[40]

[39] cf. PORTER, M. E. (1980) pp.35-41

[40] cf. PORTER, M. E. (1980) pp.41-44

Kim and Mauborgne depict that highly competitive markets should be avoided and instead new markets should be discovered.[41]

Because of the globalisation and the accelerated technology advances the markets are generally highly competitive. Kim and Mauborgne call these markets the red oceans, in which price wars are going on and profit margins are shrinking.[42]

They depict the blue ocean as a strategy to escape from these unattractive markets by developing new markets (blue oceans), in which the laws of the red oceans do not apply and therefore much higher profit margins can be achieved.[43] Table 1 shows the main differences between the red and the blue oceans according to Kim and Mauborgne.

	Strategies for the Red Ocean	**Strategies for the Blue Ocean**
Market	Current market with high competition	Developing new markets
Competition	Beat the competitors	Avoid the competition
Demand	Use the existing demand	Open up new demand
Costs – Benefit Correlation	Direct correlation	Annulation of the correlation
Alignment of business activities	To costs and benefit	To differentiation and low costs

Table 1: Strategies for red and blue oceans[44]

Blue oceans describe attractive markets with low competition and high profit margins. Another important strategic decision is the market orientation, which will be introduced next.

[41] cf. KIM W.C., MAUBORGNE R. (2005) p.18

[42] cf. KIM W.C., MAUBORGNE R. (2005) p.8

[43] cf. KIM W.C., MAUBORGNE R. (2005) p.18

[44] cf. KIM W.C., MAUBORGNE R. (2005) p.18

2.2.3.2 Market Orientation

Innovations can be triggered by new technologies or determined demands on the market. Thus two market orientations can be distinguished:[45]

- **Technology push:** New discoveries or inventions from the research and development organisation trigger the innovation. Product or service development starts subsequently. The main challenge is to find a market or a market segment where the new product or service can be successfully distributed.
- **Market pull**: The need for a new product or service is identified by the market research organisation first. This triggers the innovation process. The main challenge is to research and develop a proper technology that fits the requirements of the market. The distribution is much simpler compared to the "Technology push" strategy, while the product or service is already demanded.

Which strategy is more successful is highly dependent on the actual business and the market. Technology driven companies with big research and development departments often try to get a technological lead by pushing new technologies on the market. While this is a risky and expensive strategy today businesses focus more on identifying demands on the markets before starting with new technology developments. This strategy saves costs and reduces the risk of failing innovations. Today it is also an essential part to identify the customer benefits before innovating.

2.2.3.3 Innovation Orientation

An innovation strategy must also cover the orientation, which sources for Ideas, and knowledge should be leveraged to develop new innovations. There are basically two orientations that can be distinguished:[46]

- Internal Orientation
- External Orientation

[45] cf. WOHINZ, J. (2011) chapter 1 p.26

[46] cf. WOHINZ, J. (2011) chapter 1 p.18

The differences of these two innovation orientations will be described below.

Internal Orientation

An internal orientation consciously prevents the integration of external sources into the innovation process.[47]

The source for new ideas is the internal knowledge base of a company. Some ideas get developed to new products and flow out to the market. [48]

Chesbrough calls the internal orientation the *Closed Innovation paradigm*.[49]

External Orientation

An external orientation leverages consciously the integration of external knowledge sources for innovation.[50]

„Valueable ideas can come from inside or outside the company and can go to market from inside or outside the company as well.“[51]

Chesbrough calls the external orientation the *Open Innovation paradigm* (see chapter 2.3).[52]

Traditionally innovations were developed behind closed doors to save the internal intellectual property. However, today companies recognize more and more the benefits of an Open Innovation attitude.

[47] cf. WOHINZ, J. (2011) chapter 1 p.18

[48] cf. CHESBROUGH, H. (2003) pp.30-31

[49] cf. CHESBROUGH, H. (2003) pp.21-41

[50] cf. WOHINZ, J. (2011) chapter 1 p.18

[51] CHESBROUGH, H. (2003) p.43

[52] cf. CHESBROUGH, H. (2003) pp.43-62

2.3 Open Innovation

"Open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology"[53]

In this chapter the theoretical concepts of Open Innovation and the trends that let companies open up their innovation processes will be faced. The Open Innovation paradigm according to Chesbrough will be introduced, and the benefits and risks of the approach will be shown. Finally, the related concept *crowdsourcing* will be explained and defined.

2.3.1 Open Innovation Trends

Open innovation has become an important factor for companies. In some businesses it is even essential to open up the innovation process in order to stay on the marketplace. Chesbrough describes four global trends that force companies to think more open and integrate external knowledge in the innovation process:[54]

- Increasing Mobility
- Growing Venture Capital Market
- Rising Entrepreneurship
- Focusing on Core Competences

The trends will be outlined in detail below:

Increasing Mobility

The increased mobility and availability of individuals is a chance for every company to get highly skilled workers from a globalized labour market.[55]

On the other hand it is more often the case that highly skilled workers switch their employers and therefore take their knowledge with them to different

[53] CHESBROUGH, H. (2003) p.xxiv

[54] cf. CHESBROUGH, H. (2003) pp.34-41

[55] cf. CHESBROUGH, H. (2003) p.34

companies. Consequently the internal knowledge base of a company is more volatile.[56]

Growing Venture Capital Market

The venture capital market, investment firms and funding organisations has enormously expanded during the last years. [57] Completely new opportunities for acquiring funding for start-ups emerged in the last years (e.g. via crowdfunding[58]). More funding opportunities also means more chances for unused ideas to be realized outside the company.[59] Therefore the Open Innovation paradigm defines ways to take profit of unused ideas with high potential (see chapter 2.3.2).

Rising Entrepreneurship

Because of the increased mobility and the rising opportunities for funding more individuals get encouraged to independence and found their own company. For established companies this means that as the external options for employees with good ideas grow and product life cycles shorten it becomes an important factor to increase the rate at which knowledge gets processed.[60]

Focusing on Core Competences

Focusing on the core competences is a vital and common strategy for companies. But for that it's essential to open up the internal knowledge silos when working in some kind of partnerships, which means a risk for the internal knowledge.[61] With Open Innovation this necessary knowledge drain can be compensated with new external knowledge.

Concluding Chesbrough's depictions the knowledge landscape has changed in a way that knowledge monopolies are fading away and the distribution of knowledge has become wider. Thus knowledge has become available for

[56] cf. CHESBROUGH, H. (2003) p.35

[57] cf. CHESBROUGH, H. (2003) p.38

[58] cf. KALTENBECK, J. (2011) pp.5-11

[59] cf. CHESBROUGH, H. (2003) p.38

[60] cf. CHESBROUGH, H. (2003) p.38

[61] cf. CHESBROUGH, H. (2003) p.40

people willing to turn this knowledge into innovations. Individualism has become an important factor in our society and a new generation of highly skilled entrepreneurs with the necessary knowledge has entered the markets. For young or established companies the same rule holds: In order to be innovative, knowledge has to be turned into innovations before others do so.[62]

2.3.2 The Open Innovation Paradigm

Open innovation leverages the crowdsourcing principle, which will be further introduced in chapter 2.4, for innovation management. Open innovation means that valuable ideas can come from inside or outside the company and can go to market from inside or outside the company as well.[63]

Figure 5 illustrates the flow and development of ideas in the Open Innovation paradigm:

Ideas can originate from internal and external knowledge sources. During the process the ideas get filtered and assessed. During the process the ideas get filtered and assessed. Lots of the ideas may be not good enough or not realisable and therefore get discarded again. The remaining ideas are developed to concepts, and finally a few concepts are realized to new products or services. This works similar to the traditional Closed Innovation paradigm. The important difference is that external ideas are given the same attention as ideas, from the internal knowledge base and that no strict border between internal and external knowledge exists.[64]

Thus ideas can flow into the process or leave it to the market at different states and different times.[65] This raises the likelihood that ideas get developed to products or services (either inside the company or outside) and that these products and services are ready for the marketplace.

[62] cf. CHESBROUGH, H. (2003) pp.40-41

[63] cf. CHESBROUGH, H. (2003) p.43

[64] cf. CHESBROUGH, H. (2003) pp.43-44

[65] cf. CHESBROUGH, H. (2003) pp.63-64

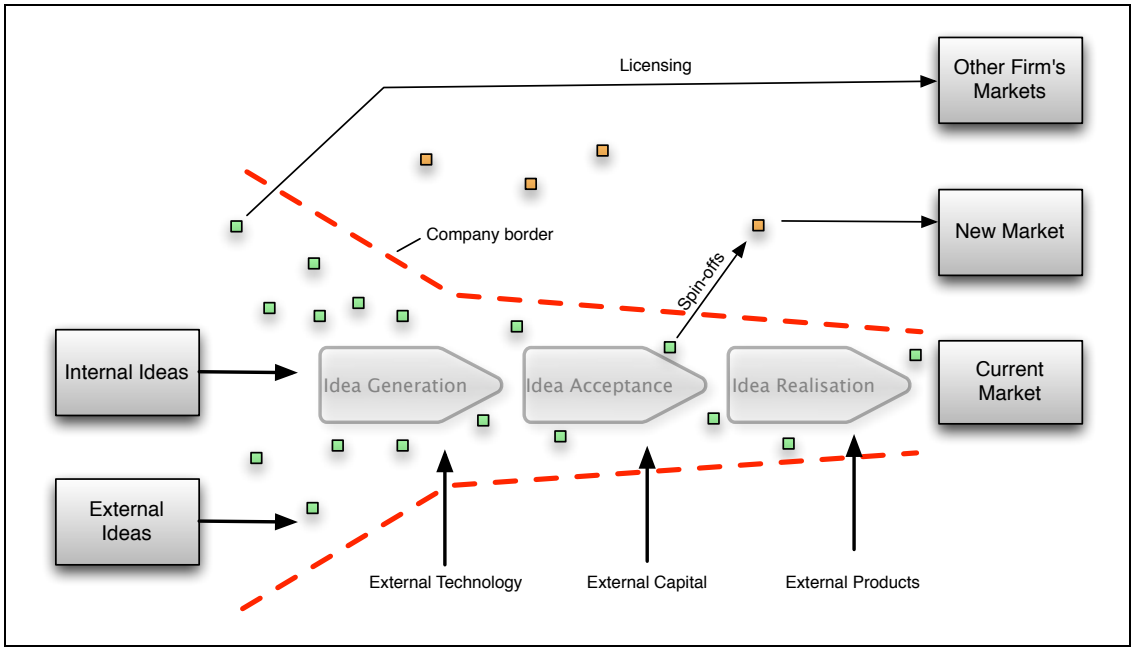

Figure 5: The Open Innovation Paradigm[66]

Chesbrough describes three ways on how ideas, concepts or products can leave the process to the market:[67]

- **Licencing:** Ideas or concepts that can't be developed to products or services can be licensed to other companies.
- **Spin-offs:** Promising concepts, products or services that might not be successful on the current market can be produce as spin-offs revenue on new markets.
- **Current Markets:** Products or Services can be developed and introduced to the current markets of the company like in the traditional Closed Innovation paradigm.

Further he describes that new resources can enter the process, like:[68]

- **External ideas:** With the help of Open Innovation platforms or external research partner's new external ideas can enter the process.

[66] cf. CHESBROUGH, H. (2011) p.70

[67] cf. CHESBROUGH, H. (2011) p.70

[68] cf. CHESBROUGH, H. (2011) p.70

- **External technology:** By licensing external technology can be used to develop new products or services.
- **External capital:** Through the various possibilities of funding new capital can be acquired. With the external capital spin-offs or the development of the products or services can be financed.
- **External products or services:** Products or services can be acquired from other companies. If a company only distributes one product it can be useful to acquire the whole company.

Because internal ideas can leave the innovation process and external ideas and resources can enter the process at different stages the Open Innovation approach leaves more options for ideas compared to the Closed Innovation paradigm (see chapter 2.2.2). This has certain advantages, but also poses new risks for companies.

2.3.3 Benefits of Open Innovation

The literature depicts major benefits of Open Innovation compared to Closed Innovation approaches. Reichwald and Piller describe the following benefits of Open Innovation for companies:[69]

- Reducing “time-to-market”
- Reducing “cost-to-market”
- Increasing “fit-to-market”
- Increasing “new-to-market”

Gassmann complements the following benefits:[70]

- Advertisement
- Increasing customer loyalty
- Overcoming operation blindness

The benefits of Open Innovation according to Reichwald, Piller and Gassmann are pointed out in more detail below.

[69] cf. REICHWALD, R.; PILLER, F. (2009) pp.149-154

[70] cf. GASSMANN, O. et al. (2010) pp.25-26

Reducing "time-to-market"

The time-to-market is the time span starting from development, till the entry on the market of a product. This time gains on importance by constantly shorter product life cycles. In Open Innovation shorter times-to-market can be achieved because the work is divided and the tasks are split up to external partners, which results in a higher problem solving capability, especially the idea generation, and concept development can be accomplished faster, more effectively and consequently cheaper with Open Innovation then with Closed Innovation.[71]

Reducing "cost-to-market"

With Open Innovation the costs for planning and development can be reduced especially if the external innovators are also involved into steps after the idea generation (e.g. prototype development).[72]

Increasing "fit-to-market"

"Fit-to-market" expresses the acceptance of a product on the market. With Open Innovation more information about the needs of the consumers is available, also a higher problem solving capability by the crowd can be achieved.[73] Desires can be identified and new impulses can help to increase the "fit-to-market".[74]

Both parameters are influencing the acceptance of the product on the market positively. Open innovation also improves the quality of information on solutions in the innovation process.[75]

Increasing "new-to-market"

An increasing degree of novelty of the products on the market leads to more attractiveness for the customers.

[71] cf. GASSMANN, O. et al. (2010) p.25

[72] cf. REICHWALD, R.; PILLER, F. (2009) p.151

[73] cf. REICHWALD, R.; PILLER, F. (2009) pp.152-153

[74] cf. GASSMANN, O. et al. (2010) p.26

[75] cf. REICHWALD, R.; PILLER, F. (2009) pp.152-153

Advertisement

Advertisement is in general not the main goal of an Open Innovation project but is a valuable concomitant. Leveraging external ideas implies to be an open and democratic company to the customers. There is a big advantage over traditional advertising, because being an innovative company can be demonstrated with Open Innovation.[76]

Customer loyalty

Leveraging customer's feedback sustainably can result in increasing loyalty over the time.[77]

Overcoming operating blindness

New ideas and impulses from outside can help to overcome old routines and thinking patterns inside the organisation. Customers may demand internally rejected ideas. Open Innovation can open eyes on that and help to overcome operation blindness.[78]

Faster innovations and better knowledge about the customer lower the costs and increase the acceptance of new products on the markets. But Open Innovation has to be done carefully and risks have to be understood in order to be successful. The next section covers the risks of Open Innovation for companies.

2.3.4 Risks of Open Innovation

If Open Innovation is successful for a certain company, it often depends on if the risks of Open Innovation have been understood and the actual execution of the Open Innovation project is correct. Chesbrough defines the following risks of Open Innovation:[79]

- The "Not Invented Here" Syndrome
- The "Not Sold Here" Virus
- Being Too Open

[76] cf. GASSMANN, O. et al. (2010) p.26

[77] cf. GASSMANN, O. et al. (2010) p.26

[78] cf. GASSMANN, O. et al. (2010) p.26

[79] cf. CHESBROUGH H. (2006) pp.25-37

Gassmann depicts the risks of Open Innovation as follows:[80]

- Total costs
- Harm of reputation
- Legal problems

The risks of Open Innovation according to Chesbrough and Gassmann will be described in detail now.

The "Not Invented Here" Syndrome

"We can't trust it because it's not from us"[81]

Every company must face the resistance to external inventions and technologies.[82] Depending on the company's innovation culture (see chapter 2.2.1) the resistance to external inventions can be very strong (Closed Innovation culture) or low (Open Innovation culture). Katz and Allen call this resistance the "Not invented here" syndrome.[83]

The "Not Sold Here" Virus

"If we do not sell it no one should"[84]

The "Not Sold Here" virus describes the resistance of companies to license ideas to other companies or create spin-offs, even if no application for the ideas exists inside the company. The reasons are mostly in the fear that competitors might be reinforced. Thus many ideas never get developed and therefore can't produce revenue. It is important to establish an innovation culture (see chapter 2.2.1) where ideas are given the opportunity to get realised either inside or outside the company. Companies might also assume

[80] GASSMANN, O. et al. (2010) pp.26-27

[81] CHESBROUGH, H. (2006) p.23

[82] cf. CHESBROUGH, H. (2006) p.23

[83] cf. KATZ, R.; ALLEN, T. (1982) pp.7-19

[84] CHESBROUGH, H. (2006) p.32

that if they can't find a profitable use for an idea or technology, no one else will either.[85]

From the buyers perspective another resistance emerges:

"Buyers may worry that sellers of unused technology may only offer the bad ones."[86]

Being Too Open

It is very important to think about which knowledge to share with other companies, innovation communities, venture capitalists or competitors. Especially for young start-ups, the internal intellectual property can be substantial and needs to be protected from bigger competitors with more resources who may be also interested in the current market. Sharing the wrong information with the wrong people can kill a company (especially a small one).[87]

Total costs

The total costs can be higher as expected while Open Innovation projects are binding human resources during the planning, execution and the exploitation. Especially the integration and the exploitation of the solution can bind unexpectedly high resources of the company.[88]

Harm of reputation

Open Innovation needs to be taken seriously and needs to be integrated into the innovation strategy of a company. Rewarding, communication strategies and exploitation plans need to be clear for all participants. Inadequate rewarding, wrong communication with the participants and uncertainty about the exploitation of the ideas can lead to harm of reputation for the company[89]

[85] cf. CHESBROUGH, H. (2006) pp.31-33

[86] CHESBROUGH, H. (2006) p.31

[87] cf. CHESBROUGH, H. (2006) pp.35-37

[88] cf. GASSMANN, O. et al. (2010) p.26

[89] cf. GASSMANN, O. et al. (2010) pp.24-27

Legal problems

Legal problems cause if the legal framework of an Open Innovation project is unclear. Thus an exact definition of the legal framework including the exploitation, usage rights and rewarding of the ideas are essential for successful Open Innovation projects.[90]

Most risks of Open Innovation emerge from an innovation culture, which isn't ready for Open Innovation. But also the integration of Open Innovation on the strategic level and the execution of Open Innovation on the operative level pose risks. Therefore it is important to implement Open Innovation integrally on the normative, strategic and operative level of an organisation.

2.4 Crowdsourcing

Crowdsourcing is a strategy for outsourcing knowledge generation and problem solving tasks to an external community by utilizing Internet technology. The term *crowdsourcing* was first coined by Jeff Howe in 2006 and is a blend of the words *crowd* and *outsourcing*. Many approaches and applications profit from crowdsourcing, like Open Innovation does. Open innovation utilizes crowdsourcing for innovation purposes but crowdsourcing is not restricted to innovation, instead several other application areas for crowdsourcing have to be mentioned. Therefore in this chapter an overview on a selection of crowdsourcing concepts should be given.

2.4.1 Crowdsourcing Concepts

In this chapter the most common applications for crowdsourcing will be introduced and distinguished. Gassmann distinguished five categories of crowdsourcing concepts:[91]

- Intermediate Platforms
- Together a Free Solution
- Proprietary platforms
- Marketplaces for ideas
- Public initiatives

[90] cf. GASSMANN, O. et al. (2010) p.27

[91] cf. GASSMANN, O. et al. (2010) pp.14-22

The single concepts will be introduced in detail now.

Intermediate Platforms

Intermediate platforms are online platforms that bring companies and innovators together and therefore serve as a link between asking and solving parties.[92] Four types of intermediate platforms can be distinguished:[93]

- **Research and development platforms** focus on solving scientific problems with the help of crowdsourcing.
- **Marketing and design platforms** focus on marketing and design tasks instead of development tasks.
- **Platforms for freelancer** serve as a link between freelancers and client companies.
- **Idea platforms** do not focus on a special qualification of their users, instead they focus on the creative problem solving capability of a community.

Through intermediate platforms Open Innovation can be accomplished. Respectively intermediate crowdsourcing platforms are often also called Open Innovation platforms.

Free Solutions

Free solutions are projects in which volunteers decide to work together for free to achieve a certain goal.[94] Gassmann distinguishes two types:[95]

- **Websites** on which lots of people contribute and share various information to the to the public, like Wikipedia.
- **Open source software:** Volunteers develop software and provide the source code to the public for free. The Open source community can be seen as crowdsourcing pioneers.

[92] cf. GASSMANN, O. et al. (2010) p.14

[93] cf. GASSMANN, O. et al. (2010) pp.14-18

[94] cf. GASSMANN, O. et al. (2010) p.18

[95] cf. GASSMANN, O. et al. (2010) pp.18-19

The reasons for participating on *free solutions* are diverse. Often people are highly intrinsically motivated but also the dissatisfaction of a certain situation and the entrepreneurial spirit can lead to participation in such projects.

Proprietary platforms

Large companies sometimes prefer to build their own proprietary crowdsourcing platforms or license proprietary instances from crowdsourcing platform providers instead of using intermediate platforms for their crowdsourcing projects. Two types of proprietary platforms can be distinguished:[96]

- **Platforms for product ideas and problem solving tasks** are either focusing on ideas from customers, fans (Open Innovation), or employees (Closed Innovation) to develop new products or services. Combinations are also possible.
- **Branding and design platforms** are focusing on the marketing and design capabilities of the customers.

Marketplaces for ideas

On those platforms artists (amateur or professionals) can distribute and sell self-crafted products to a web-community.[97]

Public initiatives

Public initiatives are *free solutions* with a public institution as client.[98]

The five above-mentioned concepts can be distinguished between non-commercial and commercial platforms. *Free solutions* and *public initiatives* do not focus on a commercial goal, on the other hand *intermediate and proprietary platforms* are commercially driven as well as *marketplaces for ideas*. Intermediate and proprietary platforms are focusing on solving business tasks, like acquisition, marketing or innovation.

[96] cf. GASSMANN, O. et al. (2010) pp.19-20

[97] cf. GASSMANN, O. et al (2010) p.21

[98] cf. GASSMANN, O. et al (2010) pp.21-22

2.4.2 The Crowdsourcing Process

Every crowdsourcing project needs to be planned, implemented and exploited carefully. Therefore Gassmann defines a generic process that is illustrated in Figure 6.
The crowdsourcing process consists of the following five phases: [99]

- Preparation
- Initiation
- Implementation
- Evaluation
- Exploitation

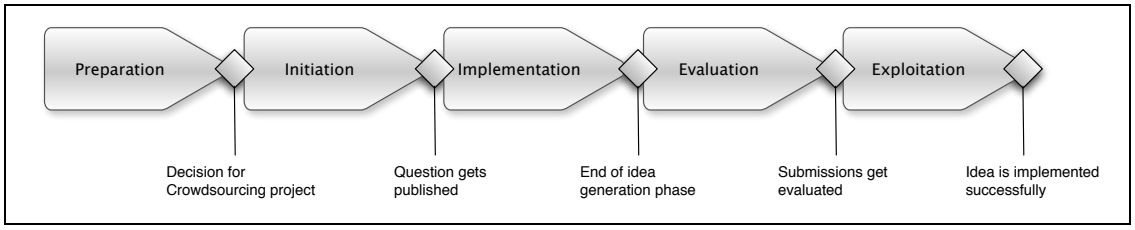

Figure 6: The crowdsourcing process according to Gassmann[100]

The phases will be described in detail now.

Preparation
In the preparation phase the crowdsourcing project needs to be defined and a decision for a particular crowdsourcing provider needs to be made. [101]

Initiation
The initiation phase deals with all activities that are necessary to ask and publish a specific question to a crowd, including a clarification of the confidentiality of the received information as well as the detailed formulisation and the publishing of the question.[102]

[99] cf GASSMANN, O. et al (2010) pp.40-55

[100] cf. GASSMANN, O. et al (2010) p.35

[101] cf. GASSMANN, O. et al (2010) p.34

[102] cf. GASSMANN, O. et al (2010) p.34

Implementation

In the implementation phase the community responds with ideas and solutions to the question during a set time period.[103]

Evaluation

In this phase a jury (and / or the community) evaluates the incoming suggestions and the idea employers get rewarded.[104]

Exploitation

For the best ideas detailed concepts are developed, feasibility studies are accomplished and new products are introduced to the marketplace.[105]

The introduced process describes the sequence of tasks that has to be accomplished in a crowdsourcing project from a business client's perspective. The community is involved in the implementation and optionally in the evaluation and exploitation phase. Optionally a pre-evaluation of the ideas by the community can be accomplished in the implementation step.

2.4.3 Crowdfunding

Crowdsourcing has become enormously popular for financing start-ups or creative projects by asking a crowd for financial support via online platforms. This special form of crowdsourcing is called Crowdfunding. The goal is to get monetary support from a community of fans and investors in order to finance projects, programs or actions.[106] Thus crowdfunding platforms serve as a link between investors and applicants.

[103] cf. GASSMANN, O. et al (2010) p.35

[104] cf. GASSMANN, O. et al (2010) p.35

[105] cf. GASSMANN, O. et al (2010) p.35

[106] cf. TACKE, O. (2010)
http://www.slideshare.net/orgfue/tools-und-trends-im-wissensmanagement-4504862 [02.10.2011]

3 Knowledge Management

This chapter constitutes the theoretical basis about knowledge management. It is divided into three parts. First the basic concepts and essential definitions for a proper understanding of knowledge will be introduced. Subsequently the aspects of knowledge management on the management level will be outlined. Later the technical support of knowledge management through knowledge management systems will also be covered in this chapter.

3.1 Knowledge

In this chapter the definition of the knowledge term and the characteristics of knowledge are introduced. Subsequently the correlations of knowledge and innovations will be outlined.

3.1.1 Definition of Knowledge

For a proper understanding of the knowledge term, the differentiation of data, Information, and knowledge is essential. Therefore the abstraction of the knowledge term based on information and data according to North should be outlined here.
Figure 7 shows that single *characters* that appear in a defined syntax are called *data (e.g. 9,85)*. Giving data a meaning by adding metadata results into *information (e.g. 9,85 seconds)*. By interpreting and combining information by humans *knowledge* emerges (e.g. 9,85 seconds is the world record in the 100m sprint).

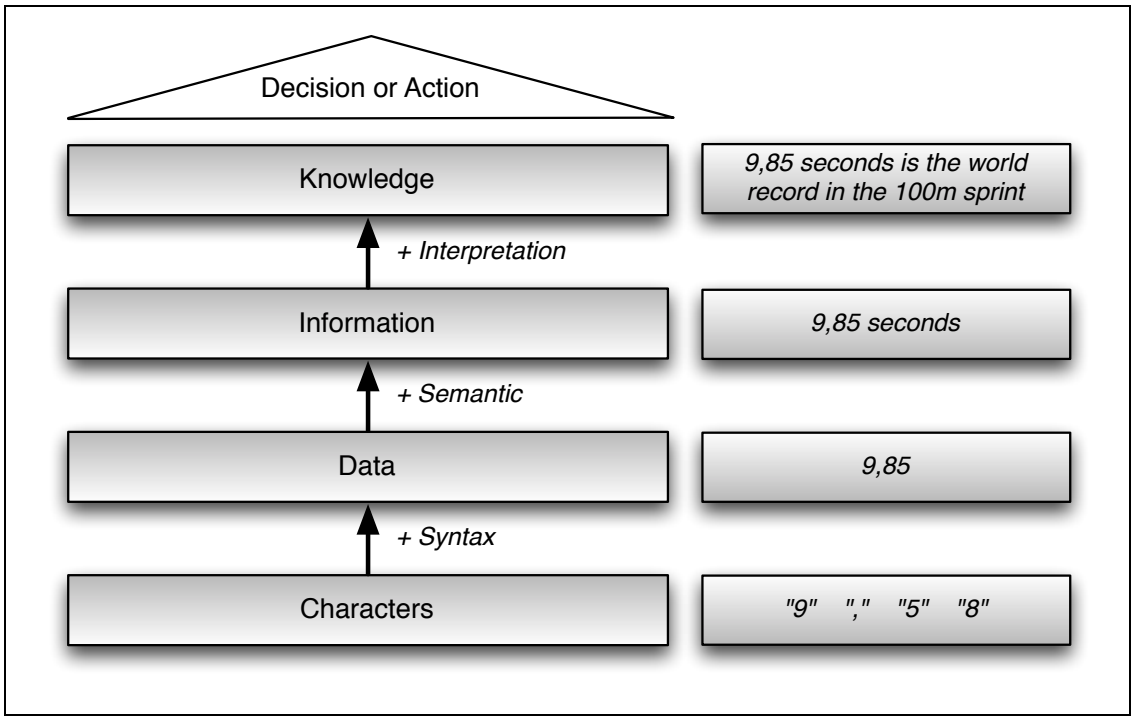

Figure 7: Abstraction of the knowledge term[107]

The levels of abstraction are defined as follows:[108]

- **Characters**: Characters are single numbers, letters or special characters. Characters do not appear in order to a given syntax.
- **Data**: Data is a sequence of characters that is ordered according to a given syntax but the interpretation is missing, which means that it has no meaning.
- **Information**: Information emerges when data is given a meaning.
- **Knowledge**: Information in an experiential context is called knowledge.

Thus knowledge is the interpretation of information in a certain context by humans. The characteristics of knowledge will be outlined in the next section.

