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Creative Cooperation in Distributed Working Situations: Towards a Design-Process-Based Cooperation System

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by Jessica Willius

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First Supervisor: Prof. Dr. Kristian Fischer
Second Supervisor: Prof. Dr. Gerhard Hartmann

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Contact details: Jessica Willius
Brunnenallee 17
53332 Bornheim
jessica.willius@smail.th-koeln.de
Matriculation number: 11102025

Prof. Dr. Kristian Fischer
TH Köln - University of Applied Sciences
Institute of Informatics
Steinmüllerallee 1
51643 Gummersbach
kristian.fischer@th-koeln.de

Prof. Dr. Gerhard Hartmann
TH Köln - University of Applied Sciences
Institute of Informatics
Steinmüllerallee 1
51643 Gummersbach
gerhard.hartmann@th-koeln.de

Abstract   3

Due to the present developments of the Internet and its technical components, the skills of the web experts have to be more and more complex and specific. The Internet experts in the creative field are located distributedly around the whole world. As a result, many companies have problems to find the needed experts on site and are dependent on creative cooperations and virtual teams with the help of technical tools. The virtual working place is an important issue, particularly in modern times and the market offers more and more cooperation systems for exactly this purpose: Creative cooperation in distributed working situations. This thesis examines the approaches of creative cooperation and cooperation technologies with an analysis about existing cooperation systems with a creative context. It spans a wide range of tools. On the one hand, there are approaches which offer only straightforward solutions for single design tasks. On the other hand, there are providers which recognised the great need of creative cooperation systems and working at full speed to extend their systems. The examined areas of this work lead to a design process oriented approach with flexible frames and enough space for the creative development of every single user. The cooperation in a creative context stays in the foreground and is the base for future approaches for the web design sector.

Keywords

Creative Cooperation, Distributed Working Situation, Web Design, Design Process, Cooperation System, Groupware, Teamwork, Remote Working, Awareness, Communication

Foreword

In front of you is the master thesis "Creative Cooperation in Distributed Working Situations: Towards a Design-Process-Based Cooperation System" – the result of my researches in the field distributed creative cooperations in the web sector including a solution approach in form of a cooperation system. This thesis is the final part of the Master Program Web Science at the Cologne University of Applied Sciences. I found the final topic through inspiration of past lectures, my everyday work and with the support of my both supervisors Prof. Dr. Fischer and Prof. Dr. Hartmann.

My profession is interaction design in an Internet agency. My everyday work consists of creating concepts and designs for websites and web applications of every sort. My job tasks start with a briefing by the customer and ends with the quality check of the final result in the Internet. The design process is complex and closely linked with other colleagues, customers and other stakeholders. Exchange and communication between stakeholders are two important key elements within the design process, but due to different working locations the possibilities are more complicated as in the case of co-located situations. I work, create and design *for* the Internet, therefore for me it is a must to think about to work *with* the possibilities of the Internet to improve my everyday work. I made the experience that already the distance of different floors within a building can be sufficient that the communication between colleagues is restricted. Hence, the subject is so relevant as never before and interests me, above all, because of my own professional sphere. The topic could be also interesting for other web designers, concept developer, programmer and other stakeholders of a design process. Due to the great personal interest the writing of the thesis came easily to me, even if the development was time-consuming and my full-time job has still aggravated the conditions. I would not like to renounce the experience which I could gain during the study and the final step – the master thesis.

I would like to finish the foreword of my thesis now with a short acknowledgement: I would like to thank all those which have accompanied me within the scope of this master thesis. Particularly I would like to thank my supervisors Prof. Dr. Fischer and Prof. Dr. Hartmann who have accompanied my work by their professional and personal support. Moreover, I would like to thank my colleagues by whose suggestions my work was continuously improved. Big thanks go to the interview partners with whose help I received important input for the conceptual part of this thesis. Finally, special thanks are valid to my parents and my life mate, who have morally supported me with a lot of patience.

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1 Introduction

Globalisation of the markets and digitisation of the communication have changed since the turn of the millennium not only the way enterprises can create value and conduct business, but also the lifestyles of consumers and the demands for a modern job. The humans spend less time with classic, but more and more with digital media and the speed in which one must orientate himself anew increases. Devices like smartphones, tablets and PCs which are available everywhere and connected to the web at any time have decisively contributed to this development. The increasing number of digital devices creates a lot of points of contact between enterprises and their stakeholders. The new circumstances imply that a representation of an enterprise in the world wide web is more important than ever before and at the same time, the presence could be diverse as never before. At the same time, these circumstances mean new challenges for web designers.

Web design is a creative field of work which lives from the exchange of ideas, opinions and experiences. The web designer works with tools like Photoshop, Illustrator or Sketch and creates layouts for websites, logos, graphs, typefaces or complex drawings. The results of the everyday professional life of a web designer are rich in variety and creativity. In addition, the modern web designer works in an enterprise 2.0 with flexible and networked work stations, flat structures and international colleagues which build distributed, virtual teams in a web 2.0 technology environment.

Due to constantly new demands and within the existing organisation forms, it does not make sense for many enterprises to hire creative specialists permanently. Nevertheless, in response to further challenges, enterprises cannot renounce on creative specialist with extraordinary competences. The consequence that arises from this is that interactive designers become strategical partners of agencies and enterprises and are incorporated earlier and earlier in the planning stage of projects. A few years ago the situation still looked different. The process or the product were central, the designer was a means to an end. Now designers move more and more to the beginning, they realize and solve problems, define processes and develop products. Due to the diversity of circumstances, web designers do seldom work alone. They are a part of a team, often locally distributed.

Therefore, it is important to make the virtual professional environment available for more than one designer at the same time for an active exchange to benefit from each other. Today, it is really easy to share a word document or an excel document via cooperation systems, but the files of a designer are more complex and more pretentious. This and other points like separation by different time zone or different languages of the team members put a lot of strain on existing systems, which have to support distributed, cooperation design work. Other hurdles like modern workflows also complicate the distributed cooperation. The work of a web designer fits best of all to an agile work flow, because of quickened, technological developments. Linear work flows, like the classical waterfall model have turned out as too stiff to react to short-term course changes. Therefore, it is usual that the roles of the team members change from time to time according to special purposes. Managers, designers, concept developers, planners and programmers recognizing themselves as equal partners within the design process, and work role-comprehensive together.

1.1   Problem Statement

How and in which parts of web design process, do web designers collaborate and how can this be achieved in distributed teams?

The aforementioned circumstances make clear that the search for a solution for creative distributed cooperations have to build on the web design process and the needs of the stakeholders.

Web design teams profit by a close collaboration. For usual web designers have personal contact to each other during a project process. They work together more effectively if several team members consider different aspects and introduce different experiences for creating creative and innovative ideas. It has a positive effect for projects and products, if different persons lighted it up from different perspectives. Web designers profit from the fact that they learn of each other and extend by the cooperation mutually their own horizon. In addition, people tend to go to fall into strict behaviour patterns. The breaking of this patterns can speed up the working process and promote creative solutions.

Therefore, there are good reasons why web designers should work together – above all in the creative phase of a design of process. It is usual that the communication takes place collocated but by new enterprise forms and new job requirements there are new barriers in terms of distance and distribution of project tasks. This situation is aggravated by the fact that design projects often do not run linearly, and also the constellations of project teams have great impact on the course and outcome. If team members do not know each other personally and they have not the chance to spatially work together, an intensive exchange is automatically disturbed. The danger is lying in ineffective teamwork due to unclear and time-delayed communication. Other issues in this context are social interaction and awareness. Social interactions within an enterprise are the subjective experiences which a person gains in the exchange with social contacts. This kind of interaction can originate with colleagues during the work, at lunch or also during common meetings. The virtual working space can – according to handling – adversely affect the origin of social contacts in the job, which could negatively affect a working day. The distance between team members is also shown in the difficulty to track work status of all members transparency and in real time. If the status of the current project status is unclear the entire workflow could come to a standstill.

At the moment, there are several incipient stages for cooperation systems for web designers, but they have not yet become firmly established in the web design sector although the need exists. Often there are tools for single phases of a design process like brainstorming or planning, but extensive tools which supervise a whole design process from the briefing to the final implementation are not well known. In addition, the choice of single cooperation systems for a web design project is not easy within distributed teams, because all systems have to run on different computer systems and have to fulfil different requirements of the stakeholders which have very differently job tasks. In addition, the technical support for distributed web design teams should be flexible enough, for unexpected project changes.

The aspects clearly indicate that new ways must be found which support multiple parts

of the design process and bring together design teams in spite of spatial separation. The issues are complex and in regard to the future developments for the web design sector very topically and relevant.

1.2 Mission Statement

The aim of this thesis is to elaborate with knowledge of fundamentals about professional circumstances for web designers and computer-supported cooperative work a web based solution approach which supports the creative work through steps of a project life cycle. The end result is a concept of a cooperation system which makes the collaboration of web designers easier and valuable. The aim is not to find a system which includes solutions for every single step of a design process. The focus lies on an approach which is flexible enough to react on unexpected occurrences but solid enough to be an extensive working place in form of a virtual platform.

1.3 Big Idea

The idea behind the mentioned concept, which is in detail worked out in the fourth chapter of this work, grew up through the need of a cooperation system, which support the creative and organisational parts of a web design team through an entire project process. The cooperation system has to combine several requirements which arise through the everyday work of designers. The design job is composed of a lot more details than just designing. Almost all tasks are based on cooperation with team members or stakeholders. The workflow of web designers is based on processes which often proceed according to one (simplified) schema – receiving the order, analysis of the circumstances and the tasks, developing ideas, concepts and designs. Last but not least in the end should be the implementation of the product. In contrast, other web design projects require on the other hand flexible processes, to react on unexpected events. Some process phases must be repeated or other planned steps become redundant. Although if projects are not always the same and both, linear and non-linear processes, have their own advantages, in the last years it turned out that the agile working style is most suitable for web design projects. (Spies 2015) This style brings special requirements wherefore the cooperation system needs particular components. The system should consist of tools which best support the creative work within virtual teams and which can be integrated into the virtual world. This means, for example, that not every brainstorming method works for distributed teams where team members only communicate via technical tools. Against it other methods can be integrated very well into the virtual space.

Due to distance between locations, technical tools are necessary and have to fulfil more than just communication functions. The main purpose of the planned cooperation system is to bring all designers and stakeholders together via one single platform. Issues like awareness, trust and social interaction for building well-established distributed teams are important indicators which should characterize the system.

Therefore, the idea behind the system is not only to find a mutual design process to fulfil the requirements of all possible projects. The idea goes one level deeper and illustrate suitable measures which are necessary to complete design projects and are important for creative

cooperation in distributed working situations. The system should be used as a modular construction system. In this manner, it is possible to choose measures of single phases which best fit to the individual project and team constellation.
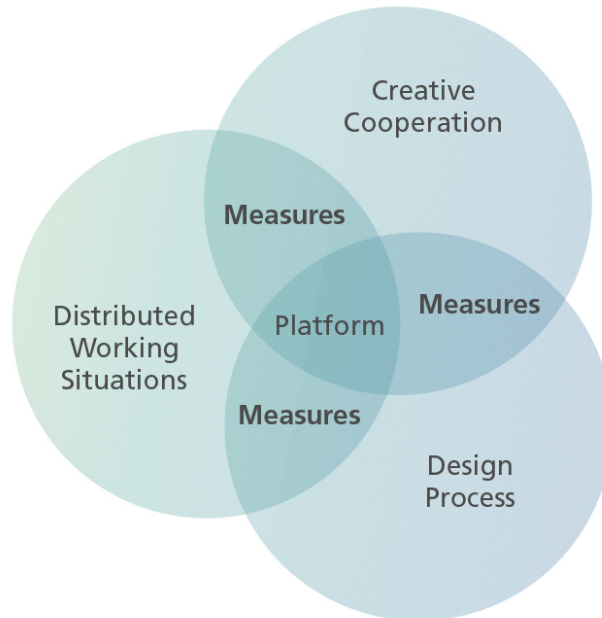
Figure 1: *Interdependencies* of the three Elements of the Big Idea.

1.4   Objectives

The focus of this thesis lies on fundamental subject-related information which builds the base for a concept of a cooperation system which is adjusted to the needs of web designers. The following objectives are important indicators for further proceedings to compile the contents to fulfil the considerations of the *big idea*.

Strategical objectives
From the strategical view, it is important to find out which cooperation system components are most suited to support the virtual web design teams during the entire design process from discovering to delivering the results. In consideration to the needs of the stakeholders, the aim is to find a flexible approach, where the user is able to choose cooperation system components which fit best to the current web design project. The final concept should consist of one single platform for web designers.

Tactical objectives
In orientation towards the strategically objectives, it is necessary to examine the details about web design teams and how web designers interact in distributed situations, respectively in which design process parts they especially collaborate. The second step is to figure out the possibilities of cooperation technologies for this division and which are the current best practices from which one can adapt important aspects for the final concept.

Operational objectives

In addition to the perceptions from the theoretical part, interviews with web designers deliver more input for the conception of cooperation systems. The interview consists of questions which approach issues to the everyday work, habits, needs, working surroundings and experiences with distributed working situations.

1.5   Scope and Outline

The thesis consists of five main chapters. The thesis starts with an introduction where the topic is explained and a problem statement is figured out. The research question represents the direction of the thesis and gives information about the key elements of further research.

The second chapter consists of research about the current status of web designers and their distributed working circumstances, which is the base for the solution approach. The focus is on the nature of teamwork and the single steps of design process where designers are engaged in collaboration.

To figure out the possibilities for distributed web design teams, an analysis about computer-supported cooperative work and related subjects, like awareness, is part of the third chapter. In this context, existing CSCW systems are analysed.

The fourth chapter deals with a solution approach in the form of a concept of a design-process-based cooperation system for web designers. To get a reinforced base for the solution approach, interviews with professionals give more information about the needs of web designers which work within distributed teams. In addition, objectives and stakeholders are formulated as base for the concept. The approach based on the five steps of the design process and includes beside the content-based concept an interface design and a click dummy.

Finally, the fifth chapter is about a conclusion with statements and the final research findings. It becomes clear which knowledge was gathered about the topic, and which aspects are of special interest. The fifth chapter answers the research question from the beginning of the thesis.

Further parts of the thesis are a glossary, which inform about the definition of important technical terms which are used in the thesis, and an appendix with detailed notes from the interviews.

2   Creative Cooperation in Distributed Working Situations

__The act of collaboration is an act of shared creation and/or shared discovery.__
(Schrage 1995, S. 16)

The aim of this chapter is to examine cooperation between web designers in distributed working situations with the help of existing literature. To understand the characteristics of cooperation in distributed web design teams, it is necessary to examine the details about web designers and their job settings, tasks, workflow, habits and needs. In this context it is also important to consider the detailed steps of an ordinary design process and the stakeholders which are closely linked to it.

Building up on this basic information the creative cooperation moves into the focus. *__"The possibilities of achieving creative ideas probably increase if they are developed by different stakeholders who have differing backgrounds and expertise."__* (Randall & Salembier 2010, S. 65) The synergy of more than a single person is helpful to find ideas and to improve existing ideas via feedback. If cooperation is based on creative work, it is important to ask in which manner cooperation technology is able to support creative thinking and creating. The aim of this sub-chapter is to clarify this question with hints for the final approach.

2.1   Distributed Web Design Teams

In the today's time, web design is more complex than before and not a job of a single designer or even a job of a single company. If one looks at the optimum conditions on design teams, then it is clear that the approach for distributed teams needs extraordinary deliberations for an ideal cooperation. The literature speaks of the fact that the optimum conditions for teams with different skills and job tasks are spatial nearness, mutual communication, mutual comprehension, a trusted working atmosphere and agile work and thinking.

A close collaboration as well as an intensive exchange originate when designers sit side by side. Face-to-face communication is in distributed situation not possible. This fact leads to communication barriers which needs alertness. (Pentland 2012)

Another key element which has a strong impact on the work of design teams is communication. *__"[...] the key to high performance lay not in the content of a team's discussions but in the manner in which it was communicating."__* (Pentland 2012, p. 4) Communication is the key to success. It provides not only clarity, but also provides motivation and increases the productivity of the team. The best way to communicate is of course the face-to-face communication and social touch points which makes the exchange between team members interesting. Therefore, communication tools are very important for distributed teams. (Randall & Salembier 2010, p. 73)

A team with different people, with different skills and experiences are rather able to deal

with complex projects than a homogeneous group. A pool of different people which work in a good cooperation there is high potential for creativity, new and innovative ideas and faster ways to find solutions. Hence, it is essentially for a successful cooperation to build up the understanding for other fields and areas of responsibility and to apply this within own discipline in a gainful manner. On this occasion, the difficulty is the construction of this understanding about the physical distance. (Randall & Salembier 2010, p. 66)

Foundation for a trustful and integrative cooperation is, above all, a labour culture in which the cooperation is esteemed and people want to work with each other and not mutually. It is doubtful to what extent it is possible to build up trust and a pleasant working atmosphere and besides to what extent technology is able to support the team building process. (Sebastian & Delft 2007, p. 49)

Agile work can be seen as a necessary basic condition for the success of the above mentioned measures. To work agile indicates generally to reduce the complexity of the planning, to put the use in the focus and to promote a fertile work atmosphere as well as an intensive participation of all partners. (Wysocki 2009, p. 34 ff)

The mentioned aspects should be taken into account for arranging web design teams within distributed working situations. The circumstances in virtual working surfaces are not ideal from the initial position, however, they have to be optimised in such a way that the teams can work together successfully.

2.1.1   Characteristics of Web Designers

The job of the web designer is the creating and maintenance of websites in the Internet. Besides, the web designer is primarily responsible for creation, construction and user guidance. The term *"Web Designer"* is internationally well known and has found entrance in many languages. In the early 90s years the occupation of the web designer developed on the basis of different, then new, circumstances. New technologies like *Cascading Style Sheets (CSS)* and *Flash* gave new opportunities to create web pages and with the commercialisation of the Internet, the presence on the Internet got a new value. The internet users realised that the *Look and Feel* of a website decisively influence the acceptance and behaviour of users and with it also the success of a website or e-commerce platform. (Spies 2015, p. 14)

The everyday work of web designers can be diverse and many-faceted. If one peruses topical job descriptions, there are listed basically always demanded skills, like extensive know-how in web technologies, creativity, capacity for teamwork, a quick perceptive facility for new issues and flexibility. In larger Internet agencies it is spread that the web designer is often used exclusively for the layout and design of the websites. Then further duties are taken over in division of labour from other specialists like programmers. But often-times it is more than only to create a layout and to deal with the implementation of Corporate Design (CD) and Corporate Identity (CI) of an enterprise. They deal with concepts, graphic creation, the fast pace of technology and need the understanding for the end result – the coding on frontend and, if necessary, on backend side. In addition, an important part of the tasks of the web designer is also to found the best compromise between the wishes of the customer, the needs of the visitors and the technical possibilities.