[107] cf. NORTH, K. (1998) pp.31-24

[108] cf. NORTH, K. (1998) pp.31-24

3.1.2 Characteristics of Knowledge

The literature depicts the following four characteristics of knowledge:[109]

- **Knowledge is generated dynamically**, which by means of changing cognitive structures.
- **Knowledge is always tied to persons**
- **Knowledge is prerequisite for human actions**, which means that without the proper knowledge humans can't set the right actions.
- **Knowledge multiplies by sharing it**, which means that by sharing information to people they may see that information in a different context and therefore new knowledge emerges.

Furthermore it can be distinguished between knowledge that can be written down explicitly, and knowledge that is characterized as expertise or practical skills. Kirsh distinguishes between explicit and implicit knowledge as follows:[110]

Knowledge that is present to everyone (e.g. written in books or on websites) is called explicit knowledge. Knowledge that emerged because of experiences (e.g. failures) or training (e.g. riding a bike) is called implicit knowledge.

3.1.3 Knowledge and Innovation

"Innovation management has been increasingly been gained on importance across industries as well as in commercial businesses. In line with this process, more and more significance has been attached to knowledge, which is useful for the process of creating and organisation's value."[111]

In the knowledge driven economy an efficient and effective management of knowledge is necessary because knowledge constitutes the basis for innovation and competitive advantage.[112] How knowledge management can be achieved will be part of the next section.

[109] cf. DITZEL, B. et al. (2007) p.12

[110] cf. KIRSH, D. (1990) pp.340-365

[111] LEBER, M. et al. (2004) p.257

[112] LEBER, M. et al. (2004) p.255

3.2 Knowledge Management

In this chapter the purpose for knowledge management in companies will be described. The abstracted levels of knowledge management will be outlined and furthermore the components and activities that define the knowledge management will be introduced.

3.2.1 The Purpose of Knowledge Management

"The careful and successful management of knowledge as the most valuable resource is increasingly recognized and perceived as management task in companies."[113]

Sammer and Bornemann depict that knowledge management is the management of an organisation with special emphasis on the success factor *knowledge*.[114] Soukup describes three trends that make knowledge management necessary for companies:[115]

- The evolution of the **knowledge society** and the changing knowledge landscape.
- The domination of **knowledge intensive businesses** and products.
- The increasing amount of creative and **knowledge-intensive work** emerges out of the higher complexity of products and businesses.

Further the portion of knowledge intensive processes to the total business value creation increases constantly.[116]

[113] cf. WOHINZ, J. (2009) p.14

[114] cf. BORNEMANN, M.; SAMMER, M (2002) p.10

[115] cf. SOUKUP, C. (2001) pp.36-37

[116] cf. DITZEL, B. et al. (2007) p.11

The following benefits of knowledge management can be depicted: [117]

- Increasing innovation strength and competitiveness
- Take advantage of unused knowledge resources of the organisation
- Networking expert knowledge
- Increasing the motivation of the employees by value them as thinkers
- Increasing learning capability of the organisation
- Increasing quality of decision making
- Avoiding unnecessary resource expense ("Do not invent the wheel constantly new")

In order to take profit of the above-mentioned benefits knowledge management needs to be implemented integrally in the organisation, which will be outlined in the next two sections.

3.2.2 Levels of Knowledge Management

Knowledge management has to be seen as an integral part of an organisation. For a better understanding what knowledge management means for an organisation it is helpful to have an abstracted view on the single levels of knowledge management. Knowledge management can take place on three different levels:[118]

- Level of Action
- Level of Knowledge
- Level of Data

Figure 8 shows the three levels of knowledge management according to Willfort. The depiction also shows a knowledge system (see chapter 3.3) containing a social sub-system and a technical sub-system. On the knowledge level and the level of action persons are the knowledge carriers and therefore form the social sub-system in the model. The data level

[117] cf. DITZEL, B. et al. (2007) p.11

[118] cf. WILLFORT, R. (2001) p.104

constitutes the technical sub-system, where the data of an organisation is stored.[119]

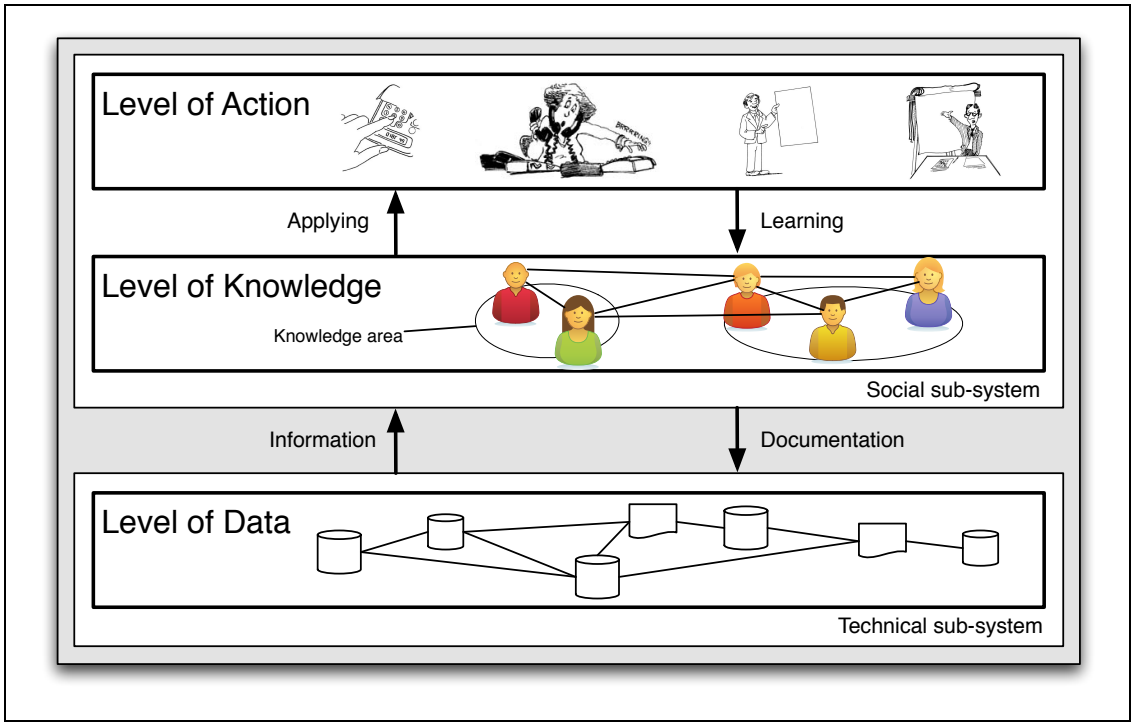

Figure 8: Levels of knowledge management[120]

The levels of knowledge management will be pointed out in detail now.

Level of Action

On the *level of action* humans use their acquired knowledge in actions. The process of learning new knowledge denotes the transition from the level of action to the knowledge level. [121]

[119] cf. WILLFORT, R. (2001) p.104

[120] cf. WILLFORT, R. (2001) p.104

[121] cf. WILLFORT, R. (2001) pp.106-107

Level of Knowledge

On the level of knowledge the social networking between the persons of the organisation takes place.[122] Persons learn from each other by transferring their knowledge to others. Two types of knowledge transfer can be distinguished:[123]

- **Direct:** The knowledge transfer is done face-to-face (e.g. teaching in a seminar)
- **Indirect:** The knowledge transfer is done via a technical system (e.g. learning out of a script or online resource)

The process of applying knowledge denotes the transition between the knowledge level and the level of action. The process of documentation denotes the transition from the knowledge level to the data level.[124]

Level of Data

On the level of data the documented explicit knowledge is stored as data in a technical system (see chapter 3.3). [125]

3.2.3 Knowledge Management Components

The model of Probst defining the components of knowledge management can be seen as one of the important models that describe the strategic and operative aspects and the transitions of the knowledge activities in integral knowledge management. They represent a conceptualisation of the knowledge activities in companies.[126] Hinterhuber and Renzl describe the aspects of strategic and operative knowledge management as following:

"The strategic dimension is to educate the managers and staff to strategic insight, strategic thinking and strategic responsibility inside the actual and the future knowledge areas. The operational dimension is to help the employees

[122] cf. WILLFORT, R. (2001) pp.105-106

[123] cf. WOHINZ, J. (2009) pp.47-48

[124] cf. WILLFORT, R. (2001) pp.105-106

[125] cf. WILLFORT, R. (2001) pp.107-108

[126] PROBST, G.; ROMHARDT, K. (1998) p.133

to connect themselves and external knowledge sources through routines that their knowledge can be used in the interest of the company."[127]

In Figure 9 the eight knowledge activities based on the model of Probst, Raub and Romhardt are shown:[128]

- Knowledge goals
- Knowledge assessment
- Knowledge identification
- Knowledge acquisition
- Knowledge development
- Knowledge distribution
- Knowledge usage
- Knowledge preservation

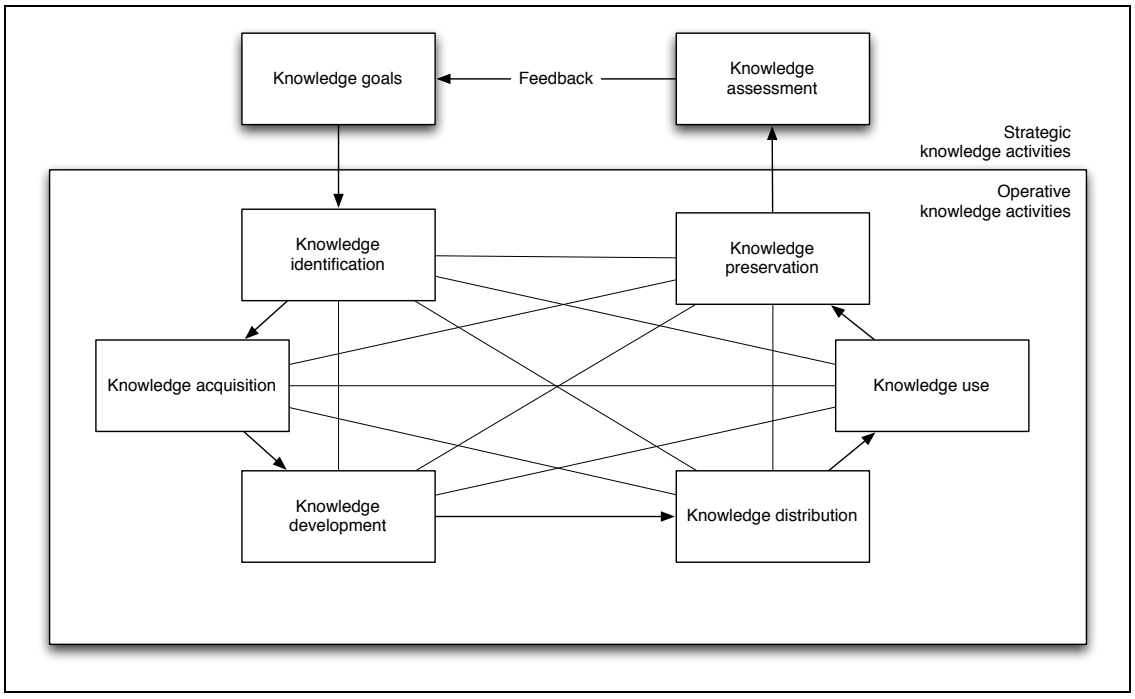

Figure 9: Knowledge Activities[129]

[127] HINTERHUBER, H. H.; RENZL, B. (2002) pp.19-20

[128] cf. PROBST, G. J. B.; RAUB, S.; ROMHARDT, K. (1999) pp.53-58

[129] cf. PROBST, G. J. B.; RAUB, S.; ROMHARDT, K. (1999) p.58

The single knowledge activities will be described in detail now.

Knowledge Goals

"Knowledge goals give the knowledge management activities a direction. Normative knowledge goals focus on creating a knowledge culture in the enterprise, strategic knowledge goals define the available knowledge and the demand for new knowledge. Operative knowledge goals focus on the implementation of the knowledge management according to the strategic knowledge goals."[130]

Knowledge analysis, planning of knowledge objectives and the assignment of resources are typical methods and instruments applied when working out knowledge goals.

Knowledge Assessment

"According to the formulated knowledge goals methods for measurement of normative, strategic and operational knowledge objectives are necessary."[131]

Knowledge assessment covers the availability and the assessment of the knowledge inside the organisation and analysis the changes of the knowledge over the time and the attainment of knowledge objectives. Knowledge management assessment and intellectual capital reports are typical methods and instruments applied for knowledge assessment.[132]

Knowledge Identification

"Many companies find it difficult today to keep track of internal and external data, information and skills."[133]

[130] PROBST, G. J. B.; RAUB, S.; ROMHARDT, K. (1999) p.57

[131] PROBST, G. J. B.; RAUB, S.; ROMHARDT, K. (1999) p.57

[132] cf. DITZEL, B. et al. (2007) p.16

[133] PROBST, G. J. B.; RAUB, S.; ROMHARDT, K. (1999) p.54

Knowledge identification covers activities for identifying and analysing knowledge inside and outside the organisation.[134]

Knowledge Acquisition

"Companies import a substantial part of their knowledge needs from sources outside the company."[135]

Knowledge acquisition covers importing new knowledge from external sources through cooperation, personnel recruiting, acquiring patents, Open Innovation etc.[136]

Knowledge Development

The development of new knowledge is complementary to knowledge acquisition and therefore focuses on developing new skills, products, ideas and more powerful processes inside the organisation.[137]

Knowledge Distribution

"Knowledge distribution is an obligatory requirement to make existing isolated information or experience available to the entire organisation."[138]

Knowledge distribution does not mean that everyone must know everything inside the organisation, but everyone who has to know about certain information should be informed through knowledge distribution.[139]

[134] cf. PROBST, G. J. B.; RAUB, S.; ROMHARDT, K. (1999) p.54

[135] PROBST, G. J. B.; RAUB, S.; ROMHARDT, K. (1999) p.54

[136] cf. DITZEL, B. et al. (2007) p.16

[137] cf. PROBST, G. J. B.; RAUB, S.; ROMHARDT, K. (1999) p.54

[138] PROBST, G. J. B.; RAUB, S.; ROMHARDT, K. (1999) p.55

[139] cf. PROBST, G. J. B.; RAUB, S.; ROMHARDT, K. (1999) p.55

Knowledge Usage

"Knowledge usage, thus more productive use of organisational knowledge for the benefit of the company's goals is the purpose of knowledge management."[140]

Knowledge usage describes the application of knowledge inside the activities of business processes.[141]

Knowledge Preservation

"Once acquired skills are not automatically available for the future. The selective preservation of experiences, information and documents requires management efforts."[142]

Knowledge preservation includes saving, distributing and actualizing learned skills, information, and documents with the help of information technology.[143]

3.3 Knowledge Management Systems

Before knowledge management systems are introduced the term *system* should be defined:

"A system consists of individual components, the elements, which together form a unit and are connected by relationships."[144]

Further the *system* term should be refined for knowledge management. Wohinz defines a *knowledge system* as follows:

"The knowledge system represents a specific expression of an industrial work system. […] The people in a knowledge system act as knowledge

[140] PROBST, G. J. B.; RAUB, S.; ROMHARDT, K. (1999) p.55

[141] cf. DITZEL, B. et al. (2007) p.16

[142] PROBST, G. J. B.; RAUB, S.; ROMHARDT, K. (1999) p.56

[143] cf. DITZEL, B. et al. (2007) p.16

[144] HABERFELLNER, R. (1994) p.6

carriers and constitute the social sub-system. The technical tools and facilities constitute the technical sub-system."[145] *(see chapter 3.2.2)*

In this chapter the technical sub-system of knowledge systems should be further described. Therefore Maier and Hädrich's definition of a technical knowledge management system should be used:

Knowledge management systems (KMSs) are seen as enabling technologies for an effective and efficient knowledge management.[146]

Droschl describes the following services that technical knowledge management systems can offer to humans: [147]

- The portal
- Annotating data with metadata
- Publishing
- Processing of structured and unstructured data
- Search engines
- Recommendation agents
- Skill profiles and expert search
- E-learning
- Collaboration

The services will be outlined in detail now.

The Portal

A knowledge management portal is a system that gives the users access to data (indirectly to knowledge) and enables the users to customize the view on that data.[148] It acts as a supportive workbench for the knowledge-worker, in which supportive services can be:[149]

[145] WOHINZ, J. (2009) p.43

[146] MAIER, R.; HÄDRICH, T. (2008) p.541

[147] cf. DROSCHL, G. (2002) pp.226-227

[148] cf. DROSCHL, G. (2002) p.226

[149] cf. DROSCHL, G. (2002) pp.230-231

- Customizing the view and data according to the user profile
- Recommending relevant information to a currently opened document
- Offering rich administration, search and filtering of the data

An example for a knowledge management portal is the software solution *Hyperwave*[150].

Annotating Data With Metadata

"The added value of metadata and annotation is that by adding data new information emerges."[151]

Annotating data with metadata is of major importance to enrich the meaning of data for humans and computers. In order to get an idea of the concept, *metadata* and *annotation* will be described.

"Metadata is structured information that describes, explains, locates or otherwise makes it easier to retrieve, manage or use an information resource."[152]

Thus annotating data with metadata helps humans and computers to get additional information about documents and therefore enriches the data with more meaningful describing information.[153] The OECD describes metadata as data about data and specifies recommendations for the use of metadata.[154] Technical standards make it also possible for computers to interpret metadata and thereby serve additional information to the user.[155] Annotating is the process of adding metadata to a document or any other

[150] *Hyperwave (2011)*
http://www.hyperwave.at/ [19.11.2011]

[151] DROSCHL, G. (2002) p.236

[152] *National Information Standards Organisation (2004)*
http://www.niso.org/publications/press/UnderstandingMetadata.pdf [12.09.2011]

[153] cf. DROSCHL, G. (2002) p.236

[154] OECD - *Data and Metadata Reporting and Presentation Handbook (2007)*
http://www.oecd.org/dataoecd/46/17/37671574.pdf [19.11.2011]

[155] cf. DROSCHL, G. (2002) pp.235-236

data.[156] Tagging is a very popular form of annotating data by adding keywords on community sites and therefore should be described.

On community sites tags are used to facilitate organisation and categorisation of data.[157] The resulting organisation of data is also known as folksonomies, which is an acronym of "folk" and "taxonomy".[158] A major strength of folksonomies is the enhanced browsing and filtering of data: Through related tags users get aware of data that wouldn't have been found if categories would have been used.[159] Thus folksonomies can be a powerful tool to organize data with tags but the following weaknesses need to be faced:[160]

- Ambiguity of tags: Different users apply tags in a different way on data
- Multiple words: It doesn't exist a standardized way on how to enter tags with multiple words. In general tags should be single words.
- Synonyms: Synonym tags, like "mac", "macintosh" or "mac computer" lead to different categories for the same thing. The same problem exists for singular and plural.

By recommending the user tags in the tagging process the above-mentioned weaknesses can be lowered. Sigurbjörnsson and van Zwol describe a tag recommendation system based on tag co-occurrences:

> *"Given a photo with user-defined tags, an ordered list of m candidate tags is derived for each of the user-defined tags, based on tag co-occurrence. The lists of candidate tags are then used as input for tag aggregation and ranking, which ultimately produces the ranked list of n recommended tags."*[161]

Garg and Weber describe a tag recommendation solution as follows:

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[156] cf. DROSCHL, G. (2002) p.236

[157] cf. MATHES, A. (2004) p.2

[158] cf. MATHES, A. (2004) p.4

[159] cf. MATHES, A. (2004) p.6

[160] cf. MATHES, A. (2004) pp.5-6

[161] SIGURBJÖRNSSON, B.; VAN ZWOL, R. (2008) p.330

"Whenever the user wants to add another tag, we recommend a ranked list of relevant tags to the user. The user then can choose whether to select any item from the list of recommendations, or to ignore all the recommendations and enter a tag herself."[162]

Garg and Weber further mention that the user's motivation for tagging resources is generally very low.[163]

Publishing

Publishing is the process of capturing data by the knowledge management system.[164] Metadata can be added to the published content either manually by the user or automatically by the system.

Processing of Structured and Unstructured Data

Data can be either structured (e.g. Tables, File Formats, etc.) or unstructured (text documents). Important to note is that the informational content of structured data is higher than of unstructured data, which is caused by metadata that enriches the unstructured data. A knowledge management system can help to handle unstructured data more efficiently by deriving structures or helping the user to add metadata or categorize the data.[165]

The following approaches can be distinguished:[166]

- Through objects or **containers** data can be capsuled.
- Through **categories** similar documents or data can be categorized.
- Through **tree structures** or **taxonomies** the data can be organized hierarchically.
- Through **links** relations between documents or data can be accomplished.

[162] GARG, N.; WEBER, I. (2008) p.67

[163] cf. GARG, N.; WEBER, I. (2008) p.67

[164] cf. DROSCHL, G. (2002) p.233

[165] cf. DROSCHL, G. (2002) p.234

[166] cf. DROSCHL, G. (2002) pp.234-235

- Through standardized **metadata** data can be exchanged with other knowledge management systems or other data sources.

When categories are used for categorisation six problems of categorisation has to be faced:[167]

- Arbitrariness of categories: Is there a certain category that is more *natural* than others?
- Equivalence of category members: Which objects are representative for a category?
- Determinacy of category membership and representation: What are the boundaries between categories?
- The nature of abstraction: What is the appropriate level of abstraction?
- Decomposability of categories into elements
- The nature of attributes: What is considered a category and what is considered an attribute?

With semantic technologies categorisation, hierarchies and links between data can be achieved by using standardized metadata. In chapter 3.4 semantic technologies will be introduced in detail.

Search Engines

"Employees spend a substantial part of their available time with searching."[168]

Powerful search engines are essential to minimize the time for searching. Search can be empowered by various aspects:[169]

- Progressively refining the search topic
- Comparison with similar reference documents
- Individual search results according to the users profile

[167] cf. MERVIS, C. B.; ROSCH, E. (1981) p.90-91

[168] cf. DROSCHL, G. (2002) p.225

[169] cf. DROSCHL, G. (2002) pp.237-238

While traditional search is based almost purely on the occurrence of words in documents semantic search offers opportunities to improve the search results by augmenting the results with semantically relevant information (related information) and mappings to real-world things.[170] More details about semantic technologies will be introduced in chapter 3.4.

Recommendation Agents

Recommendation agents are programs that run in the background and recommend potential relevant data to the user.[171] Therefore the recommendation agent searches relevant data fitting to the currently showing document and shows these related documents to the user.[172] The user gets aware of potential relevant information without having to explicitly search for it. Automatic recommendations are also very popular on e-commerce platforms.

Skill Profiles and Expert Search

"Experts are not simply general problem solvers who have learned a set of strategies [...] they are more likely then novices to recognize meaningful patterns of information [...] "[173]

Skill profiles can express specialist expertise of users that work with a knowledge management system.[174] The user can either self-assess her expertise and provide this information to the system (e.g. to a user profile) or the system can try to figure out expertise by analysing the user's contributions (e.g. if a user typically contributes documents about "software engineering" to a system, it can be derived that the user might be an expert in this domain).[175]

[170] cf. GUHA, R.; MCCOOL, R.; MILLER, E. (2003) p.702

[171] cf. DROSCHL, G. (2002) p.238

[172] cf. DROSCHL, G. (2002) p.238

[173] BRANSFORD, J. (2000) p.48

[174] cf. DROSCHL, G. (2002) p.239

[175] cf. SCHÄFERMEIER, R.; PASCHKE, A. (2011) p.63-67

Expert search describes the process of searching experts in a knowledge management system.[176] Therefore the available skill profiles are compared to the requested query and the best matching users are shown as experts to the user. Creating skill profiles and expert search engines has the following benefits:[177]

- With the help of skill profiles an expert search can be accomplished efficiently.
- The knowledge management system can better recommend documents to the users when skill profiles are provided.
- Skill profiles of individuals can be merged and visualized.
- Skill profiles extend regular personnel directories.
- Monitoring aspects of the personnel development is easier.

Accoring to Ehrlich reputation is an important measure when it comes to judging experts.[178] In communities experts can also be defined by activity, reputation and trust measures, which means that highly active and trustful users that contribute lots of content create a certain added value.[179] These users are called *lead users*.

Lead-users can be seen as a special sort of experts and are of special importance for Open Innovation and crowdsourcing. Eric von Hippel defines a lead user as follows:[180]

- Lead users face needs that will be general in a marketplace, but face them much earlier than the majority.
- Lead users are positioned to benefit by obtaining solutions to those needs.

Lead-users often act as opinion leaders and therefore have the power to innovate but also influence others to actions.[181] Therefore keeping lead-users

[176] cf. DROSCHL, G. (2002) p.239

[177] cf. DROSCHL, G. (2002) p.240

[178] EHRLICH, K. (2003) p.304

[179] cf. VON HIPPEL, E. (1986) p.791

[180] cf. VON HIPPEL, E. (1986) p.791

motivated is of major importance for successful crowdsourcing and Open Innovation.

E-learning

"E-Learning are all forms of electronic supported learning and teaching, which are procedural in character and aim to effect the construction of knowledge with reference to individual experience, practice and knowledge of the learner. Information and communication systems, whether networked or not, serve as specific media (specific in the sense elaborated previously) to implement the learning process."[182]

Drucker has already emphasized the role of continuous learning in enhancing a knowledge worker's productivity.[183] The role of learning can be seen as an intrinsic part of knowledge work and can be identified in all major knowledge work types:[184]

- **Application of existing knowledge to current problems:** A person learns every time a skill is applied to new problem situations.
- **Knowledge transfer:** When transferring knowledge (e.g. via teaching) others can pass on the learned knowledge.
- **Knowledge Acquisition:** Acquiring knowledge by researching or learning.
- **Creation of new knowledge or innovation:** Employers that work together in teams to collaboratively create new knowledge learn from each other.

[181] cf. URBAN, G.; VON HIPPEL, E. (1988) p.579 and MORRISON, P.; ROBERTS, J.; MIDGLEY, D. (2004) p.2

[182] TAVANGARIAN D., LEYPOLD M., NÖLTING K., RÖSER M. (2004) p.274

[183] cf. DRUCKER, P. (1999) pp.79-94

[184] *The Aposdle Approach to self-directed work-integrated learning (2006)* http://www.aposdle.tugraz.at/media/multimedia/files/the_aposdle_approach_to_self_directed_work_integrated_learning [08.10.2011]

As mentioned before, collaboration is an important aspect for learning. How collaboration can be supported by knowledge management systems will be pointed out next.

Collaboration

"Collaboration describes the joint work of a group of people on shared objects, where people share common goals and are jointly responsible for the outcome."[185]

Collaboration in the context of knowledge management is about supporting the users by collaborative work. A knowledge management system can therefore integrate tools like Wiki's, discussion forums or social software.[186]

Social software is web-based technology that supports easy and rapid knowledge transfer and collaboration in distributed knowledge networks.[187] Zeitler and Schauer depicts that a single, unambiguous, universal definition of social software does not exist.[188] Allen refers to an explanation by Shirky, who defined social software as *software that supports group interaction*.[189] Social software supports and encourages communication, social interaction and collaboration among people and generates added value by creating knowledge networks.[190] Social communities create their own momentum and not everyone in a community is equally willing to contribute content. This phenomenon is known the 90-9-1 principle: Thereby 90 percent of the users in an online community are consumers, who read and observe but never contribute, 9 percent of the users contribute from time to time and only 1 percent participates a lot and therefore is responsible for most of the content.[191]

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[185] RIEMER, K. (2007) pp.346-357

[186] cf. DROSCHL, G. (2002) p.243

[187] WILLFORT, R. et. al. (2007) p.10

[188] ZEILER, M.; SCHAUER, B. (2011) p.2

[189] *ALLEN, C. Tracing the evolution of social software (2004)*

http://www.lifewithalacrity.com/2004/10/ tracing_the_evo.html [08.10.2011]

[190] *ALLEN, C. Tracing the evolution of social software (2004)*

http://www.lifewithalacrity.com/2004/10/ tracing_the_evo.html [08.10.2011]

[191] *NIELSEN, J. (2006)*

3.4 Semantic Technologies

Semantic technologies are an upcoming trend in many areas of informatics. In this chapter semantic technologies will be defined, core technologies will be introduced and application areas will be outlined.

To get an understanding of semantic technologies the terms *semantics* and *syntax* must be defined:

> *"Syntax is generally understood as a set of rules for the structuring of characters and strings. […] Semantics generally stands for the meaning of words, phrases or symbols."*[192]

Semantic technologies are often misinterpreted in a way that the core ideas behind them are focusing on making computers understand information with the help of artificial intelligence. The actual goals of semantic technologies are, to support applications to present information in a way that machines can handle information in a way that humans gain benefit.[193]

A single definition of semantic technologies does not exist and therefore a definition for the purpose of this work should be given:

> *"Semantic technologies cover knowledge representation languages for ontologies as well as methods and tools to create, maintain and use ontologies."*[194]

The concepts of ontologies will be defined now.

Ontologies

Ontologies are core concepts of semantic technologies. In order not to confuse with the definition of ontologies in philosophy the following definition should be used throughout this thesis:

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http://www.useit.com/alertbox/participation_inequality.html [02.09.2011]

[192] HITZLER, P.; KRÖTZSCH, M.; RUDOLPH, S.; SURE, Y. (2008) p.13

[193] cf. HITZLER, P.; KRÖTZSCH, M.; RUDOLPH, S.; SURE, Y. (2008) p.12

[194] HITZLER, P.; KRÖTZSCH, M.; RUDOLPH, S.; SURE, Y. (2008) p.12

"In philosophy, an ontology is a theory about the nature of existence, of what types of things exist; ontology as a discipline studies such theories. Artificial-intelligence and Web researchers have co-opted the term for their own jargon, and for them an ontology is a document or file that formally defines the relations among terms."[195]

Accordingly ontologies formally describe knowledge of an application domain in files and documents.[196]

An idea-ontology for the application area on innovation platforms needs to hold information on the following aspects of innovation management:[197]

- Comments and discussions on ideas
- Assessment of ideas through ratings
- Grouping and clustering of ideas and idea submissions
- Status of ideas (e.g. "in feedback", "submitted", "rejected")

Depending on the application domain the ontology needs to fit to other aspects.

Compared to traditional data representations (e.g. unstructured files or relational databases) the above-mentioned idea ontology has the following benefits:[198]

- The concept of the idea and the relations to other idea concepts are formulated in a machine process able way
- Other idea concepts and relations can easily extend the ontology data model.
- The semantic reasoning of idea concepts can be expressed on data level.
- Clustering ideas by similarity or relatedness

[195] *BERNERS-LEE, T.; HENDLER, J.; LASSILA, O.: The Semantic Web (2001)* http://www.scientificamerican.com/article.cfm?id=the-semantic-web&page=4 [22.11.2011]

[196] cf. HITZLER, P.; KRÖTZSCH, M.; RUDOLPH, S.; SURE, Y. (2008) p.12

[197] RIEDL, C. et al. (2009) pp.5-6

[198] RIEDL, C.; May, N.; FINZEN, J.; STATHEL, S.; KAUFMAN, V.; KRCMAR, H. (2009) p.7

- Analyzing contributions and contributors
- Information integration and data exchange across innovation platforms
- Attaching to social networks and facilitating collaboration

From a non-technical view ontologies are knowledge bases, which store knowledge of a certain domain in a formulised structure.[199]

The formalisms used to describe ontologies will be outlined now.

Ontology Description Languages

Ontology description languages define formalisms, which are used to describe ontologies. A whole range of ontology description languages is available on the web. The most important to mention is the *Resource Description Framework (RDF)*, which should be defined now:

> *"The Resource Description Framework is a formal language to describe structured information. Through RDF applications should be able to exchange data without losing its meaning."*[200]

In 1999 the *Word Wide Web Consortium* (*W3C*) defined RDF originally as a metadata standard, which helped to annotate websites with structured metadata.[201]

Today *RDF* enables applications to exchange data in information systems without losing the original meaning of the data.[202]

While standards, like *RDF*, has gained on importance for information systems the application areas for semantic technologies have been extended during the last years. An overview on applications that are using semantic technologies should be given next.

[199] cf. HITZLER, P.; KRÖTZSCH, M.; RUDOLPH, S.; SURE, Y. (2008) p.12

[200] HITZLER, P.; KRÖTZSCH, M.; RUDOLPH, S.; SURE, Y. (2008) p.15

[201] cf. HITZLER, P.; KRÖTZSCH, M.; RUDOLPH, S.; SURE, Y. (2008) p.35

[202] cf. HITZLER, P.; KRÖTZSCH, M.; RUDOLPH, S.; SURE, Y. (2008) p.35

Application Areas of Semantic Technologies

Semantic technologies are currently used in different application areas. The most important ones should be outlined here.

In technical knowledge management systems, like *APOSDLE*, semantic technologies are used to support knowledge-workers (see chapter 3.3) by their everyday work processes to enhance the productivity.[203]

Semantic technologies are the core technologies of the new generation of the World Wide Web. Tim-Berners Lee's vision of the S*emantic Web* is as follows:

"The Semantic Web is not a separate Web but an extension of the current one, in which information is given well-defined meaning, better enabling computers and people to work in cooperation. […] Machines become much better able to process and "understand" the data that they merely display at present."[204]

"The semantic web provides a common framework that allows data to be shard and reused across application, enterprise and community boundaries. […] The semantic web is based on the resource description framework (RDF)."[205]

The paradigm change from the current *Web 2.0* to the *Semantic Web* does not rapidly occur; rather projects like the *Linked Open Data (LOD)* project ensure the constant progress of the change. The *Linked Open Data* project pursues the goal of making data better accessible on the web and therefore publishes various open datasets in *RDF* format on the web and interlinks these datasets. The result is called the *Linked Open Data cloud*, which is a

[203] cf. LINDSTAEDT, S.; LEY, T.; MAYER, H. (2005) p.1

[204] *BERNERS-LEE, T.; HENDLER, J.; LASSILA, O.: The Semantic Web (2001)*
http://www.scientificamerican.com/article.cfm?id=the-semantic-web&page=2 [22.11.2011]

[205] *W3C Semantic Web (2011)*
http://www.w3.org/2001/sw/ [02.10.2011]

constantly growing, free accessible knowledge base that contains over thirty-one billion interlinked *RDF* triples about various domains.[206]

[206] *Linked Open Data (2011)*
http://www.w3.org/wiki/SweoIG/TaskForces/CommunityProjects/LinkingOpenData
[08.10.2011]

4 Benchmarking

In chapter 5 a benchmarking study on innovation platforms will be accomplished. In order to give the interested reader an overview on the benchmarking process this chapter should provide the theoretical basis for the benchmarking study. In this chapter the benchmarking term will be introduced and the various types of benchmarking will be outlined. Finally, a generic benchmarking process will be introduced.

Every company should be ready to take the opportunity to learn from others. Benchmarking is a method for continuous improvement and should be understood as chance for change. Benchmarking is a method on how companies can learn from experiences from other industries, competitors or departments in order to increase efficiency.[207]

4.1 Characteristics of Benchmarking

Pieske defines the following characteristics of benchmarking:[208]

- Benchmarking is comparison
- Benchmarking is collecting and processing information
- Benchmarking is change
- Benchmarking is communication
- Measurement-, comparison and positioning aspects
- Learning aspects

The characteristics will be outlined in detail now.

Benchmarking is comparison

Benchmarking is based on the principle of comparison. It deals with the quantitative and qualitative comparison of at least two objects. In the qualitative comparison *numbers* (e.g. revenue, market share, company size, etc.) are determined and set in relation. The qualitative comparison

[207] cf. MEYER, J. (1996) p.IX

[208] cf. PIESKE, R. (1995) pp.15-19

determines the correspondence of features, characteristics, processes, services and principles.[209]

Benchmarking is collecting and processing information

For every comparison information is required. Respectively benchmarking implies an information need. In general benchmarking is a specific type of information processing that determines orientation points, the "benchmarks". But "benchmarks" can be also interpreted as progressive, different from the own practice conditions, tools, procedures, design principles, etc. These "benchmarks" are called "best practices".[210]

Benchmarking is change

It is not sufficient to know "best practices" or target values and archive them in the shelf. The focus of benchmarking is to work with this information and the derivation of appropriate consequences for the own company. The organised search for rational solutions and methods is a major characteristic of benchmarking.[211]

Benchmarking is communication

This characterisation of benchmarking is to be read in conjunction with the above-mentioned features. First, it is necessary to communicate the need for continuous improvement by benchmarking in the company. Second, the collection of information can be accomplished by direct communication (e.g. surveys) with the benchmarked companies.

Measurement-, comparison and positioning aspects

The comparison as part of the benchmarking clearly reveals the initial situation of a company. Based on measurements and comparison with the benchmarking objects it becomes easier to position on the market. Therefore benchmarking answers the question: "Where do we stand?"[212]

[209] cf. PIESKE, R. (1995) p.12

[210] cf. PIESKE, R. (1995) pp.12-13

[211] cf. PIESKE, R. (1995) p.14

[212] cf. PIESKE, R. (1995) p.15

Learning aspects

Because of the comparison with the best among the competition of industries the potentials of the own company are revealed. Therefore benchmarking is an extension of the internal know-how by identifying and modifying knowledge of others. The essence of benchmarking is to recognise useful innovations and therefore the approach is not seen as innovative.[213]

4.2 Benchmarking Subjects and Types

Benchmarking information, "benchmarks" or "best practices" can origin from various sources. The sources are known as the benchmarking subjects. The following benchmarking subjects can be distinguished:[214]

- **Customers:** The dynamically changing needs of the customers constitute target "benchmarks".
- **Competitors:** Activities of the competitors in the same industry and the deterioration of a company's situation often trigger the benchmarking. Thus the competition is the subject for the benchmarking.
- **Companies from other industries:** Other industries may have the same challenges but other more innovative solutions. Therefore solutions of companies of other industries are the subject for the benchmarking.

Based on the above-mentioned subjects three types of benchmarking can be distinguished:[215]

- Internal benchmarking
- External benchmarking (Competitor benchmarking)
- Functional benchmarking

The benchmarking types are outlined in detail now.

[213] cf. PIESKE, R. (1995) p.17

[214] cf. MEYER, J. (1996) pp.34-38

[215] cf. KARLÖF, B.; ÖSTBLOM, S. (1994) p.38

Internal benchmarking

The internal benchmarking focuses on the comparison and analysis of methods, processes, key figures, etc. inside the company or group of companies (e.g. departments, facilities, cost centres, etc.). It is well suited for globally operating enterprises with various sites and a wide spectrum on products and services.[216]

External benchmarking (Competitor benchmarking)

The external benchmarking focuses on the methods, processes, services etc. of the direct competitors on the marketplace. It shows the position on the market compared to the competition and creates transparency about the current situation.[217]

Functional benchmarking

The functional benchmarking compares and analyses methods, processes, services etc. of companies that are operating on different markets and are not direct competitors. The goal is to identify innovative solutions from companies with similar challenges and adapt or modify the solutions for the company. New innovative solutions are more likely then in the other above-mentioned benchmarking types. [218]

The advantages and disadvantages of the three above-mentioned benchmarking types are shown in Table 2.

Type	Advantages	Disadvantages
Internal benchmarking	• Collecting information is relatively easy • Good results for diversified outstanding companies	• Limited viewing angle • Internal prejudices

[216] cf. PIESKE, R. (1995) pp.42-44

[217] cf. PIESKE, R. (1995) p.45

[218] cf. PIESKE, R. (1995) pp.45-47

External benchmarking	• Relevant business information • Products / processes comparable • High acceptance • Unique positioning on the market	• Collecting information is partially hard • Risk to business oriented copying
Functional benchmarking	• Relatively high potential to find innovative solutions • Enrichment of the idea spectrum	• Relatively hard to modify solutions • Argument against: Comparability • Time consuming analysis

Table 2: Advantages and disadvantages of benchmarking types[219]

The measurement and comparison of metrics is primarily important in the internal benchmarking, while the learning aspects are second. The functional benchmarking is primarily focusing on learning from other companies, while the measurement and comparison of metrics is second. In the external benchmarking both aspects, the measuring- and the learning aspects are equally important.

4.3 The Benchmarking Process

The benchmarking process is a structured method that describes the activities and relations between actions in benchmarking. Basically the process can be structured in an analysis- and an implementation phase. The analysis phase deals with the determination of the optimisation potentials of the benchmarking subject. Subsequently the implementation of new concepts, obtained from the analysis, is accomplished. The detailed phases and activities of the benchmarking process are structured differently in the

[219] cf. PIESKE, R. (1995) p.48

literature. Authors mostly depict the number, description and sequence of single activities and phases differently.[220]

For this thesis a benchmarking process based on Meyer should be used (see Figure 10).

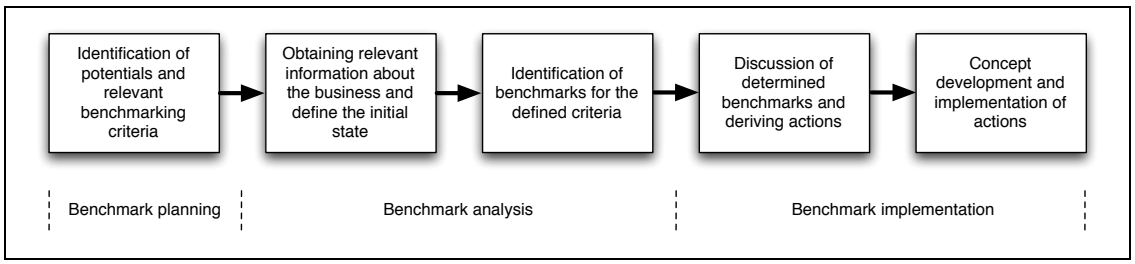


Figure 10: The benchmarking process[221]

The benchmarking process starts with the identification of potentials and the definition of benchmarking criteria. Subsequently through an internal analysis of the business the initial situation is made transparent. The actual analysis of the benchmarking subjects is following. Thereby information from the benchmarking objects according to the defined criteria is obtained through primary and secondary research and the performance of the benchmarking object is analysed. Through an evaluation of the obtained data "best practices" and "best performers" are determined and the gap to the competition is made transparent. Based on the benchmarking results an action plan for the business is derived containing required actions to close the gap to the competition. The change targets are defined and the actions are prioritised. Finally concepts are developed and the necessary actions are implemented in the operational practice. After the implementation the continuous monitoring on the impact of the set actions starts.[222]

The planning and the internal analysis, as well as the discussion of the benchmarking analysis are accomplished in teams. Therefore dedicated employees with necessary expertise should be integrated into the benchmarking process.[223]

[220] cf. PIESKE, R. (1995) p.49

[221] cf. MEYER, J. (1996) p.13

[222] cf. PIESKE, R. (1995) pp.52-54

[223] cf. MEYER, J. (1996) p.138

5 Identification of Development Potentials Based on a Benchmarking Study for *Neurovation.net*

This chapter constitutes the practical part of the master thesis. Based on benchmarking new development potentials for *Neurovation.net* will be analysed and evaluated. The procedure is illustrated in Figure 11. First an internal analysis of Neurovation is accomplished. It consists of a SWOT – Analysis and the definition of the benchmarking criteria (benchmarks). Subsequently the benchmark analysis is accomplished. First the benchmarking subjects are selected, a direct competitor benchmarking and a functional benchmarking is accomplished. Subsequently the gap between Neurovation and the competition is outlined. Based on the benchmark analysis concepts for further development of *Neurovation.net* are introduced and evaluated. At last an outlook on further development opportunities for *Neurovation.net* is given.

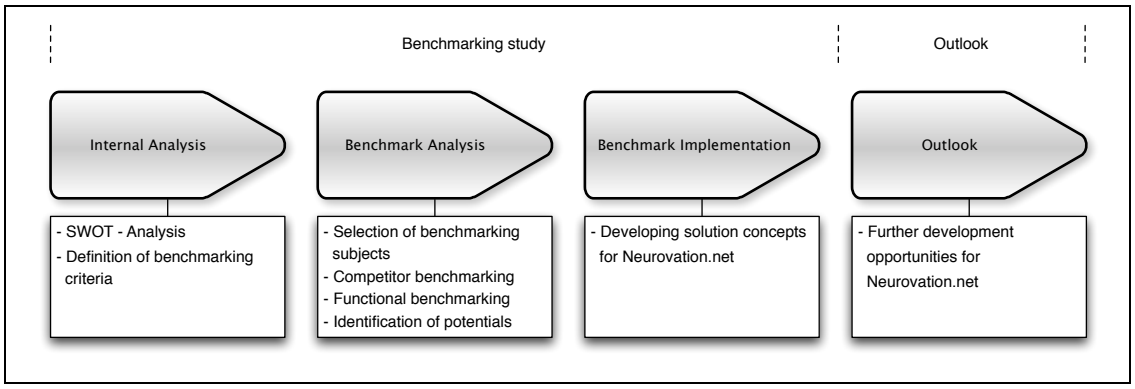


Figure 11: Process model of the practical part of this thesis

5.1 Internal Analysis of Neurovation

The internal analysis of Neurovation consists of a brief introduction of the company followed by a SWOT – Analysis. Subsequently the potential for improvements of the current platform solution are identified and formulated.

5.1.1 Introduction of the Business

Neurovation is an acronym of *neurology science* and *innovation*. The Neurovation project was born in 2005 when a group of brain researchers, innovation and knowledge management experts worked together developing new computer-based creativity techniques. The Neurovation GmbH was founded in 2007 based on the research results of the project. The company deals with developing creativity tools, Open- and Closed Innovation and idea management solutions, which are services in a growing market. The offered core services should be outlined now:

Open Innovation
On the intermediate innovation platform *Neurovation.net* innovation projects with business clients, who want to integrate external knowledge sources into the innovation process, are executed.

Closed Innovation
Customized instances of the innovation platform are implemented in organisations for continuous internal use. Therefore companies can integrate employees into the innovation process as well as accomplish sustainable idea management with the platform. Optionally external knowledge sources can be levered in single innovation projects.

Creativity Services
Neurovation researches and develops computer-based creativity tools for companies and Internet users. The goal is, to increase the creativity of the users and therefore support them in their everyday creative work processes. Details on the offered tools will be outlined later in this chapter.

Currently Neurovation is generating most of its revenue from Open Innovation projects but the demand for sustainable integrated innovation platforms and creativity tools in companies is increasing. Because the margins for integrated innovation platforms are much higher than for single Open Innovation projects, the business case is highly attractive for Neurovation.

A major success factor in Open Innovation is the innovation community. Thus Neurovation has to satisfy the requirements for two different target clients:

- Business clients
- Platform users

The characteristics of the target clients will be outlined now.

Business Clients

The business clients are paying customers for Neurovation. They either want to use an instance of the Neurovation platform internally in their company (Closed Innovation) or use the intermediate platform *Neurovation.net* for Open Innovation. For business clients the most important success criteria are the quality of the resulting ideas and the efficiency of the solution. Furthermore, the innovation platform is demanded to be secure and flexible in use.

Platform Users

The platform users are participating on innovation projects and therefore act as the problem solvers. Platform users can be employees of a company (Closed Innovation) or can be part of the public Internet community (Open Innovation). The goals of platform users are various; for some users the rewards are the main motivation for participating on innovation projects. For other users networking with creative people and having fun are the main motivations. Platform users demand a user-friendly and functional platform. They want to get recognised, inspired and respected.

Both kinds of target clients are essential for Neurovation. Through selling services to business clients revenue can be produced. Through a community of highly creative problem solvers the value for Open Innovation services increases and therefore the attractiveness of *Neurovation.net* for business clients increases as well.

5.1.2 SWOT – Analysis

The SWOT – Analysis is accomplished to identify the strengths and weaknesses of Neurovation as well as the opportunities and threats of the

environment. In order to get better results the analysis was accomplished in a workshop involving Neurovation employees with different backgrounds (see appendix A). The results of the SWOT – Analysis should give an objective overview on the current internal situation as well as the environment of Neurovation.

In a business analysis the strengths and weaknesses of the company are analysed. For Neurovation the following strengths and weaknesses can be identified: A wide competence spectrum in knowledge management, innovation management and creativity research could be identified as strength. Though lots of know-how is present in the company, services can be flexibly developed. Strong partners and ten years of experience in innovation management are also strengths that could be identified. A lack of resources and less know-how in mobile technologies are identified as weaknesses. A summary of the results is shown in Table 3.

Strengths	Weaknesses

• Competence spectrum
  o Knowledge management
  o Innovation management
  o Creativity research
• Partners
  o ISN
  o IITF
  o Universities
• Flexibility of the services
  o Open innovation
  o Closed Innovation
  o Custom Brandings
  o Idea management
• 10 years of practical experience in innovation management
	• Resources
	  o Personal
	  o Financial
	• Less know-how about mobile technologies
	• Marketing and Sales

Table 3: Strengths and Weaknesses of Neurovation

In an environmental analysis the opportunities and threads of the environment is analysed. The analysis leads to the following results: The fast

growing crowdsourcing market, growing awareness of companies for Open Innovation, idea management and creativity support and the growing demand for the offered services can be identified as opportunities for Neurovation. On the other hand, growing markets also imply a fast growing competition. The fast developing technology and the dependency on it raises the threat of wrong technology choices. The acceptance of crowdsourcing in the future can change anytime and can hardly be influenced by Neurovation. Privacy issues are also always a risk. Table 4 shows the summary of the results.

Opportunities	Threats
• Growing market • Growing demand for services offered by Neurovation • Growing awareness of crowdsourcing in companies	• Fast growing competition • Wrong technology choice • Acceptance of crowdsourcing in companies may shrink • Privacy

Table 4: Opportunities and Threats for Neurovation

The SWOT – Analysis shows the characteristics of an innovative company with high potential, a lot of opportunities but less resources and uncertain future developments of the environment. The potentials of the Neurovation platform should be formulated next.

5.1.3 Definition of Benchmarking Criteria

The benchmarking criteria have been selected in a workshop with Neurovation employees (see meeting protocol in appendix A). The following criteria were selected for the competitor benchmarking based on success criteria in the business, the relevance for Neurovation and the availability of information:

- Community size
- Media presence
- Services offered to business clients
- Number of innovation projects in 2010
- Costs

- Scientific activities
- Company size

They will be introduced in detail now.

Community size

The community size is a major success criterion for Open Innovation projects. Business clients utilise the community as external knowledge source for innovation projects. Platform users feel as part of a strong social network in a big community.

Media presence

For innovation platform providers it is important to be present in the media in order to attract new platform users as well as business clients. The evaluated media presence expresses the media presence by taking into account the amount of published press reports as well as the traceability of the innovation platform through search engines on the Internet.

Services offered to business clients

Extra services for a product often give the rash to a buying decision. Thus a lot of innovation platform providers offer extra services that lead to added value for business clients. The criterion describes the range of services offered by the analysed innovation platform providers.

Number of innovation projects in 2010

Through innovation projects new business clients can be attracted, the community gets expanded and revenue is produced. The number of innovation projects is a quantitative measure on the order situation in 2010 of the analysed innovation platform providers.

Costs

The costs that emerge for business clients when using a particular innovation platform are analysed with this criterion. The prices for innovation projects offered by innovation platform providers are analysed and compared. Total costs for business clients can be much higher depending on the effort spent on preparing the project and exploiting the ideas.

Scientific activities

The business of innovation platform providers is very knowledge intensive and technology driven. Trough scientific activities or partners new knowledge and technologies are accessible and can be turned into competitive advantage. Scientific activities also express trust and an established background.

Company size

For the benchmark analysis the number of employees is used to express the company size. It gives insight about how much resources are available and at what stage of the growth phase the company is.

Technology is a key success factor for innovation platforms, like *Neurovation.net*. In coordination with the Neurovation management the following functional benchmarking criteria has been formulated:

- Categorisation of ideas
- Detection of idea duplicates
- Collaboration
- Discovering experts

The functional criteria reflect the current technical challenges on *Neurovation.net*. They are introduced in detail now.

Categorisation of ideas

It has been shown that the categorisation strategies for ideas have become more important the more ideas are on the platform. Business clients have also requested good strategies for categorisation and structuring of ideas in order to save time and costs. Therefore the current solutions should be analysed and the categorisation of ideas on the platform should be improved in order to make ideas better filterable, searchable and cluster able for platform users and business clients.

Detection of idea duplicates

Past projects showed that near duplicate ideas are very common on the platform. In order to avoid near duplicates a lot of time has to be spent on

monitoring the ideas on the platform. Furthermore, near duplicate ideas do not lead to added value for business clients and therefore should be avoided. On an efficient innovation platform similar ideas or near duplicates should be identified by the system automatically and the users should be informed about duplicate ideas by the system in order to prevent near duplicates on the platform.

Collaboration

Collaboration increases the problem solving capability of a community if creative, complex and knowledge-intensive tasks need to be solved. Furthermore, business clients are requesting collaboration tools that can be used either inside of organisations or on the Internet. Therefore technologies that enable collaborative idea generation and submission on the platform should be introduced and evaluated.

Discovering experts

Not only the size of an innovation community is important, also the problem solving capability of the single platform users is of interest. Business clients are often focusing on experts that can provide more valuable solutions than the average user. Finding experts in a community is very important for the success and the quality of the solution. Therefore the Neurovation platform should provide technologies to identify the most influential users in the community. Furthermore, domain experts should be categorized and found easily.

The above-defined development potentials serve as the criteria for the functional benchmarking in chapter 5.2.

5.1.4 Conclusions of the Internal Analysis of Neurovation

The internal analysis pointed out the main services offered by Neurovation: A platform solution for Open Innovation, Closed Innovation and creativity services. The clients can be distinguished between paying business clients and platform users. The SWOT – Analysis showed that a major strength of Neurovation is the versatile know-how inside the company and available through network of partners. Low resources have been identified as major weakness. Growing markets and increasing demand on the offered services

opens up great opportunities for future developments. Unpredictable trends and the fast growing competition have been identified as threats for Neurovation. The community size, media presence, offered services, number of projects, costs, scientific activities and the company size have been selected for the competitor benchmarking. Better categorisation, duplicate idea detection, collaboration and discovering experts have been defined as functional benchmarks.

5.2 Benchmarking Analysis

In the benchmarking analysis first an overview on the current competitors of Neurovation should be given and consequently, benchmarking should be accomplished. Therefore a wide section of the market should be analysed, the identified competitors should be categorized and a selection of the direct competitors of Neurovation should be made. Subsequently the benchmarking subjects are benchmarked according to the previously defined criteria (see chapter 5.1.3). The results constitute the initial situation and serve as the basis for solution concepts.

5.2.1 Selection of the Benchmarking Subjects

Through a secondary research 270 crowdsourcing platforms could be identified and categorized (see full list of platforms in appendix B). The categorisation is based on Gassmann's definitions of crowdsourcing concepts (see chapter 2.4.1). Many crowdsourcing providers focus on a sort of crowdsourcing projects. Therefore the focus of the identified companies has been analysed and subsequently the country of origin has been examined. The selection of competitors for the detailed analysis has been accomplished in a workshop with Neurovation employees (see meeting protocol in appendix A). The criteria for the competitor selection has been well defined. The following criteria were essential for the selection:

- **Platform type:** Neurovation offers an intermediate platform as well as customized proprietary instances of the platform. Therefore the selection was restricted to companies with a similar platform type.
- **Focus:** Neurovation focuses on idea contest in general. Therefore the selection was focused on competitors with a similar orientation.

- **Origin:** Neurovation's clients are mostly from the German-speaking market. Therefore platforms from Germany, Switzerland and Austria are preferred. One platform from the USA has been selected in order to have a benchmark to the US market.
- **General relevance:** Based on a subjective assessment the general relevance of the competitors on the market has been identified. Based on that analysis only those competitors that are relevant for Neurovation ("the best on the market") were picked.

Name	Platform Type	Focus	Origin	URL
Atizo	Intermediate / Proprietary	Idea platform	Switzerland	http://www.atizo.com
Brainfloor	Intermediate	Idea platform	Austria	http://www.brainfloor.com
Hyve	Proprietary	Idea platform	Germany	http://www.innovation-community.de
InnoCentive	Intermediate / Proprietary	Research & Development	USA	https://www.innocentive.com/
Jovoto	Intermediate	Idea platform	Germany	http://www.jovoto.com/

Table 5: Selection of competitors for the benchmark analysis

In Table 5 the final selection of the competitors is shown. The selection consists of two German, one Swiss, one Austrian and one US competitor. The selected competitors should be introduced now. Atizo is an aspiring company from Switzerland that was founded in 2007. Brainfloor is an Austrian company, founded in 2008. Hyve is an experienced German crowdsourcing provider that was founded in 2000. Hyve has several sub-companies. The *Innovation Community GmbH* is responsible for crowdsourcing and focuses on customized proprietary platform solutions. InnoCentive is an established crowdsourcing provider from the USA founded in 2000. It was the first Open Innovation platform on the web and is today's best-known company for selling Open Innovation services. InnoCentive focuses on research and development projects. Jovoto is an aspiring German crowdsourcing provider that was founded in 2006. A competitor benchmarking with the selected competitors should be accomplished next.

5.2.2 Competitor Benchmarking

The benchmarking according to the selected subjects (see Table 5) and criteria (see chapter 5.1.3) is accomplished now. The criteria are as follows:

- Community size
- Media presence
- Services offered to business clients
- Number of innovation projects in 2010
- Costs
- Scientific activities
- Company size

Only the selected direct competitors are analysed in this benchmarking.

5.2.2.1 Community Size

Before showing the results for the community size benchmarking some definitions should be given: The community size is the sum of all available users that the company can access on the platform and through social networks. This includes fan pages on Facebook as well as Twitter accounts maintained by the company. Through a secondary research the community sizes of all competitors has been identified and compared (see Figure 12). Regarding the evaluation, community sizes vary from around 5.000 (Neurovation) up to 250.000 users (InnoCentive). It is assumed that all platforms have an equally relative number of inactive users. It should be also mentioned here that some platforms might have more communities, which either cannot be accessed via a secondary research like mailing lists or personal contacts or are not obvious for outstanding persons. It is important to note that the actual number of unique users is assumed to be smaller than the resulting community sizes because of overlaps of platform-, Facebook-, and Twitter-users.