Web designers are mostly qualified graphic artists, media creators or information scientists who have specialised in this area with the connection to an education in the creative field. The job title *Web Designer* is not protected in Germany, what means that every person without previous knowledge, who is able to create a website or another programmed product for the web, can be label themselves as a web designer. Therefore, web designers belong to a heterogeneous group respectively community of practice. The occupation is taught in form of professional and advanced training, pure schooling and various courses of studies at private educational institutions or at Chambers of Industry and Commerce. Web designers work as employees, independently or freelances in or for:

- Graphic agencies

- Advertising agencies

- Internet agencies

- Multimedia agencies

- Full service agencies

- Institutions of the civil service

- Associations and organisations

- IT-departments*

- PR departments*

*Departments of companies of any branches which manage their own web presence.

Beside all these professional competences, web designers should – based on the mentioned skills in the introduction of this chapter – also be equipped with soft skills like communication skills, social competence, creativity, organization, readiness to move forward and flexible enough to deal with capacity.

Web designers have to deal with extensive projects with large project teams. Hence, they have to be open for close communication between all internal and external parties. Beside face-to-face communication the technical channels telephone calls, emails, text chats and video conferences are indispensable. The ordinary everyday work is characterized by distributed communication, therefore it is important to build up a trustful company between all parties. Spatial distances originate even if team members are located in different rooms on different floors or building. Trust and social competence are two important key elements for a creative collaboration. If web designers sympathize with each other it is easier to work and to create new ideas together. The creative processes are characterized by generating synergies between people, to get new input through other perspectives.

Certainly, also the creative work of web designers need organized working conditions. A structured overview about tasks and project phases helps to deal with extensive projects and unexpected proceedings. (Markopoulos et al. 2016, p. 13) Depending on circumstances, web designers have to deal often with temporal bottlenecks and have to work under pressure

to fulfil the high expectations of internal parties, like management, and external parties like customers. The organization of the working conditions is part of project management which includes both classical and modern organizational models. Due to the technical development and fast moving projects is the agile project management the most practised model in this day and age. This also entail that web designers should be open for new technologies and a constant learning process during the everyday work. Web designers need to educate themselves self-reliant. In this context the work within a team has the positive side effect, that there is a great chance to learn from each other to get advanced experiences.

2.1.2 Job Settings and Workflow

Creative and technical know how is required for the web design job, although if the ability to programming is not mandatory. The job settings composed of two subject areas.

The area **web interface design** is about the creation of all elements which are needed to use digital products in an optical appealing manner. *"[...] interface design doesn't start with pictures. It starts with an understanding of people: what they're like, why they use a given piece of software, and how they might interact with it. The more you know about them, and the more you empathize with them, the more effectively you can design for them."* (Tidwell 2010, p. 1) Therefore, more details belong to the design job as even creating a layout. Web designers need an extensive know-how in the following fields (with the note that web of designers also are able to specialise in single areas, but in general they have to be adaptably applicable in the most of the following mentioned disciplines). (Tidwell 2010)

For creating ideas, the know-how about different brainstorming methods is helpful, although if these tools are frequently neglected in a stressful project process. For capturing ideas, the methods scribbling and wireframing are often used. Hence, drawing talent is an advantage, but on the basis of technical solutions no necessity. To be able to offer a logical designed interface to the user, conceptional thinking is important in the graphic and contentual context. Information and navigation architecture are two important terms in this connection. Besides, the target group may be never disregarded. Generating of target group profiles is not often considered due to time reasons, however, they can deliver valuable hints for the end product. One of the main tasks of designers is the designing by itself. Designing exists of a structured construction, look and feel, typography, colour management and last but not least attention to detail. All digital products are designed, like websites, interfaces of content management systems, advertising banners, etcetera. Due to modern technology, responsive designs are required and the knowledge to design for all different devices is necessary. Besides, the areas and purposes can be as different, like e-commerce sector, advertising sector or informal purpose. Working with graphic programs like Photoshop or Illustrator to create and treat vector- and pixel-graphics are a part of everyday working life. Designers also have to act on base of knowledge about HTML, CSS, template engines, optional scripting languages and modern technologies, although it is not absolutely necessary to implement the own designs on a technical level. Special knowledge is required if the project includes the developing and implementing of multimedia elements. Nowadays these elements almost already belong to the standard, hence, the designer should be able to handle these elements. Narrow connected with it is also the dealing with audio and video contents. This area requires special extensive knowledge wherefore designers mostly completely specify on

this area if they work with audio and video products. A quality check in the web sector is a very important task. Designers have to be able to test their products so that their can improve the own work. The support of colleagues could here also be very helpful, therefore every designer should be able to emphasize with the role of a user, so that it is possible to test external products. Optional tasks are programming, data bank management, editorial maintenance, handling of CMS systems and knowledge in photographic issues (including choosing ideal photo material or to instruct photographer)

The second area is the **usability** of interfaces. All elements of digital products will be created in due consideration of an intuitive and easy use. ***"Usability is the extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in their specific contexts of use."*** (International Organization for Standardization 2010)
Developing of concepts and designing of web interfaces with the focus on the intuitive use according to ISO 9241-210:2010 is the central task of a designer in this context. This also includes developing of concepts and designing of websites without barriers (keyword accessibility) and the accomplishment of usability tests.

In addition, web design projects could have very divers requirements, therefore it is difficult to create one ideal workflow for all projects. Linear processes and processes which based on milestones are suitable for projects where almost all details are known and unexpected events are improbably. But in general, these circumstances do not exist in the case of web design projects. The workflow model also has to be chosen according to the current project and project team. For example, a team which is not well attuned needs another workflow model as a team where the members operating well together. Nevertheless, all web designers need basic conditions for their work. According to Spies (Spies 2015, p. 46), the ideal workflow for web designers has to be flexible and unitized for the predefined methods and steps of the project. Design processes should be scalable in width and depth and extensible for special issues. The objectives which have great impact of the workflow should be easy to communicate and understandable for team members and customers, so that a goal-oriented working is possible. These aspects are seen as a frame to make the work of web designers schedulable.

2.1.3   Organization of Web Design Teams

Web design teams are in general composed of different professional experts with different special fields and work together on the base of creative collaborations. The team members are goal-oriented with a mutual sense of mission to create and deliver something together. (Markopoulos et al. 2016, p. 14) The main objective of design teams is a best possible result which developed with the creative experience from different designers. The way to such a best possible result is very common from all other branches: The teams should work so quick possible, to reduce costs but without to neglect a high quality. The inference of this objectives are to improve the dimension quickness, cost reduction and quality constantly.

It is important that web design teams are able to organize themselves and to interact with each other, to ensure that they fulfil the objectives. Technology is at this point a key element, for example to handle a closely communication between all members.

But before web design teams choose suitable technologies, there is at the beginning of every project the question about the team constellation and the size. For the organization of web design teams obtain two relevant rules of thumb. (Spies 2015, p. 26) The more complex and unclear the job task, the more important is the constellation of the team. Furthermore, the more single team members are equipped with experiences, the smaller could be the team.

The ideal constellation consists of complementary team members with different experiences and know how. All members should be equipped with comprehension for the view of the others and it is a great advantage if all team members speak the same language in a metaphorically manner.

The size of a web design team depends on the briefing and definition of the project. Every web design project has different requirements, so that it is not possible to determine guidelines about team sizes. The smallest constellation consists of concept developer with advisory and organizational skills and a web designer with technical understanding and know how. On the other side the team size has no limit. Indeed, the smaller a web design team, the easier is it to communicate (internal and external) with all other team members and stakeholders like customers or principals. (Spies 2015, p. 26)

On the basis of the web design process (please consider chapter 2.2.) the creation of digital products involved a large number of stakeholders which all have to collaborate with each other to complete a web design project. Therefore, it is an inherent part that web designers have to collaborate with experts from the technical side. In combination with a wide range of tasks of all web design team members, the organization of a web design team through an entire design process is not easy. The different tasks, in combination with always new demands, also lead to agile team processes. For example, the classical waterfall model, a kind of linear workflow, is not able to fulfil the flexible requirements of a web design process any more. The linear processes are too inflexible, because the reaction time on new technological demands and an unforeseeable result is not ensured. As opposed to this agile actions ensure flexible changes within roles and responsibilities during the design process. The job descriptions become indistinct and all stakeholders of the web design process become equivalent partners and work role-comprehensively.

A special form of an agile process model is the *Agile Prototyping.* (Spies 2015, p. 46) This method is based on the working philosophy of the *Kaizen* where the entire team works closely together on short, defined processes of development – so called *Sprints*. This method enclosed the collaboration between web designers and programmers, between web designers of different disciplines and between web designers and strategically concept developers.

2.1.4 Distributed Working Situations

The forms of distributed working situations may be varying in team constellation and local circumstances. In distributed teams at least one member is separated locally from the other members. Beside this, it does not depend on the distance. Teamwork can be already affected by a spatially separation within a building. However, meanwhile it is no more rarity that team members live and work in another country or on another continent. Nevertheless, the

problems are the same one in wide parts. The main communication takes place via technical tools. With distributed teams where the distance is not so huge, personal meetings are possible at least every now and then. Nevertheless, the main work still happens above the technical way. (cf. Bell & Kozlowski 2002, p. 13) The challenge here is, that there have to be technical approaches for the creative work. To communicate with each other will be not the greatest problem due to communication channels like email, chat, video conferences etc. These kinds of communication are learnt meanwhile, even if the handling is often not optimally carried out. Against this, the real design process bases on visual charms. The designers need during idea generation and creation a "picture" before their eyes. Therefore, it is important to find other ways – in form of technical support – for the creative collaboration of virtual teams.

The mentioned key factors for effective teamwork from the beginning of this chapter illustrate, that distributed working situation bring some challenges. To ensure an effective teamwork, it is important to figure out aspects which can influence and even interfere the effectiveness considerably.

The **diversity** of virtual teams is in this context one of these aspects. (cf. Prescott 2016, p. 240) Diversity in teams encloses the cultural dimension, different functions, hierarchy levels and enterprise affiliations. The diversity aspect can affect positively as well as negatively. The already described diversity in duty-related dimensions like function and enterprise affiliation as well as hierarchy can be used to introduce different perspectives and to solve problems. Enterprises can fall back with the composition of the team on their whole international staff and recruit the respective experts of their subject. It is possible within the process of solving problems to scoop from a raised repertoire of experiences, knowledge, approaches, skills, styles and perspectives, under the condition that all parties activate relevant knowledge and be open for group discussions. Beside the positive capabilities there are also risks: Seldom all members are equal in their roles, because the cultural majorities and minorities state who expresses and who is heard. This makes clear that not only directly duty-related dimensions vary and influence the cooperation, but also stronger personal ones which enclose beside culture, for example, age and gender. Also the linguistic group which belongs a team member can become relevant because in international teams mostly English is spoken which could split team members in native speakers and non-native speakers. (cf. Prescott 2016, p. 243 ff) However, personal and just cultural diversity is also to be looked by the positive side: Culturally differences in perceptions and operating procedures are also an enlargement of the repertoire to solve complicated problems through which the team can help itself. Just with creative tasks it is important to have at origin differing ideas from which an innovative solution can be developed.

Further aspects are the technical cooperation systems which influence the magnitude and type of the communication and cooperation what takes thereby also influence on the team development and guidance. The main challenge here is the **lack of social context cues** according to Sproull and Kiesler. Already in the 1980s by the use of e-mail one recognised that the media communication filters out information about the person and about the context of the transmitter. (Sproull & Kiesler 1986) In a face to face situation will be communicated beside the spoken word also about para-verbal (e.g., tone) and non-verbal channels. In particular, the visual portion in the area of the non-verbal communication is

important because additional information which is necessary to the understanding can be taken up by the observation of the movements and the reactions of the dialogue partner. The extent in available channels varies according to the medium. Thus video conferences which come up rather near to the face to face interaction are called by the draught of the *media richness* especially extensive, because they contain beside the spoken word para-verbal and non-verbal (even if technically restrictedly) elements. (cf. Prescott 2016, p. 247 ff) Talks by phone run verbally and para-verbal. However, e-mails lose every portion para-verbal and non-verbal elements and are classified as little extensive. It becomes clear that the communication basically will be less effective indifferent by which medium. A higher coordinative expenditure is necessary, despite the result is just a comparatively lower output.

In addition, to consider is the possibility of **conflicts** within virtual teams. Conflicts in teams are normal and not necessarily negative. Synergies can originate from discussions and are able to generate positive results. Nevertheless, conflicts can be better cleared if the communication takes place synchronously – face-to-face. Against it with an asynchronous communication, for example via email, information can become false-interpreted and complicated circumstances can be misunderstood. (cf. Prescott 2016, p. 248) Another example for a typical conflict situation is the different handling of tasks. Due to different local terms of employment and different culturally working procedures it is basically possible that the treatment of subtasks or instructions in another location are different or with another priority. Just after the distributed team member lacks the information (due to lack of social context cues and context information), the member has no idea of the causes or backgrounds why a task has not been done according to expectations. A misattribution is made quickly under these circumstances, i.e. the affected person ascribes a wrong cause to the event and sees a failure of sides of the distributed team member instead of considers the context terms.

As already intimated, also the issue about **trust** is important for distributed working situations. (Jarvenpaa et al. 1998) Creativity and common problem approaches are based on the condition of mutual trust and require intensive exchange of ideas. Beside the trust inclination, so the personal arrangement of a team member, matters above all his appraisal of the trustworthiness of the interaction partner. Factors like motivation, personal qualities, intentions, professionalism and group affiliations (as for example culture, enterprise, department, etc.) and behaviour flow into the trustworthiness. The trust construction arises through personal interaction. If cooperation systems are inserted, it is difficult to take place common actions and with it immediate perception of trustworthy aspects. Only the information which is given by cooperation systems is not sufficient for a trust construction, because the important personal elements are absent. This happens not only accidentally by fading out the non-verbal elements, but also intentionally, because team members brief themselves and communicate with reference to the relevant issue. (Huang & Lambotte 2010, cf.) According to the research by Huang and Lambotte with 120 participants from 19 existing project groups in the context of a study from the countries Canada and Belgium, there are five measures to optimise the trust building in distributed teams: An **early communication** and the focus on keeping all team members in distributed working situations up to date. In this context, it is important to take care of all time zones of the team members and taking joint decisions. (cf. Huang & Lambotte 2010, p. 24) At this point workshops for all team members are helpful for teaching an effective handling of divided tasks with people who are not located at the same place. Also the **task complexity** is able to affect trust building

within the team. Important is, that the teams use synchronous communication channels the more complex the tasks are. (Bell & Kozlowski 2002, p. 18) Trust can originate from **leadership**. A person who is the spokes man or/and the organizer of the team is able to build up trust and could be the connection between single team members. (Bell & Kozlowski 2002, p. 19) **Motivation** has impact on the distributed team work. (Huang & Lambotte 2010, p. 25) A common goal and a successful project result, which can be reached, above all, with team work, are impulses for motivated team members. **Task organization** is the fifth measure to optimize trust within virtual teams. (Gibson & Cohen 2003, p. 77)

Web designers need for the own job know-how and soft skills (please consider chapter 2.1.2). Nevertheless, distributed working situations assume additionally special **qualities** – *knowledge, skills, abilities and other characteristics* (Krumm et al. 2016) – which web designers in the ideal case have to possess. Krumm et. al. examined with the help of a study the requirements for the special qualities which are needed for the work with virtual teams. They oriented and compared the perceptions to the *Great Eight Competency Model* by Bartram. (Bartram 2005). According to Bartram there are eight competencies which identify the capability of employees at a higher level which is important for classical teamwork and manager's operations. (Bartram 2005, p. 1187) Team Members take over **management and leading functions**, initiates actions and aims and takes over responsibilities. These competencies help the own organisation and open the mind for **supporting** others. Team Members should show respect as well as positive esteem in social situations. Social situations life from **interacting**. In the ideal case team members communicates and pursues networking efficiently, convinces and influences other successfully and behaves towards others in a sure and relaxed manner. An evidence for **analytic thinking**, understanding complicated problems and issues in the core, applies own expert opinion effectively and applies quickly new technologies. Furthermore, team members work well in situations which requires **openness** for new ideas and experiences, looks for learning opportunities, meets situations as well as problems innovatively and creatively, is capable of wide and strategically thinking and supports organizational changes and speeds this up. As already mentioned **organisational skills** for planning with foresight, working in systematic, organised environments could lead to a high-quality service or a high-class product to the agreed standard. A good organisation also brings the opportunity that team members are able to react on changes, **handles efficiently** with pressure and masters setbacks well. Last but not least if team Members are focused on results and the achievement of personally they have the opportunities for the **personality development** and the professional rise.

The study from Krumm et. al. produces that certain requirements are more relevant for virtual teams than for traditional teams (Krumm et al. 2016, p. 14), especially organisational skills and analytical thinking are important. Due to distributed working situations, which are typically for virtual teams, the single team members are often put on themselves and have to make independently decisions. Furthermore, virtual team members should be open for cooperation systems which can count to the affinity for new technologies and the willingness to solve problems efficiently.

2.2 Design Processes

Apart from the project management model, web designers need a solid base to go through an entire design process. The design process is often discussed in the literature in a number of different ways. In addition, web designers and design teams often have their own processes which are based on a current project. But in general all web design projects are able to run through one fundamental process which gives on the one hand a stabilising frame and on the other hand opportunities for changes of course. Some design processes are figured as a cycle and others are linear. However, they all turn around on an optimized design work. Buxton makes clear that design teams should not renounce, in any case, the application of co-ordinated process phases. ***"In order to create successful products, it is as important (if not more) to invest in the design of the design process, as in the design of the product itself."***(Buxton 2010, p. 59)

Before introducing older, current and well-known design processes it is important to know what *Design* really means. Just as there is no design process chiselled in stone, there is no universally valid definition. (Design Council 2005b) According to Richard Seymour design is something what ***"making things better for people"***. (Design Council 2005b, cf.) Against it, Erik Stoltermann go into this issue in greater depth: ***"It is about creating something in the world with a specific purpose, for a specific situation, for a specific client and user, with specific functions and characteristics, and done within a limited time and with limited resources. Design is about the unique, the particular, or even the ultimate particular."*** (Stolterman 2008, p. 59)

The following design processes make clear on the one hand the origin of the creative thinking up to the today's time. and on the other hand that there are different focus areas in the space of the single design processes. The introduced processes show no entire listing, but rather have been selected after content aspects. At last they should deliver knowledge for the design process, on that the cooperation system is based, which is conceived in chapter four.

2.2.1 Linear Design Process Models

The theorist in design L. Bruce Archer shaped already in 1965 with his view the design scene. The design scene is currently talking about the concept about *Design Thinking* thereby the term is not unknown. Archer wrote in his article *Design as a Discipline* (1979) ***"My present belief, formed over the past six years, is that there exists a designerly way of thinking and communication [...]"*** (Archer 1979, p. 17).

A few years before, Archer developed a **check list type model** for designers which are based on six phases. (cf. Chan 2015, p. 16) The start of a design project begins with **receiving an order** from principal or customer including a briefing with requirements and needs. To the first phase also belongs an analysis of the problem. Only if the problem is clear, the planning tasks and estimating the scope can begin. The second phase is composed of **purchasing all relevant information**, including analysing and if necessary rescheduling the project plans. The third phase is the most creative phase of the check list type model. The creative process deals with **developing the main concept** and an outline of the design idea with first drafts. This drafts are worked out at fourth in form of a **prototype**

of the idea. It is important that the prototype also illustrate the information from the first phase and the outcomes from the second phase. If the prototype is done, the **testing phase** begins. In the manoeuvring area it is advisable to be plan and organise the tests. During the test phase the improving of the results stays in the focus. In the ideal case this task could be done by different people with different background and interests. For prospective design projects it is helpful to produce a **documentation** in the end of the project. The documentation includes all strengths and weaknesses which were figured out during the phases. There are mostly points which could plan or implement in a different or better manner to receive an even better result through a more efficient way. Another great issue is besides the work tasks the communication within the team. The details about communication ways, bottlenecks, positive and negative experience are also parts of the final documentation. If the documentation is completely the project is closed.

The model is based on the acceptance that design is able to solve problems. This procedure is according to Archer a systematic model but it does not imply that the solving of problems originates automatically through analysis or collecting data. The creating of ideas and being creative are necessary tasks of designers to get successful results. Furthermore, if a solution can be found by the compulsive contention with data, automatically, it does not concern a design problem. Archer mentions the subjectivity which arises from the value judgement while designing and used this also as an argument that there is no absolute, everlasting and universally valid solution and for that no method for automated creation to find a solution exist. A special aspect of this model is placed in the sixth phase. The communication of the solution is looked as a part of the design process and an important point. Since a successful solution which is not correct communicated to the principal will not finish the design process. In this respect this point should not be absent. Although the model is building up linear, Archer planned the construction of the design process, that it is possible to return to a former phase, if there are unexpected events or other reasons for repeating of process phases. The single phases enclosed a total of 227 points in form of a check list. (cf. Chan 2015, p. 17)

Another model of the original forms of processes, which can be also adapted for a design process, originate from Koberg and Bagnall. This model based on an input which is processed in two steps and is called **two stage design process**. (Koberg & Bagnall 1972) In the first step the details are examined and the second step is about the improvement of the input, so that the output dispose of an added value. Koberg and Bagnall conceptualized this kind of process according to an problem-solving-approach (Koberg & Bagnall 1972, p. 16) due to breaking up the process into two stages. This process is one of the simplest and shows how a process start and end.

Of course, the rudimentary representation is not suitable if the designer wants specifically analyse the design process. But this model makes clear that in the progress of the project the weighting of the analysis decreases, while in the reverse the synthesis increases and the analysis does not disappear completely up to the end of the project. Therefore, lack of clarity is transformed by the analysis into the synthesis to receive a complete product – the output – at the end.

On this basis, Koberg and Bagnall developed the **seven stage design process** which
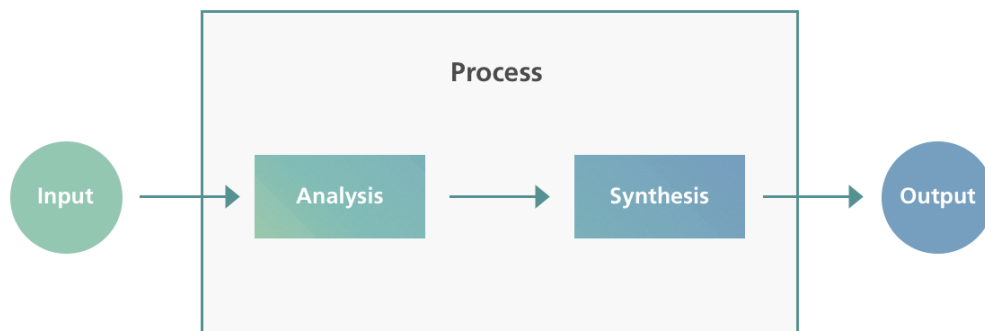
Figure 2: *The Two Stage Design Process* has influenced current design processes and typifies the original form of design processes. (cf. Koberg & Bagnall 1972, p. 17)

consists of (Koberg & Bagnall 1972, p. 17) **acceptance, analyse, definition, design, selection, implementation and evaluation**. The first stage, the acceptance characterises the initial start of a project. To get familiar with the problem and for defining the main issues of the projects analysis are necessary. If analysis and defining of problems and objectives are done, ideas could be generated. The focus during the phase of ideas lies on finding more than one possible approach to get a wide range of perspectives. Only in the next step the best solution approach is filtered out. Besides, during this task the defined objectives will always keep in view. For the implementation are measures needed. The aim is to figure out the best suitable actions to reach the ambitious objectives. The project is finished with determining the result with focus on satisfaction, needs and requirements.

This model exists of seven steps which are together backward accessible like a waterfall model. The model can be also understood in such a way that one always decreases one step, checks the results in the preceding step and balances to return then again to this step and to change from this then to the next step. This seven steps especially should support the development of creativity during a design process. The model begins with the *acceptance* of a situation what should point to the fact that a problem situation was recognised, whereupon takes place an *analysis*. In this analysis the surroundings of the artefact to be designed are examined. The third step *define* it is about the definition of the declared aims. There originates a differentiation claim of the design. At the end of this step a list with criteria stands to the design. The fourth step *ideate* is about the ideation and is characterized through a wide, divergent spectrum of ideas. The *selection* occurs as a rule according to implementation, economic aspects, uniqueness of ideas and other points of view perhaps project specific aspects. If an idea was selected, as a result it will be *implemented*. In the end the results are *compared* to the at first set goals from the first step. (Koberg & Bagnall 1972) In general: The model by Koberg and Bagnall is a back-coupling process basing on feedback in which the designer checks constantly whether the aims and demands of the preceding phase agree with the current phase.

Although this design process approach is from 1972 it is still topically. Especially the part of *ideate*, to find more than one solution approach is common practice. Also the idea of a journey through a design process typifies the current thinking of designers, to look at the big whole and not only of single parts of a project. With this view on thinks it is possible

to change directions in unintended events.

2.2.2 Cycle Design Process Models

The expert for creativity and innovation Nico Mcdonalds published in his book *What is Web Design?* (2003) the **product development process** by Chris Pacione (2002). (Macdonald 2003, cf.) His perspective comes close to that of a designer, even if his views are multidisciplinary. The model of Pacione is aimed at interface design and is built up in cycles. The process has the starting point in the centre and goes from there further onwards. The single phases are defined by four fields which the line crosses. Pacione connect his phases partially with methods which can be seen as proposals. The ways between the points mark the single phases. Naturally, the phases always end with the entry into a new phase. The four phases of the process composed of **define, design, delve and determine**.
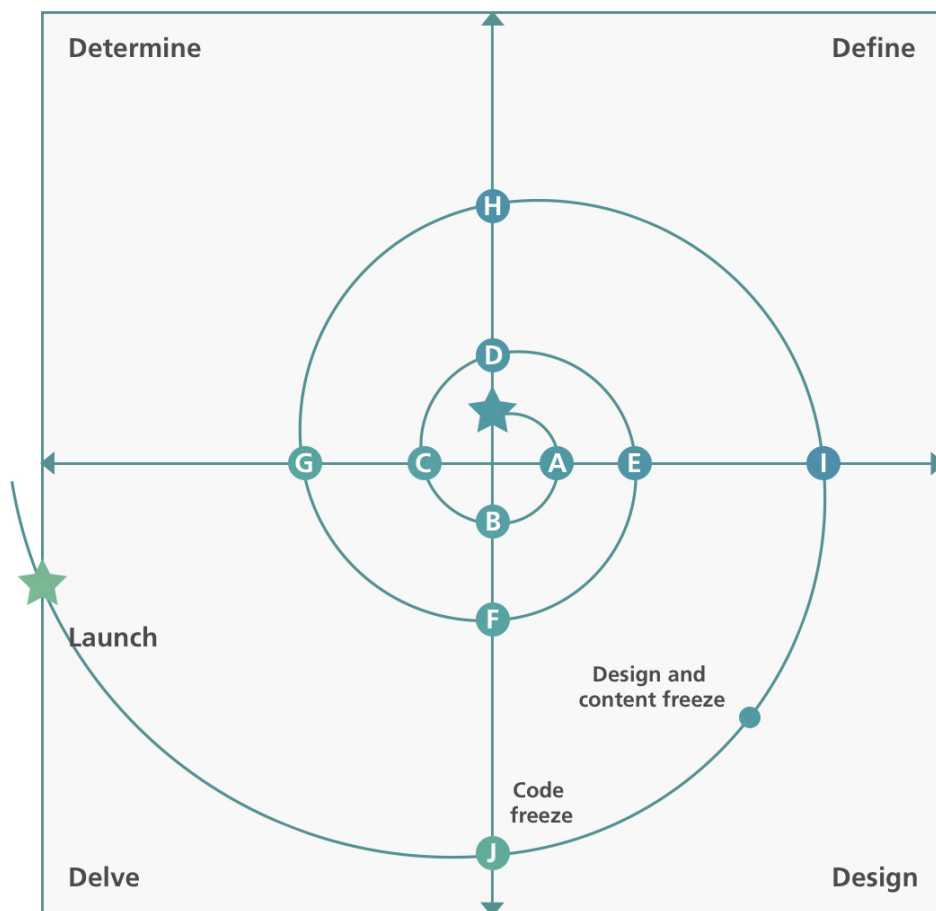
Figure 3: *Product Development Process* by Chris Pacione from 2002. (cf. Macdonald 2003, p. 115)

The single steps are divided into points from (a) to (j) (Macdonald 2003, cf.) Steps of the already mentioned processes can be also found again here, but Pacione included more details. The first phase deals with **defining** (starting point – A) the problem and is characterized through a briefing which often includes a kick-off meeting and brainstorming. The second phase is with the term **design** (A – B) distinguished, but means mainly the creation of information architecture and first prototypes. The essentially design will be created

at a later time in the design process. Before designing, the first ideas are **delve** (B – C) according to usability and usefulness. This succession ensured that unnecessary working steps are avoided as much as possible. Furthermore, to avoid other problems during the process, Pacione planned one phase for **determining** (C – D) strengths, weaknesses, risks and possible time bottlenecks. The investigation of these issues makes sense at this point of process, because all relevant information are collected and the first ideas are not figured out. In this manner arise the opportunity that negative as well as positive characteristics of the circumstances have impact on the following created solution approaches. The job tasks of creating ideas has the focus, according to this model, on **defining** (D – E) different approaches or to change and develop existing ideas which are useful in the core but need due to alterations updates. On the define phase follows the **design** phase (E – F) where the information architecture is repeatedly checked, so that the design can follows the function and content can be built in. Pacione bundles designing with programming, so that also the implementation of designs is part of this phase. After implementation the phase of **delve** (F – G) recurs, but with another focus. The focus lies on the current state of the project and possible programming errors and weak spots of the usability on side of the interfaces. To ensure that the results suit to the determined measures from the beginning of the process, the **determining** (G – H) also recurs with the focus on the current state of the project. Solutions for strengths, weaknesses, risks and possible time bottlenecks are reworked or if necessary are created completely new. The changes entail possible changes of design and code through **defining** (H – I) the necessity. Before launch, the design process proposes last **design** (I – J) changes and their implementation. The process is finished after final quality tests and if the project is **launched**. In the beginning the contents of the phases are still very general and little specific and details are not considered yet. The further the spiral is apart from the starting point, the more detailed and specific become the tasks or the issues of the product. The curves also make clear that the single phases take more or less time depending in the depth of details. The overall process is based on the idea, that a design process consists of always returning check and improvement of the results.

One of the well known process cycles is the **PDCA quality cycle**. This model is based on **three steps in quality control process** by Walter Shewhart (1939) (Shewhart & Deming 1939, p. 1) which consists of the steps **specification, production and inspection**. *"These three steps must go in a circle instead of in a straight line, as shown [...] It may be helpful to think of the three steps in the mass production process as steps in the scientific method. In this sense, specification, production, and inspection correspond respectively to making a hypothesis, carrying out an experiment, and testing the hypothesis. The three steps constitute a dynamic scientific process of acquiring knowledge."* (Shewhart & Deming 1939, p. 45) The classical form of the PDCA process subsequently originated through the student from Shewhart. The student Edward Deming developed the three steps model further to a four step model, also called **deming wheel** and consisting of design, production, sales, research. (Deming 1986, p. 4) Through Deming the model came to Japan where it was extended to the model which is relevant even today.

PDCA stands **plan, do, check and act**. The name of the single actions clearly shows, it concerns a 4-steps interactive problem-solution-process which had origins in the quality assurance. Meanwhile the model is reworked very often and especially in the high-class

management often used. The model shows a circulation which can theoretically continue forever. Thus a constant, continuous improvement of a state or problem is aimed in four phases. Also in the ISO norm 9001 the quality circle with the four phases is meanwhile firmly integrated. (International Organization for Standardization 2015) The start of this model characterised the **planning phase**. The actual state of a certain problem, state or system is analysed. Besides, the improvement is outlined and described. Information and causes are gathered and an objective is formulated. It is searched for measures to reach the objectives. In the **do Phase** the measures are carried out and also documented in the planning phase for the enhancement. The **check Phase** refers to the achieved results are valued and compared to the objectives from the planning phase. The implemented results are reflected to work out improvement possibilities in the **act Phase**. Successful procedures and actions are documented and standardised for following projects. Beyond it, less positive results are developed and improved.
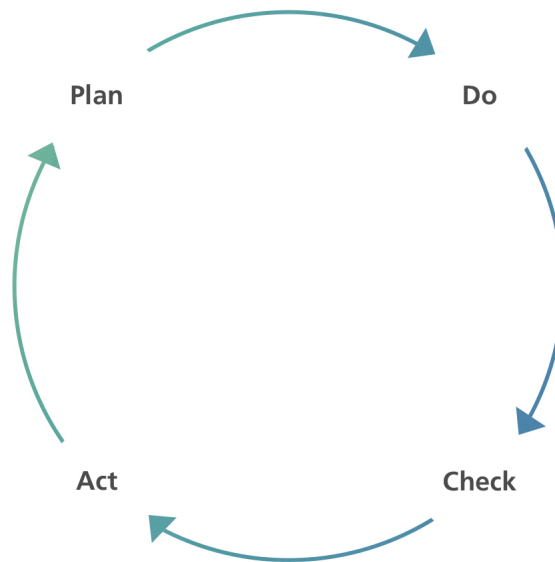
Figure 4: *PDCA quality cycle by Edward Deming* from 1951. (cf. Imai 1986, p. 60)

Web designers can derive a benefit from this model, while they lay the focus on a constant improvement of the results. Although this model is too rough for the real creation process of web design, it is helpful to evaluate the solution approaches. Furthermore, the constant check of the results is for the design process very important. In this context it is an advantage if the designers have the possibility within the process to repeat certain phases to receive the at last best possible result. Constant balancing of the solution with the objectives and the needs of the users is a point which is essentially for the design process.

2.2.3 Analytical Design Process Models

Koberg and Bagnall characterized the basis for today's design processes. The model of Bela H. Banathy, professor for system sciences at the San Josè State University, from 1996, goes one step further with the **dynamics of divergence and convergence** and follows even more the analytical approach. (Banathy 1996) Banathy has quite an other perspective on the design process. Although his approach refers rather to designing of systems, it is also relevant for designers, due to the depth of information content of the single process phases.

The first part **transcend/envision** of this model is about the assumption that there are different images of reality. On the basis of subjectivity there are different views. Exactly these views are shown and are strengthened by borders, design possibilities and an aggregation of value and basic ideas. (Banathy 1996, p. 73) The convergence originates in the first part from the meeting of decisions and as a consequence from these decisions, through the drawing of a futuristic vision. If an unequivocal picture of the future has originated, the synthesis will follow, what means that this image will transfer to the reality. Subsequently, the divergence is released by creating alternatives. This divergence is dissolved by the evaluation of the possible alternatives and as a consequence from it, the decision for one of the developed alternative implementations. This decision-making process generates convergence in the second field of the diagram and leads, according to Banathy, to the model of the future. (Banathy 1996, p. 73)
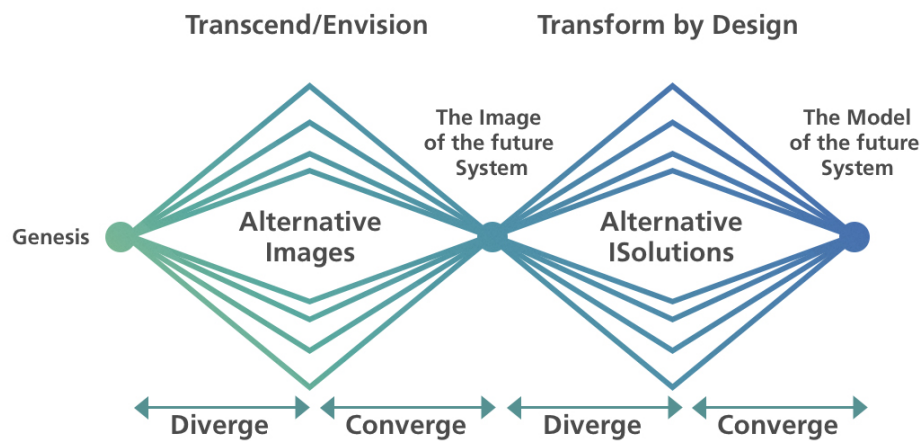
Figure 5: *The dynamics of divergence and convergence* by Bela H. Banathy from 1996. The model about the analysis what systems are able to do for users. (cf. Banathy 1996, p. 75)

The model of Banathy cannot be interpreted as a complete design model. Nevertheless, the process of the divergence and the resolution of this divergence, by decisions and transferring to convergence, is a very typical process within the design process. Also the lines of the models are interesting elements, which are relevant for designers. The lines stand for different opinions, meanings and views. They start all at one point – the problem. From this point they will be more and more divergent until to another point where they converge to each other. Nevertheless, it is none a quite automatic process, because the designer must generate this divergence themselves, as a reaction to opinions and other views. This also means, that the designer has to finish the divergence, so that it is possible to find the final image of the future system or design. This design process model makes clear that certain actions based are subjective feelings. This phenomenon becomes clear above all in projects with bigger teams where many opinions and views come together.