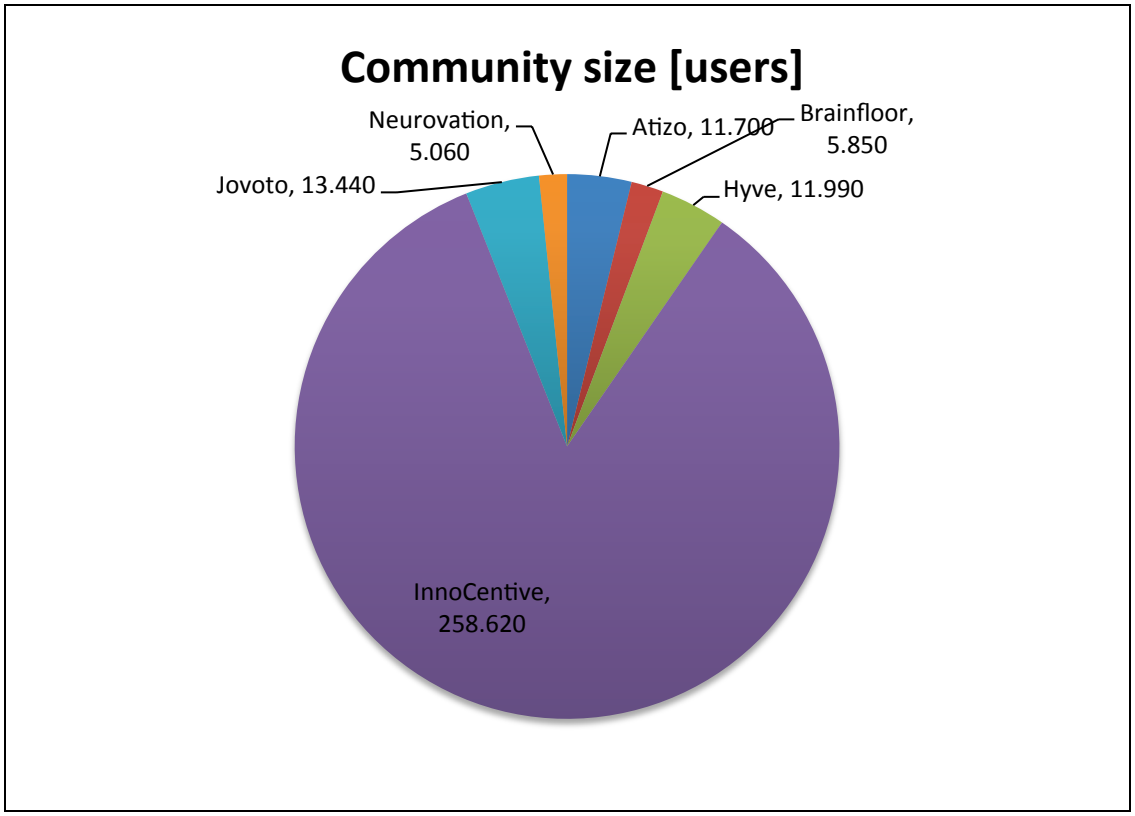


Figure 12: Community sizes of European and US platforms

Figure 12 makes clear that InnoCentive is massively ahead of European companies in this statistic. To have a better look at the community sizes of the European companies, they are shown exclusively in Figure 13.

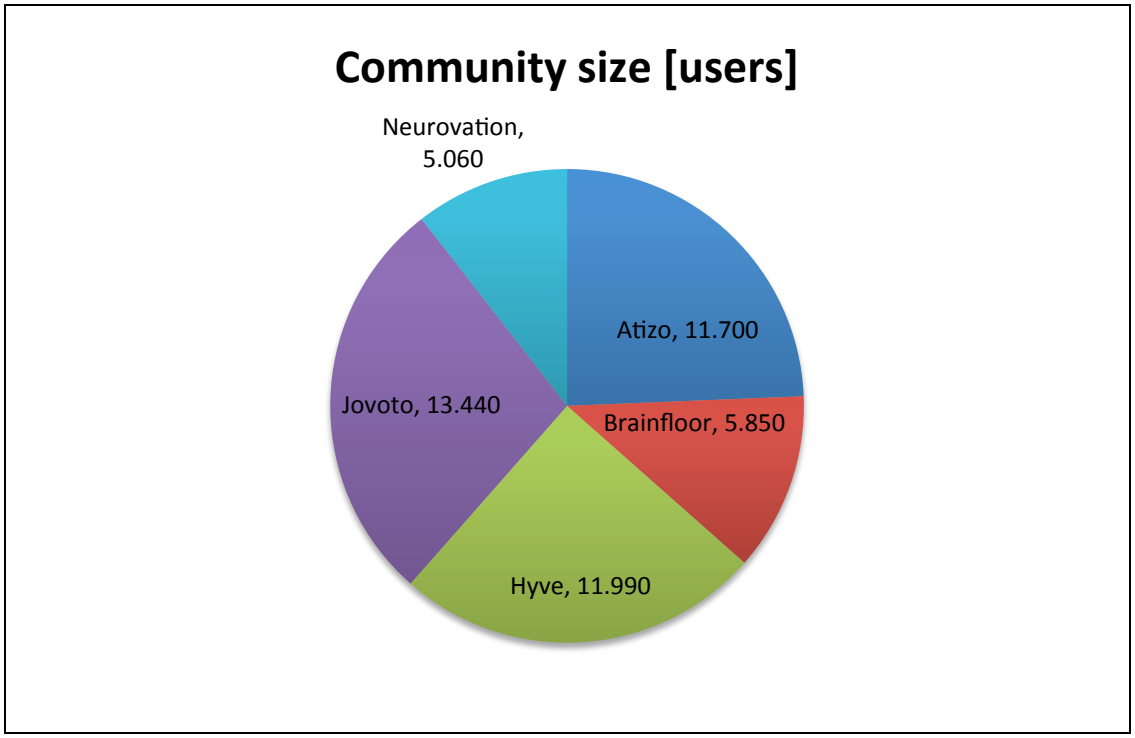


Figure 13: Community sizes of European platforms

In Table 6 the detailed composition of the communities (Platform, Facebook and Twitter) is shown.

	Platform	Facebook	Twitter	Total (Platform + Facebook + Twitter)
Atizo	10.070	830	800	11.700
Brainfloor	3.860	710	1.280	5.850
Hyve	3.780	7.030	1.180	11.990
InnoCentive	250.000	4.500	4.120	258.620
Jovoto	10.000	1.410	2.030	13.440
Neurovation	1.640	3.030	120	4.600

Table 6: Detailed community composition

The statistics shows a rather small community of Neurovation, which results in a gap to the competition. While the community size plays an important role for the attractiveness of an intermediate platform, Neurovation must enlarge its community in order to close the current gap.

5.2.2.2 Media Presence

The media presence is a measure that takes into account the online presence of the platform and the amount of press reports. To measure the online presence of the platform the *website-grader*[224] tool was used in order to get comparable results. The tool computes the relevance of a website similar to search engines and computes a grade from 1 (worst) to 100 (best). To compare the presence in traditional media the amount of the available press reports has been researched. Figure 14 shows the results for the media presence of all compared platforms. Respectively Atizo has the best website grade while InnoCentive has the most presence through press reports. Neurovation appears in the middle-field in this statistics.

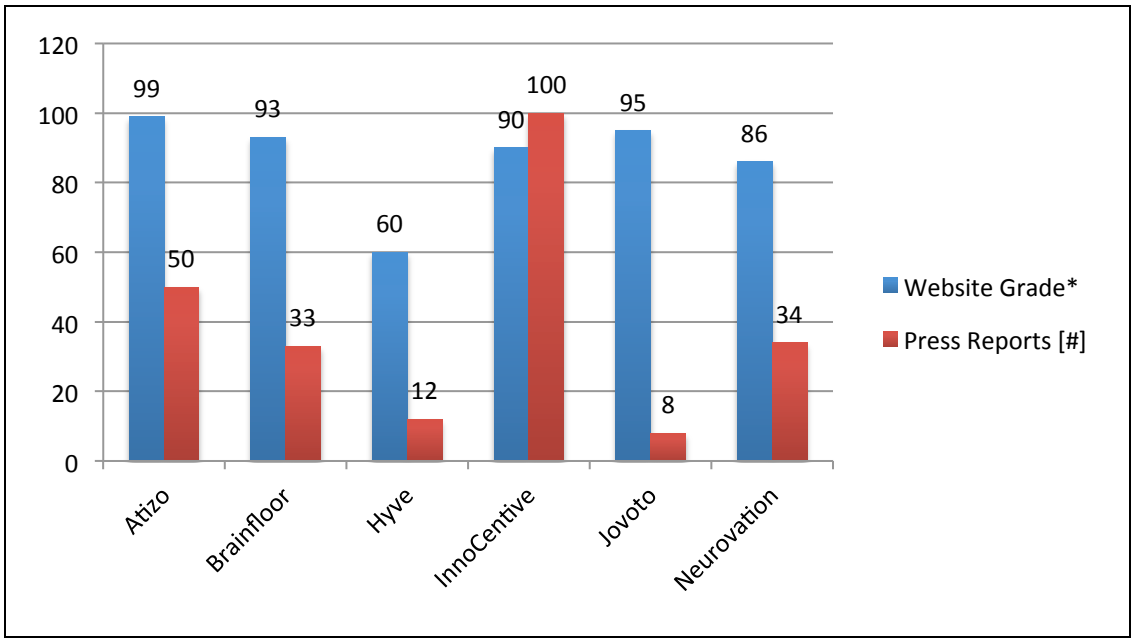


Figure 14: Media coverage comparison

*) Maximum possible grade: 100

The statistics give an overview on the media and public relations activities of the investigated companies. The statistics also show the result of good press contacts and search engine optimisation.

[224] *Website Grader (2011)*
http://websitegrader.com/ [01.08.2011]

5.2.2.3 Services for Business Clients

The investigated crowdsourcing providers offer a set of extra services to their clients. Good extra services can lead to a positive buying decision and to a competitive advantage. The following services can be distinguished:

- **Open Innovation:** The Company offers Open Innovation by involving public communities (see chapter 2.3.2).
- **Closed Innovation:** The Company offers innovation according to the traditional Closed Innovation paradigm (see chapter 2.2).
- **Platform customizing** includes the configuration of additional functionality and custom designs of the platform.
- **Online marketing** includes the conception and execution of online marketing campaigns in order to support a crowdsourcing project with distribution activities.
- **Consulting** includes all kind of innovation management, marketing, social media consulting services that are offered by the company.

Table 7 shows the companies-to-services distribution. Thereby offered services by a company are marked with an “x”.

	Open innovation	Closed Innovation	Platform customizing	Online Marketing	Consulting
Atizo	x	x	x	x	x
Brainfloor	x			x	x
Hyve	x	x	x		x
InnoCentive	x	x			x
Jovoto	x		x	x	
Neurovation	x	x	x	x	x

Table 7: Comparison of the offered services to clients

The results are interpreted as follows: European companies in general try to offer more services to their clients. InnoCentive on the other hand is highly focused on a few core services. The strong focusing of InnoCentive may be one of the success factors of the company, but also the fact that InnoCentive was first on the market offering Open Innovation services is seen as a major

advantage. A different innovation culture in the USA may also play a role for InnoCentive's success. European companies are forced to differentiate to InnoCentive, which is partially accomplished by offering supportive extra services to business clients.

5.2.2.4 Number of Innovation Projects in 2010

The following comparison should provide information about how many projects have been carried out in one year on the investigated platforms. Therefore the number of innovation projects being started in 2010 (not necessarily ended in 2010) has been researched.

Figure 15 shows the results of the benchmark.

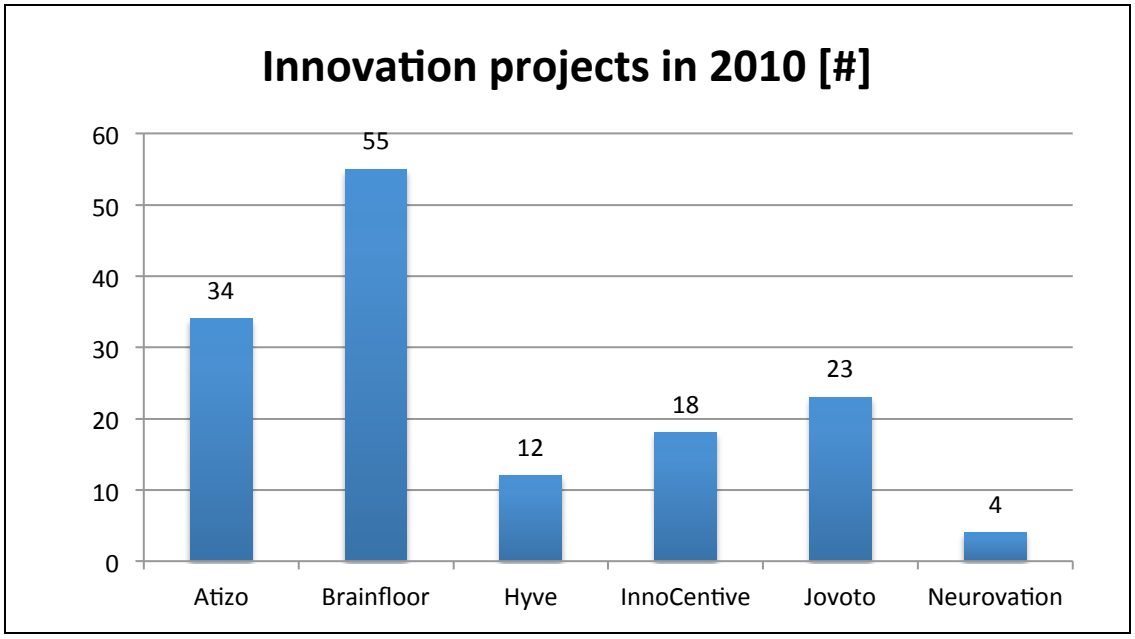


Figure 15: Comparing the amount of crowdsourcing projects in 2010

Brainfloor and Atizo lead the statistics, followed by Jovoto and InnoCentive. All of them focus on standardized Open Innovation services. Hyve may be selling less platform solutions because of the high degree of customisation. Neurovation brings up the rear in this statistics.

The resulting number of projects reflects a quantitative measure of the order situation in the defined time frame. Accordingly Brainfloor, who are focusing

strongly on marketing and sales, carried out 55 projects, while Neurovation could only execute four projects in 2010. While no standardized services are sold, the results can't express the actual business value of the single projects. Therefore Hyve may have produced more business value with 12 customized solutions then Brainfloor with 55 standard Open Innovation projects. Even if Neurovation had 4 very large projects in 2010 the number of projects per year needs to be increased in order to increase the revenue. The number and attractiveness of innovation projects has also a major impact on the successful growth of the community size.

5.2.2.5 Prices

Prices are always an important factor for business clients. Therefore the differences should be analysed. Unfortunately the companies did not provide detailed information about their pricing models and therefore a detailed statistics couldn't be accomplished. Instead a price range for Open Innovation and Customized Closed Innovation platform solutions has been achieved. The price range for Open Innovation projects is starting from 2.000 Euros up to 10.000 Euros. Customized solutions are starting from 10.000 Euros up to 25.000 Euros. It should be mentioned that pricing is highly depended on the degree of customisation and the offered extra services. Therefore the given prices are only for orientation and can be much higher in single projects.

5.2.2.6 Scientific activities

Research activities or scientific partners are important for the development of new products and services. Therefore the amount of scientific publications and the presence of scientific partners have been researched for the investigated companies. According to the research only Hyve (101 publications) and Neurovation (6 publications) are scientifically active, while most of the companies have scientific partners. Only for Brainfloor and Jovoto no connections to Universities or private research organisations could be identified. In summary, Hyve has been identified as a company with a high focus on research activities in various areas (including Open Innovation). Active research can influence the trust and reputation of a company for business clients and can be an important factor for successfully acquiring single projects.

5.2.2.7 Company Size

The company size is expressed by the amount of the employees. It is important to mention that the statistics does not provide information about the qualification and the quality of the employees. Figure 16 shows the results of the benchmark.

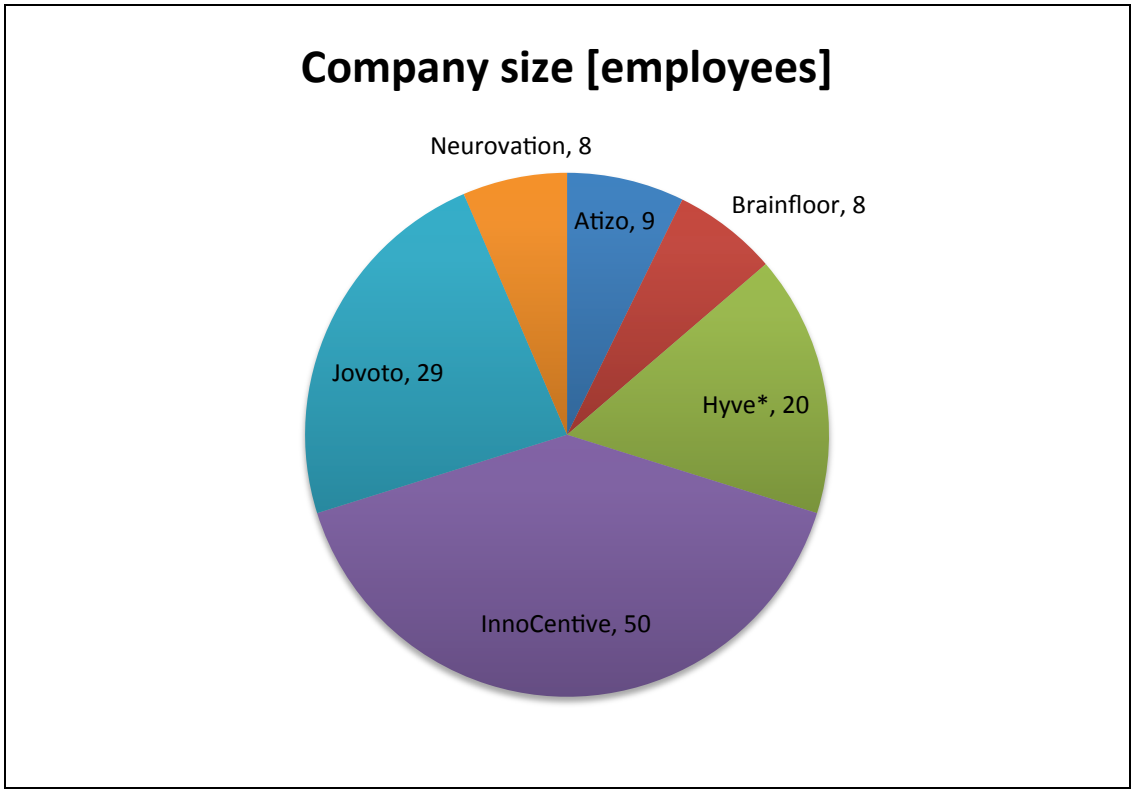


Figure 16: Comparison of the company size

* Only considered the subsidiaries Innovation Community GmbH of the Hyve AG. The whole Hyve AG has 43 employees.

According to the results InnoCentive and Hyve have been grown to medium size businesses since they have been founded in 2000 Neurovation, Atizo and Brainfloor have been identified as small businesses with actually the same number of employees. Jovoto has been fast growing since 2006. In summary, smaller businesses can react faster on changing environments, while bigger businesses have more opportunities for acquiring large projects with high business value. Consequently it can be assumed that Neurovation,

Atizo and Brainfloor are the most agile companies, while InnoCentive, Jovoto and Hyve have more resources but may be more static companies.
Looking at the employed professionals of each company the following observations could be made: Hyve has the most scientists employed. Jovoto has more community managers employed then the other companies. Brainfloor has the most sales person employed, but is the only company, which is outsourcing software development. Atizo and Neurovation have a similar personnel structure focusing on software developers and consultants.

5.2.3 Functional Benchmarking

At next functionalities of the investigated platforms as well as other web platforms with similar problem cases are analysed and benchmarked. The previously defined functional criteria (see chapter 5.1.3) for *Neurovation.net* serve as the benchmarks:

- Categorisation of ideas
- Detection of idea duplicates
- Collaboration
- Discovering expert

The results of this benchmarking should give an overview on existing functionalities on innovation platforms as well as on other web platforms in the defined criteria. The results constitute the basis for improvements for *Neurovation.net* in chapter 5.3. The solutions of the different platforms will be illustrated by screenshots, which are attached in the appendix C.

5.2.3.1 Categorisation of ideas

The following section points out existing approaches from the investigated web platforms that face the challenges of idea categorisation.

Table 8 shows if categorisation of ideas is supported by the investigated platforms, and which functionalities are used. Solutions for idea categorisation could be found on Atizo, Hyve Jovoto and Neurovation. Brainfloor and InnoCentive do not make ideas accessible for the community on their platforms and therefore also miss technologies for idea

categorisation. An alternative solution has been investigated on the web platform Quora.

	Functionalities
Atizo	Tags, tag auto-completion
Hyve	Tags, tag recommendations, categories
Jovoto	Tags
Neurovation	Tags, tag recommendations, tag auto-completion, categories
Quora	Community tagging

Table 8: Approaches for idea categorisation

The results will be described in detail now.

At Atizo ideas are enriched with metadata by tagging. New ideas need to be mandatorily annotated with at least three tags. Auto-completion of tags is offered in order to help the user in the annotation process (see Figure 25). Users can search and filter ideas by tags. The solutions are very solid.

Hyve uses tags with tag recommendations and optionally categories in order to categorize ideas (see Figure 26). Both, tagging and categorisation is optional. Popular tags are recommended to the user (see Figure Figure 27) for support.

At Jovoto ideas can be optionally annotated with metadata by tagging (see Figure 28) but no supportive technologies, like tag recommendations or auto-completion are offered.

At Neurovation new ideas can be optionally annotated by tagging. Predefined categories have to be selected mandatorily in order to categorize ideas. Tag auto-completion (see Figure 31) as well as tag recommendations (see Figure 29) are supported in order to help the user in the annotation process but the solutions are not solid and have a need for improvement.

Quora[225] is a question-answer web platform, where users ask public questions to the community in order to receive answers. This is similar to public idea contests on *Neurovation.net.* The problems with categorisation of questions and answers on Quora are the same as with ideas on *Neurovation.net*. Quora therefore makes tags (topics) from questions public editable, which leads to better tagged questions and respectively better categorisation and search ability (see Figure 30).

5.2.3.2 Detection of idea duplicates

The following section points out existing concepts that face the challenges of detecting duplicate ideas. Table 9 shows if detection of duplicate ideas can be accomplished on the investigated platforms and which technologies are used. Solutions for the detection of duplicates ideas could only be found on Atizo and Neurovation. All other platforms do not have any approaches that counter the problem.

	Functionalities
Atizo	Duplicate ideas can be detected in the idea entering step by analysing the idea description text
Neurovation	Duplicate ideas can be reported by the community

Table 9: Approaches for detecting duplicate ideas

The approaches of Atizo and Neurovation will be described now.

At Atizo duplicate ideas are preventively detected during the idea-entering step. Therefore an agent runs in the background and analyses the given idea title, compares it to already submitted ideas and calculates a similarity measure based on text similarities. The user gets immediately informed through the user interface if duplicate ideas have been detected.

[225] *Quora (2011)*
http://www.quora.com

At Neurovation the platform users can report duplicate ideas as a duplicate by clicking a link. Business clients get informed about the reported ideas through an administrator interface.

5.2.3.3 Collaboration

The following section points out existing solutions from competing platforms and from *Neurovation.net* that face the challenges of collaboration support.

Table 10 shows which platforms support collaboration through technologies and points out which technologies are used. Solutions for the detection of duplicate ideas could be found on Atizo, Hyve, InnoCentive, Jovoto and Neurovation. Brainfloor does not have any approaches to counter the problem. Furthermore on Google Docs and Facebook functionalities for collaboration support could be identified.

	Functionalities
Atizo	Comments, private messages, brainstorming tool
Hyve	Comments, private messages
InnoCentive	Team building and submissions
Jovoto	Comments, ratings, team building and submissions
Neurovation	Comments, private messages, ratings, brainstorming tool
Google Docs	Real-time collaboration editor
Facebook	Public or private groups for collaboration

Table 10: Approaches for collaboration

The approaches will be described in detail now.

At Atizo the community can comment on ideas and users can communicate via private messages. For collaborative idea creation a brainstorming tool is offered (see Figure 34). Users can start and invite friends to virtual brainstorming sessions and ideas can be created collaboratively, similar to traditional brain writing methods.

At Hyve the community can comment on ideas and users can communicate via private messages on the platform.

InnoCentive provides technologies that enable users to temporarily form virtual teams and submit ideas as a team (see Figure 35).
Users can comment and rate ideas at Jovoto. Users can temporarily form virtual teams and submit ideas as a team similar to InnoCentive (see Figure 36).

At Neurovation users can comment and rate ideas and can communicate via private messages on the platform. For collaborative idea creation a brainstorming tool is offered (see Figure 37). Users can start and invite friends to virtual brainstorming sessions and ideas can be created collaboratively similar to traditional brain writing methods.

Google Docs[226] offers real-time collaboration tools for writing and drawing documents. Collaborators can interact in real-time together.

Facebook[227] offers groups that can be either public or private for collaboration (see Figure 38). The groups are basically used for discussions but can be also used for working on topics.

5.2.3.4 Discovering experts

The following section points out existing approaches from competing platforms and from *Neurovation.net* that face the challenges of discovering experts on the platform.

Table 11 shows which platforms support expert finding through technologies and points out which technologies are used. Solutions for discovering experts could be found on Atizo, Hyve, InnoCentive, Jovoto and Neurovation. Brainfloor does not have any approaches to counter the problem.

[226] *Google Docs (2011)*
http://docs.google.com
[227] *Facebook (2011)*
http://www.facebook.com

	Functionalities
Atizo	Activity and trust points, High score list
Hyve	Activity statistics
InnoCentive	Self-assessment of expertise
Jovoto	Activity and trust points, Filtering of experts, Self-assessment of expertise
Neurovation	Activity, creativity and trust points

Table 11: Approaches for discovering experts

The approach will be described in detail now.

At Atizo users get activity and trust points by creating valuable ideas, commenting on ideas, winning contests or other respected activities on the platform (see Figure 39). Points are a measure for the reputation and trust level of the user on the platform. Therefore users with high points are the most active, respected and trusted users on the platform. Users with the most points are shown on a high score list on the platform. Therefore other users and business clients can identify lead-users in the community.

Hyve uses user statistics about the amount of ideas, ratings and comments that express the activity of the users. Reputation and trust can't be expressed because there is no measure for the value of the contributions (see Figure 40). The statistics are public and therefore business clients or other users can identify the most active users.

At InnoCentive users can self-assess their domain expertise via a form (see Figure 41). All major scientific areas are available for selection. The data is not public and therefore only InnoCentive can profit from it.

At Jovoto users can earn karma points by creating, rating or commenting on ideas. Similar to Atizo's approach the points express activity, reputation and trust of the user. The points are public and through sorting users according to there score lead-users can be identified by business clients, platform users and Jovoto. Users can also self-assess their domain experience via a form (see Figure 43).

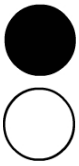
At Neurovation users can earn points by creating, rating and commenting on ideas and other activities on the platform. Three types of points are distinguished:

- Activity: Every activity on the platform raises the activity points
- Creativity: Producing good ideas and comments on ideas raises the creativity points
- Trust: Giving good feedback on other ideas increases the trust points on the platform

When a certain amount of points has been reached the users gets a *level up*. Therefore users with high levels are the most active, creative and trusted users on the platform. The points are public but a high score list or other mechanism to make lead-users visible are missing. Therefore it's hard to figure out lead-users for business clients and users via the platform.

5.2.4 Identification of Development Potentials

This chapter concludes the results of the accomplished benchmarking study. The best performers of the competitor- and functional benchmarking are shown and the gaps to the competition are outlined. Table 12 shows the performances of the companies in the competitor benchmarking. Table 13 concludes the performances in the criteria of the functional benchmarking. In Table 14 the solutions from other web platforms are listed. The performance in the criteria in Table 12 and Table 13 is interpreted as follows:


= Very good

= Insufficient

The results of the competitor benchmarking are interpreted as follows: Neurovation performed best in the criterion "services for business clients" because a lot of extra services that lead to added value are offered to business clients. The benchmark on the community size and the number of innovation projects showed a relatively large gap to the competition. The analysis shows that Hyve has the strongest scientific background, which

results in a strong internal knowledge base and increases the level of trust. InnoCentive and Hyve are the biggest companies interpreting the number of employees. InnoCentive has a very powerful community, which is a big competitive advantage for Open Innovation services.

	Community size	Media presence	Services	Number of projects	Scientific activities	Company size
Atizo						
Brain-floor						
Hyve						
Inno-Centive						
Jovoto						
Neuro-vation						

Table 12: Conclusion of the competitor benchmarking

The largest gap of Neurovation to the competition was detected in the community size and in the number of projects. While these measures are vital for the company actions that increase the community as well as the sales has to be set. Neurovation has a good media presence in online and offline media and offers rich extra services.

The results of the functional benchmarking shown in Table 13 and Table 14 are interpreted as follows: For the categorisation of ideas similar concepts are in use on the investigated platforms but Atizo offers the most solid

solutions. Only Atizo and Neurovation have strategies for the detection of duplicate ideas. Collaboration support is accomplished on all investigated platforms except Brainfloor either through social media functionalities, like comments, ratings and private messages or through team submissions and collaboration tools. Jovoto offers the most solid collaboration functionalities. Jovoto offers the best solutions for discovering experts. Lead-users as well as domain experts can be filtered on the platform. Brainfloor does not offer functionalities for any of the criteria.