William M. Pena and Steven A. Parshall developed in 1969 a model about **programming and designing**. They go forward very analytically and devote themselves, primarily, to the programming with connection to the design parts of a web project. (Pena & Parshall 2012, p. 12) The five elements of the model comprises of establishing objectives, collecting

and analysing information, designing and testing conceptional ideas, determining needs and figuring out the problem. The model based on the view that "[...] programming is problem seeking, [...] design is problem solving." (Pena & Parshall 2012, p. 15) Furthermore Pena and Parshall describe both elements of a design process that the programming part is a kind of analysis and design is synthesis. According to the model, it is possible that one person is able to handle both, the programming and the designing part. It is helpful that a programmer has the skills of a designer to understand the requirements of a web project holistically. As well it is a big advantage if the designer design with the knowledge of a programmer, because it will come during the implementation to less problems. Nevertheless, it is appropriate to separates these both occupational fields, even if both are closely connected with each other, due to the complexity of both jobs. The essentially model is divided into two phases. The phase of the schematic tasks includes the development of concepts and to figure out all requirements and needs. Important is to filter the mass of information and not to loose important facts, because ***"The schematic program must provide this important overall information useful in schematic design."*** (Pena & Parshall 2012, p. 40) The second phase is about what the term already tells: The development of schematic design. The program and the design part collaborate closely.
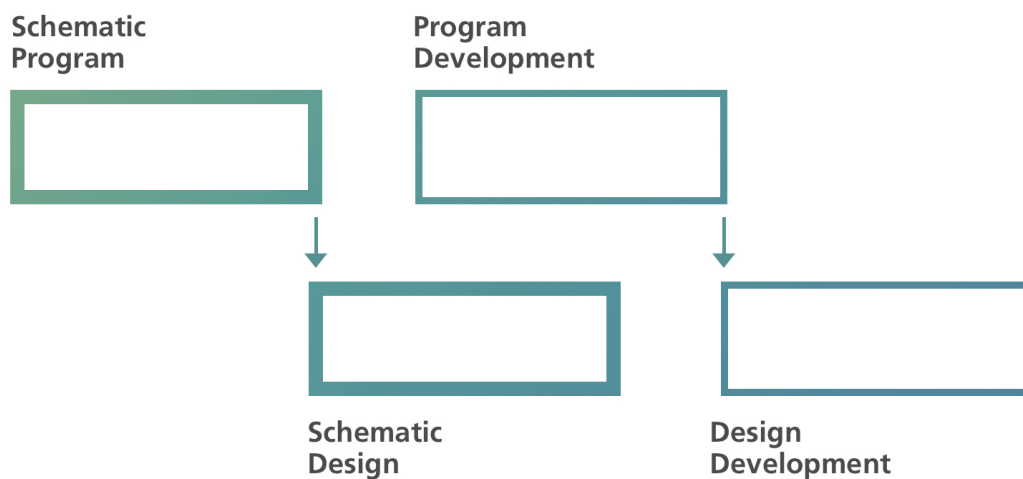
Figure 6: *Programming and Designing Process Model* by William M. Pena and Steven A. Parshall from 1969. (cf. Pena & Parshall 2012, p. 40)

2.2.4   Design Process Models in regard to complex Web Design Projects

The following design process model is based on a comprehensive design study organized by the British *Design Council* in cooperation with eleven world-leading companies. They examined the methods of operating of their design departments to develop an universally valid design process, which covers all relevant phases without to limit complicated setting of tasks. The constellation of the **double diamond design process model** consists of the single design phases **discover, define, develop and deliver**. The first diamond of the model consists of two process phases which occupy with the understanding of the problem definition. (Design Council 2005a)

The aim of the first step of the first diamond is a depth understanding of the problem.

Therefore, the design process starts with analyses concerning market, users, research groups and other fields of interesting. In this manner aims, missions, visions and stakeholders can be determined.

The second step consists of defining of the mentioned elements like mission and vision in connection of first ideas. The aim is to find a solution approach for the discovered problem from the first step. In addition, this phase is also characterized through organisational activities like project management and development and a draw up of a project sign-off. The second diamond consists of the overall creative process including delivering of the final results. (Design Council 2005a)

In the third step the designer has to deal with creative tasks to generate ideas. The aim is to find most of possible solution approaches because one says that the first idea is mostly not the right one. Important is a nearly unlimited view on the things. Precisely because it is possible that limits like budget or formal hurdles are able to constrain the creative work on the way to find the perfect solution. Only after the creative phase a possible implementation of the ideas is examined. During the phase it is ordinary to work multi-disciplinary. Also the development of methods and testing of the ideas is part of the third step. In the end of this phase is the fixed design with details from concept to information architecture and user interface.

The fourth step is the delivery stage, where the results are launched. In this phase it is important to test the final results and to evaluate the feedback of stakeholders like users and/or customers. Finally, there should be an outlook for future work, which includes details about lessons learned and other perceptions.

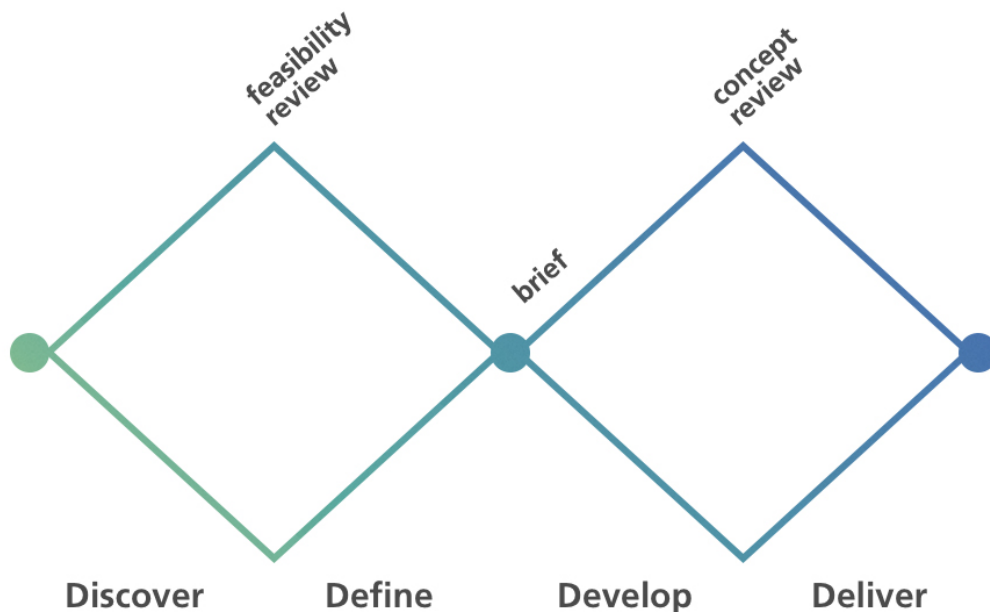Figure 7: *Double Diamond Design Process Model* by Design Council (UK) from 2005. The model unites phases of the design process which all designers go through, even if many have their own procedures. (cf. Design Council 2005b)

If the picture of the diamonds is translated literally, one can speak of the fact that the designer develops their strengths within demarcations. Within these demarcations the de-

signer develops user oriented solutions. However, the demarcations are only built up after the question ideally spread out in an intellectual manner (creative process) whereupon the question will be limited again (defining). Figuratively spoken a double diamond arises from it.

At this juncture, the **branded interaction design process** described a fundamental form of a creative design process for web projects in five steps. *BIxD* described who makes what and when within the project process on the base of the double diamond design process model developed by the Design Council. Even if this extensive model is laid out particularly in regard to brand design, it is to be understood for web designer as universally valid.

The process with all five phases – from analysing across creating of ideas through to solution approaches with following implementation – is to understand as a frame and suitable for all projects around digital products. Every web designer has the chance to find the own agency processes in the following described BIxD process.

One must consider that web design projects unusually are linear. External influences are able to change the direction of a project and in addition it is possible, that certain tasks run simultaneously and are connected and require each other. Nevertheless, a well-defined working process is necessary for a successful web design project. It promotes planning certainty, project controlling and is also from economic aspects a kind of protection. In addition, the design process is able to ensure quality checks and structure the collaboration with the customer. In summary this does mean, that web design teams are able to collaborate on creative and strategic level with a high quality and efficiency. (Spies 2015, p. 27)

On the face of it the procedure of the BIxD process is linear, but within and above the separate phases there are work streams which run simultaneously. Regardless of the size of a project, the design process should always run through all five phases discover, define, design, deliver and distribute. On a case-by-case basis it has to decide which methods and techniques has to be involved during the process. (Spies 2015, p. 35) Also the deliverables of the phases can vary but in an optimal case in the end of the phases there should be milestone presentations with clear results to present the current state to all stakeholders. Depending on the customers there are more or less "glances over their shoulders" to plan. All other details of the phases can proceed fluently. (Spies 2015, p. 38)

The phases are similar to the four phases of the double diamond design process model. The main differences are more details within the single phases and a fifth phase.

Discover

Beside analysis about markets, users and other fields, according to Spies, at the beginning of the project it is important to involve the principal. That means, beside the discovery of details about the problem, it is important to have a depth understanding of the customer, brands and their business. With other words, the focus lies on the analysis of stakeholders which could be project manager, project team, principal, customer, project sponsor, external teams, tester, consumer/users, programmers, and various others. To figure out all details of a briefing it is helpful to arrange a workshop with all relevant stakeholders. The aim of such a workshop is to answer all open questions and to clarify objectives, requirements and

tasks. (Spies 2015, p. 53 ff) Nevertheless, it is not possible to close all gaps in knowledge by a workshop. Analyses in the areas of product, competition and user help to understand the project. Finally, the phase of discover should not be finished without setting objectives. Although if principals or customers argue that they already formulated all objectives, analysed all relevant fields and figured out all requirements, it is important to go through all stages of the first phase, to ensure that no detail would be lost.

Define

This phase decides the direction of the project. Here the design project receives a frame in the form of communication signs, touch points and construction. The designers plan with the help of rough wire frames the user journey and the behaviour of contents on different resolutions. Also the information architecture is part of the second phase and with it the planning of user experience. In the end of the phase of defining there should be a catalogue of measures for the following steps to reach all objectives from the starting phase. (Spies 2015, p. 115 ff)

Develop

The third phase is the most creative phase with detailed designs. After the strategy has been worked out, now ideas are going to be generated. To receive a creative leading idea there are different creative methods which are a great support for all designers. In the previous phase it was more about to plan the user experience, in this phase it is about to design and form the user experience. (Spies 2015, p. 175) The design tasks ranged from templates in form of wire frames to detailed worked out interfaces. The creation of the interfaces encloses the production of several draughts. Besides, grids, side construction and composition are considered. The detailed elaboration exists afterwards of look and feel, typography, header, logo, navigation, interaction elements and functional and contentual modules. After design production the prototypes are tested on usability and other requirements.

Deliver

After concept and creation must be ensured that the design will be properly implemented. (Spies 2015, p. 255) Hence, the designer provides style guides and users experience guidelines, in addition, they supervise the technical implementation. On this occasion, the web designer processes all graphic elements and provides textual contents. The web designer is also involved in project launches and feedback meetings or debriefings. Postdiscussions are important for the last phase of a design process and also offer for future projects important knowledge.

Distribute

With the project launch an important milestone is reached, however, the project is not thereby concluded. The new product comes to contact with the users and starts to live. Only in the course of the time possible weak spots can be uncovered. (Spies 2015, p. 303) Nevertheless, a product can also change or develop concerning the contents, hence, the product should be always updatable. Advancements always consist of testing, measurement and optimising and are very important on the fast-moving Internet. Therefore, one can say for some projects the design process is never completely concluded. However, beside the product-related advancement still other factors matter in this phase. Thus the past cooperation of the team is also analysed and changed or developed for the future cooperation.

2.3 Creative Cooperation

Creativity is to be understood at social level not only as an achievement of an individual, but also as a horizon of enlarged knowledge which stretches itself between individuals. Three elements build the base for creativity: creative persons, creative processes and creative products. (Warr & O'Neill 2005, p. 119) The personality of people gives information about the level of creativity. Therefore, creative cooperations benefit of individuals who are creative inherently. Creative processes are important key elements, which support the development of ideas. Creative processes are not the same as design processes. It means rather that creative processes arise through social interaction and cooperations and takes place in the way of thinking of the individuals. The third key element, which could be seen as a generator for creativity, is the creative product. With other words creative ideas arise through finding a solution approach for a design problem. (Warr & O'Neill 2005, p. 120) In summary: *"Collaborative design is the process through which actors from different disciplines share their knowledge about the design process and the design itself. This creates shared understanding related to both process and artefact, helps integrate their knowledge, and helps them focus on bigger common objectives – the final product to be designed."* (Andreasen et al. 2015, p. 85) This citation by Andreasen leads to two key elements which are essential for a successful creative cooperation: Sharing of knowledge between different disciplines and communication and an active exchange between all parties. (Luther & Bruckman 2008, p. 343)

To understand the synergies of creativity and cooperations, the following chapter gives detailed information about different creativity models and cooperation models and explains by making comparisons the meaning of synergies – *"The whole is greater than the sum of its parts."* (Aristotle)

2.3.1 Models of Creative Processes

Creative processes describe the ways how individuals generate ideas. War and O'Neill have summarised an overview from four important processes which are also relevant for this thesis. (Warr & O'Neill 2005, p. 120) In general, the generation of ideas stays in close connection to problem preparation and idea evaluation. The generic model has no clear order, because all steps are ordered within a cycle and are interrelated. The following models with the single steps or phases could be sorted into the three areas of the generic model. Although the other models are not equal and they represent different approaches, they include steps which belong to the overall tasks like problem definition, finding and evaluating ideas. The following four models deepen the topics and are to be understood as a parallel concept for all design processes, because upon reversion design processes have to support the creative development process of individuals and teams.

The model by Wallas consists of four phases: **preparation, incubation, illumination and verification**. (cf. Warr & O'Neill 2005, p. 120) The single phases evoke a connection to design processes, what make sense if we consider that designs are based on creativity and the generation of ideas. Therefore, according to the model by Wallas it is necessary to figure out the circumstances to define a problem, to get creative insights through developing ideas, to strengthen these ideas and finally delivering concrete solutions for the in the beginning figured out problem.
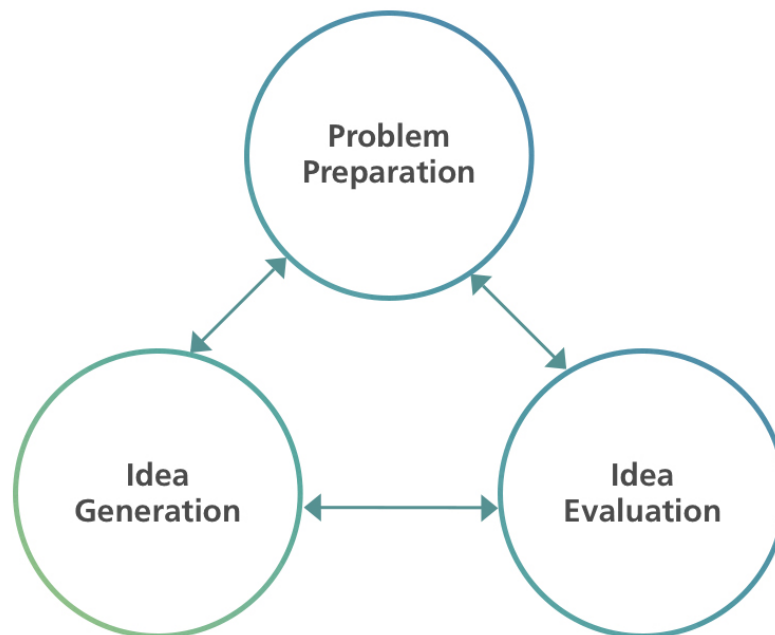
Figure 8: *Generic Creative Process Model.* (cf. Warr & O'Neill 2005, p. 120)

Another model by Osborn is based on the, in the beginning of this subchapter mentioned, generic model. (cf. Warr & O'Neill 2005, p. 120) The idea generation consists of two steps, the **fact-finding** and the **idea-finding**. The idea evaluation includes not only the estimation of new ideas, also old ideas are considered to examine if they have potential for a redesign.

A third model is based on an interesting different view and divided process components in **domain-relevant skills, creative-relevant skills and task motivation**. (cf. Warr & O'Neill 2005, p. 121) The domain-relevant skills have impact on how the individual performed with the own factual knowledge. The creative-relevant skills mean the cognitive style and have impact on the exploratory and conceptual tasks. Task motivation stands for the personal attitude by the individual and the grade of enthusiasm. With this background information Amabile creates a creative process model containing five steps: **problem or task presentation, preparation, response generation, response validation and outcome**. The problem and task presentation needs domain-relevant skills and task motivation to ensure, that the problem solvesimilaritiesr is able to understand the problem and is high motivated to find a solution. The preparation consists of collecting information via researches and here are domain-relevant skills also needed. Response generation is connected with creative-relevant skills because the quality of the generated ideas depends on the abilities. For the validation is knowledge needed, therefore the domain-relevant skills should be highly developed. For the outcomes Amabile intends three different types: The results were satisfactory and the solution is a success, the ideas run in the wrong direction and the entire result failed and the solution approaches are not completely wrong but need an update, wherefore the process starts again from the beginning.

The fourth model which War and O'Neill in their paper mention, is the four step model by Shneiderman: **collecting, relating, creating and donating**. (cf. Warr & O'Neill 2005, p. 121) The first three steps does not particularly distinguish from the first three steps from the last model. But the last step, donating, includes the exchange to other individuals which give feedback to the before generated ideas and are able to dispose that ideas have to rework via heading back to a former step.

All models are not to understood as linear processes, it is possible to return to erstwhile phases. They have a lot of similarities and the same purpose: Supporting creative people to find ideas for solving problems. But the authors of the single models were creating their concept from different perspectives. Shneiderman see the creative person as a **inspirationalist**. In contrast, the authors Amabile and Osborn see the individual more than a **structuralist**. (cf. Warr & O'Neill 2005, p. 122) With today's view Shneiderman creates the model with one of the most important detail: the social component.

2.3.2   Models of Cooperation

The real professional life often exists on creative lone fighters. Designers run alone through creative processes and compile her tasks exclusively with own knowledge. Certainly, positive effects through creative teamwork cannot be denied. (Warr & O'Neill 2005, p. 123) Even more teamwork is in creative processes of great importance and should not be neglected for creative projects (please note in this context the following chapter). The following models of cooperation support the creative teamwork and are a help for project planning.

According to Pisano and Verganti there are different models of cooperation. They speak about the so called *collaborative architecture* (Pisano & Verganti 2008, p. 1) with special structures and organisations. In general, there are four different ways of cooperation with different forms and different team constellations. Additionally, the time span of the team constellation has impact on cooperation models. A short time span limited the team building and disabled the development of structures and mutual objectives. Therefore, long term projects are more suitable for constellations of creative teams. The team constellation also depends on which extent people can join. In open cooperations it is possible that everyone can be a part of the team, for example well-known from crowdsourcing projects. In contrast to this open form there is the closed form, where the problem is solved of a selected group of professionals. These both kinds of groups can be organised hierarchical or flat. Four different cooperation models arise from these circumstances. The **elite circle** – the closed and hierarchical network – consists of team members which are especially compiled by a company with the purpose to solve problems in form of finding best solutions. The **innovation mall** – open and hierarchical network – could be a place like a Internet platform, where the company can publish a problem and all available designers could deliver a solution. In the end the company choose according to their own interests the best solution. The **innovation community** involves also a kind of platform in form of a open and flat network. Namely, a network is responsible for the creating of solution and the decision which one fits best is a tasks of the entire network. The creation and selection of solutions are tasks of a private group, the **consortium** – a flat and closed network. Furthermore, the private group is also responsible for the selection of problems in the beginning of a project process. Therefore, the group members are completely under themselves.
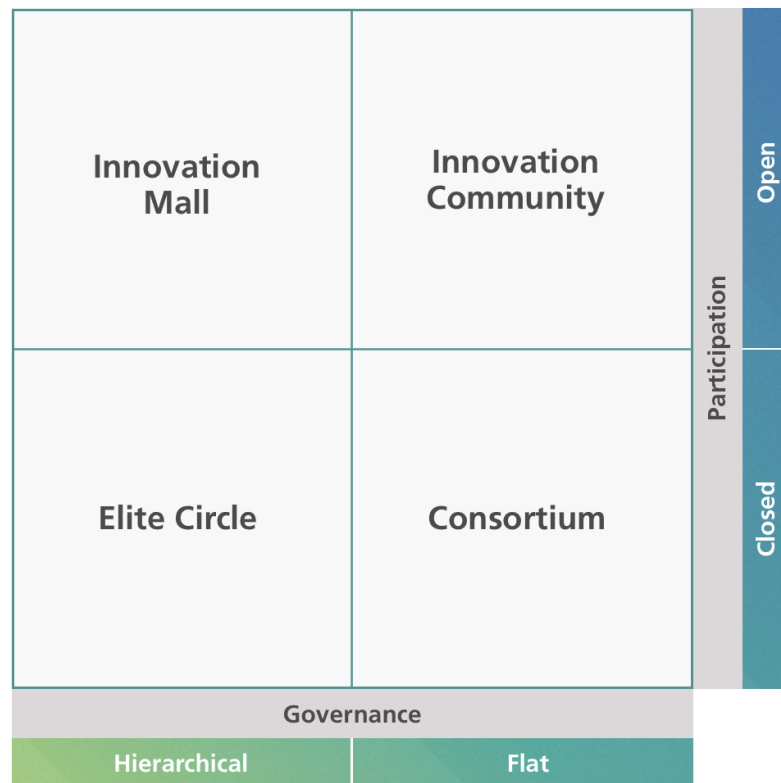
Figure 9: *The Four Ways to Collaborate* from 2008. (cf. Pisano & Verganti 2008, p. 4)

To find the best suitable cooperation model there are two questions to ask:

1. Do the circumstances support a **open or closed network**?

2. What is more suitable for the project: a **flat or a hierarchical governance**?

In general, open networks are usually larger than closed groups. This fact gives a first direction if project managers have to decide how much people are needed to create new ideas and solutions. Indicators for the size of teams could be the clearness of the problem. Of the one hand it is an advantage to know which knowledge and which skills are needed to create solutions. On the other hand, it is necessary to know the problem, so that it is possible to compile a team consisting of experts. If there are no indicators for the way or direction to a solution, it would be better to choose an open network, because it will be more likely that by many people the right solutions will be generated. The advantages of an open network are the large number of problem solvers and the large number of ideas. This approach opens opportunities to get solutions which they have never before considered or to become acquainted with experts who where not on favourite lists before. Of course, there are also disadvantages on both sides. If the solving of problem generates troubles it could be difficult for an especially compiled team. In contrast, for an open network it is difficult to figure out the experts for the solution approach and to screen a large number of ideas to choose the right one in the end. Therefore, open networks need certain circumstances for good results. *"Open collaboration works best when the consequences of missing out on a much better solution from an elite player are small."* (cf. Pisano & Verganti 2008, p. 5) In conclusion:

	Open Network	**Closed Network**
Advantage	Large number of solutions and solution solvers	Solutions created by the best professionals
Challenge	Screening all ideas and check it for relevance	Identifying the knowledge domain to find the expert group
Opportunity	Finding solutions with low budgets	Finding unknown experts and to build up experienced teams

Table 1: Advantages, challenges and opportunities of open and closed networks.

The decision who is responsible for defining the problem and choosing the solution can be taken on flat or hierarchical levels. The advantage of the hierarchical model is that one person is responsible and is able to control the dynamic of the idea creation. In contrast, on a flat level there is more than one decision maker which has the advantage that the responsibilities for costs, risks and challenges can be shared. The hierarchical level is to prefer if convenient expert knowledge is available. On the other hand, the flat level is more suitable if the capabilities are limited and a wide spectrum of views are necessary for successful results. (cf. Pisano & Verganti 2008, p. 7) In conclusion:

	Hierarchical Level	**Flat Level**
Advantage	One person control the direction of innovation	Sharing responsibilities
Challenge	Choosing the right approaches	Pooling the input of all contributors to get a suitable solution
Opportunity	Dividing work among externals to integrate them afterwards	Gaining common goals via processes and rules

Table 2: Advantages, challenges and opportunities of hierarchical and flat cooperation models.

2.3.3   Cooperation versus individual Work

Creative web design tasks are often done by individual designers. There could be different reasons, like budget or missing resources. Still it is firmly anchored in the heads that innovative ideas can originate rather from teamwork. (Warr & O'Neill 2005, p. 122) This assumption is applied surely often, however, it can not be generalise, above all, in virtual teams. Furthermore, literature denoted the results of creative cooperations sometimes less valued as individual work. (cf. Hill & Monroy-Hernández 2013, p. 3)

According to Hill and Monroy-Hernández there are on the other hand also studies which

prove that so called **peer-productions** often deliver high-quality results, above that they achieve better results than individual work. This diversity is interesting and lead Hill and Monroy-Hernández to the idea to investigate the conditions. In addition, they examine if cooperations are more suitable for functional job tasks like coding as for creative job tasks. Whereby one must make a distinction in the creative area between artistic tasks and tasks for digital products. (Luther & Bruckman 2008, p. 343) Luther and Bruckman examined over a period of four years a platform of a community for sharing creative content in form of images, sound, and other media in connection with coding. The community members are able to publish their own work and work on projects with other members. They analysed by reference to positively assessed projects and visits of the users.
Due to not unequivocal circumstances the results of the study are not solid but gives a tendency. (Hill & Monroy-Hernández 2013, p. 14) The projects which were developed of teams were considered less favourable than works of single community members. Furthermore, media rich projects were quite popular but code-intensive projects had a better performance.

In contrast, War and O'Neill developed the theory that social creativity has more potential as developed ideas by single designers. (Warr & O'Neill 2005, p. 123) They figured out a simple case scenario: If two single designers create ideas, than there are just two single ideas. The designers generate the ideas only with the own knowledge and experiences. But if these two designers create together ideas and combine knowledge and experiences, the results can be high-quality and more varied. To underline this theory the authors appointed three significant **social influences** which have negative impact on creative group work and should be avoided: **production blocking, evaluation apprehension and free riding**. The production blocking describe the phenomenon if during brainstorming meetings the ideas are expressed asynchronous successively. If team members are waiting up to be next, it is possible that they have forgotten the own ideas or that the own ideas are no longer relevant. It is not possible that a real exchange could be achieve. Solution approaches for this situations are to write down all ideas or technical brainstorming systems. According to Paulus et al has a combination of speaking and typing of ideas the best effect in creative brainstorming meetings. (Warr & O'Neill 2005, p. 125) This fact is interesting in view of the use of cooperation systems. Evaluation apprehension means that criticism could slow down the creativity of a group. Furthermore, it is possible to manipulate the creative processes with negative statements about expressed ideas. Therefore, during brainstorming meetings are critical comments are not allowed. Doubts and opinions could be expressed of group members during the phase of idea evaluation. Another important solution approach is the possibility to create ideas anonymously via technical systems. The anonymous modus gives all team members the security to express without fear. The free riding phenomenon describes group members which are not motivated enough to generate high-quality ideas. The solution is to generate high motivation within the group. At first the single group members are more motivated if the group consists of lesser people. Furthermore, the motivation level can be strengthened by creating responsibilities so that every member is actively involved into the creative process. Another solution is to give all group members feedback about the individual performance. If the group members are confronted with their behaviour they are more motivated to avoid negative repercussions for the group. (Warr & O'Neill 2005, p. 125)

2.4   Discussion and Interim Conclusion

At first glance, design teams do not differ from other teams. To build a successful team it is necessary to provide nearness between all members, several ways of communication, a trusted working atmosphere and due to the current fast moving situations is an agile working style the most suitable. Though the characteristics and work settings of web designers and the fact that distributed working situations are currently very relevant illustrate that a team constellation of distributed web design teams is not as simple to assemble. The creative process within teams is based on trust and a good atmosphere. These circumstances must be generated anyhow in the virtual space, above all if the team members do not know each other beforehand.

The different design process models illustrate that, no matter which form of process (linear, cycle or agile), some phases are very important and firmly anchored within design processes. One of these important element is the briefing in the beginning of a project. Before the designer could start with the creative work it is necessary to know the problem, all requirements, needs and wishes of the customer/principal/user and to understand the overall project. Therefore, also an important phase within a design process is the phase about collecting information in form of analysis about competitors, market and other fields. Designing as itself, so the creative phase is mostly not formulated in detail, but the most models set the focus on different solutions to find the best fitting approach. The design process model programming and designing clarify the importance of the cooperation between designers and programmers. (Pena & Parshall 2012) Also if the view of Pena and Parshall not illustrate the classical design process which is suitable for all web design projects from the view of web designers, it is helpful for the phases of implementation to realize that both parts are interdependent. Web designers and programmers have to work hand in hand for a successful project result which fulfilled all objectives from the starting phase. The great difference between newer and older design process models is the final phase about monitoring, testing and improving the results. This is particularly today essentially because of many changes in short time on the Internet. A lot of models neglect this point wherefore designers should be oriented above all to the branded interaction design process by Spies. (Spies 2015)

The study by Hill and Monroy-Hernández (Hill & Monroy-Hernández 2013) reflects negatively on the results of creative cooperations and also other voices from the literature are not positive against creative cooperation: ***"Could Hamlet have been written by a committee, or the Mona Lisa painted by a club Could the New Testament have been composed as a conference report Creative ideas do not spring from groups. They spring from individuals."*** (Alfred Whitney Griswold (1957)). But the literatures seem to be not in a full agreement, because other resources prove the importance of creative cooperation. In connection with experiences of designers it can be noted, that creative cooperation is a important key element for successful projects. Of course, there are some requirements which have all parties of a collaboration to fulfil. Not every designer is a team player and open for synthesis and feedback from stakeholders for an improving working style. But if the course has been set in the right direction creative cooperations have a great potential for successful work results.

According to the mentioned design processes and the circumstances of distributed design

teams arises a modified respectively adjusted process with five phases. The differences are – with the view on the support of distributed teams – that the fields of tasks are separated according to topics. For the work in virtual environments it is more comfortable to shift tasks like brainstorming from the beginning of the project to a later phase which deals completely with the creative work. This has the advantage that it is easier to use certain technology for special purposes and it is easier for designers to come to an agreement within the virtual world. Furthermore, due to the fact that every project varies in detail, it is helpful to conceive the frame for design processes like a kind of modular construction system with a range of selected measures which are important to fulfil project objectives. This means, that the five phases consist of five sections which give a vaguely order of process flow, but deliver the possibility to the designers that they use only use this tools, which are necessary in an order which is suitable. The virtual circumstances limit the possibilities. Therefore, the best way would be to offer a wide range of technical tools which support distributed cooperation. Which tools are important for special projects is than the designer's choice.

The first task range is called simply **project start**. This section includes tasks which are necessary in the beginning, like briefing, schedules, resource planning, the planning of a kick of meeting and other relevant elements. It is important that all stakeholders are sitting at a round (virtual) table. Therefore, it is also important that the principal or customer gets a feedback after the first and each subsequent phase. Communication and a good overview about the project is an important point which has to consider from the very first minute. The mentioned process in this chapter make clear, that an **analyse** phase is indispensable. To create interesting and valuable products it is important to know all details about circumstances and requirements. The competitors should be examined and the users are important indicators for the further course. Subsequently follows the **design** section with the creative part of the process. Here are brainstorming, wireframing, creating layouts and prototyping included. If all creative elements are finalised the **implementation** follows with the close communication between designers and programmers. Last but not least, the project concludes with a **improving** phase with testing and evaluation.

Also important are considerations of the intensity of collaboration during the process flow. The most intensity of collaboration between designers is placed in the project start and in the design sector. The designers support each other with creating ideas and giving feedback. Furthermore, the designers also have to work with other parties of a project like customers, programmers or concept developers. Therefore, also in the other three process sectors is a high intensity of cooperation existing but with different purpose. More details about stakeholders and their involvement within design process could be found in the fourth chapter **concept of design-process-based cooperation system**.

3   Analysis of Related Approaches

The previous chapter illustrates the need, respectively the potential of solution approaches for distributed, creative team constellations. Although if creators often have the opinion that distributed working situation have to be most widely avoided, the trend to international teams or teams which are distributed within a single country is unstoppable. Due to special fields of work it is not comfortable to recruit only employees from the regional surrounding. Therefore, in current times every company founder, manager, team manager and employee has to deal with distributed working situations. A suitable and efficiently approach is necessary for successful cooperations.

The following chapter is going to analyse a technical approach. Cooperation technologies are used more and more often in the design sector. Mostly there are small tools with the purpose of supporting design tasks and the cooperation between designers via solutions for communication and file sharing. This approach is very promisingly and offer new opportunities for all stakeholders of a web design project. The following sections show details about general cooperation systems and especially details about existing systems for the creative work. The last part of this chapter includes interviews of web designers for a comprehensive view on the circumstances. Together with the second chapter of this thesis has this chapter has the aim to give fundamental insight for the following concept in chapter four.

3.1   Cooperation Technologies

Cooperation technologies based on **computer supported cooperative work** (often abbreviated as CSCW) and stands for the technical support of teamwork. In this context one also speaks of **groupware**. CSCW denoted the cooperation in teams with help of technology to the fulfilment of a common task. Above all communication, coordination, organisation, making of decisions within the group and the common treatment of objects are supported. CSCW deals with the question how the cooperation of teams at work can be supported by information technologies and communication technologies suitably to increase the efficiency and effectiveness of the cooperation. According to Randall and Salembier there exist **heavyweight** and **lightweight technologies**. The purpose of lightweight technologies is to simplify procedures with the development of lean systems with a easy usability and maintainability. Lightweight technologies have no predefined architecture and support a simple communication within parties in distributed situations. (Randall & Salembier 2010, p. 179) The social factor is here relevant, and the interaction within teams stay in focus. Against it, heavyweight systems like PDM (product data management) or PLM (product life-cycle management) systems are more complex and are not suitable for cross-company collaboration because of the difficulties to implement the system within a virtual team. *"Moreover, such systems are typically characterized by a rigid taxonomy, which raises further barriers to interoperability from a conceptual point of view."* (Randall & Salembier 2010, p. 185) Due to this circumstances the focus lies on lightweight technologies in the following paragraphs.

3.1.1 Groupware

Groupware could be software, hardware or services to support teams via technical solutions to solve working tasks. According to Grudin the main differences to other software is that groupware illustrates the presence and availability of all group members and give the choice to all members to stay in contact. Through groupware the awareness of all parties could arise within the virtual room and gives information of activities. Also the group membership can be strengthened, so that every member has the feeling to belong to a group. Groupware could have several and diverse characteristics, because of different group constellations, purposes and requirements. Therefore, an important quality attribute of groupware is the adaptability. (Grudin 1994)

All solutions which support groups with the cooperation belong to groupware. With the support of asynchronous cooperation are, for example, in addition to above mentioned functionalities tools for the management of common data supplies (rooms of information) with awareness functionality. With the support of more synchronously (simultaneous) cooperation one considers in context with groupware also different conference systems, instant messaging, synchronous group editors and also so-called social software. Solution approaches for social software promote the group interactions in different areas. The applications can be classed in the areas social networking, social collaboration, social tagging, social communication and social navigation. Social software is based on the nearly same principles like the original groupware, nevertheless, it appeals to another user group like communities or networks instead of team. Consequently, the concrete uses have developed to an independent area with a steadily growing functional extent. Nevertheless, social software can be also looked as a kind of groupware if it concerns the implementation of social software in an enterprise.

To fulfil most of the individual needs of a group such a software, hardware or service has to be generic or as already mentioned, adaptable. Factors like place, time, communication, coordination and size have to be considered. Typical questions are:

- Where are the group members located? Are they sitting in the same building or distributed in different cities, countries or continents?

- Which kind of communication do they prefer? Synchronous or asynchronous? And which scope and content will be exchanged between parties?

- What about milestones and due dates? Are there any schedules?

- Which group size is needed for the individual project and how will the collaboration work due to the size?

According to circumstances like location and time there are different possibilities for the use of groupware. Different activities like tele or video conferences, mails or interactive multicast seminars could be varied in time and place. Although if the model of the following figure is older and topical activities are not falling in one of the categories, it is interesting with the view of adapting this idea for current tasks and activities of a design process.

	Time		
	Same	**Different but predictable**	**Different and unpredictable**
Same	Meeting facilitation	Work shifts	Team rooms
Different but predictable	Tele/video desktop conferencing	Electronic mail	Collaborative writing
Different and unpredictable	Interactive multicast seminars	Computer buletin boards	Workflow

(Place — vertical axis label)

Figure 10: *Three-by-three map of groupware* from 1994. (cf. Grudin 1994, p. 25)

3.1.2   Media Richness Model

The media richness theory connects the choice of media with the task of the designers which they want to solve in cooperation. The choice depends on circumstances and the characteristics of the medium. Additionally, the theory divided tasks according to uncertainty and equivocation. Uncertain tasks can be solved if all information are available. Against it, equivocal tasks cannot be solved although if a lot of information are figured out. These tasks need the ability of interpretation of designers to getting close to the goal. According to Daft and Lengel who create the original model, it is helpful to use media with a high level of information for the equivocal tasks. (Daft & Lengel 1983, p. 7) For uncertainty tasks are rich media, like meetings, more suitable. The richness of a medium depends on the number of channels and their informative content, on personality of communication and on variety of intermediatory language. The better the media suits to the tasks the better will be the result and effectiveness of the team.