Neurovation has a platform with rich functionality. The largest gaps could be determined in the collaboration and experts discovering functionalities. The detection of idea duplicates is uncommon and therefore can be seen as a competitive advantage. The categorisation of ideas is good but not as good as Atizo's solutions.

	Categori-sation of ideas	Detection of idea duplicates	Collabo-ration	Discovering experts
Atizo				
Brainfloor				
Hyve				
Inno-Centive				
Jovoto				
Neuro-vation				

Table 13: Conclusion of the function benchmarking

Alternatives for idea categorisation and collaboration that have been found on other web platforms with similar problem cases are listed in Table 14. On Quora the community is allowed to tag all public content on the platform, which results in more tagged content and further to better categorisation. Google Docs constitute state of the art real-time collaboration tools that are on innovation platforms. On Facebook users can collaborate in private or public groups, which can be useful for collaborative idea generation on innovation platforms as well.

Web platform	Functionality	Useful for…
Quora	Community tagging	Tagging of ideas
Google Docs	Real-time collaboration tools	Collaboration in the idea generation process
Facebook	Groups for collaboration	

Table 14: Alternative solutions on other web platforms

The following similarities and differentiators between the analysed companies could be identified: Atizo and Neurovation offer similar services and have the most similar platform concepts. InnoCentive and Brainfloor both do not offer a lot of platform functionality. They focus on Open Innovation services and omit social media functionality on their platforms. InnoCentive prefer scientists in the community, while Jovoto mainly focuses on artists. Hyve is the only company without an intermediate platform; instead they focus on customized proprietary platform instances. For Neurovation the best differentiators are the versatile platform environment, the offered services and the creativity support on the platform.

5.3 Developing Solution Concepts for *Neurovation.net*

This chapter constitutes the benchmark implementation. Solutions that have been obtained from the benchmark analysis are introduced and current solutions of *Neurovation.net* are enriched. The goal is to use the identified potentials (see chapter 5.2.4) and close the determined gaps to the competition by utilizing strategies and functionalities that have been identified in the benchmark analysis. The focus is set on functional concepts for idea

categorisation, detection of idea duplicates, collaboration and discovering experts on *Neurovation.net*. The technical and economical aspects of the solutions will be determined and the benefits and costs will be estimated.

In the competitor benchmarking (see chapter 5.2.2) Neurovation has the most of catching up in the community size and the amount of projects per year. Based on the results of the benchmark analysis the key factors to a large community are:

- Constantly interesting and challenging innovation projects on the platform
- Sustainable community management
- A functional and user-friendly platform

Furthermore the following chicken-egg dilemma has to be faced: With a large community, projects can be acquired more easily, but on the other hand new projects lead to new users and therefore enlarge the community. By focusing on marketing and sales activities new projects will be acquired and the number of new projects, as well as the community size will increase. Brainfloor is a good example for successful project acquisition. InnoCentive, as the most successful innovation platform also showed that focusing on expert users leads is a powerful community, which is an important aspect for business clients. An important aspect is that projects need to fit the expectations and requirements of the users in order to keep them motivated.

The following concepts utilize the determined functional development potentials (see Table 13) of the current innovation platform.

5.3.1 Categorisation of Ideas

For the categorisation of ideas on *Neurovation.net* two improvements will be introduced and evaluated. The concepts are as follows:

- Better idea tags and categories
- Community tagging

The benchmark analysis (see chapter 5.2) showed that tagging and categories are already used for idea categorisation on *Neurovation.net* and therefore the current solutions will be evaluated and recommendations for improvements will be given. Community tagging is a solution that is currently not used on *Neurovation.net*. The concept will be introduced and evaluated. The technical and economical aspects of the solutions will be determined and the benefits and costs will be estimated.

The technical aspects of the solutions for idea categorisation will be outlined now.

Better idea tags and categories

The functionality for tagging ideas is already given by the Neurovation platform (see chapter 5.2). The advantages and disadvantages of the current solution will be discussed now.

At *Neurovation.net* tagging is not mandatory for users. This has the advantage that users that are not aware of tagging or do not want to tag ideas are not forced to do so. On the other hand untagged ideas cannot be categorized by tags and therefore are hard to find via search and filtering on the platform. Therefore tags should be mandatory in order to get a better categorisation of ideas. Atizo makes tagging mandatory and asks for at least three tags for each idea in order to achieve consistently tagged ideas.

Another disadvantage of the current solution is the bad quality of tags in the system. Low quality tags lead to bad categorisation and lower the quality of tag recommendations and auto-completion of the tagging system. In order to receive tags with higher quality the users must be educated by the system. This can be achieved with helping examples and quality assessment of tags in the tagging process.

It has been investigated that tag recommendations and auto-completion recommend many useless tags to the user, which is generally the result of low quality tags in the system and a trivial recommendation algorithm. The recommendation algorithm needs to be refined in a way that prepositions and connectives are filtered out of the recommendation candidates. The auto-

completion of tags can be improved by increasing the quality of tags in the system by educating users and quality assessment.

Neurovation provides categories for ideas on the current platform solution (see chapter 5.2). The advantages and disadvantages of the current solution will be discussed now.

Categories are a requested feature by many business clients. In Closed Innovation categories are often used to reflect the structure of a company (e.g. departments). On the other hand categories can be an impediment if they for users if they are not well chosen or the data is too diverse for finding good categories. On *Neurovation.net* the available categories are very general and cover only a part of the possible topics. Categorisation of ideas is mandatory on *Neurovation.net*, which leads to the problem of frustrated users that struggle with the categorisation of their ideas, which further leads to bad categorisation and unhappy users (see the problems of categorisation in chapter 3.2.3). An “Other” category is missing at *Neurovation.net*.

To improve the current categorisation system it is recommended to make categories optional and include a generic “Other” category. Important to mention is the risk that users might use the “Other” category extensively and therefore good categorisation of ideas is not achieved. The users need to be educated on how to use categories and the benefits of well-categorized ideas must be made clear. Categories also need to be moderated by Neurovation and need to be changed if necessary.

Community tagging

Community tagging should be defined first, in order to prevent confusion with similar concepts: Traditionally only the creator of an idea tags the idea herself. If tags can be added and edited by everyone in the community this is called community tagging. This is not an official definition and therefore is only valid for this thesis.

The concept is used on the web platform *Quora* (see chapter 5.2.3.1) for making resources better searchable and easier to find. On *Neurovation.net* the solution can be used as an alternative to mandatory tags or as an add-on. Untagged content can be suggested to the community in order to get tags. Through collaborative tagging the community takes care of all the content on the platform and less uncategorized content is present. The approach should be considered especially for Closed Innovation.

Estimations and Recommendations for Idea Categorisation on *Neurovation.net*

Table 15 summarizes the solutions for idea categorisation on *Neurovation.net*. The implementation recommendations are depicted and the implementation effort (in person-days) and the costs (in Euro) are estimated. The hourly rate for the cost estimation was determined to be 75 Euros per hour.

	Implementation recommendations	Estimated implementation effort [person-days]	Estimated costs [€]
Better idea tags and categories	Prepositions and connectives are eliminated from the tag recommendations	8	4.800
	Educate user through tag validation and feedback (only single-word-tags are accepted)	5	3.000
	Most relevant tags (starting with input string) appear first in the auto-completion	1	600
	Every idea needs to be tagged	1	600
	A category "Others" needs to be included if categories are offered	1	600
	Ideas can be optionally categorised	1	600

Community tagging	Idea tags can be added, deleted and edited by the community	9	5.400
		26	15.600

Table 15: Cost estimations for idea categorisation

Platform users profit from better support in the tagging process and subsequently a better categorisation of ideas. Categorisation of ideas gets easier for platform users, which results in better-organised ideas. Business clients and platform users can find tagged ideas faster in the system. The solutions are necess ary improvements to close the gap to the competition.

Community tagging increases the completeness of idea tags. Platform users and business clients profit from more idea tags in the system, which makes ideas better searchable. Less time has to be spent on searching ideas in the system. The solution is unique among the competition but easy to imitate.

5.3.2 Detection of Idea Duplicates

For the detection of duplicate ideas on *Neurovation.net* two improvements will be introduced and evaluated. The solutions are as follows:

- Improved community feedback
- Automatic detection of idea duplicates based on text similarities

The benchmark analysis (see chapter 5.2) showed that community feedback is already used for the detection of duplicate ideas on *Neurovation.net* and therefore the current solution will be evaluated and recommendations for improvements will be given. Duplicate detection based on text similarities in idea descriptions is a solution that is actually not used on the Neurovation platform. The economical benefits and costs for all solutions will be determined and implementation costs will be estimated. Implementation recommendations will be given for Neurovation.

The technical aspects of the solutions for the detection of duplicate ideas will be outlined now.

Community feedback

The functionality for detecting duplicate ideas by leveraging community feedback is already given by the Neurovation platform (see chapter 5.2). The advantages and disadvantages of the current solution will be discussed now.

Humans are very good at comparing different types of information. Thus a major advantage to automatic approaches is that humans can interpret text as well as images or other media and determine if ideas are similar or not.

The major disadvantage is that the detection of similarities is dependent on the motivation of platform users. Users can misuse the functionality to annoy others with false reports. Another disadvantage is that similarities can't be detected in the idea entering process and therefore the approach doesn't prevent duplicate ideas in the system.

Automatic detection of idea duplicates based on text similarities

In general, text similarities are computed by comparing documents based on the existence of similar words or *shingles*[228]. The text similarity algorithms are often used for near duplicate detection[229]. The advantages and the disadvantages of this solution will be outlined.

Similarity measures based on text comparison are well established and standard algorithms, like the above-mentioned algorithm for near-duplicate detection exist. The approach works automatically and the user can be warned in the idea entering process if already duplicate ideas are in the system. A running example can be looked up at the Atizo platform (see chapter 5.2.3.2).

The major disadvantage of similarity measures based on text similarities lies in the fact that comparison is made on a string basis. Similarities are inferred from the existence of similar words used for the textual description of ideas.

[228] *Shingles (2011)*
http://www.lucidimagination.com/blog/2010/12/17/whats-a-shingle-in-lucene-parlance/ [06.10.2011]

[229] *Shingling – Near Duplicate Detection (2009)*
http://phpir.com/shingling-near-duplicate-detection [05.10.2011]

Thus solutions based on text similarity can't detect semantically similar ideas, ideas that are written in different languages, synonyms and ambiguities of words.

Estimations and Recommendations for the Detection of Duplicate ideas on *Neurovation.net*

Table 16 summarizes the solutions for the detection of duplicate ideas on *Neurovation.net*. The implementation recommendations are depicted and the implementation effort (in person-days) and the costs (in Euro) are estimated. The hourly rate for the cost estimation was determined to be 75 Euros per hour.

	Implementation recommendations	Estimated implementation effort [person-days]	Estimated costs [€]
Improved community feedback	Automatic E-mail notifications for business clients and user if duplicate ideas are reported by a user	1	600
Detection of idea duplicates based on text similarities	Implementation and testing an algorithm that calculates duplicates based on text similarities	15	9.000
		16	9.600

Table 16: Cost estimations for the detection of duplicate ideas

Because of automatic notifications about reported idea duplicates time and costs are saved for business clients. The quality of ideas increases because of less duplicates in the system. The solution works for all kinds of ideas (textually described ideas and designs).

By detecting idea duplicates based on text similarities not all similarities are detected and therefore business clients still need to spend time on monitoring ideas.

5.3.3 Collaboration Support

For collaboration support on *Neurovation.net* three improvements will be introduced and evaluated. The solutions are as follows:

- Improved brainstorming tool
- Team submissions
- Real-time collaboration tools

The benchmarking analysis (see chapter 5.2) showed that a brainstorming tool is already used for collaboration support on *Neurovation.net* and therefore the current solution will be evaluated and recommendations for improvements will be given. Collaboration support through collaborative idea submissions and real-time collaboration tools are two solutions that are actually not used on the Neurovation platform. The economical benefits and costs for all solutions will be determined and implementation costs will be estimated. Implementation recommendations will be given for Neurovation.

The technical aspects of the solutions for collaboration support will be outlined now.

Improved brainstorming tool

A brainstorming tool is already offered by the Neurovation platform (see chapter 5.2). The advantages and disadvantages of the current brainstorming tool will be discussed now.

The brainstorming tool supports the platform users in the idea generation process by offering a virtual environment for collaborative brainstorming. Thus ideas can be generated with (Facebook) friends collaboratively regardless of the locations of the participants. While the tool is also accessible on Facebook new users from Facebook are converted for the Neurovation platform. Through comments and ratings the idea generation process gets more dynamic and the quality of the ideas increases.

A major disadvantage is the missing integration of the tool in the Neurovation workflow. Thus ideas cannot be submitted to the system as a team. Further the generated ideas in brainstorming can’t be exported and further developed

with the tools on the Neurovation platform. The tool is also depended on the Facebook API and it's rapid changes.

It is recommended to integrate the brainstorming tool into the Neurovation workflow that ideas can be further developed on the Neurovation platform.

Team submissions

Submitting ideas as a team is currently not supported on the Neurovation platform. The benchmarking analysis showed that Jovoto and InnoCentive provide this functionality on their platforms (see chapter 5.2).

Business clients have requested the functionality for submitting ideas as a team, which gives the feature a high priority for Neurovation. In combination with the actual brainstorming tool the idea generation process as well as the submission process can be accomplished as a team, which is unique among the investigated platforms in the benchmarking analysis (see chapter 5.2). Of major importance for platform users is the distribution model of the rewards, which needs to be transparent when submitting ideas as a team.

Real-time collaboration tools

Lot's of real-time collaboration tools have been emerged during the Web 2.0 era on the web. Through these tools (e.g. *Google Docs*[230]) individuals can collaborate on various tasks (e.g. writing a text document) regardless of their location in real-time.

Etherpad[231] is an open source real-time collaborative document editor similar to *Google Docs*. It can be integrated in any website and it is allowed to modify the code in order to achieve customisation. It basically serves the same functionality as the *Google Docs* editor for text documents. The advantages and disadvantages of real-time collaboration tools for collaboration on *Neurovation.net* will be discussed now.

[230] *Google Docs (2011)*
https://docs.google.com/ [21.09.2011]
[231] *Etherpad (2011)*
http://etherpad.org/ [21.09.2011]

With the *Etherpad* tool real-time collaboration in the idea development process can be accomplished. While none of the investigated innovation platforms (see chapter 5.2) offers this service, it can represent a unique selling proposition. Furthermore a module for the Neurovation system is available (*Etherpad Intergration*[232]), but needs to be tested.

The high network traffic produced by real-time collaboration tools is the major disadvantage. It needs to be tested to see if the current hardware is able to handle the produced traffic. Another disadvantage of the *Etherpad* tool is that it is only text-based.

A combination of the brainstorming tool, the real-time collaboration tool and team submissions leads to a massive added value while the whole process starting from idea generation through further concept development and the idea submission can be accomplished collaboratively and directly on the platform. Furthermore a virtual collaboration room is recommended where collaboration tools can be accessed and users can work together.

Estimations and Recommendations for Collaboration Support on *Neurovation.net*

Table 17 summarizes the solutions for collaboration on *Neurovation.net*. The implementation recommendations are depicted and the implementation effort (in person-days) and the costs (in Euro) are estimated. The hourly rate for the cost estimation was determined to be 75 Euros per hour.

	Implementation recommendations	Estimated implementation effort [person-days]	Estimated costs [€]
Improved brainstorming tool	Integration of Brainstorming Tool in the Neurovation workflow	20	12.000
Team submission	Forming a virtual team and submitting a solution as a team	20	12.000

[232] *Etherpad Integration (2011)*
http://drupal.org/project/etherpad [20.11.2011]

Real-time collaboration tool	Implementation of a text-based collaboration tool (Etherpad)	55	33.000
General recommendations	A virtual meeting room for collaboration attached with collaboration tools	20	1.500
	If similar ideas are detected collaboration should be supported by team invitations	18	1.350
		133	59.850

Table 17: Cost estimations for collaboration support

Combining the solutions constitutes a major improvement of the current platform *Neurovation.net.* For platform users the process of idea generation, development and submission can be accomplished collaboratively on *Neurovation.net*, which is unique among the competition. While collaboration tools are highly valued and demanded by business clients increasing revenue and competitiveness is expected.

5.3.4 Discovering Experts

In this section three solutions that support the discoverability of experts for *Neurovation.net* will be introduced and evaluated. The solutions are as follows:

- Game-based level points
- Self-assessed expertise

The benchmarking analysis (see chapter 5.2) showed that level points are already used for making experts more discoverable on *Neurovation.net* and therefore the current solution will be evaluated and recommendations for improvements will be given. The functionality that users can provide self-assessed expertise is a solution that is currently not used on the Neurovation platform. The economical benefits and costs for all solutions will be determined and implementation costs will be estimated. Implementation recommendations will be given for Neurovation.

The technical aspects of the solutions for finding expert will be outlined now.

Game-based level points

On the actual Neurovation platform users can earn points for activity, creativity and trust (see chapter 5.2). The advantages and disadvantages of the current solution will be discussed now.

For business clients it's important to know the most active and productive users on the platform (lead-users). The current game-based level points system on the current platform helps to identify lead-users in the community.

A disadvantage of the current solution is that lead-users are not recognised on the platform, which is important for their motivation.

A high-score list and badges are recommended in order to provide a way to show the accomplishments of lead-users on the platform. Further it is recommended to make the level points better understandable for novice users by providing a more intuitive visualisation.

Self-assessed expertise

Neurovation does not provide a way for users to self-assess their expertise on the platform. The benchmarking study showed that InnoCentive and Jovoto provide a form with predefined expert domains, which the user can choose in order to tell the system about the users expertise (see chapter 5.2). The advantages and disadvantages of the approach will be discussed now.

Users who provide information about their domain expertise can be categorized in expert domains. This has the advantage that for innovation projects in a special domain only those experts can be targeted.

On the other hand, three disadvantages of self-assessed expertise can be outlined:[233]

- It generates additional work for the experts
- Self-assessed expertise is hardly comparable

[233] cf. SCHÄFERMEIER, R.; PASCHKE, A. (2011) p.64

- Self-assessed expertise is biased either consciously or unconsciously.

Fazel-Zarandi and Yu observed that people tend to exaggerate when providing expertise information about them with the aim of gaining higher reputation.[234] On the contrary, Desouza observed in a study that people might also be inclined to understate their expertise to avoid additional workload or to avoid being tied to a certain role.[235]

Estimations and Recommendations for Finding Experts on *Neurovation.net*

Table 18 summarizes the recommended features for discovering experts on *Neurovation.net*. It also includes an estimation of the implementation effort (in person-days) and the costs (in Euro), which has been provided by the software development team of Neurovation. The hourly rate for the cost estimation was determined to be 75 Euros per hour.

	Implementation recommendations	Estimated implementation effort [person-days]	Estimated costs [€]
Game-based level points	Implementing a High-Score list, which makes lead-users recognisable on the platform	20	12.000
	Implementing badges for users to express reputation	20	12.000
Self-assessed expertise	Domain experts can provide their self-assessed expertise on the platform	25	15.000
	Domain experts can be searched and filtered by expert domains	5	3.000
		70	42.000

Table 18: Cost estimations for finding experts

A high score list and badges makes reputation of platform users better expressible. This is a major interest of platform users and therefore an

[234] FAZEL-ZARANDI, M.; YU, E. (2008) p.237

[235] DESOUZA, K. (2003) p.100

increase of the community size and more experts in the community are expected.

Filtering and searching of domain experts is highly requested by business clients and therefore the revenue is expected to increase. The feature is common among the competitors and therefore no competitive advantage is expected.

5.3.5 Outlook on Further Development Opportunities for *Neurovation.net*

The following innovative concepts should give an outlook on further development opportunities for the innovation platform *Neurovation.net*. They should provide a direction for further improvements of the current platform. The following concepts that are based on semantic technologies (see chapter 3.4), which are an upcoming trend in information systems with a high potential for innovation platforms will be introduced:

- Semantic tag recommendations for supporting the user in the tagging process
- Detection of idea duplicates based on statistically similarity measures
- Discovering experts by analysing the contributions of the users

The concepts are introduced in detail now.

Semantic tag recommendations for supporting the user in the tagging process

Semantic tag recommendations are a trend emerging from information retrieval systems. The idea of those systems is to extract tags from unstructured text. Thereby the resulting tags are not only single (e.g. often occurring) words in the input text, instead algorithms analyse the input text and extract semantic information from it. Thus the resulting tags carry more information and express the meaning of the input text better. While designing and implementing an information retrieval system is a very complex task, an existing service, called *OpenCalais*[236], should be used. *OpenCalais* is a free

[236] *Open Calais (2011)*

web-toolkit that allows extracting metadata from unstructured text in order to get information about its semantic reasoning. The goal is to use this metadata for semantic tag recommendations.

Figure 17 shows the usage of the service for extracting semantic tags from idea descriptions on *Neurovation.net*. The idea description serves as the input text for the service. Because the service does not accept German input texts the idea descriptions need to be translated to English, which can be accomplished with the *Google Translator*[237]. The algorithms extract semantic tags, which are shown as tag recommendations on *Neurovation.net*.

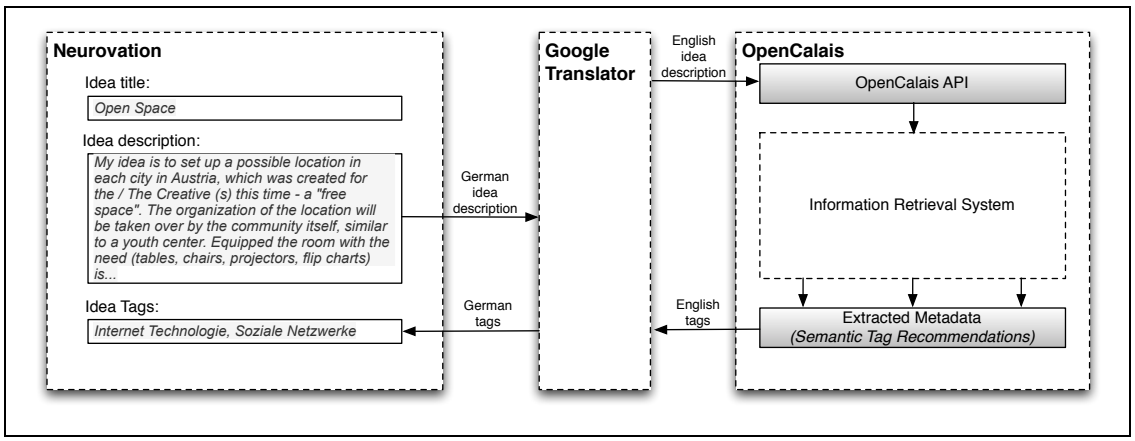


Figure 17: Semantic Tag Recommendations with *OpenCalais*

Another project that should be mentioned here is called *Link2WoD*[238] (Link to world of data) that focuses also on semantic metadata extraction in a different use case. The service takes unstructured documents and extracts organisations, places, companies and other information out of the text and shows recommendations for these keywords linking to photo sites, video resources, lexica and geographic resources. Thus the user gets additional information to the document while working on it.

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http://www.opencalais.com/ [13.09.2011]

[237] *Google Translator (2001)*

http://translate.google.com/ [20.11.2011]

[238] *Link2WoD (2011)*

http://link2wod.joanneum.at/ [23.09.2011]

A third service that should be mentioned is called *DBpedia Spotlight*[239] that focuses on annotating mentions of DBpedia resources in unstructured text corpora and linking it to the *Linked Open Data* cloud through *Dbpedia*[240]. This approach does not focus on categorisation but also utilizes analysing methods of unstructured text corpora that might be also useful for categorisation.

While no practical use of the *OpenCalais* service for idea descriptions is available the solution has been evaluated with twenty-one randomly picked idea descriptions from *Neurovation.net*. 62% of the ideas received useful tag recommendations. For 38% of the ideas could either be no tag recommendations generated or the received tag recommendations were useless. It was not tested if the tag recommendations have a major impact on better categorisation of the ideas.

The problem is, that the service does not accept German input texts. By using the *Google Translator* tool a possible work-around exists but the automatic translation is flawed, especially if the idea descriptions are not grammatically correct.
Another major problem is that the service can't be used through a secure connection, which results in a security vulnerability for the Neurovation system.

A qualified statement for the usefulness of the received tag recommendations under "real-life" circumstances can't be made, while the evaluation is only based on twenty-one ideas, which is too low to derive general assumption. Furthermore, the influence on the categorisation of ideas couldn't be proofed. Thus the service must be implemented and evaluated on a test environment under which real-life circumstances can be simulated.

[239] *DBpedia Spotlight (2011)*
http://dbpedia.org/spotlight [06.10.2011]
[240] *DBpedia (2011)*
http://dbpedia.org [06.10.2011]

It is also recommended to extend the research for similar tools that can be used internally or over a secure connection in order to prevent serious security vulnerabilities.

Detection of idea duplicates based on statistically similarity measures

Landauer, Foltz and Laham introduced an approach to detect semantic similarities in unstructured text with a statistical method called *Latent Semantic Analysis (LSA).*

"LSA is a fully automatic mathematical/statistical technique for extracting and inferring relations of expected contextual usage of words."[241]

A prototype implementation of this approach is available for the Neurovation system (*Semantic Similarity*[242]*)*. The approach is also highly sophisticated and unique on innovation platforms. It makes the detection of semantic similarities of ideas possible. However no evaluations are available for using the approach for the detection of duplicate ideas. Further idea descriptions do not carry a lot of information in the text, thus it has to be tested if the algorithm works for rather short idea descriptions. It is also assumed that the module needs to be modified to fit the requirements of Neurovation. The approach is only text-based and can't be applied for ideas without descriptions (e.g. designs).

Discovering Experts: Analysing Contributions

Schäfermeier and Paschke introduce an approach to automatically find experts in a social community by analysing the content of their contributions in the system and by taking into account the reputation of the users in the community.[243] Based on their approach a solution for Neurovation can be as follows: For every user the system maintains an expert score. It is assumed that users who are experts in a certain topic contribute content about that topic.[244] Through contributing ideas, comments or other textual content of a

[241] LANDAUER, T.; FOLTZ, P.; LAHAM, D. (1998) p.267

[242] *Semantic Similarity (2010)*

http://drupal.org/project/semantic_similarity [05.10.2011]

[243] cf. SCHÄFERMEIER, R.; PASCHKE, A. (2011) p.63-67

[244] cf. SCHÄFERMEIER, R.; PASCHKE, A. (2011) p.65

certain expert domain the expert-score increases for that domain. Also the contests to which contributions are given can influence the score. The advantages and disadvantages will be discussed now.

The approach promises to find domain experts in the community automatically based on the submitted ideas and comments.

The major disadvantage is that the approach is complex and still in the research state. Thus it has to be evaluated if the approach is major enough that it would work for Neurovation. It is also limited on textual contributions. It is recommended to accomplish a research work (bachelor or master thesis) on the evaluation of the approach for *Neurovation.net*.

6 Conclusions and Outlook

The following chapter sums up the results of the master thesis and points out my final conclusions. The achievement of the objectives is verified and an outlook to future research and development in the area of innovation platforms is given.

6.1 Conclusions

The accomplished internal analysis of Neurovation could give a solid overview on the internal situation of Neurovation. Strong partners, versatile know-how and flexible services could be identified as strengths, on the other hand marketing and sales as well as scarcity of resources are current weaknesses of *Neurovation*. The criteria for the benchmark analysis were defined and a benchmark analysis has been accomplished.

A selection of five benchmarking subjects has been made in order to set the focus on the most important competitors: Atizo, Brainfloor, Hyve, InnoCentive and Jovoto were selected. The benchmark analysis revealed the gap between Neurovation and the competition. The results showed that *Neurovation* has to acquire more projects in the future to increase the revenue and the community size. According to the functional benchmarking *Neurovation* provides a state-of-the-art innovation platform but needs to fix vulnerabilities.

In a next step, based on the benchmark analysis, improved solutions for *Neurovation.net* were introduced and evaluated. Through improvements of the current tagging functionality and categories the current solution of Neurovation could be enriched. Detecting and preventing duplicate ideas automatically could reduce the time spending on monitoring of ideas. Respectively the costs are lowered. A concept was developed that allows users from the first idea through the concept phase till the idea submission to work collaboratively in teams. This leads to a big added value for the users and the quality of the resulting ideas. Two types of experts can be identified on innovation platforms: Domain experts can be identified through self-assessed expertise and an expert search. Lead-users can be identified with

the help of activity points that express activity, reputation and trust of the users.

In the near future semantic technologies can support the user to categorise ideas and semantic similar ideas can be identified automatically. Also experts can be identified automatically by analysing the contributions of users.

6.2 Outlook

In the future innovation platforms will be implemented in most enterprises because the need for more open business models and collaboration is steadily growing. Companies will evolve to borderless enterprises. Most companies will maintain their own permanent internal and external communities (e.g. in social networks) and will utilize them sustainably as knowledge sources. Some enterprises will also focus on temporary external communities from crowdsourcing providers or social networks. For companies like *Neurovation* it will become more important to integrate with other enterprise software, like ERP systems and knowledge management tools, in order to make it possible to interact with existing systems (e.g. software as a service). Innovation platforms will need to reflect small business ecosystems (inside or outside of enterprises) where ideas are the main product. The available platforms will be more focused on certain types of projects (design, innovation, trends scouting, etc.), communities (experts or layman) and will differ in their general purpose (Open Innovation, marketing, science, etc.). Systems will become more intelligent with semantic technologies and artificial intelligence and will better *understand* the meaning of information provided by the users. Innovation platforms and creativity tools will make their way to mobile devices. Thus new inspirations and ideas can be captured via mobile phones every time, regardless of location. Ideas will be stored in knowledge clouds (e.g. ontologies) that are automatically populated with metadata and relations to other (internal or external) sources. Experts are derived by the system only by analysing the contributions of users. Creativity will be the major economic source in enterprises and therefore collaborative creativity tools will be available on every workplace. Virtual creative networks will be established and networking will be a major benefit for the individual user.

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List of Abbreviations

API	Application Programming Interface
ERP	Enterprise Resource Planning
KMS	Knowledge Management System
LASSO	Lookup and Alignement Service with Semantic Open Data
Link2WoD	Link to World of Data
LOD	Linked Open Data
OECD	Organisation for Economic Co-operation and Development
RDF	Resource Description Framework
USP	Unique Selling Proposition

Appendix A: Protocol of the Initial Workshop

Date:	27.07.2011
Duration:	2,5 hours
Participants:	Marlies Narat (Usability Designer), Jürgen Volleritsch (Project Manager), Stefan Wunder (Software Development)
Purpose:	The purpose of the meeting was to find out the strengths, weaknesses, opportunities and threads of Neurovation. Further the most important competitors should be identified.
Agenda:	• SWOT-Analysis • Defining the critical success factors in competition • Defining criteria for the competitor comparison • Defining the most important competitors
Results:	The attached photo protocol reflects the results of the workshop.

The following strengths could be identified:

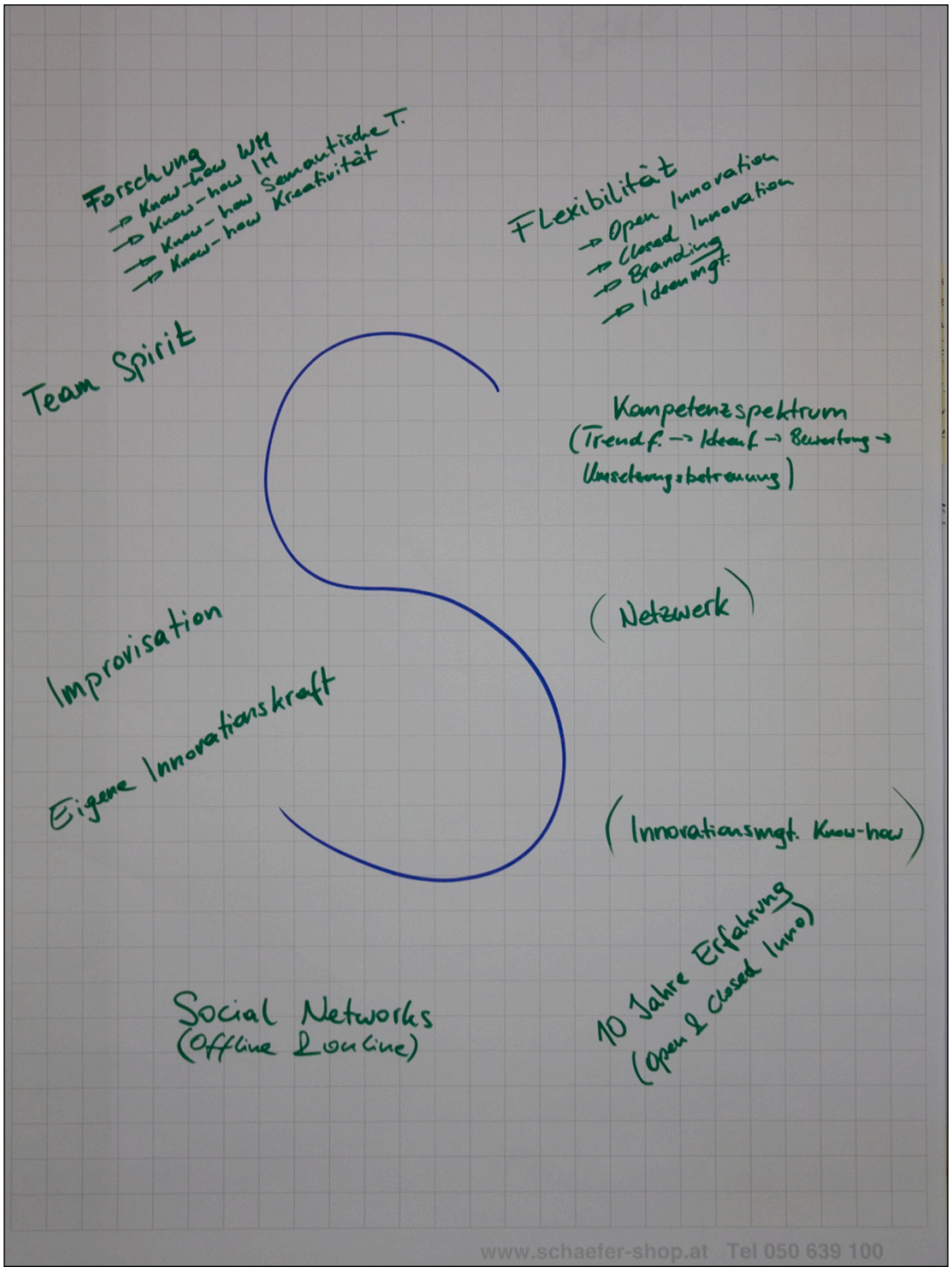


Figure 18: Strenghts of Neurovation

The following weaknesses could be identified:

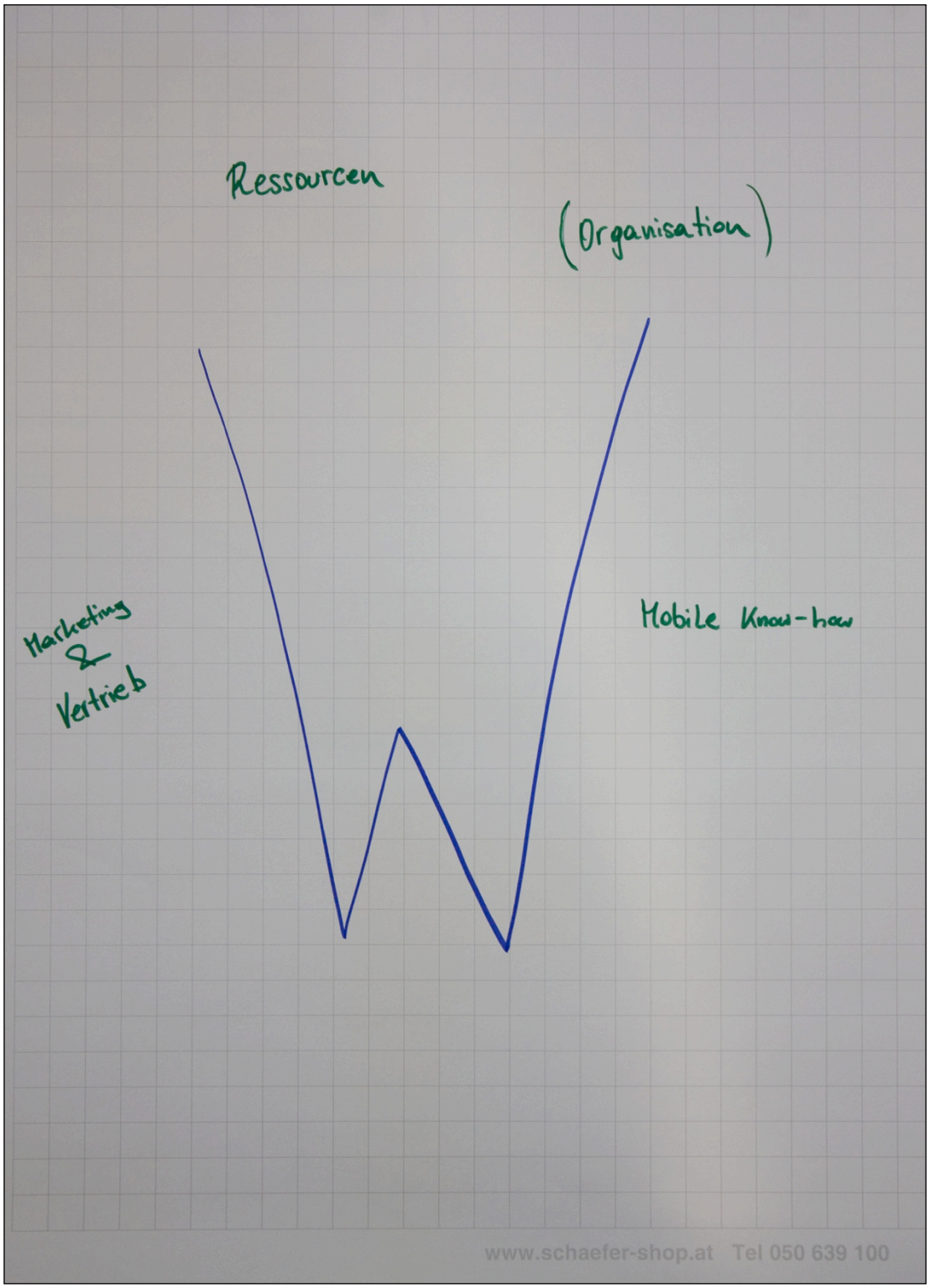


Figure 19: Weaknesses of Neurovation

The following opportunities could be identified:

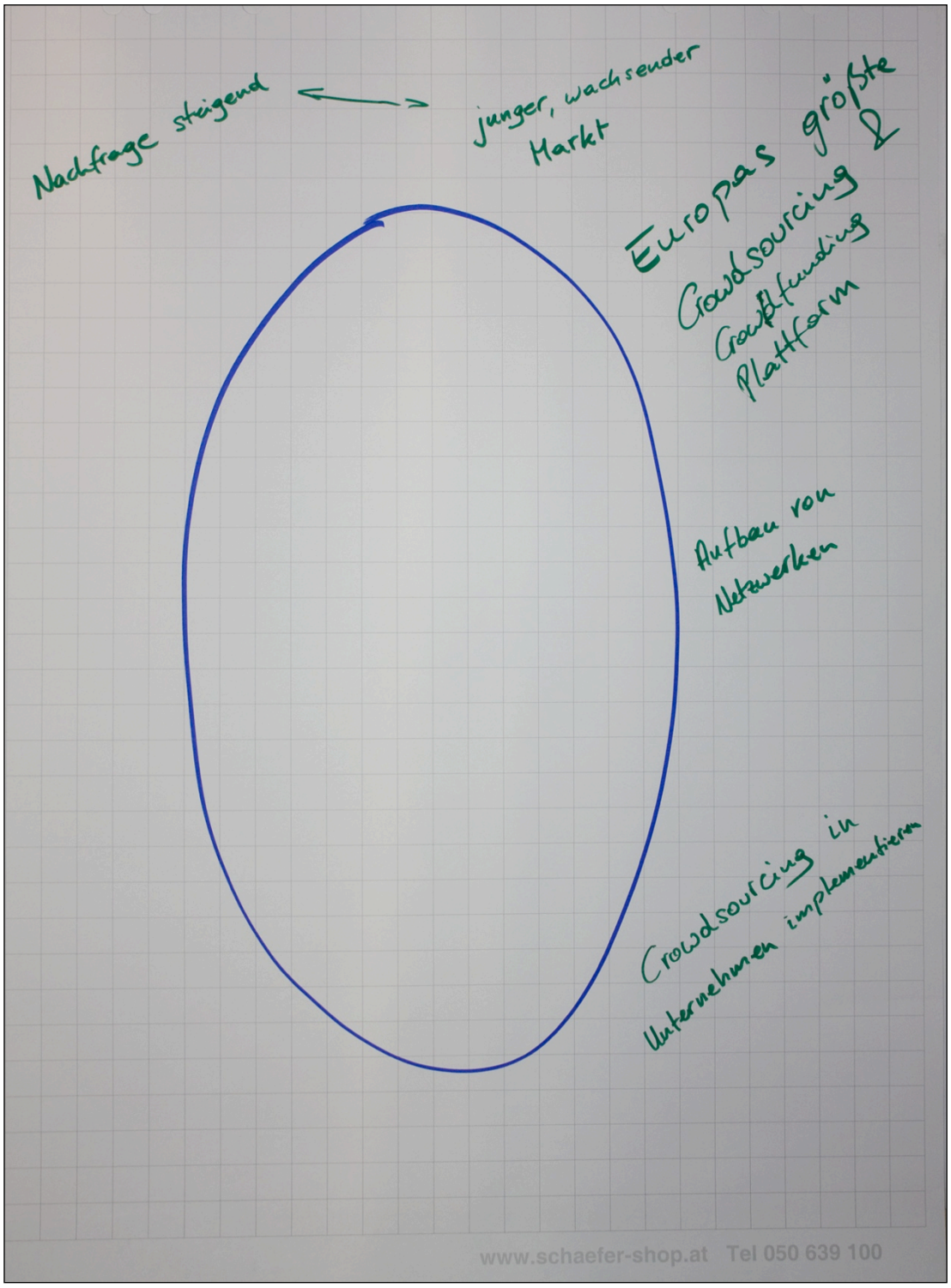


Figure 20: Opportunities of Neurovation

The following threats could be identified:

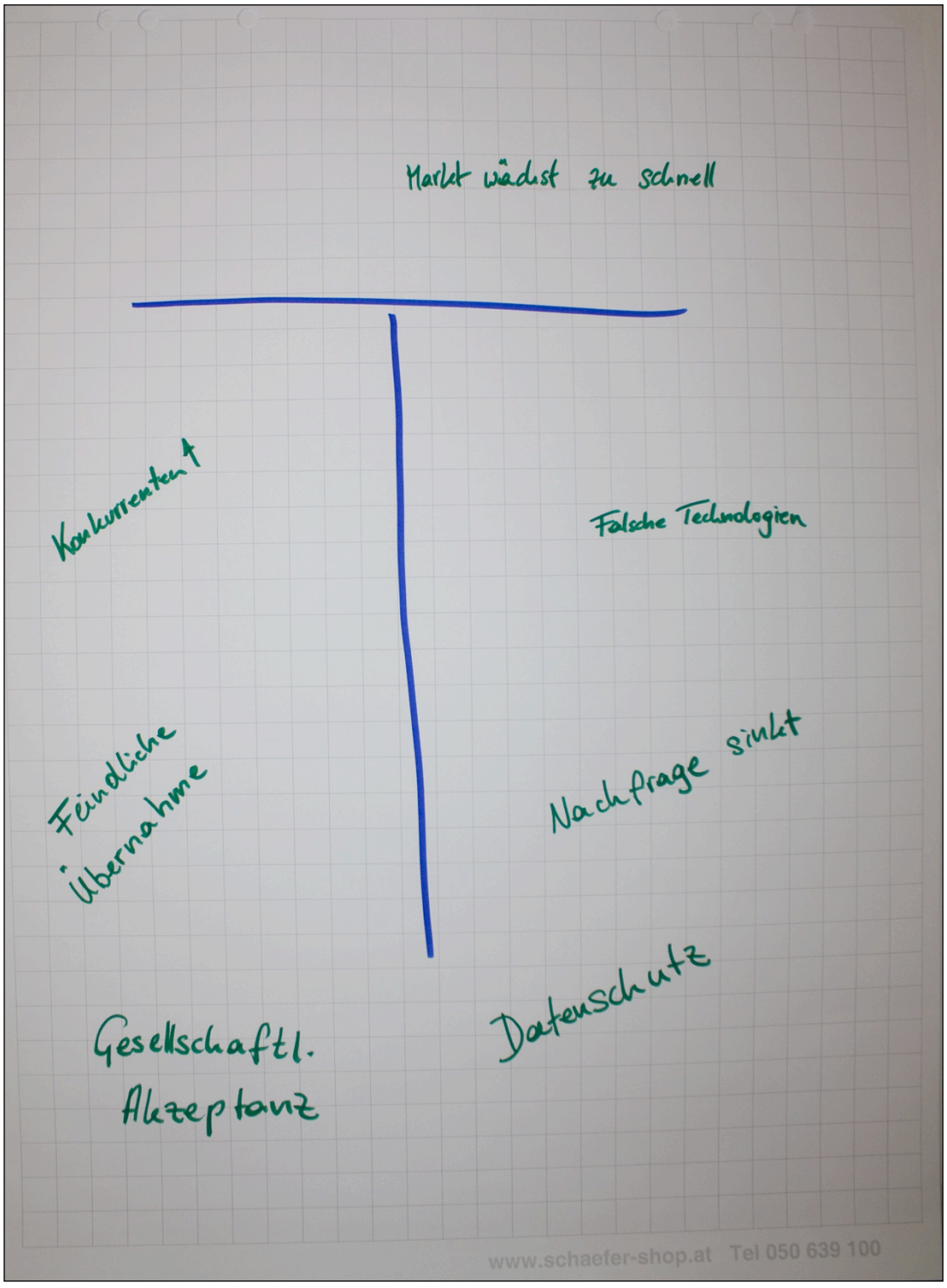


Figure 21: Threats of Neurovation

The following critical success factors in competition has been defined:

Figure 22: Success Factors in Competition

The following direct competitors could be identified:

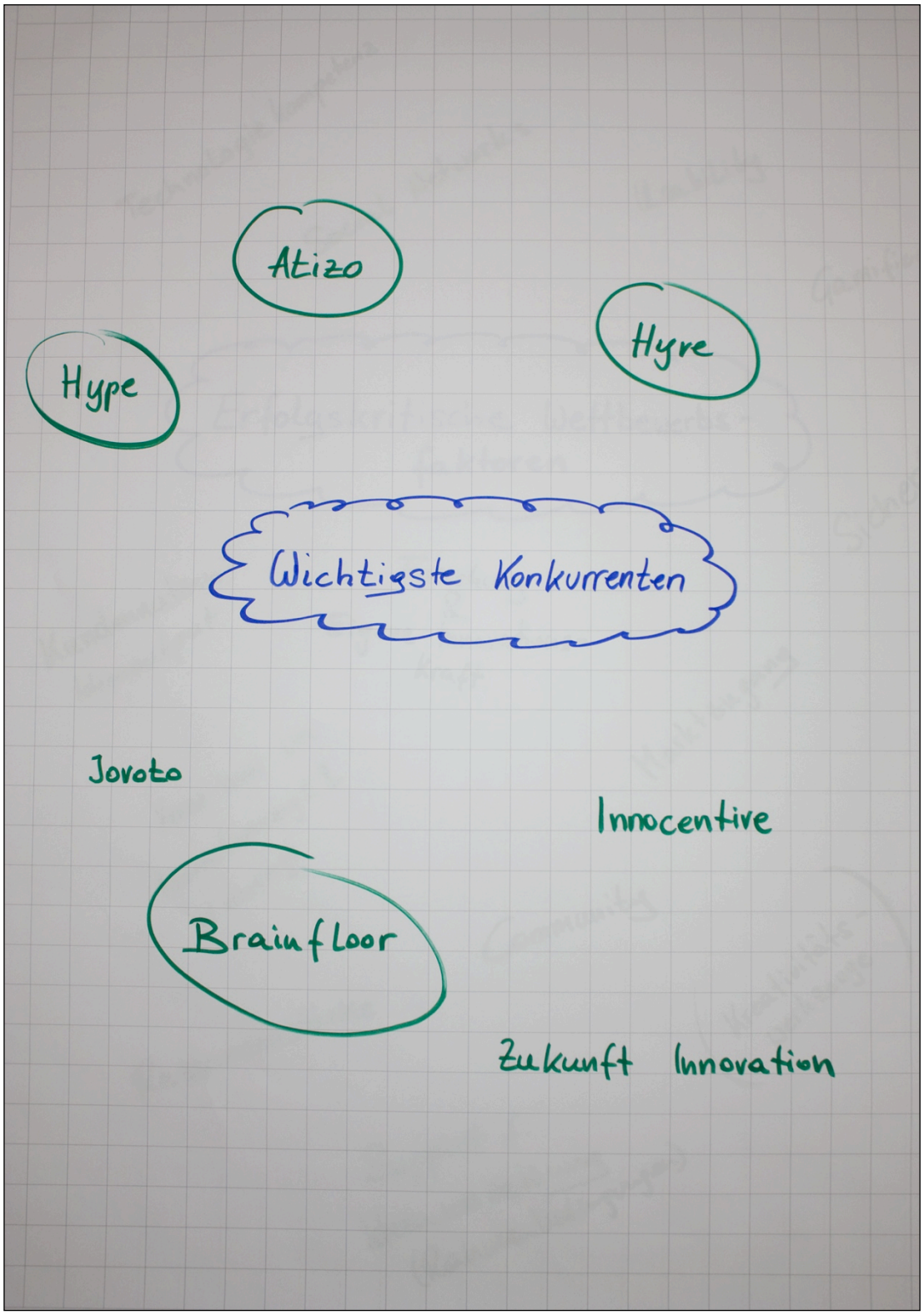


Figure 23: Important Competitors

The following comparison criteria were defined:

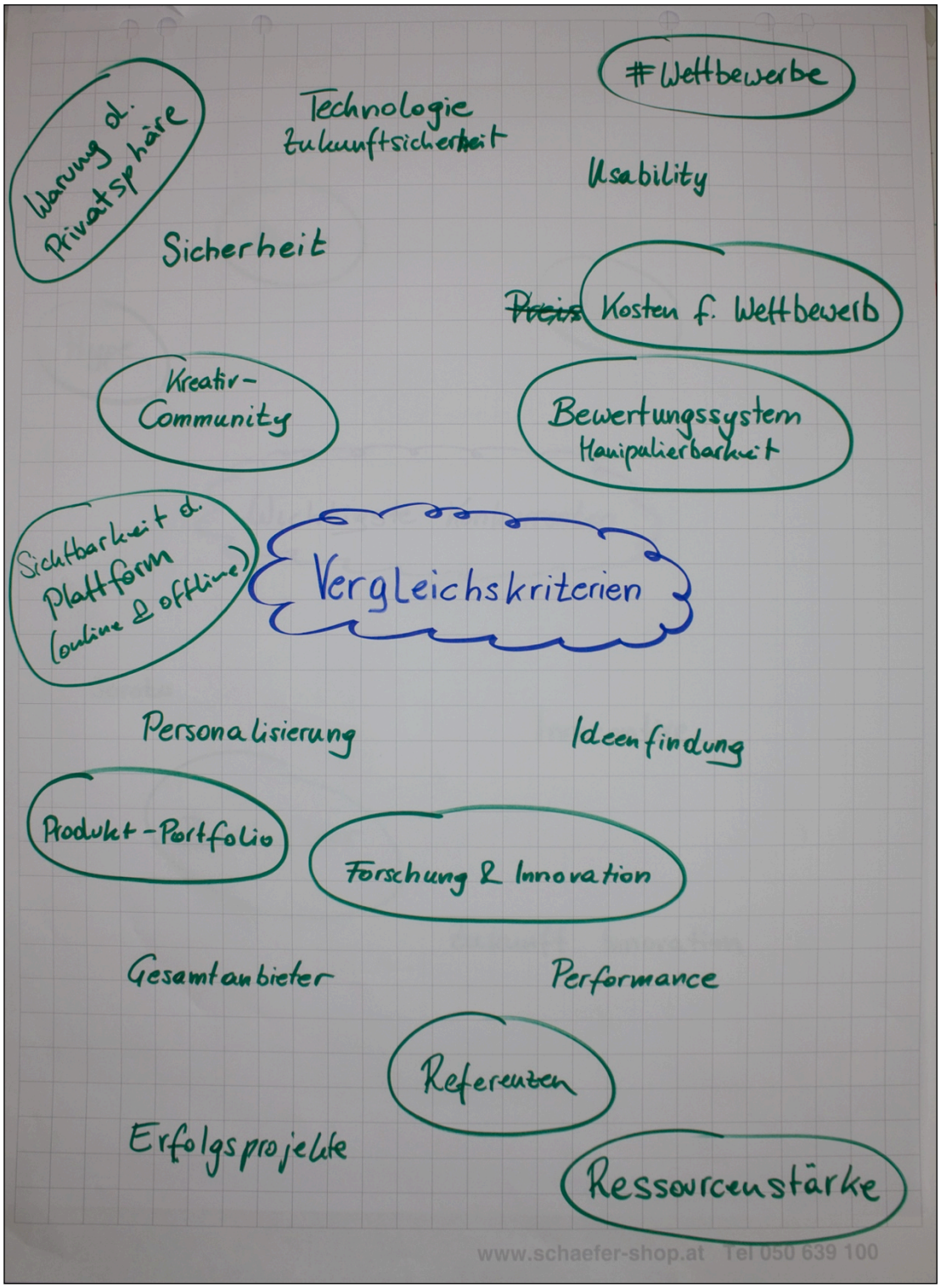


Figure 24: Comparison Criteria

Appendix B: Full List of Researched Platforms

The following list contains 270 crowdsourcing platforms that have been categorized according to Gassmans five crowdsourcing concepts (chapter 2.4.1). The first row column describes the name of the platform; the second row defines one of the crowdsourcing platform concepts according to Gassmann. The third column describes the focus of the platform as free text. The forth column describes the origin of the company and finally the fifth column gives the unique resource locator (URL) to the platform.