Reichwald goes one step further with the vision to dissolve the approach of place and time from the previous subchapter. (Reichwald et al. 2013, p. 7) He enhanced the media richness model with a new structure. So that the rich media are not better anymore and less rich media poorer. Rather depending of the situation the types of communication are more or less suitable. Face-to-face dialogues and meetings have the most media richness. Against this letters and written documents have a small media richness level. In dependence how equivocal tasks are there are different media to prefer. Otherwise the choice of rich media could lead to an overcomplication. (cf. Reichwald et al. 2013, p. 58) Rich media are able to divert, so that important information recede into the background. On the other hand, it is also possible that too poorly media could be too oversimplify. In this case the medium just is qualified for search of information and interpretation from side of the searcher is needed, because the medium is not able to give a feedback and is no help for interpretation.
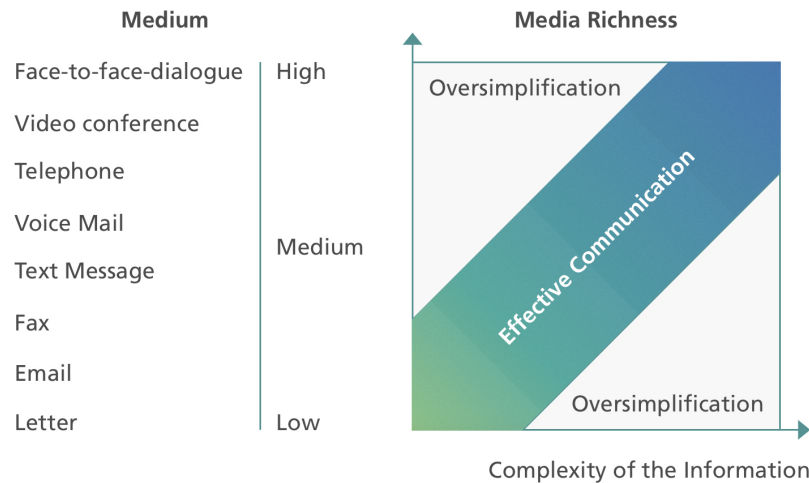
Figure 11: *Media richness model* according to Reichwald from 1992. (cf. Reichwald et al. 2013, p. 57)

3.1.3   Impact of Context on Technology

Virtual teams could work in different areas with different context. The respective technology which will be applied depends on this context. An important part is the member's background which belongs to the so called multiple contexts. The different background characteristics have impact on building and behaviour of virtual teams.

The physical infrastructure and the handling of single team members gives exposure about backgrounds. (cf. Gibson & Cohen 2003, p. 244) Every team member has different backgrounds and deals with communication technologies in a different manner. Some people prefer the direct face-to-face communication, other people write a short chat message before they go to another office to clarify details with another colleague. But of course, it depends on the richness level of information. Not all information are suitable for text chats as mentioned in the previous subchapter. Beside preferability and usage of technology also habits, knowledge and possibilities plays a role. Not every individual has the same assumptions, therefore it is possible that communication miscarries due to access problems. Also in Germany is this an issue. Although we live in a far developed country there are regions where the Internet access is not build out and communication via video conferences is complicated. Furthermore countries could have special rules for the access and standards, so it is not possible to use Google products like Hangout in China, because of *China's Great Firewall*. Such problems have to be considered if cooperations are planned with people from these areas.

In the second chapter the cultural background is already mentioned. But it is not only an issue for human, it is also a great issue for the developing of cooperation systems. Culture and language could influence the preference for certain technologies. (cf. Gibson & Cohen 2003, p. 246) Also the behaviour has an impact on the choice of systems if a team is searching tools for cooperation. An American designer knows and is familiar with other types of software as an Indian designer. Here it is important to find accordances or systems which are lightweight, so that the learning does not need much time and effort for both

parties. Different languages are able to trigger misunderstandings and also the language of the system plays a role for a good cooperation. These aspects should be considered for the conceptual thoughts of a new cooperation system. Of course, it is helpful to know all stakeholders but this is not always the case. Often the system developers are not able to know all stakeholder in the foreground, because projects are very different and need different man power. So it is possible that systems are used from time to time from different individuals from all over the world with different background, habits and language.

Also the infrastructure on the hardware side has to be suitable for a distributed working situation. (cf. Gibson & Cohen 2003, p. 247) Especially in the design sector is the accessibility of information a great issue, because the most designers are working with the operating system Macintosh. On the other hand, especially in the motion sector, the operating system Microsoft is more widespread. It is often a problem to share files and documents between these two systems. Also servers are often justified only for one system. If a user utilizes the server with another system, it is possible that files get lost or the support is prohibited from the very start. Problems with the technical part compromise the cooperation significant because they lead to frustration and time lag.

Admittedly, time zones have not much influence on cooperation systems, because the systems have to be accessible around the clock. Nevertheless, it has impact on the cooperation, if team members are located in different time zones. (cf. Gibson & Cohen 2003, p. 248) The motivation would be higher if the meetings are planned to normal daytimes, so that nobody has to be available during the night. If the time zone gaps are too large, one has to consider that spontaneous virtual meetings are not possible. A good support of the certain system would be to display the time zones of all team members, so that scheduling of mutual meetings will be easier.

Another issue is the team size. (cf. Gibson & Cohen 2003, p. 249) On the one hand, the used system should be extensible, so that small groups as well as large groups can use the system. On the other hand, it is important to consider that certain technologies are not suitable for large groups. Or with other words in connection with an example, some communication tools like chats or forums fit to special situations. A text chat with a lot of people could be very confusing, but for smaller groups is it a very helpful tool for fast agreements. Forums are able to handle large group size and it is easier to track relevant information within threads.

Although if technical support in form of tools and systems are a great help during a working day, one has to consider that this also could be problems for team. Due to fast changing technologies the team members have to deal with new circumstances from time to time. That means that they have to learn new things and to be open for new situations. Furthermore, bosses and managers have to look after regularly workshops and trainings, so that all employees are up to date. Also a comprehension for which technology is suitable for what tasks is very important. It is helpful to know that social software is often suitable for management tasks and lightweight systems support sharing of knowledge and the interaction between parties.

3.1.4   Relation between Tasks and Technology

According to Gibson and Cohen also the type of tasks has great impact on the choice and nature of technology. There are four dimension of complexity with four arrangements of workflow. These characteristics are carried over through activities of distributed, virtual teams. One distinguished between pooled, sequential, reciprocal and intense workflow structures. The pooled type illustrates the situation that all tasks are done separately by individual team members and are only combined as one project result in the end after creating. The sequential structure is characterised through tasks which are going from member to member before completion. The reciprocal structure also includes different team members, but the tasks are not only going in one direction, they are able to go backwards and forwards. The intense structure is more complex than the other types. The tasks are interdependent, so that the members have to analyse and solve problems via simultaneous cooperation with the other team members. Therefore, the whole team is responsible for the completion of tasks.

The complexity of task depends on environment and external and internal coupling. The task complexity itself could be classified into low to high. A task environment could be static or dynamic. The static environment is easy to handle because of the stable characteristic without changes and no need for monitoring. But due to complex tasks often are dynamic environments needed, so that all parties have to deal with uncertainties. The advantages are the flexibility for the teams, so that it is helpful to control the dynamic structure to ensure a high quality of the results. External coupling is divided in a rang from loose to tight. This means the relationship of the single team members to each other and between the entire team and the tasks. Against it, the internal coupling described the relationship of single team members to each other and between the team and the tasks on a scale from weak to strong.

Task Complexity Characteristics				
Work flow interdependence	Pooled	Sequential	Reciprocal	Intensive
Task environment	Static ——————————— Dynamic			
External coupling	Loose ——————————— Tight			
Task environment	Weak ——————————— Strong			
External coupling	**Low** ←——————————→ **High**			

Figure 12: *Task complexity* in 4 dimensions and workflow characterised by 4 arrangements according to Gibson and Cohen from 2003. (cf. Gibson & Cohen 2003, p. 251)

"Teams with low task complexity are generally in a static environment, loosely coupled to that environment, and have fairly low interdependence or internal coupling. These teams require only minimal information sharing or collaboration among team members, which usually means they have a pooled or sequential workflow." (cf. Gibson & Cohen 2003, p. 252)

"In a team with high task complexity, the environment is likely to be quite dynamic, the team will be tightly coupled to that environment, and the members will be highly interdependent with one another, requiring greater levels of information sharing and real-time collaboration. Teams with high-complexity tasks are usually characterized by reciprocal or intensive work flow arrangements."
(cf. Gibson & Cohen 2003, p. 253)

If context and complexity is figured out it is still not easy for virtual teams to choose the most suitable system. To set up requirements would be helpful at this point. Furthermore, if a system is chosen, it is possible that the requirements change during a project life cycle, and the team members are dependent on other technological tools. The circumstances can change from time to time, from task to task. Therefore, it is not easy to answer which system will be the best one for a certain project. Nevertheless, one can see some standardisations. Virtual teams begin often with a face-to-face meeting in form of video conference. This meeting serves to create a communication and workflow strategy. This kind of communication type is also suitable for agreements with customers, principals and other stakeholders. Different factors influence the selection of technology especially the mentioned six characteristics and technologies with their costs, support, availability which is better known as physical infrastructure. Nevertheless, also the task complexity has impact as explained before, too. The following figure visualise this with the context (characteristics) and the nature of task (complexity) which are influencing the team development over time.
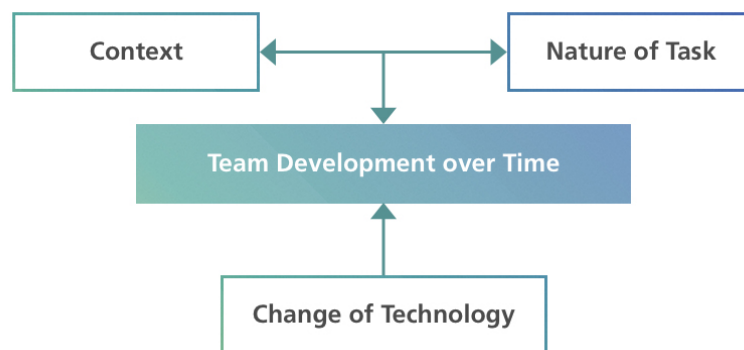
Figure 13: *Team development* over time. (own resource)

Also the technological changes have impact on the team development. Besides, it makes a difference whether the changes are initiated through the team itself, by other parties or by external influences like new launched technologies on the market. New technologies could be a great chance for virtual teams to improve the everyday work but on the other hand it is could be too time-consuming to learn the ropes of the new one. A special case are cooperation technologies which standardise a process. They are usually complex and it needs more time and effort that all team members are able to handle the system. However, these time-luxurious trainings are often worthwhile. Standardised processes are helpful for knowledge sharing and give the opportunity to build up efficient workflows. Nevertheless, special attention needs the creative development within the teamwork which can be limited by such standards. Distributed teams often use the mixture form of cooperation technologies. For clarifying time-critical tasks often phone calls and video conferences are used. But also

text chats are helpful if the information are not too complex. For challenges with time zones and language barriers a communication via mail is suitable but due to the asynchronous mostly not fast enough. There are no rules for very complex tasks and it is difficult to say which technology is always the right one. The best way in difficult situation is that the entire team decide together which cooperation tools are needed and the best to fulfil all purposes. It is also common that teams try out different approaches if they decide which one they want use permanently.

3.2 Awareness

"Awareness systems can be broadly defined as systems intended to help people construct and maintain awareness of each others' activities, context or status, even when the participants are not co-located." (Markopoulos & Mackay 2009, p. V) Awareness deals with the activities of another group member in a common field of work. It makes the coordination easier and allows the cooperation. Awareness is relevant always where a common field of work is used for the groupwork. This applies above all on the system classes *common rooms of information* and *workgroup computing*. The parts of awareness are knowledge about the information objects (which objects are new, old and which were extinguished), knowledge about changes of information objects and knowledge about persons who work with the information objects (who works with who and who is active online to the current time). The literature speaks from different types of awareness. The most familiar types are group awareness are **social awareness, informal awareness, structural awareness, workspace awareness, situation awareness, awareness of others**, etcetera. The advantages of a good working awareness within a group is that all persons are up to date about group activities and that they are able to make decisions in regard to own activities.

3.2.1 Importance of Awareness for the conceptualisation of cooperation systems

The important key elements of awareness are principles and conditions which are a great help for finding technical approaches for the cooperation. The knowledge about the mentioned current circumstances helps to interpret situations and the behaviour of other group members what are all indicators for choosing the right cooperation tools. (Gutwin et al. 1996, p. 21) With the consideration of awareness during the conceptualisation of a cooperation system it is possible to reduce uncertainties and helps with spontaneous coordination. Uncertainties are not seldom and arise often through mutual dependencies. Furthermore, the coordination of tasks and activities of team members of a virtual group is a great challenge and not easy about distance. Therefore, awareness is necessary that all team members have the knowledge about current states of the tasks, of the entire project and about the other members of the cooperation. The support of awareness is one of the essential duties of groupware and a main characteristic feature which distinguishes this from other distributed software.

3.2.2 Awareness Cues

Awareness cues, also called computer-mediated cues are indicators for reflecting the habits and actions of group members of a virtual team. Awareness cues also give exposure about

locations, intentions and active commitments. The cues come in different appearances. (Oulasvirta 2009, p. 4) Cues are signals, symbols or marks within the user interface in textual, graphical or auditory forms. The cues are automatically produced from persons which are distributed from other people. The developing of awareness cues occur in real time is characterised through the gathering of data from hardware or software sensors. They applied to computational transformations and is with other words the projection of a distributed team member. Cues are generated contemporary and automatic. The individual stands in the focus, so that cues related to persons and not to locations, files or other objects. Nevertheless, awareness cues could be also a material object, which can be perceived and interpreted by individuals. This causes that cues only become meaningful through the perception of individuals. Because of the interactive phenomena like self-presentation, performances, discourse and coordination, awareness systems are relevant as never before.

"Basically, all automatic and real-time sources of information that people appropriate to apprehend the undertakings of a remote person can be analyzed as awareness cues." (Oulasvirta 2009, p. 5)

The mentioned meaning-giving process of cues – perception and action in individuals – is influences by limitations of the system. Possible limitations with a major impact are for example noise problem, augmentation problem or a keyhole problem. In case of noise problems, it is possible that the technology completely fails. False interpretations are responsible for augmentation problems and keyhole problems illustrate the difficulty to capture everything what is relevant for a project and that it is possible that some aspects are missing. The symbolisation problem is about the question if the social can be projected and the fact that cues replace a stream of data with simpler data or some human-recognizable symbol or label. (Oulasvirta 2009, p. 6)

3.3 Existing Cooperation Systems in Creative Contexts

At the market there are many cooperation systems for distributed design teams. The existing systems are ordinarily partial solutions and support single parts of the design process, like brainstorming, prototyping or creating wireframes. Many of the best known systems can be taken from the list which can be found in the appendix of this thesis. The following paragraphs are about four cooperation systems which have the most relevant for the current web design sector and which are well known in Germany. The single systems will be analysed according to the issues communication, coordination and cooperation, awareness and knowledge memory. These aspects are important for a comparison. The purpose is to get an overview about the offering systems. It must be considered that the chosen different systems are a selection according to the experiences of the author. The author did not work with all of these systems but researched that they have established in the past and are relevant for the future. There are no official sources which give a list about the best or most relevant systems, therefore the decision of selection lies of the side from the author.

3.3.1 InVision App – A Platform for Prototyping

InVision App is a platform for prototyping in form of click dummies. The main feature is to upload designs and layouts e.g. as JPG or PNG and to link through the single layouts

like a real website. Beside that, InVision App offers a range of cooperation tools and in the last few months these became more and more. It looks like the provider of InVision App has recognised the need of cooperation systems and increases the product from time to time with new features. These are communication, management and presentation features on a collaborative level. Furthermore, InVision App works in cooperation with other providers of design and communication tools like Sketch App (layouts on base of vectors) or Slack (tool for team communication). Therefore, the user can count on new features in the future due to the fact that InVision App is build up scalable and extensible. (InvisionApp 2016)

Communication

Team communication is beside the main feature an important tool and gives the user a lot of options. After loading up prototypes the user has the possibility to send a link of the work to the customer, colleagues or other stakeholders, so that they are able to give feedback. All parties are able to communicate asynchronous or synchronous. The asynchronous way consists of comments which can be given directly on a certain position in the layout. Every comment is seen as a task and could be automatically displayed in a to-do-list. The synchronous communication works in real time via virtual meetings in form of voice or video-conferences and text chats. (InvisionApp 2016) The user is able to chose the suitable media richness level for the current task. Another form of communication is the drawing function. The reviewer is able to draw on the layouts to show more complex changes. Another communication feature includes a close connection to Adobe Photoshop – a widespread graphic tool. The designer can share within the program in live time the work in a video conference style, so that the viewer can give immediate feedback. The streaming runs directly into a web browser and does not need any special settings or skills. It is easy to use and brings designer's work with all relevant stakeholder together on a direct way. Video-conferences are also helpful and give additional exposure about the layout it the reviewer test the click dummy in real time in front of the camera. The direct pronouncing of all thoughts during testing give more information as only text comments on the screens. Also user's behaviour in this context is a form of communication and complete the feedback.

Coordination and Cooperation

Basic features for a coordinated cooperation are supported. Every single prototype can be shared with other people. It is sufficient to send a mail with the link to the prototype to the stakeholder who has access to the prototype without to sign in. If the recipient wants to change the something on the prototype it is necessary to log in with an own InVision App account. It is also possible to create task lists with marks *on hold, in progress, need review or approved*. (InvisionApp 2016) The overview of the current status of the to do's is helpful to have an overview about all tasks and all involved people. A more detailed scheduling is not possible and still missing. The open task board is more for the spontaneous working on tasks which arise through feedbacks. Therefore, InVision App does not replace management tools for project and team manager. The part after creative process stands in the foreground.

Awareness

Users and created prototypes could be connected with other users. One can see which user is connected with which prototype and if the person is online at the moment. (InvisionApp 2016) All users have an avatar and represented with the own name. The menu point *Activities* gives information about all activities of users which are connected with the own account.

So it is possible to see all changes of prototypes to those one self follows. Furthermore, if a comment is added to an prototype where the follow function is activated one get mails with notes about who did what.