Name	Platform Type	Focus	Origin	URL
12designer	Intermediate	Design	Germany	http://www.12designer.com/
15 Talents	Marketplace for ideas	Job seeking	Germany	http://www.15talents.com
2aid.org	Public initiative	Social engagement	Germany	http://www.2aid.org/
40 Billion	Intermediate	Crowdfunding	USA	http://www.40billion.com/
8 Bit Funding	Intermediate	Crowdfunding	USA	http://8bitfunding.com/
99 tests	Intermediate	Freelancer	India	http://99tests.com/
99designs	Intermediate	Marketing & Design	USA	http://99designs.com/
A Swarm of Angels	Together a free solution	Film	USA	http://aswarmofangels.com/
Africa Unsigned	Intermediate	Crowdfunding	Netherlands	http://www.africaunsigned.com/
AKA Music	Intermediate	Crowdfunding	Belgium	http://en.akamusic.com/
Amazee	Intermediate	Crowdfunding	Switzerland	http://www.amazee.com/
Amazon Mechanical Turk	Intermediate	Freelancer	USA	https://www.mturk.com/mturk/welcome
Artist Share	Intermediate	Crowdfunding	USA	http://www.artistshare.com/
Atizo	Intermediate	Idea platform	Switzerland	http://www.atizo.com
Audiodraft	Intermediate	Audio	Finland	http://www.audiodraft.com/

Battle of concepts	Intermediate	Marketing & Design	Netherlands	http://www.battleofconcepts.nl/
BeeQuu	Intermediate	Idea platform	Germany	http://www.beequu.com/
Believers Fund	Intermediate	Crowdfunding	Belgium	http://www.believersfund.com/
Betavine	Proprietary	Product development & problem solving	USA	http://www.betavine.net/
Better place	Intermediate	Crowdfunding	Germany	http://www.betterplace.org/
Better World Network	Intermediate	Crowdfunding	Germany	http://www.betterworld-network.org/
Big Idea Group	Intermediate	Idea platform	UK	http://www.bigideagroup.net/
Biracy Project	Intermediate	Crowdfunding	Canada	http://www.biracy.com/
Bitworxx	Intermediate	Freelancer	Germany	http://www.bitworxx.com/
BluePatent	Intermediate	Patents	Germany	http://www.bluepatent.com/
Bluetooth Innovation Worldcup	Proprietary	Bluetooth products	USA	http://www.innovation-worldcup...
BMW Via	Proprietary	Product development & problem solving	Germany	http://www.bmwgroup.com/via/
Bonspin	Intermediate	Idea platform	Germany	http://www.bonspin.de
Boots	Proprietary	Pharmacy & Healthcare	UK	http://www.bootsinnovation.com
Bosch Power Tools Innovation Portal	Proprietary	Product ideas	Germany	https://www.bosch-pt.com/innov...
Brainfloor	Intermediate	Idea platform	Austria	http://www.brainfloor.com
Brainr	Together a free solution	Idea platform	Germany	http://www.brainr.de
Brainrack	Intermediate	Idea platform	Netherlands	http://www.brainrack.com
BrainStore	Proprietary	Customized solutions	Switzerland	http://www.brainstore.com
Brand tags	Intermediate	Marketing & Design	USA	http://www.brandtags.com/
Brightidea	Intermediate	Customized Idea platforms	USA	http://www.brightidea.com/
Bulbstorm	Intermediate	Marketing & PR	USA	http://www.bulbstorm.com/

BurdaStyle	Proprietary	Branding & Design	USA	http://www.burdastyle.com/
Buy a credit	Intermediate	Crowdfunding	UK	http://www.buyacredit.com/
Buzzbnk	Intermediate	Crowdfunding	UK	https://www.buzzbnk.org/
C-crowd	Intermediate	Crowdfunding	Switzerland	https://www.c-crowd.com/
cafepress	Marketplace for ideas	Posters, T-shirts,...	UK	http://www.cafepress.co.uk/
Cambrianhouse	Intermediate	Idea platform	Canada	http://www.cambrianhouse.com/
Cap Angel	Intermediate	Crowdfunding	France	http://www.capangel.com/
Chaordix	Intermediate	Idea platform	Canada	http://www.chaordix.com/
Chip In	Intermediate	Crowdfunding	Honululu	http://www.chipin.com/
Choosa	Intermediate	Marketing & Design	Argentina	http://www.choosa.net/
Cinema shares	Intermediate	Crowdfunding	USA	http://cinemashares.com/
Citizen effect	Public initiative	Social engagement	USA	http://citizeneffect.org/
Clearly so	Intermediate	Crowdfunding	UK	http://www.clearlyso.com/
Clickworker	Intermediate	Freelancer	USA	http://www.clickworker.com/en
Clu	Intermediate	Idea platform	Germany	http://www.clu.de/
Co fund it	Intermediate	Crowdfunding	Switzerland	http://www.cofundit.com/
Co fund OS	Intermediate	Crowdfunding	Germany	http://www.cofundos.org/
Co-Ceate London	Public initiative	Ideas for the City London	UK	http://www.cocreatelondon.com/
Collaborate and Innovate with LG	Proprietary	Idea platform	South Korea	http://www.collaborateandinnov...
Couch tycoon	Intermediate	Crowdfunding	Germany	http://couchtycoon.net/
Creanto	Intermediate	Idea platform	Spain	http://www.creanto.com/
Create a fund	Intermediate	Crowdfunding	USA	http://www.createafund.com/
CreateMyTatoo	Marketplace for ideas	Tatoos	USA	http://www.createmytattoo.com/
Crowd cube	Intermediate	Crowdfunding	UK	http://www.crowdcube.com/
Crowd rise	Intermediate	Crowdfunding	USA	http://www.crowdrise.com/
Crowdbands	Proprietary	Music bands	USA	http://crowdbands.com/
Crowdflower	Proprietary	Enterprise 2.0	USA	http://crowdflower.com/

Crowdpark	Intermediate	Dynamic Betting	Germany	http://www.crowdpark.de/
CrowdSpirit	Together a free solution	Product development 2.0		http://www.crowdspirit.com/
crowdSPRING	Intermediate	Marketing & Design	USA	http://www.crowdspring.com/
Crowdworkx	Proprietary	Enterprise 2.0	Poland	http://www.crowdworx.com/
Deine Idee zu Energie	Public initiative	Energy	Germany	http://www.deine-idee-zu-energie.de
Dell Ideastorm	Proprietary	Product development & problem solving	USA	http://www.ideastorm.com/
Der Ideensturm	Public initiative	Area Südschwarzwald	Germany	http://www.der-ideensturm.de/
DesignCrowd	Marketplace for ideas	Logos, Designs, Websites,...		
Detecon Mobile Award	Proprietary		Germany	http://www.mobile-award.de/
DINI	Public initiative	Student networks	Germany	http://www.dini.de/studentisch...
Doonited	Public initiative	Social engagement	Germany	http://doonited.com/
Dream Heels	Marketplace for ideas	Shoes		http://www.dreamheels.com/
Einfach telefonieren (Hyve)	Proprietary	Mobile phone ideas	Germany	http://einfachtelefonieren.ch
Elektrolux Design Lab	Proprietary	Branding & Design	Sweden	http://www.electroluxdesignlab...
Emphasis	Intermediate	Crowdfunding	Ireland	http://www.emphas.is
Energie für Ideen	Public initiative	Students	Germany	http://www.energie-fuer-ideen....
Energy In Common	Intermediate	Crowdfunding	USA	http://www.energyincommon.org/
Epitch	Intermediate	Idea platform	Austria	http://www.epitch.com/
Eureka medical	Public initiative	Medicine	USA	http://www.eurekamed.com/
Exnovate	Intermediate	Idea platform	Belgium	http://www.exnovate.org/
Expertcloud	Intermediate	Freelancer	Germany	http://www.expertcloud.de/
Facebus	Proprietary	Crowdfunding	Germany	http://www.facebus.de/
Fashion stake	Marketplace for ideas	Fashion	USA	http://www.fashionstake.com/
Feed the muse	Intermediate	Crowdfunding	USA	http://www.feedthemuse.net/
First giving	Intermediate	Crowdfunding	USA	http://www.firstgiving.com/

Fluevog	Proprietary	Branding & Design	Canada	http://www.fluevog.com/
Fold it	Public initiative	Scientific puzzles		http://fold.it/
Fotolia	Marketplace for ideas	Photos	Canada	http://de.fotolia.com/
Freejeenee	Intermediate	Crowdfunding	Germany	http://www.freejeenee.com/
Friend fund	Intermediate	Crowdfunding	Germany	http://www.friendfund.com/
Fundry	Intermediate	Crowdfunding	Australia	http://fundry.com/project
Galazy Zoo	Public initiative	The Universe		http://www.galaxyzoo.org/
Garmz	Marketplace for ideas	Fashion	Austria	http://www.garmz.com/
Gastronomie Report	Proprietary	Gastronomy	Germany	http://www.gastronomie-report....
Gemeinsam anpacken	Public initiative	Jobs, Economy, Social, Education,...	Germany	http://www.gemeinsam-anpacken....
Genius Rocket	Intermediate	Video, Animation, Motion Graphics	USA	http://www.geniusrocket.com
Gigalo	Intermediate	Freelancer	Germany	http://www.gigalo.de/
Give a little	Intermediate	Crowdfunding	New Zealand	http://www.givealittle.co.nz/
Give forward	Intermediate	Crowdfunding	USA	http://www.giveforward.com/
Give zooks	Intermediate	Crowdfunding	USA	http://www.givezooks.com/
Glamya	Intermediate	Freelancer	Germany	http://de.glamya.com/
Global innovation	Intermediate	Idea platform	Germany	http://www.globalinnovation.de/
Globe forum	Intermediate	Crowdfunding	Sweden	http://www.globeforum.com
Gmail M-Velope Video Competition	Proprietary	Branding & Design	USA	
Go fund me	Intermediate	Crowdfunding	USA	http://www.gofundme.com/
GoldCorp	Proprietary	Product development & problem solving	Canada	
Google Moderator	Intermediate	Idea platform	USA	http://www.google.com/moderato...
Greedy or needy	Intermediate	Crowdfunding		http://www.greedyorneedy.com/

Grow VC	Intermediate	Crowdfunding	Hong Kong	http://www.growvc.com/main/
Hukilau	Marketplace for ideas	Authors	USA	http://hukilau.us/
Human Rights Logo	Public initiative	Logo Design	Germany	http://humanrightslogo.net/
Hype	Proprietary	Idea platform	Germany	http://www.hypeinnovation.com/
Hypios	Intermediate	R&D platform	France	http://www.hypios.com/
Hyve	Proprietary	Customized Idea platforms	Germany	http://www.innovation-communit...
IBM Idea Jam	Proprietary	Product development & problem solving	USA	http://ideajam.net
iBridge Network	Public initiative	Universities seeking for innovations	USA	http://www.ibridgenetwork.org/
Idea Bounty	Intermediate	Marketing & Design	Africa	http://www.ideabounty.com/
Idea Crossing	Intermediate	Idea platform	USA	https://www.ideacrossing.org/
Idea Walk	Together a free solution	Companies and Products	USA	http://ideaswalk.com/
IdeaConnection	Intermediate	R&D platform	USA	http://www.ideaconnection.com/
Ideaken	Intermediate	Idea platform	Singapore	http://www.ideaken.com
Ideas Campaign	Public initiative	Ireland seeking for ideas to push the economy	Ireland	http://www.ideascampaign.ie/
Ideas4Unilever	Proprietary	Product development & problem solving	UK	http://www.unilever.com/
Ideen Initiative Zukunft	Public initiative	Ideas for our planet	Germany	http://www.ideen-initiative-zukunft.de/
Ideenkanal	Public initiative	Idea platform	Liechtenstein	http://www.ideenkanal.com
Incuby	Intermediate	Idea platform / Crowdfunding	USA	http://www.incuby.com/
Indiegogo	Intermediate	Crowdfunding	USA	http://www.indiegogo.com/
Inkubato	Intermediate	Crowdfunding	Germany	http://www.inkubato.com/
InnoCentive	Intermediate	Science	USA	http://www2.innocentive.com
Innolist	Intermediate	Idea platform	Switzerland	http://www.innolist.ch/

Innomag	Intermediate	Magnetic micro systems	Germany	http://www.innomag.org
Innovation Exchange	Intermediate	Idea platform	Canada	http://www.innovationexchange.com/
Innovations Kraftwerk	Proprietary	Product ideas	Germany	https://www.innovationskraftwerk.de/
Innovatrs	Intermediate	Crowdfunding	UK	http://www.innovatrs.com/
Innovestment	Intermediate	Crowdfunding	Germany	http://www.innovestment.de/
Inovado	Intermediate		Germany	http://www.inovado.de
Instant Startups	Intermediate	Crowdfunding	Germany	http://www.instantstartups.de/
Invested in	Intermediate	Crowdfunding	USA	http://invested.in/
Investiere	Intermediate	Crowdfunding	Switzerland	http://www.investiere.ch/
Iron sky	Proprietary	Crowdfunding	Finland	http://www.ironsky.net/
Jovoto	Intermediate	Idea platform	Germany	http://www.jovoto.com/
JuJups	Marketplace for ideas	Various presents		http://www.jujups.com/
Just giving	Intermediate	Crowdfunding	UK	http://www.justgiving.com/
Justin Wilson investors club	Proprietary	Crowdfunding	UK	http://justinwilsonplc.com/
Kachingle	Intermediate	Crowdfunding	USA	http://www.kachingle.com/
Kapipal	Intermediate	Crowdfunding	Italy	http://www.kapipal.com/privacy
Katholische Kirche Köln	Public initiative	Catholics	Germany	http://www.katholische-kirche-koeln.de/
Kickstarter	Intermediate	Crowdfunding	USA	http://www.kickstarter.com
Kopernik	Intermediate	Crowdfunding	USA	http://kopernik.info/
Kraft	Proprietary	Product development & problem solving	USA	http://www.kraftfoodscompany.com/
Lanzanos	Intermediate	Crowdfunding	Spain	http://www.lanzanos.com/
LeadUsers.nl	Proprietary	Product development & problem solving	Netherlands	http://www.leadusers.nl
Leadvine	Intermediate	Freelancer		http://www.leadvine.com/

Lego Factory	Proprietary	Branding & Design	Denmark	http://factory.lego.com
Lego Mindstorms	Proprietary	Branding & Design	Denmark	http://mindstorms.lego.com/
Lynch three project	Proprietary	Crowdfunding		http://lynchthree.com/
MAM	Proprietary	Designing baby articles	Austria	http://mam.vo-agentur.de/
Mashup finance	Intermediate	Crowdfunding	Germany	http://mashup-finance.de/
Media funders	Intermediate	Crowdfunding	Switzerland	http://mediafunders.net/
Micro fundo	Intermediate	Crowdfunding	USA	http://www.microfundo.com/
Micro pledge	Intermediate	Crowdfunding	New Zealand	http://micropledge.com/
Muji	Proprietary	Branding & Design		http://www.muji.com/
Mutopo	Proprietary	Product development & problem solving	USA	http://www.mutopo.com/
Mutuzz	Intermediate	Crowdfunding	France	http://www.mutuzz.com/
My football club	Proprietary	Crowdfunding	UK	http://www.myfootballclub.co.uk/
My major company	Intermediate	Crowdfunding	France	http://www.mymajorcompany.com/
My Openideas	Intermediate	Idea platform	Austria	http://myopenideas.com/
MyMicroCredit	Public initiative	Crowdfunding for the third world	Austria	http://www.mymicrocredit.org
myWot	Together a free solution	Software	Finland	http://www.mywot.com/
Naked & Angry	Marketplace for ideas	Ties, umbrellas, wallpapers	USA	http://www.nakedandangry.com/
Naked&Angry	Intermediate	Pattern design	USA	http://www.nakedandangry.com/
Namion	Intermediate	Marketing	Germany	http://namion.de/
Neighbor land	Together a free solution	Ideas for the neighborhood	USA	http://neighborland.org/
New face film	Intermediate	Crowdfunding	UK	http://www.newfacefilm.eu/
NineSigma	Proprietary	Customized solutions	USA	http://www.ninesigma.com
Open Management Network	Intermediate	Idea platform	Switzerland	http://www.omanet.ch

Open Planet Ideas	Public initiative	Ideas for our planet	USA	http://www.openplanetideas.com
Openideo	Intermediate	Ideas for our planet	USA	http://www.openideo.com/
OpenLeaks	Together a free solution	Whistleblower platform	Germany	http://www.openleaks.org/
Openstreetmap	Together a free solution	Free map	UK	http://www.openstreetmap.org/
OSRAM LED-Emotionalize	Proprietary	Branding & Design	Germany	http://www.led-emotionalize.com/
P&G Open Innovation Challenge	Proprietary	Product development & problem solving	USA	
Peugeot	Proprietary	Branding & Design	France	
Pharmalicensing	Intermediate	R&D platform	UK	http://pharmalicensing.com/
Picnic Green Challenge	Public initiative	Ideas for a clean environment	Netherlands	http://www.greenchallenge.info/
Pifworld	Intermediate	Crowdfunding	Netherlands	http://www.pifworld.com/
Pirate my film	Intermediate	Crowdfunding		http://www.piratemyfilm.com/
Pledge music	Intermediate	Crowdfunding	UK	http://www.pledgemusic.com/
Pledgie	Intermediate	Crowdfunding	USA	http://pledgie.com/
Pling	Intermediate	Crowdfunding	Germany	http://www.pling.de/
Pozible	Intermediate	Crowdfunding	Australia	http://www.pozible.com/
PRESANS	Intermediate	R&D platform	USA	http://www.presans.com/
Prizes	Intermediate	Idea platform	USA	http://prizes.org/
Pro founder	Intermediate	Crowdfunding	USA	https://www.profounder.com/
Quirky	Intermediate	Product development	USA	http://www.quirky.com/ideas
Quora	Together a free solution	Questions and answers	USA	http://www.quora.com/
Racing shares	Proprietary	Crowdfunding	UK	http://racingshares.co.uk/
Raise capital	Intermediate	Crowdfunding	USA	http://www.raisecapital.com/
Realisr	Together a free solution	Finding project partners	Germany	http://www.realisr.com
reCAPTCHA	Together a free solution	Image recognition	USA	http://www.google.com/recaptcha
Redesign me	Intermediate	Marketing & Design	Netherlands	http://connect.redesignme.com/
Respekt.net	Intermediate	Crowdfunding	Austria	http://www.respekt.net/

Research Garden	Intermediate	Mathematics	Germany	http://www.research-garden.de/...
Revenue trades	Intermediate	Crowdfunding	USA	http://www.revenuetrades.com/
Rockethub	Intermediate	Crowdfunding	USA	http://www.rockethub.com/
Sandawe	Intermediate	Crowdfunding		http://www.sandawe.com
SAPiens	Proprietary	Customer Ideas	USA	http://www.sapiens.info
SaraLee	Proprietary	Marketing & Product ideas	USA	https://www.openinnovationsara...
Science Park Ideenwettbewerb	Proprietary	Start-ups	Austria	http://www.ideenwettbewerb.at/
Seed lounge	Intermediate	Crowdfunding	Germany	http://seedlounge.com/
Seedmatch	Intermediate	Crowdfunding	Germany	https://www.seedmatch.de/
Sell a band	Intermediate	Crowdfunding	Germany	https://www.sellaband.com/
Shop Windoz	Marketplace for ideas	Creative self-crafted products	Germany	http://www.shopwindoz.com
Siebel Energy Free Home Challenge	Public initiative	Sustainable buildings	USA	http://www.siebelfoundation.org/
Skild	Proprietary	Idea platform	USA	http://www.ideacrossing.com/
Skipso	Intermediate	Crowdfunding	UK	http://www.skipso.com
Slicethepie	Intermediate	Crowdfunding		http://www.slicethepie.com/
Small can be big	Intermediate	Crowdfunding	USA	http://www.smallcanbebig.org/
Small change fund	Intermediate	Crowdfunding	Canada	http://smallchangefund.org/
Social wish	Intermediate	Crowdfunding	USA	http://socialwish.com/
Solvster	Intermediate	Product development	Austria	http://www.solvster.com/
Sonic angel	Intermediate	Crowdfunding	Belgium	http://www.sonicangel.com/
Spanner films	Proprietary	Crowdfunding		http://www.spannerfilms.net/
Sponsume	Intermediate	Crowdfunding	UK	http://www.sponsume.com/
Sponzu	Intermediate	Crowdfunding	USA	http://www.sponzu.com/
Spot.us	Intermediate	Crowdfunding	USA	http://www.spot.us/

Spreadshirt	Marketplace for ideas	T-shirts	USA	http://www.spreadshirt.com/
Sprowd	Intermediate	Crowdfunding		http://launch.sprowd.com/
Spudaroo	Intermediate	Freelancer		http://spudaroo.com/
Starbucks	Proprietary	Product development & problem solving	USA	http://mystarbucksidea.force.c...
Startnext	Intermediate	Crowdfunding	Germany	http://www.startnext.de/
Swisscom Labs	Proprietary	Customer Feedback	Switzerland	http://labs.swisscom.ch/
Talenthouse	Intermediate	Idea platform	USA	http://www.talenthouse.com/
TekScout	Intermediate	R&D platform	USA	http://www.tekscout.com/
Textbroker	Marketplace for ideas	Texts	Germany	http://www.textbroker.de/
The cosmonaut	Proprietary	Crowdfunding		http://www.thecosmonaut.org/
The indpendent collective	Proprietary	Crowdfunding		http://theindependentcollective.com/
The point	Intermediate	Idea platform / Crowdfunding	USA	http://www.thepoint.com/
Threadless	Marketplace for ideas	T-shirts	USA	http://www.threadless.com/
Tongal	Intermediate	Video production	USA	http://tongal.com/
TopCoder	Intermediate	Freelancer	USA	http://www.topcoder.com/
Trampoline systems	Proprietary	Crowdfunding	UK	http://crowdfunding.trampolinesystems.com/
Trawlix	Intermediate	Design & Marketing	Germany	http://www.trawlix.de/
Trust Art	Intermediate	Crowdfunding	USA	http://www.trustart.org/
Tschibo Ideas	Proprietary	Product development & problem solving	Germany	http://www.tchibo-ideas.de
Twick.it	Together a free solution	Questions and answers	Germany	http://twick.it/
UI-Check	Intermediate	Freelancer	Germany	http://www.ui-check.com/
Ulule	Intermediate	Crowdfunding	France	http://www.ulule.com/
UnserAller	Intermediate	Product development	Germany	http://www.unseraller.de

uTest	Intermediate	Software testing	USA	http://www.utest.com/
Venture bonsai	Intermediate	Crowdfunding	Finland	https://www.venturebonsai.com/
Versatel	Proprietary	Product development & problem solving	Germany	
Vision bakery	Intermediate	Crowdfunding	Germany	http://www.visionbakery.de/
Vision Elektromobile	Proprietary	E-Mobility	Germany	http://www.vision.elektromobile-stadt.de/
Vocalpoint	Proprietary	Product development & problem solving	USA	http://www.vocalpoint.com/
We fund	Intermediate	Crowdfunding	UK	http://www.wefund.com/
Weltbeweger	Public initiative	Public engagement	Germany	http://www.weltbeweger.de/
Wi seed	Intermediate	Crowdfunding	France	http://www.wiseed.fr/
Wikio experts	Together a free solution	Questions and answers	France	http://www.wikio-experts.com/
Wikipedia	Together a free solution	Free encyclopedia	USA	http://www.wikipedia.org/
X-Prize	Public initiative	Innovations for astronautics, mobility,...	USA	http://www.xprize.org/
Yahoo Answers	Together a free solution	Questions and answers	USA	http://answers.yahoo.com/
Yet2.com	Intermediate	R&D platform	USA	http://www.yet2.com/
Yutong	Intermediate	Idea platform	Switzerland	http://ideation.yutongo.com
Zazzle	Marketplace for ideas	Posters, T-shirts, Coffee cups,...	UK	http://www.zazzle.co.uk/
Zukunft Innovation	Intermediate	Idea platform	Austria	http://www.zukunft-innovation.c...

Appendix C: Screenshots of the Platform Benchmarking

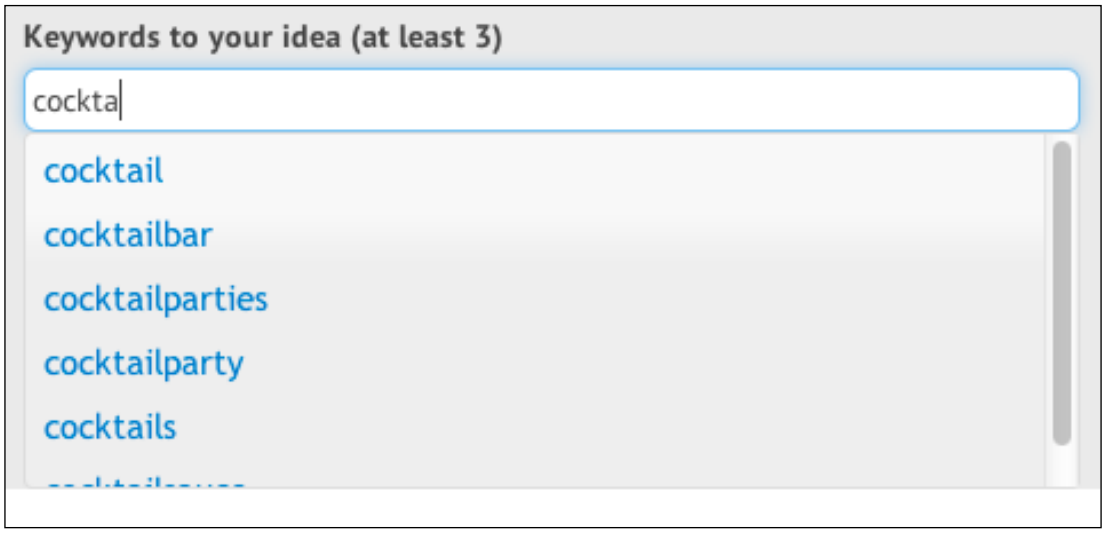


Figure 25: Atizo - tag-completion

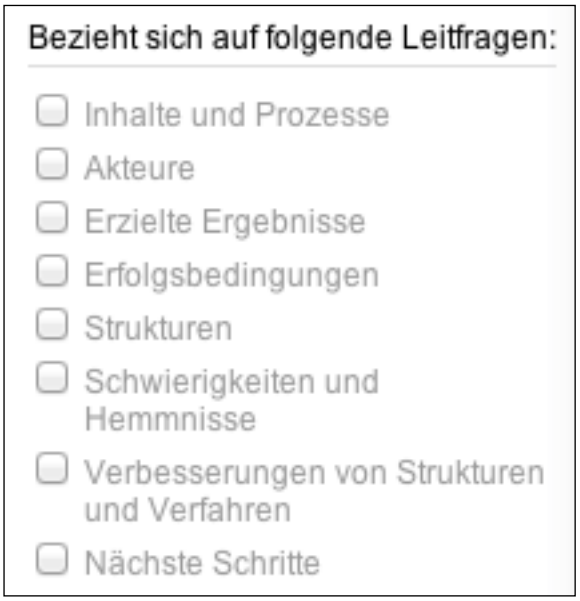


Figure 26: Hyve – predefined categories for idea categorisation

Figure 27: Hyve - popular tags as tag recommendations

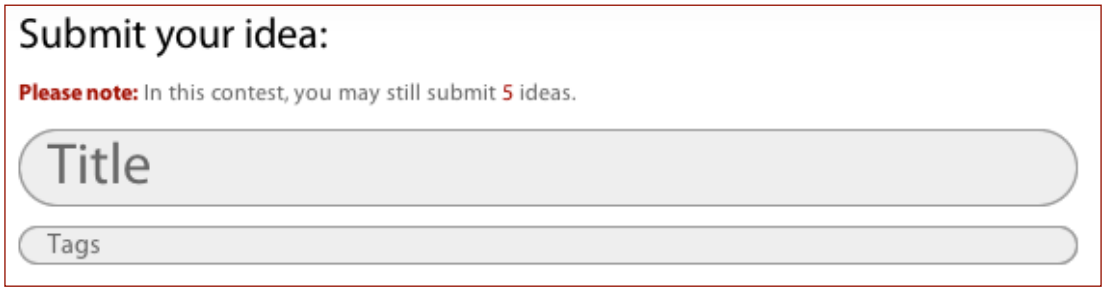


Figure 28: Jovoto – tags for idea categorisation

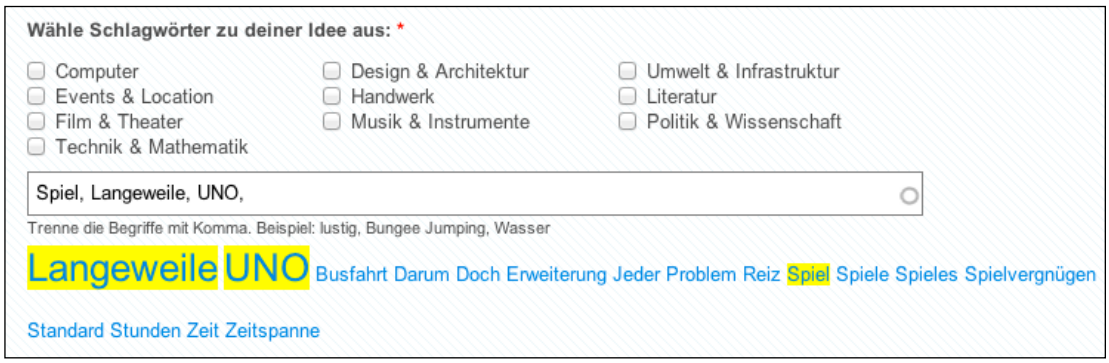


Figure 29: Neurovation - tag recommendations and predefined categories

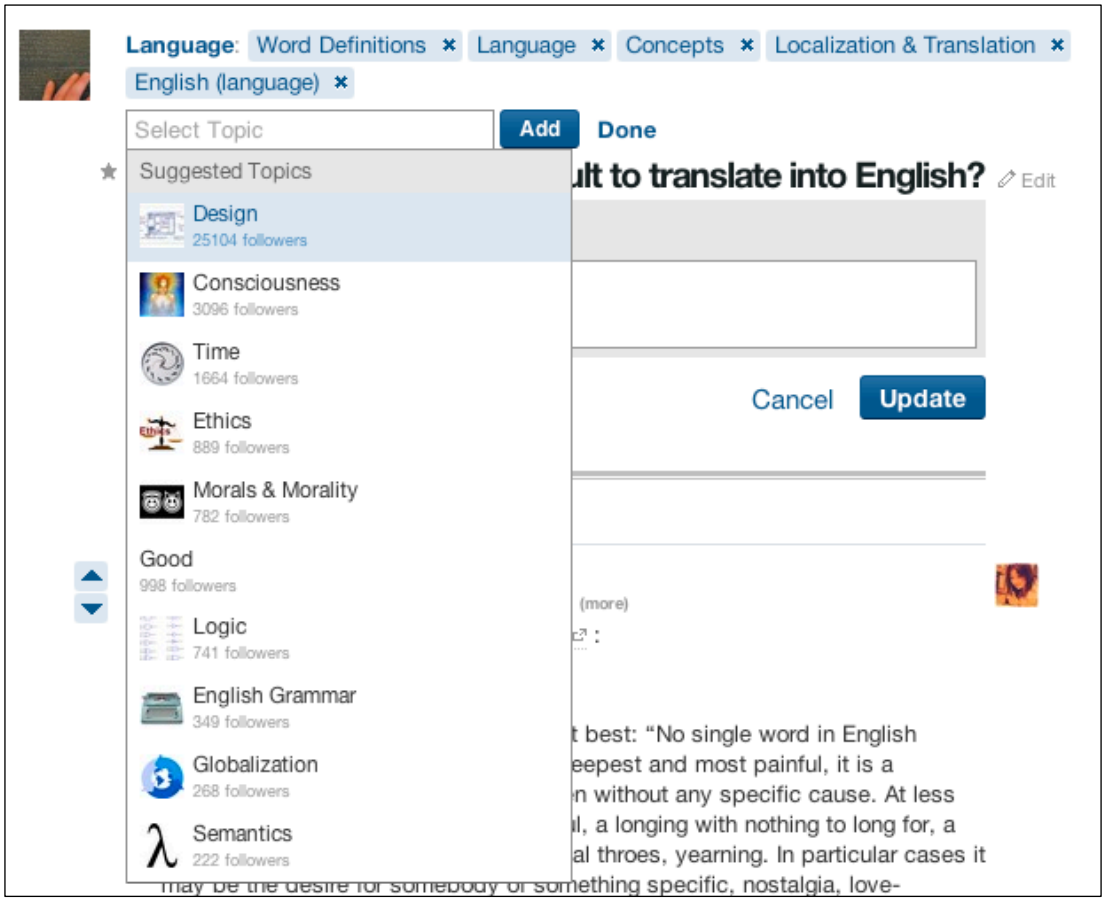


Figure 30: Quora - community tagging (topics)

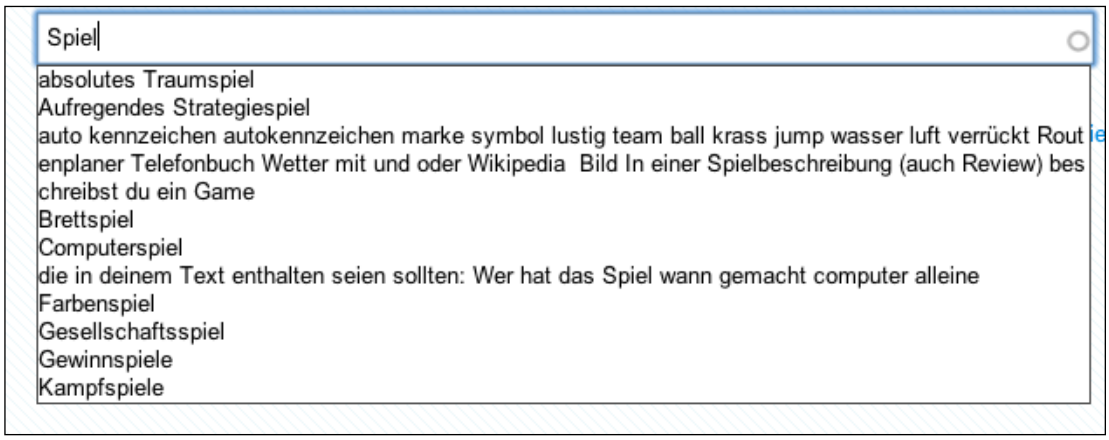


Figure 31: Neurovation – tag auto-completion

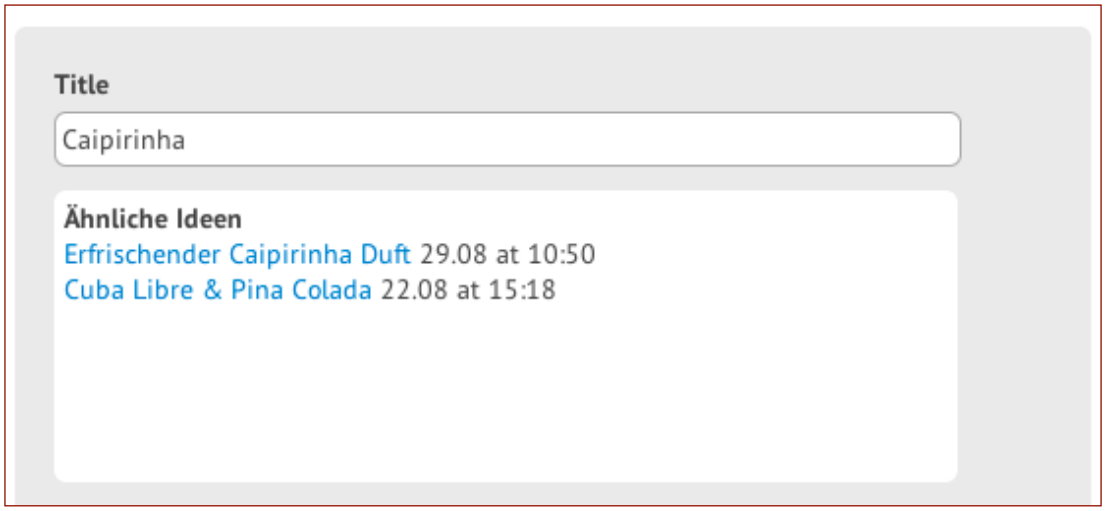


Figure 32: Atizo – similar idea detection

Figure 33: Neurovation - similar idea detection

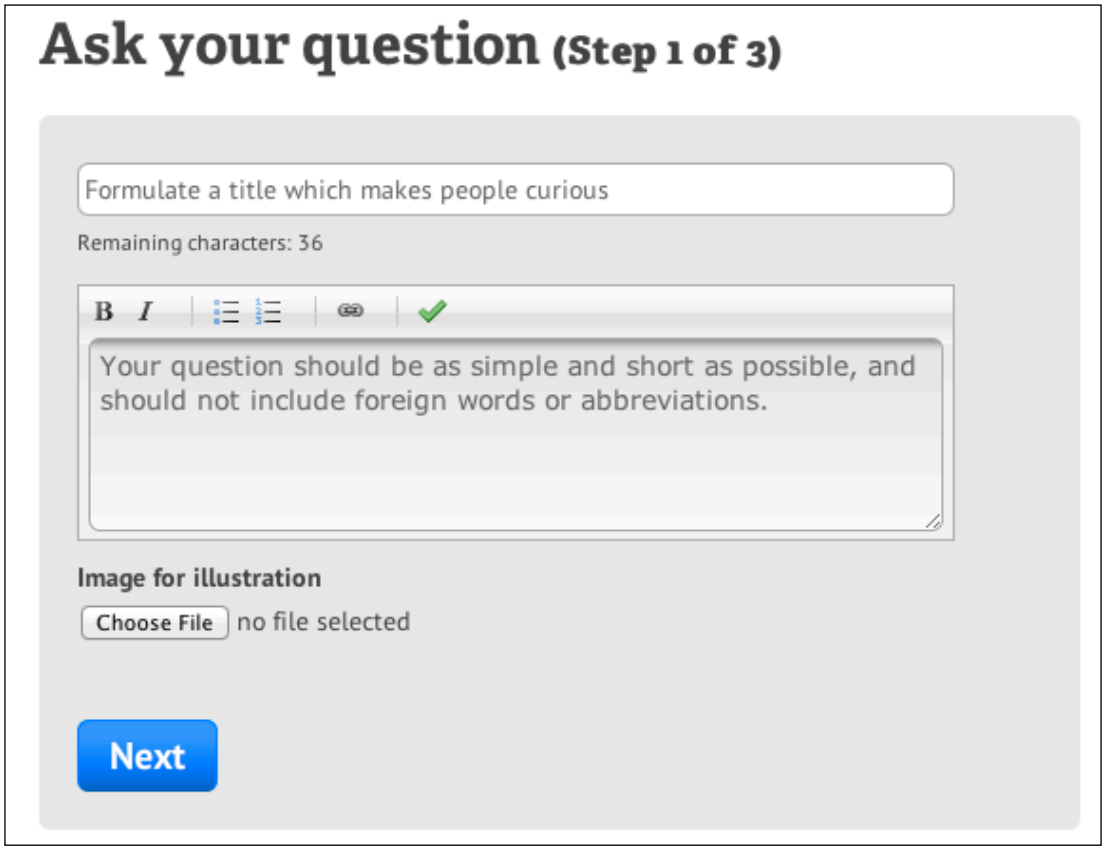


Figure 34: Atizo – brainstorming tool

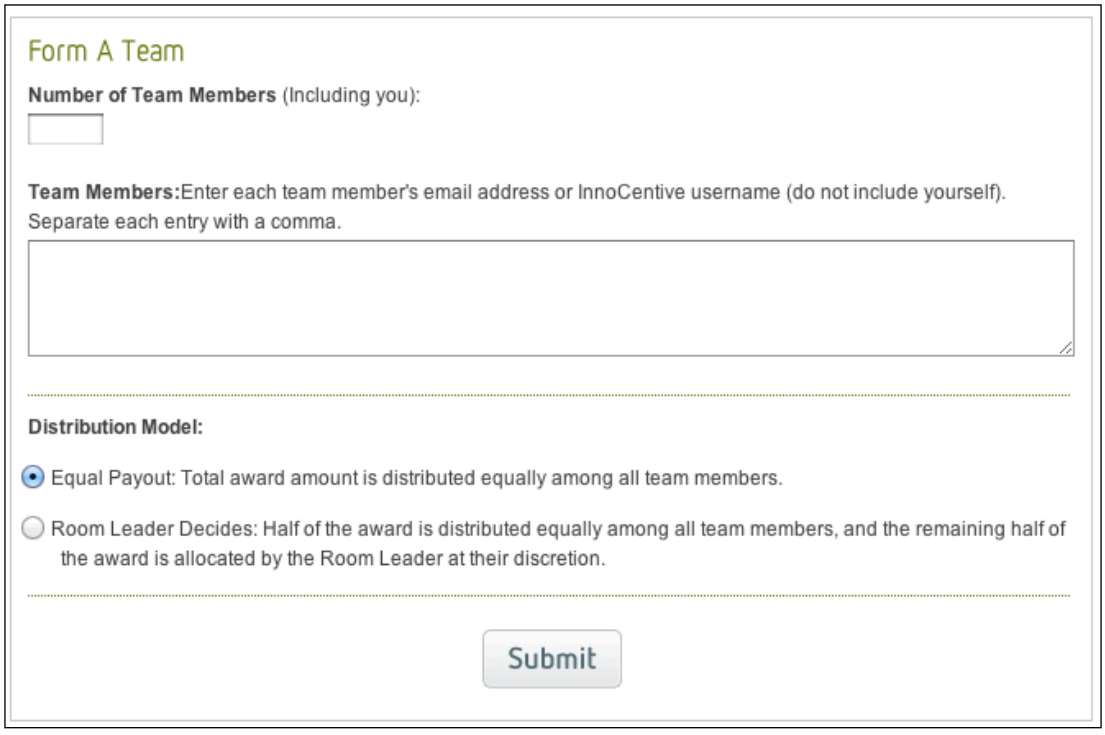


Figure 35: InnoCentive – team submissions

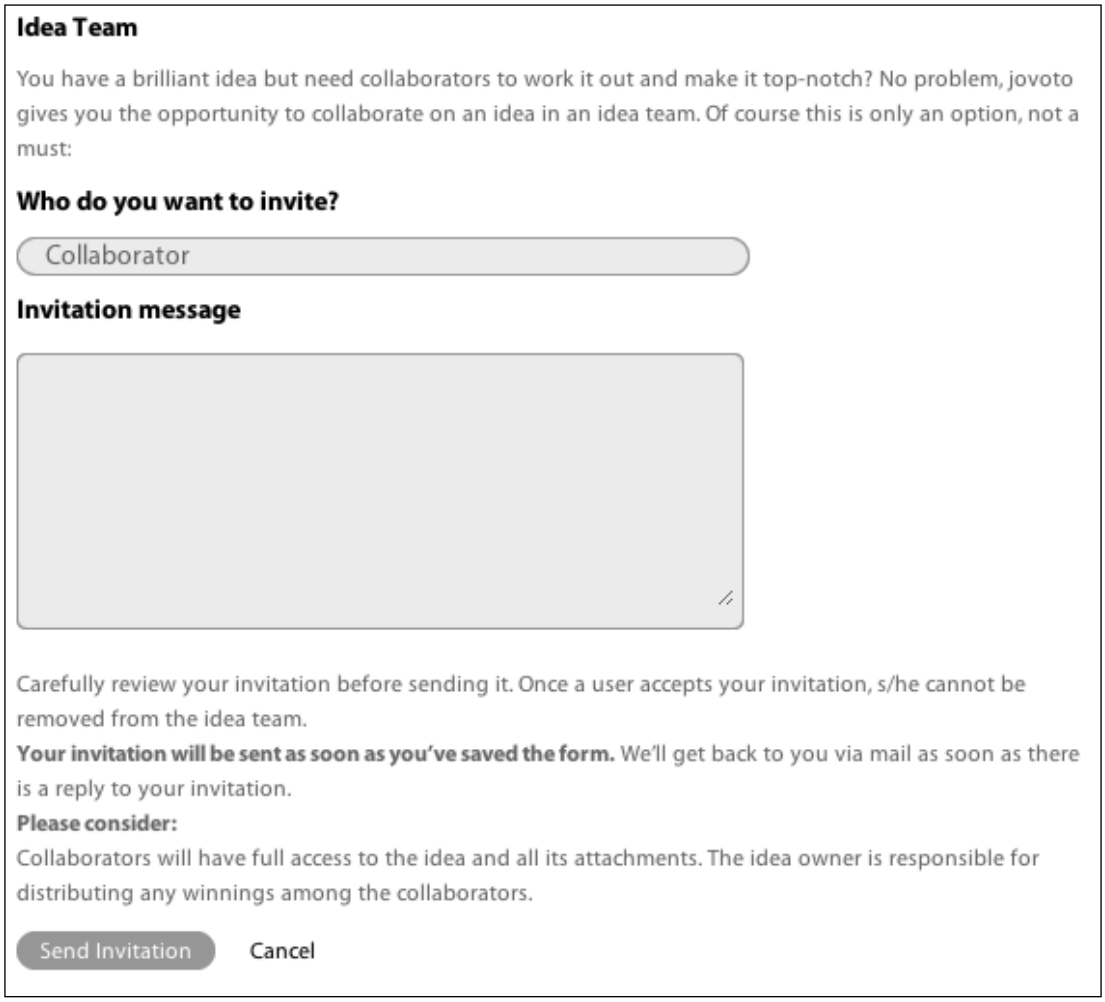


Figure 36: Jovoto – team submissions

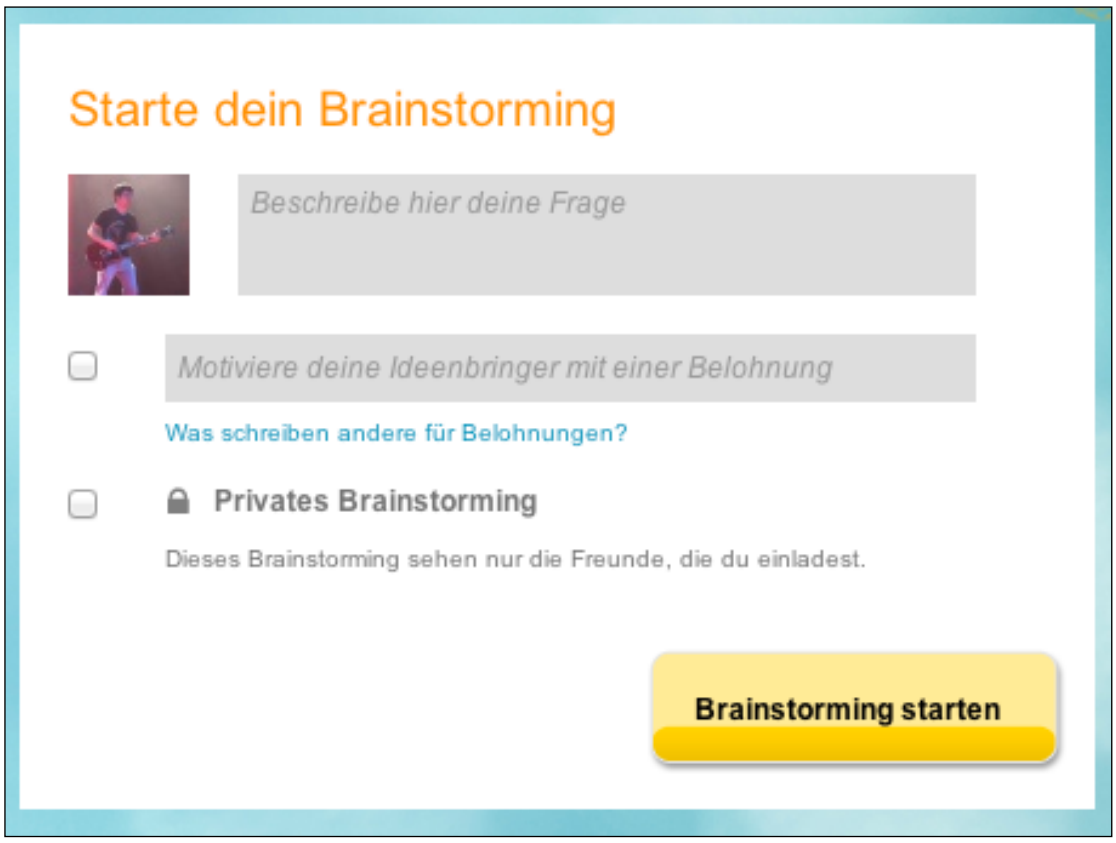


Figure 37: Neurovation's brainstorming tool

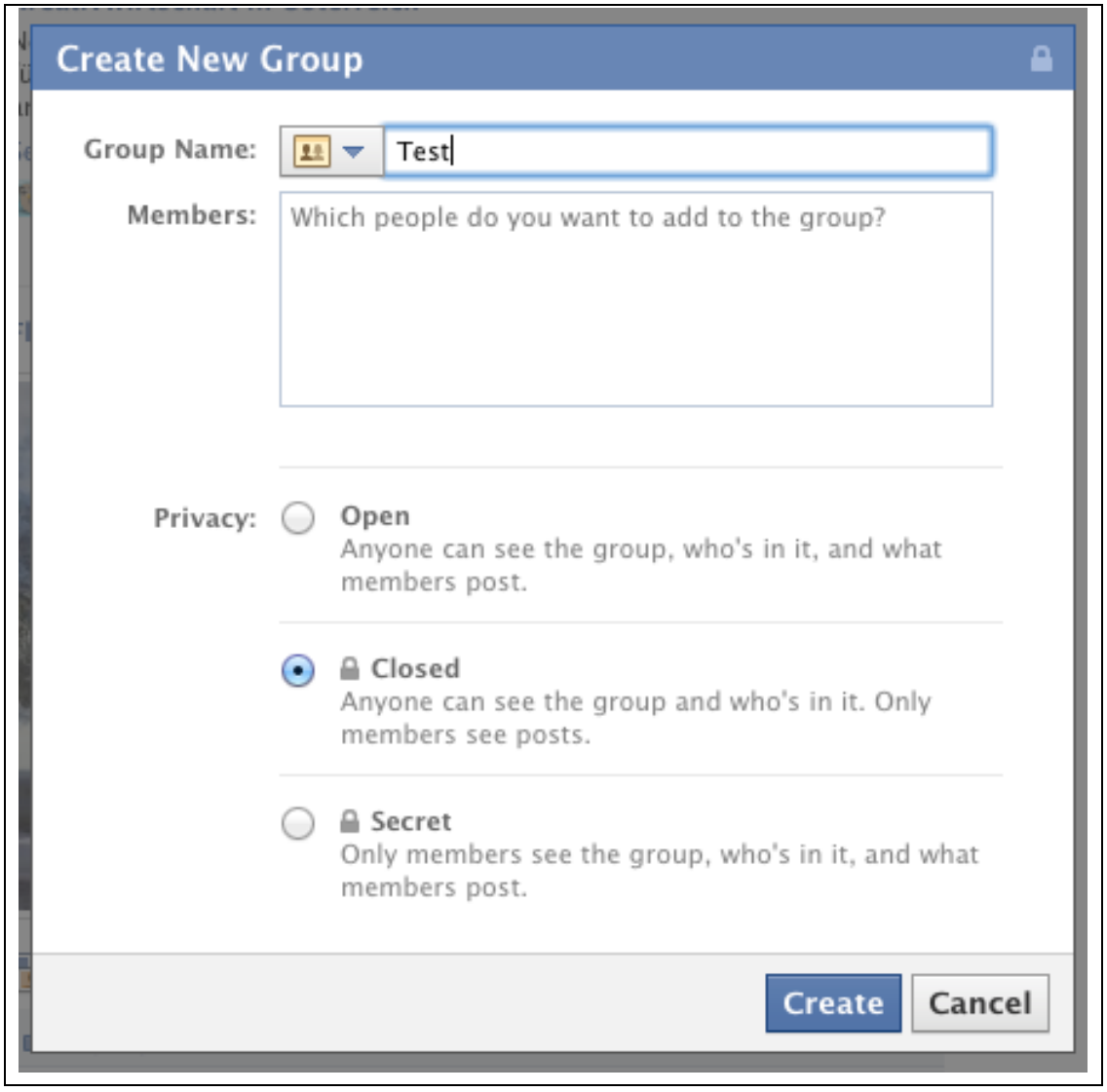


Figure 38: Facebook - public and private groups

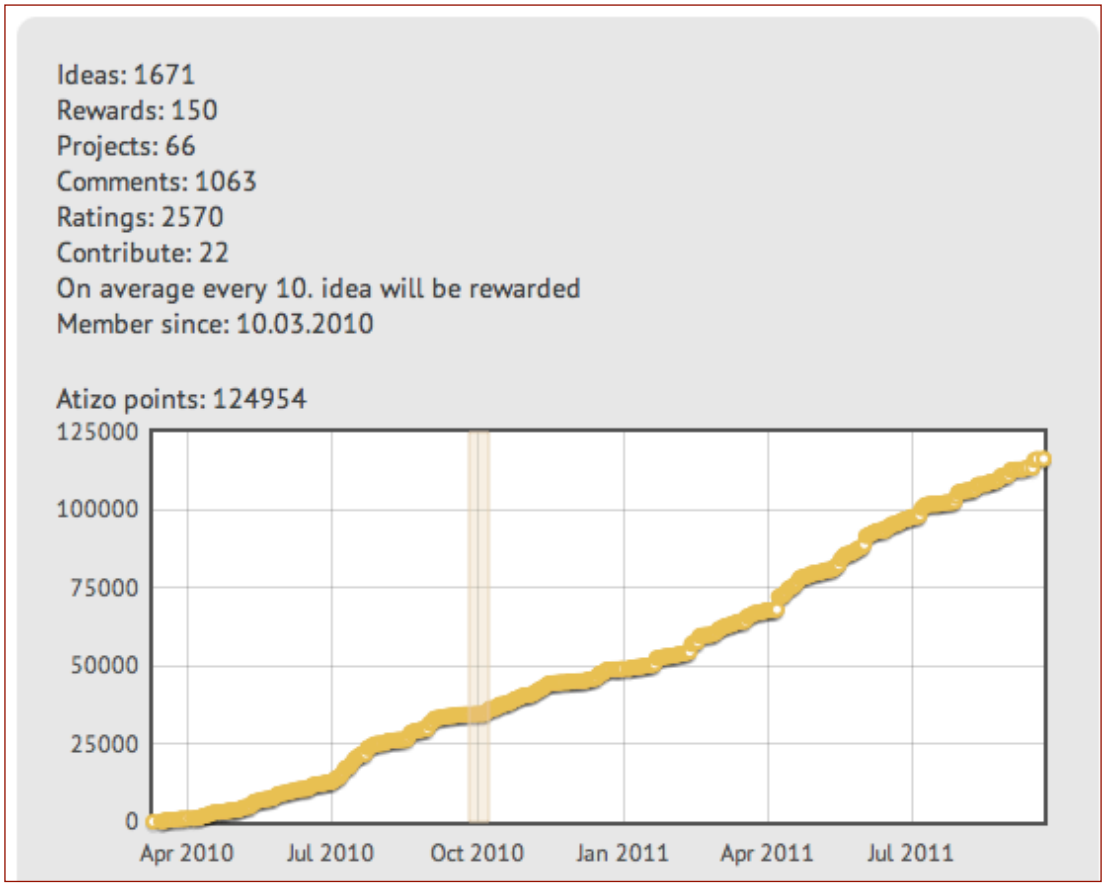


Figure 39: Atizo - activity-points

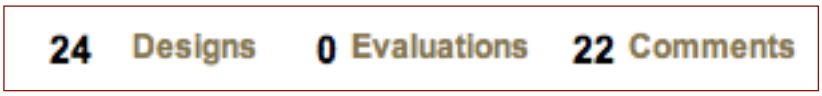
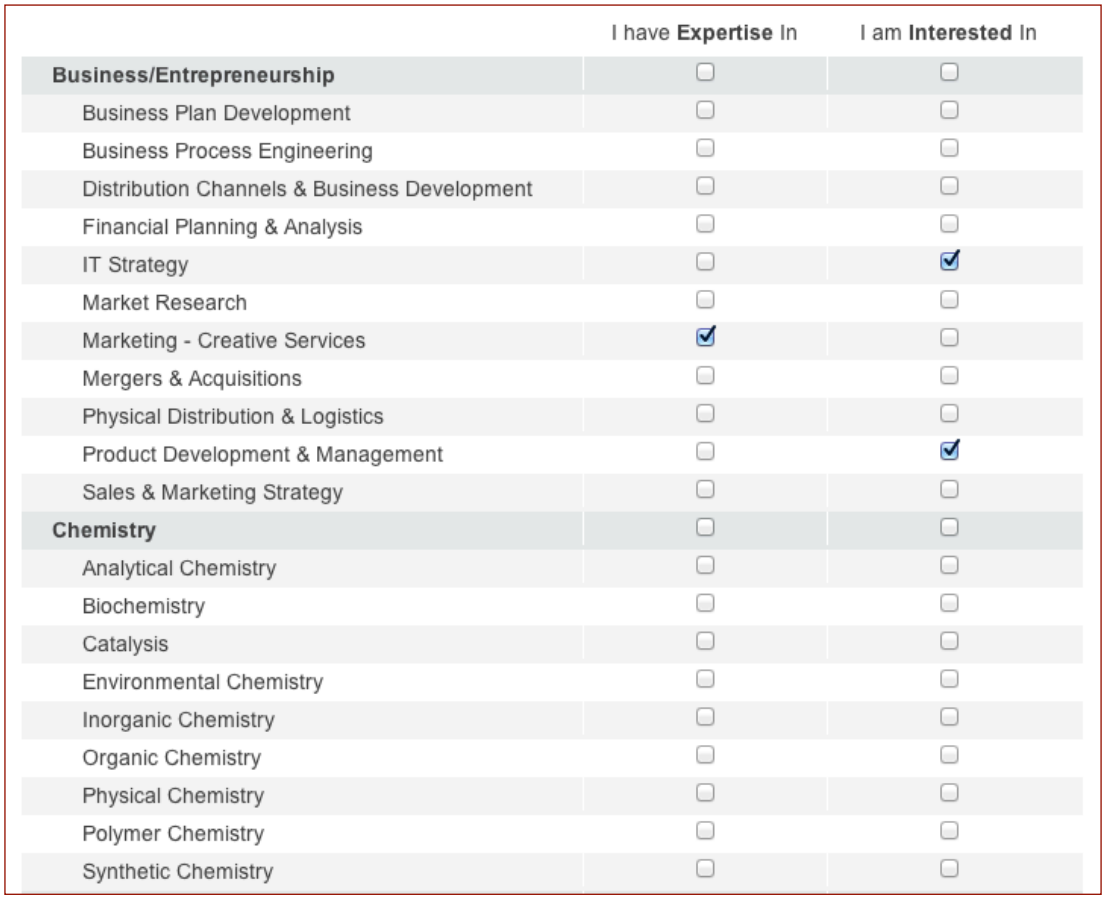


Figure 40: Hyve user statistics



	I have **Expertise** In	I am **Interested** In
Business/Entrepreneurship	☐	☐
Business Plan Development	☐	☐
Business Process Engineering	☐	☐
Distribution Channels & Business Development	☐	☐
Financial Planning & Analysis	☐	☐
IT Strategy	☐	☑
Market Research	☐	☐
Marketing - Creative Services	☑	☐
Mergers & Acquisitions	☐	☐
Physical Distribution & Logistics	☐	☐
Product Development & Management	☐	☑
Sales & Marketing Strategy	☐	☐
Chemistry	☐	☐
Analytical Chemistry	☐	☐
Biochemistry	☐	☐
Catalysis	☐	☐
Environmental Chemistry	☐	☐
Inorganic Chemistry	☐	☐
Organic Chemistry	☐	☐
Physical Chemistry	☐	☐
Polymer Chemistry	☐	☐
Synthetic Chemistry	☐	☐

Figure 41: InnoCentive – Self-assessed expertise

Figure 42: Jovoto - karma system

Figure 43: Jovoto - self-assessed expertise

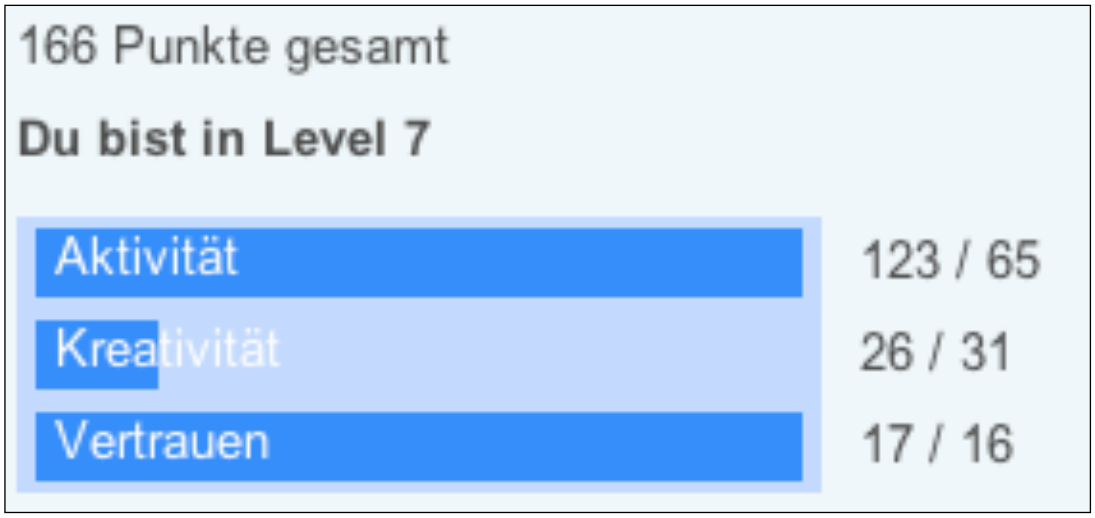


Figure 44: Neurovation - level points