Knowledge Memory
InVision App supports the control of versions and stores the development of each prototype. Older prototypes could be moved to an archive. (InvisionApp 2016) No information get lost and users can monitor all changes although if they were not online to this time. InVision App offer a lot of possibilities but a central base for collection information is not possible. A collection of facts and information of the analyse phase should be collected via other tools.

3.3.2 Axure RP – A Platform for Prototyping and Organisation

Axure RP is an interactive wireframing tool which is used primarily in the draught phase to provide website prototypes which can be sent then on the one hand for the vote to the customer and serve on the other hand as a specification document for programmers and developers. Axure is intuitive and one can provide after 30 minutes already the first layout. For returning elements one can tangle libraries (or use the quite available libraries) from those one can insert the elements simply by drag and drop into the layout. If the layout is provided, one generates by button click a prototype whose files via FTP can be comfortably uploaded on a customer account. The prototype is indicated within a frame. In a left frame is a navigation placed with which the customer is able to reach the single sides. It can fulfil all demands from low-fi sketchy wireframes up to highly polished, interactive prototypes. Interactive agencies and design agencies use the tool instead of Photoshop to form their draughts faster and in more clearly manner. Nevertheless, the extent of Axure also brings a high complexity. The interface can look very overpowering for beginners. Axure does not cover all steps of a design process but is very complex in the fields prototypes, diagrams, documentation and offers features especially for team cooperations. (Axure RP 2016)

Communication
Every user with the access to a project is able to write down his opinion in form of text messages. (Axure RP 2016) Furthermore, the communication aspect is expandable, because the chat options are rudimentary and for agreements it is better to use other communication tools.

Coordination and Cooperation
Creating of diagrams and prototypes is the main features of Axure. The results are easy to share and with integrated documentations it is easier to coordinate for other stakeholders. The documentations give information about functionality of prototypes, list current states of tasks and organise notes with regard to separate fields for different interest groups. (Axure RP 2016) With Axure it is possible to control the roles of team members and access to all single, stored projects.

Awareness
With Axure it is possible that several team members can work on one file at the same time. With a *check-in and check-out system* it is possible to realize all changes in connection with the responsible user. A history feature lists all activities of users, so that every group mem-

ber is able to track the development of team projects. (Axure RP 2016)

Knowledge Memory
With the history list it is possible to track all changes and developments of projects. (Axure RP 2016) And also the documentation feature is very important for writing down relevant information for current and future process steps. Also the creating of libraries with styled shapes and icons for fast prototyping is part of knowledge memory and is a great plus for the system.

3.3.3   Adobe Cloud – A Platform for Creating creative Work

The products by Adobe are well known and important tools for all designers. Most of designers are working with Adobe products, indifferent for graphics, motions or programming. The *Adobe Creative Cloud* is the first approach of Adobe to create a platform for creative people and to bring all products more together than before. In the Cloud the programmes Photoshop, Premiere Pro, Dreamweaver, Illustrator, InDesign and more are included. The last Creative Suite (CS 6) was launched in May 2016. All following versions are going to be part of the cloud and automatically available with a monthly subscription fee. Although if the cloud feature is only a spin-off product, the online memory of 20 gigabytes could be convenient for sharing the own work. Also the support of different devices is covered. Adobe tries to go with the time, although if launches of new features take time. The online service of Adobe includes the following programmes, which are well known from the Creative Suite: Photoshop CC (digital image processing and montage), Premiere Pro CC and After Effects CC (video cut and processing), InDesign CC (layout), Dreamweaver CC and muse CC (web programming or web design), Illustrator CC (graphics), Acrobat XI per (PDF production), Audition CC (audio cut and processing) and many other add on programs and plugins. Further, also tools and materials like stock photos and fonts are available in the cloud. Around the cloud there is build up the community Behance where designers have the option to upload and share their work. The designers get feedback from other professionals and are able to generate through their portfolios new orders and interesting contacts. (Adobe Creative Cloud 2016)

Communication
A direct communication is not possible but across other platforms like Behance and Facebook or sending designs via mail are possible ways. (Adobe Creative Cloud 2016) For example, Photoshop offers the function to send designs to receivers which can answer on mails with feedback. The sharing is also possible with the connection of Facebook. And as already mentioned Behance, the community created by Adobe itself, could also helpful for getting feedback in form of comments from other users. Beside the pure text form there are no other possibilities to communicate with other people. Unless one connects Photoshop with external systems like InVision which enables to share the designs via video conference in life time. But Adobe does not offer own solutions in this context.

Coordination and Cooperation
Adobe advertises with the ***And it's all connected.*** but it is a fact, that this is currently not the case. Besides the users are only connected on the platform Behance, and even there is the interaction between users limited. But in the context of coordination of creative teams

there is one helpful feature: *Adobe Libraries*. (Adobe Creative Cloud 2016) Connected with the cloud it is possible to create design snippets which can be shared with other users of the Adobe Cloud. Users get access to libraries through invitations, so that one can decide which users are able to see all elements of the single libraries. The purpose of this feature is best described with an example. Design teams often work for companies, which already have a concrete corporate design with defined elements like buttons, fonts, colours and others. Every user of the Creative Cloud is able to create a library where elements like text boxes, buttons, colour gradient and a lot of more could be stored and shared with other team members. If the team members work on different projects for the same customer it is ensured that all involved designers work with the same design snippets and divergences can be avoided. Otherwise there are no features to cooperate or coordinate team work.

Awareness

The awareness is still not enlarged. Furthermore, there is a weak spot due to the missing awareness feature in the Adobe Cloud. The sharing of libraries is a very important feature, but every user who has access on a library is able to change elements and it is not possible to track all changes and activities or to undo false changes.

Knowledge Memory

On the whole, features for sharing and store knowledge in form of documentations are not supported by the current version of Adobe Cloud. But the option of creating libraries with design elements for fast designing is part of knowledge memory and is a great plus for the system.

3.3.4   Mural – A Platform for Prototyping

The system *Mural* is is originally developed for the support of video game design. The product developed to a tool for the general creative work of designers. The main features of Mural are creating and sharing creative ideas. It is possible to collect ideas of a creative cooperation on a virtual whiteboard with all possible elements of a digital product. The results of the whiteboard can be illustrated in a basic wireframe. The creative process within virtual teams stands in the foreground, therefore among other things templates for SWOT analyses, persona, calendar roadmaps and canvas business models are available. In the farthest sense the platform Mural is a whiteboard for different creative and analytical content. (Mural 2016)

Communication

The communication between users is limited to text chats. Due to the missing features like voice and video conferencing it is advisable to use for the communication other tools. Also the text chat is very basic without special functions, formatting options or emoticons. The text chat could be used for synchronous and asynchronous communication and offer single and group chats. (Mural 2016) But due to the basic characteristics of the tool is the text chat not suitable for great groups. Messages with relevant information can be lost in large chat threads and in general is the tool structurally confusing.

Coordination and Cooperation

The purposes of the whiteboards are to support the cooperation of creative teams with the

brainstorming and decision-making features. (Mural 2016) The users are able to add, edit or delete pictures, thoughts in form of notes, text elements and other visual objects which suits to a mood board. With a comment function every user can annotate own and other snippets. To get meanings and make decisions within a group it is possible to open votes for whiteboards. The offered features make clear, that the main focus lies on the starting phases of a creative project, because brainstorming and idea sharing are best of all supported. To comment design drafts or organise open tasks is not possible and features like video conferences completely missing.

Awareness

On the one hand Mural offers good awareness functionalities and on the other hand other functionalities are expandable. It is not possible to highlight or realize any changes since last visit. Also it is not clear which elements are new or who changed, added or deleted which object. The solution for this missing feature would be to use comments where all users write down their changes, adds, and deletes. It is possible to see who is to the current time active and available for cooperations, what makes it easier to communicate. Another positive feature is the following of members in live time, if the person is presenting something. (Mural 2016) Than it is possible to follow their cursor on the screen during explaining concepts and ideas. In this context it is also possible to realize who is working on which whiteboard, what makes it easier to contact the relevant persons to clarify issues.

Knowledge Memory

The creating of complex canvasses is a great plus for this system. (Mural 2016) Through the easy sharing and inviting of other users it is easy to share knowledge. If all steps of a design process are covered with whiteboards, then it is possible to get an entire documentation of a project which could be shared with all relevant stakeholders. But this is not one of the main functions, therefore the solution for this issue is not optimal.

3.4 Interviews about Needs of Web Designers

In regard to the use of cooperation systems with close link of web designer needs were five interviews carried out. All interviews were executed orally in form of one-on-one interview and were recorded in writing meanwhile. The detailed interviews are in the appendix of this thesis. The narrative interviews constituted of open questions which support the qualitative form of interviews. Characteristically is the fact that there are no answer alternatives given to the interview partner therefore the entire interview is highly structured through the interviewees. The interviewee is not steered in a certain direction and has the possibility to give an answer which corresponds to the own way of thinking, attitude and opinion.

As preparation the interview partners became only a short introduction about the topic *Creative Cooperation in Distributed Working Situations* – according to the acceptance that the answers will be more varied if the interview partner answer impartially, without knowledge about the planned system. The interview questions are divided into two areas. In the first area there are more general questions, which should figure out the working situations and the experiences with distributed working situations. In the second phase of the interview the questions go deeper into the design process and the needs of web designers which

arise through the virtual room. All together 11 questions are posed:

1. How important is collaboration within a design team?

2. How relevant are distributed working situations at the current time in the design sector? How relevant is this form of team especially for your working situation?

3. Do you have experiences with distributed design teams? If so, what went well and what wrong?

4. In which phases of design process are collaborations especially importantly?

5. What are your key elements for a well-integrated team?

6. What is with the communication within teams? Which ways are common for you? What went well and what wrong?

7. How does the perfect virtual team look for you?

8. What collaboration systems do you know? What systems do you use for your everyday work?

9. What technologies did you know or use, which support the creative work of web designers?

10. What kind of technology do you miss in connection with distributed working situations?

11. If you could create the perfect collaboration system for creative design processes, which elements are important?

The questions have a great reality relation and are answered through own experiences. The details about time dimension relate to current working situations and to desired situations which could lie in the future. The interview results based on certainness and not on suppositions.

The interviews were conducted all together with fife designers of the web sector who have in each case more than fife years work experience. The interviewees have extensive experiences in the specialist fields web design, motion design, video and audio design, UX design, concept developing and team and project management. This pool of experiences offers good conditions to receive important answers, new inputs and perspectives for the following cooperation system concept. All persons are familiar with design processes, issues of web based aspects, communication within small, large and virtual teams and they have to deal with a lot of stakeholders during everyday work.

It has to be considered that the single results of the interviews only can be hardly compared. The interviewees have different professional backgrounds and due to working in several companies and nationalities are the experiences of each interview partner differently. Furthermore, a number of five interviews illustrate no overall impression of a branch. The principal reason for the carried out interviews is the possibility on single important hints to needs which originate from different perspectives of the different designers. The following results are a conclusion of all interviews and illustrate the most important statements.

3.4.1   The Results

The interviews show, that the opinions and experiences of the single designers are different. The openness for cooperation systems depends on the own experiences and individual working situations. Some designers are more familiar with such systems and others have not got into contact with it yet. This could be the reason why the one half of interview partners were mildly against technical support and the others were interested in the mentioned issues.

All interview partners agreed about the importance of cooperation within design teams. Cooperation strength the creative process and leads to more creative ideas. But the circumstances and the attitudes of the virtual team members have great impact on the work. The overall meaning about the relevance of distributed working situations is that this is not the best case but often unavoidable. The skills of experts are important to deal with complex web projects. The companies do not have the options to hire every needed freelancer and often are the experts not on site. There are different good reasons for remote working, but all interviewee conceive the co-located work with mostly unknown people difficult. Getting to know the other team members was often mentioned in this context. Beside an open communication style of the individual designers was often mentioned that it is much easier to work across distance if one knows the working style and the attitude of the others. Especially, if the main communication channels are text messages or mail it is probably that misunderstandings arise.

Although if all interviewee had experiences with distributed working situations, the use of cooperation systems is not established yet. Of course, they all use different tools for communication, but they do not utilise the support of tools which support the creative part of design process. The support of communication stands in the foreground and seems to be most important. The most used tools are text messages in form of mails for a more detailed communication without time pressure. Also text chats are often used. Especially, for fast agreements between two persons. Group chats are not often used, but in some cases helpful to inform all persons about the current state. Another important tool is video and voice conferencing with an including screen sharing function. This is important to present designs and helpful to get immediately feedback. Nevertheless, it is interesting that three of five interview partners reported that working in virtual teams worked well and that the results were successfully, although the communication channels like mail and video conferencing were very basically.

The issue about the collaboration in context with the single phases of design process give exposure about how different the opinions of the individual interview partners are. If one considers all five interviews, all phases of the design were named as an answer on the question to which phase of the design process is the cooperation especially importantly. Absolutely decisive here are own individual circumstances and experiences. The working background has impact on the design processes of teams. Furthermore, the individual skills of the designer is responsible for preferences of the moment when a cooperation is needed. If the designer has special know how in creating concepts it is probably that external support is not necessary needed. In contrast, other designer need more support in designing and are reliant on expert opinions. This could be a reason for the different answers to the question.

All answers to the question about the perfect virtual team were similar. All team members need certain attitudes. They have to be open for virtual work and they need similar goals to work in the same direction. Clear roles and a certain discipline helps to form a virtual team. Also for this question the term communication was an important issue. The team members need to trust each other. Important information, project details, feedback and criticism may not be held back. Shyness and shame are here out of place. It is important to speak out and to communicate all thoughts. If all members have the feeling, that they could talk and write openly and freely automatically a feeling of trust arises.

According to the question about the missing technologies in distributed working situations it seems that the interview partners do not know the possibilities of cooperation systems in the creative field. It can be concluded that here is a great potential for pointing out chances and possibilities of suitable tools, so that all of them can optimise their work flow. Almost all of them already heard or read of tools like InVision, but in the end they did not used it in the past. One reason could be the training period which is needed if one tries new technologies. One has to invest time and often also patience. Another reason could be the habits. Although if the cooperation systems are available in a wide range at the market, the utilization of this technologies is not learned and not anchored in the working routine of most of the designers.

The missing knowledge about current cooperation systems for creative virtual teams was an advantage for the last question of the interviews. The different answers show versatile perspectives of the designers and were very interesting. The basic communication tools like video and voice conferencing, screen sharing, text messages in form of chat and group chats are still important. Furthermore, there were new impulses in form of the idea to integrate virtual reality technology. This technology is just about to appear and will play a certain role in the future. The suitable hardware is still not far spread. This would be an interesting topic for further investigations. Another answer gives an interesting input with a detailed description of the situation. The ideal case of a virtual cooperation would be, if there is now distance between the co-located parties. This could be the case if all necessary functions are at one platform and the streaming is able to show the involved persons, the screens and all other relevant elements which are important components of creative meetings. It has to seem that all involved parties are in one room. Of course, this is a great challenge for the conception if suitable tools, but gives helpful hints for the right direction.

Although if the most designers do not have much experiences with the us of cooperation tools with a creative connection, all of them had ideas or suggestions about a helpful systems. Some of the designers told or wrote some days later, that they now are more curious and interesting than before and that they try to figure out if supporting tools are necessary for future team work. Not only for team members with a locally big distance is it interesting. Also it could be an interesting issue for designers which are sitting in different offices.

3.5   Interim Conclusion

The insight from this chapter clarifies that the following cooperation system should consists of single tools which are based on lightweight technology, to ensure an easy usability and

a comprehensive support for group communication and groupwork. The system is still not limited in his complexity and should offer solutions for many duties. Due to the fact that different communication features support different purposes the diversity in this area is very important. In this context also the media richness model gives exposure about the importance of the connection between medium and purpose. It is well known that a face-to-face communication has a rich media level and deliver a lot of information. But in the case of distributed working situations have to be search for alternatives with a similar media richness level. Of course without loosing the view for the purpose. Therefore, video conferences and chat messages will be important communication channels for a synchronous agreement within group members. Of course also documents and mails are provided but just for the purpose to write down and record relevant information. Another synchronous medium would be a whiteboard for collecting and sharing ideas. On this types of media can other solution approaches build up.

Beside a wide range of tools also the context of technologies have to considered. Summarised it is important to know that individuals have different habits and backgrounds what have great impact of the use of technology. Furthermore, the type of task is also important for the following concept. Tasks varied in complexity in different dimensions. Due to the complex nature of design tasks are they classified into intensive interdependencies and a complex work flow. The cooperations are characterized through dynamic environments with high external couplings. All these elements (context, nature of task and technology) have impact on team development which need time to strengthen.

One key element of cooperation technology is an awareness. All team members should be up to date and need to know all relevant information about team members, project status, activities and more. Information can get lost very fast in the virtual space, so awareness is necessary and relevant for all phases of a project.

Good existing cooperation systems in creative context implemented different awareness measures. Additionally, the overview of four well known systems illustrates that a comprehensive approach is still missing. But with the development of the last month it is clear that the providers have realised that there is a great need so that the removal of the systems is worthwhile. The interviews revealed a similar picture of the whole situation. Although if the interview partners do not use creative cooperation tools in a comprehensive measure, the need exists and offer new potential for successful projects.

4   Concept of Design-Process-Based Cooperation System

The following paragraphs deal with a concept of design-process-based cooperation system for extensive projects. This system indicates virtual platform for web designers who work on projects with other people from all over a world. The system is a kind of a supporting tool and should simplify the work of distributed teams. As already mentioned before, there are a lot of solution approaches for single design tasks at the market. The uniqueness of the following system is, that the most process steps are covered on one platform. This has the advantage that distributed team members do not have to search for tools which run on different operating systems. It is easier to install one system for all relevant tasks, so that it is ensured that all team members have access on to same tools.

The details of the following concept are based on the theoretical part of this thesis. Beside concept details this chapter deals with the objectives and a stakeholder analysis. Interviews with web designers who are trusted with the current branch deliver additional indicators for the concept. The concept itself consists of five different sections oriented to design process phases and the matching tasks. The concept also proposes solutions for communication, planning and trust building within teams. To provide a comprehensive view a prototype shows an impression of the system in the end of the chapter.

4.1   Objectives

Strategical objectives
The cooperation system should support the work of distributed web design teams in form of a solid platform. The platform comprises the most relevant cooperation tools within a design process. This construction ensures the successful differentiation from the competition. The aim is, that all stakeholders of the project process are able to use the system in a gainful manner. In the end the collaborations should deliver better results as before through the use of different technical tools to bridge the distance of distributed teams.

Tactical objectives
The construction of the platform is based on a modular construction system. All tools can be used flexible according to the projects own needs and special requirements of a project. This ensure an agile working style for all system users and a fast reaction on unexpected events during a web design process.

Operational objectives
In addition to this, it is important to ensure simple communication ways between all stakeholders and to take measures for building trust within project teams. A well-established team is the main goal in this category to obtained positive project results.

4.2   Challenges

The web designer has to manage projects with multiple, distributed stakeholders, who are possible located in different time zones and using a variety of different tools to cooperate and get new inputs from the team.

For the daily work the designer needs many different software for creating solution approaches for digital media, like Photoshop, Sketch or Illustrator. But the requirements change from time to time. The most relevant change during the last few years in the web design sector was the implementation of responsive web design for digital products which is running on all possible devices with different resolutions. Also the technical problem solver has to fulfil these new requirements. But the standards continue indifferent how long they are used. Proven things like drawing with pen and paper may not be disregarded. That illustrates that the portfolio of skills is rising rapidly. It is important that web designers do not solve problems with old learned habits just to get the job done, but rather set on cooperation with other experts, to get the best possible result. Additionally, the system has to support this working attitude with providing features to create wireframes, websites and other digital projects. Awareness and different communication channels are important requirements of new cooperation systems and have to be seen from web designers as important tools which give the chance to stay strong together although not physically.

The range of the size of teams and agencies varied, so the working situations do. It makes a difference if someone is working in a small, a mid-size or a large distributed group and all sizes have their own advantages and disadvantages. Independently, this choice depends on the circumstances of the current project, all stakeholders have to deal with this situation. For the designers which work in an environment where are all processes are adjusted on co-located situations it is easier to work as in environments where only rudimentary set up is available. Particularly suitable are so called 2.0 enterprises with networked work stations, flat hierarchical structures, a team with experts (perhaps with international colleagues) who build up distributed teams with cooperation tools. But this ideal circumstances are not standard at today's time. Rather orders from customers or principals put pressure on design teams because the technical equipment it not up to date. Another challenge is cooperation across different countries and continents with different languages and time zones. Here it needs beside technical support also a strong project management and it is important that all parties have a shared understanding of requirements and situation. Finally, it has to be considered that the design process does not cover the workflow of a single designer. All stakeholders are part of the process and demand a certain flexibility to react on changes and new circumstances.

4.3   Stakeholders

A stakeholder is everybody who uses the cooperation system or who has a certain knowledge which one needs for the realization of the projects. The stakeholders are in distributed working situations or in situations where technical tools are helpful for the everyday work, even if the distance between parties is not especially large. A cooperation system is already helpful if the parties are sitting in different offices within one building.

Web Designer
In general, the web designer is involved during the entire design process. Designers undertake beside the design procedure a lot of other tasks in different fields. Therefore, the designer stays in contact with other designers, team members from other fields and other

stakeholders like the principal or customer. An additional detailed characterisation of web designers can be found in the chapter 2.*1.1. Characteristics of Web Designers.*

Principal or Customer

The principal of a new design project could be an internal department or the management of the company. Customers are mostly external parties and spatially seen they are mostly not directly on-site. Principal and customer deliver project briefings, authorize budgets and they express theirs needs and requirements. A close communication between principal/customer and designer is very important during the entire project. Nevertheless, the project manager often takes over the customer communication and is the voice between both parties. Here it is important that the project manager has the knowledge and skills to understand both, so that all information will be correctly transmitted. The agreements and consultations take place within a design process always between the phases and with appearing of questions. The more narrowly the arrangements are the better the results match. Therefore, the principal or customer is in the ideal case involved during the entire process. Even in the end of a project additional feedback from this side is helpful to improve the product after launch.

Manager

Small and large design projects need management for a good organisation. Resources, time and budget are not the only points to plan and monitor during projects. According to scope it is important that special people care about after these areas.

- **Team Manager**
  A team leader has an important position within a team and cares about the productivity and success of a team. The team manager is a contact in several areas, marks out the aims of the team and takes care of a good team atmosphere. If it is a matter to distribute tasks the team manager gives recommendations, because he knows his team best of all. The team manager also has expertises and helps in problem cases. Together with the project manager, the team manager plans the team resources and is therefore overall in the beginning of the project involved. If there are some temporal bottlenecks by cases of illness the manager is also involved during the process to fix problems.

- **Project Manager**
  The main tasks of a project manager are communication between principal, customer, team members of different job fields and to manage the overall project without bottlenecks in resources, budget and time. Also the project manager always keeps the objectives of the project in view. The project should never get in faltering and to meet deadlines is the uppermost order. The project manager is active involved in the beginning of a project and similar to the team manager, afterwards the manager steps in the background and supervises the running process. In the beginning there are tasks like preparing the offer for principal or customer, creating a plan for the entire project and figure out possible risks and weaknesses to have the chance to react fast to it

Concept Developer

The concept developer is employed for creative ideas before the real design part starts. The concept developer creates communication strategies, prepared concepts for web contents and concepts for page structures. The concept developer involves the wishes and needs of

principal, customer and target group in concepts and considers project objectives. Other terms for this job description are *architect of information* or *user experience designer*. The content developer is involved in different phases of the design process like analysis, design and improving phase.

Programmer

A programmer should be involved from the beginning of a project. If there are already technical demands from the principal or customers side during the phase of briefing, it is important that the programmer can test the wishes for feasibility. It is also helpful if the designers share layouts and concepts from time to time, so that it is ensured that all ideas can be implemented without problems or breaking the budget. Of course the main tasks of the programmer take place in the phase of implementation. Here the professional needs current technical know how to stay up-to-date. As a rule, the implementation phase is also characterised through communication with the designers who support the coding with graphics and first quality checks for improving the results. There are the following different types of programmer which could be relevant for a design project:

- **Frontend Developer**
  A frontend developer implements designs with HTML(5), CSS, JavaScript and other languages. The programmer codes this what users of the web product can see and utilise. It is an advantage if the programmer has great perceptions for visual details. In any case, it is necessary to implement the proposals of the designer after arrangement without changing the usability and the look and feel of the product. Therefore, it is important that programmer and designer work hand in hand.

- **Backend Developers**
  Backend developers, also called as software developer, usually do not have that much touching points with the design of web products. This kind of developer code application packages, for example on the basis of the higher computer languages C ++ or Visual Basic, or more complicated web applications in Java or C #. Nevertheless, points of contact can originate if a designer have to layout interfaces for applications like content management systems or if they have to discuss points of intersection between design elements and backend elements.

- **Content Manager**
  A content manager organises, provides and edits content of Internet platforms and websites. The manager creates strategies and outlines for web contents above all in regard to marketing strategical purposes. Although an online editor has knowledge about programming with HTML and CSS it is not inevitably necessary for the job tasks. An editor often has a journalistic education and is specialised on online publications. Often the everyday working tool are content management systems. The collaboration between editors and designers consists of the exchange of graphics and the answer of layout questions. Both have to consider that all layout adjustments will be supported through the respective content management system.

4.4   Design-Process-Based Solution Approach

The cooperation system is based on a fife-phase-design-process which is inspired by several design process models which have been previously described in chapter *2.2 Design Processes*. This approach is task oriented and should support the procedure of designing web based projects by distributed design teams. The terms of the single phases are formulated so that immediately becomes clear what the main parts are. In this context every web design project consists of a project start, an analysis phase, a creativity phase, an implementation phase and finally an improving phase.

The setup of all phases supports an agile working style. It is possibly at any time to return to a previous phase to repeat tasks or to improve results. Furthermore, the system has to be understood as a modular construction system. The designer is able to choose only the modules which are necessary for the individual project. It is also possible to select system modules during the project, which were not planned from beginning. Although it is guaranteed that all parties are able to react to unexpected events.

Nevertheless, the system does not cover the whole design process. Some areas can be taken over only difficulty in the virtual world, as for example, pixel-based image processing with Adobe Photoshop or similar programmes because of the huge amount of data which can originate. There are also a lot of creativity methods or brainstorming methods which are useful for design teams but which can not be implemented in a virtual room. The following collaboration system is to be understood not as a comprehensive system, but as a **support** for distributed design teams, to handle hurdles due to distances and team constellations.

Technically the system is a browser application or can be used as a computer application for current operating systems. A highly competitive Internet connection is important, so that all real time functions operate well. All stakeholders who are involved need an account and access to the platform. Also external customers need an account for using the different communication channels. It is important that the registration procedure is easy and fast. For registration an active user with a special licence is needed who activates new accounts.

The platform is build up on different levels. On the first level there are necessary tools for communication, calendar, schedules and lists, data management and community. Theses features and areas of the platform are available on the first tier, so that the user is able to reach these tools at every time of using. The platform is design process oriented and offers different tools for the different phases which facilitate the work of web designers and the connected stakeholders. The different design process phases involved different stakeholders with different levels of intensity and necessity. The composition of the design process phases is described in chapter *2.4 Discussion and Interim Conclusion*. During **project start** there are designer, project manager and principal respectively principal especially involved. The external customers and principals give the most input for the first hints of project direction. The designer has to be involved from the beginning, so that it is ensured that no information get lost from the briefing to the design. The project manager plans the single steps from the first idea to the final product and creates time schedules, to do lists and much more relevant organisational measures. Also the team manager is important in virtual design teams which do not organise themselves. The team manager plans the resources and is able to decide
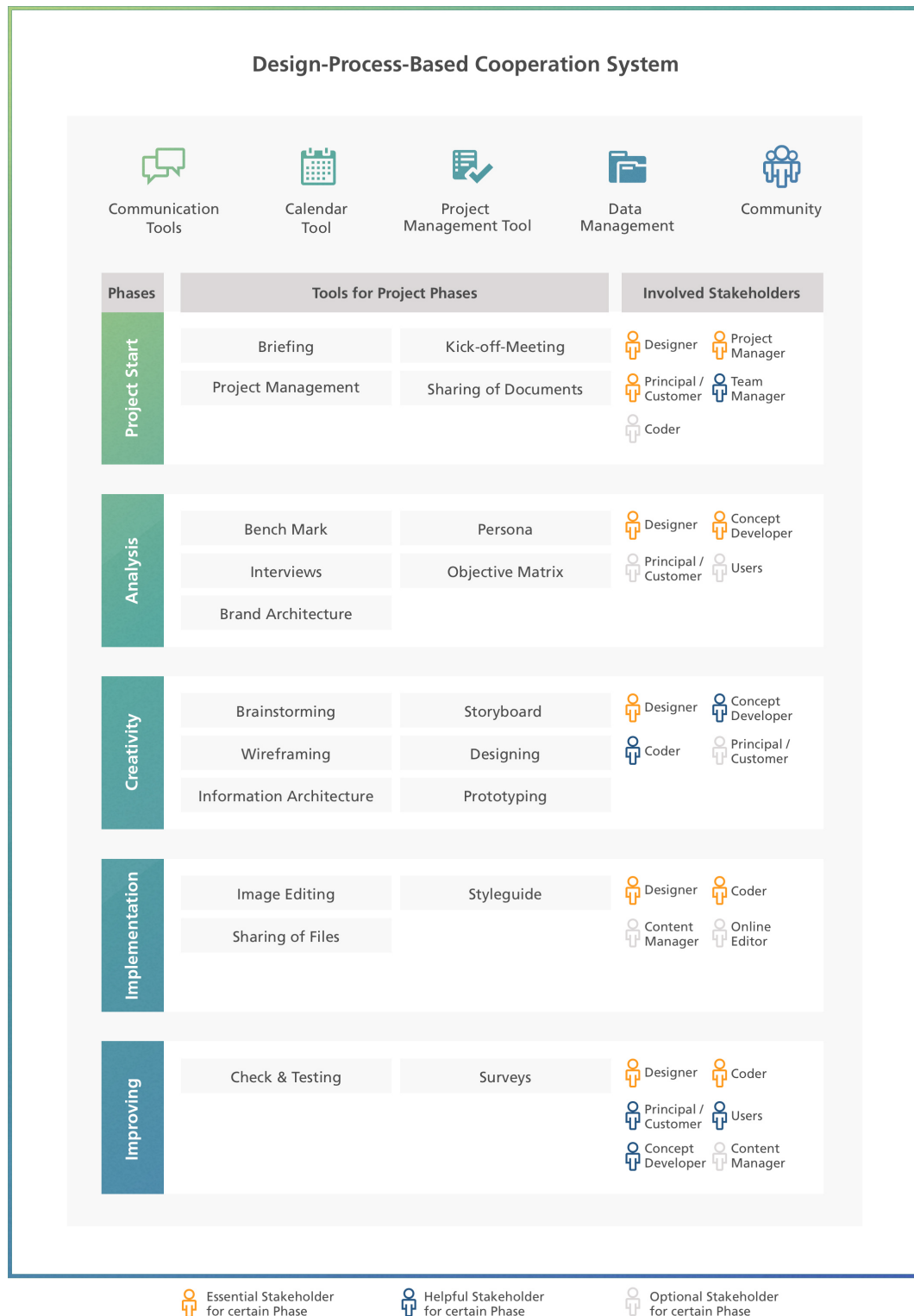
about responsibilities and best fitting skills.

Design-Process-Based Cooperation System

| Communication Tools | Calendar Tool | Project Management Tool | Data Management | Community |

Phases	Tools for Project Phases		Involved Stakeholders	
Project Start	Briefing	Kick-off-Meeting	Designer Project Manager	
	Project Management	Sharing of Documents	Principal / Customer Team Manager	
			Coder	
Analysis	Bench Mark	Persona	Designer Concept Developer	
	Interviews	Objective Matrix	Principal / Customer Users	
	Brand Architecture			
Creativity	Brainstorming	Storyboard	Designer Concept Developer	
	Wireframing	Designing	Coder Principal / Customer	
	Information Architecture	Prototyping		
Implementation	Image Editing	Styleguide	Designer Coder	
	Sharing of Files		Content Manager Online Editor	
Improving	Check & Testing	Surveys	Designer Coder	
			Principal / Customer Users	
			Concept Developer Content Manager	

Essential Stakeholder for certain Phase   Helpful Stakeholder for certain Phase   Optional Stakeholder for certain Phase

Figure 14: *Platform Structure and Stakeholder Involvement.* (own resource)

For the first phase it is helpful but mostly optional if the coder is informed about requirements, so that possible problems in the later implementation phase could be prevented. The **analyse phase** need essential support of designer and concept developer. Both analyse

target groups, competitors, objectives and become acquainted with brand architectures of principals companies. Optional could principal, customer and users be involved in this process. The **creativity** phase is part of the designer. The designer is involved in all phases but in this phase this person is the most important compiler. Helpful are concept developer and coder to ensure that the designs reflect the developed concept and fulfil the technical requirements. Also the principal and customer can give optional input, apart from the agreements with this parties if the designs are finalised. In the **implementation** phase the coder has the key role and is in close cooperation with the designer to ensure a result which is closely to the created designs. Content manager and online editor can optional support the work of the designer and the coder. The final phase, the **improving** needs input from different stakeholders like designer (improving of design), coder (improving of implementation), content developer (improving of concept), principal and customer (comparison between result and demands), users (comparison between result and needs) and content manager (testing of contents).

4.4.1   Superordinated Tools

All phases are accompanied by several communication tools, a calendar function, a concept for data management and the possibility to create schedules and to-do-lists in form of checklists. The tools are available at the first level of the system, so that they are always available.

Communication Tools

The system provides different communication tools for different purposes which are available at the highest level of the information architecture. It is important that users reach the communication tools at any point. For fast agreements there is a **chat** available with different features. Text messages from user to user can be dispatched and group chats can be provided. All messages can be tagged with hashtags thus it is guaranteed that the news can be found afterwards with the help of a search engine. Every user is able to create new open (for all team members visible) or closed (only for selected team members visible) chat channels for inviting several users for exchange on-topic information. It is also possible to send PDF files or graphic files like JPGs or PNGs via chat tool. These files will be stored only between the involved users and not centralized and for all team members visible. This kind of communication serves for quick arrangements. In addition, this kind of communication substitutes the e-mail. It is possible to send longer messages and with the option of tagging there is no risk that messages will be getting lost. It is important that all users use the tagging feature. This must be taken up in the working routine. The chat offers the option to archive messages, for more clarity. The communication occurs synchronous and also asynchronous. If the other chat partner is not online to the same time, the message will be stored and available at next login. Additionally, it is possible to connect the chat with mail accounts, so that all messages which arrive during user's absence will be forwarded.

Another important communication tool is the **video and voice conferencing**. The conferencing tool brings several users together with voice and picture. All participants of a conference have an own video frame and the option to turn on camera and microphone whenever they want. The tool offers to create new whiteboards or to share existing whiteboards which were created and stored within the third process module. For notes and textual work there is a text editor. For presenting documents it is possible to upload different types

of files. It is also possible that users can add notes or draw something in the presentation slides. During a conference there is the option to give all or only a well-chosen number of users the right to elaborate whiteboards, text editors or presentations. Additionally, there is the option to split the members of a conference and invite certain users to group rooms. It is possible to share beside presentation documents also the desktop screen of user's. The conference tool is comprehensive and tries to give the users the feeling that they communicate face-to-face.

Another way to communicate on the platform is to write **comments** within the single tools of the five modules. These comments are important elements for agreements and exchange of meaning during process phases.

Calendar Tool

The calendar tool could be connected with the task manager and the tool for time schedules. All due dates, milestone meetings, meetings for agreements and feedback conferences could be added to the calendar of the involved users. For a better **overview** about forthcoming appointments the single types of dates could be marked with different colours. Furthermore, the tool has all well known features of a ordinary calendar software. The user can **add new dates** with invitations for other users and details about the meeting. It is also possible to connect the dates with a conference room, so that the invited members know on which way they will meet. It has to be considered that the system also could be used of groups which have the possibility to meet regularly or from time to time. Therefore, it is also possible to enter a location on-site. The calendar tool could be connected with already installed calendar software on mobile phones, tablet PCs and desktop PCs like Outlook or Mail. Thus the users are informed about appointments although if they are not currently logged in on the platform.

Data Management Tool

This tool enabled that all uploaded and on the platform created files are stored on a central place, so that the users can access too any time. That means in detail that the user can find the files within the phases in which the files were prepared. Additionally, the users can find the files over following a section on the first level of the platform for a direct access from everywhere. The files are visible for creators and for the users with the **accordingly rights** (view or edit). Thus the users only can see the files for them they have suitable rights. All files are listed and assigned with the name of the creator and the date of creation. Also a **version control** is included, so that the users can reconstruct the development of files. The types of files vary. For the design process are needed text documents, whiteboards, graphical files, PDF files and other formats like JPGs, PNGs, SVGs, PSDs, GIFs and others. The system must consider that files could be comprised of large amounts of data. For a better overview about all the files which are collected during month and years, it is necessary to make folders with a hierarchical order. The names of the **folders** of the first level consist of the project title. The next level is divided into folders with the terms like *Design, Material, Project Management, Development, Concepts, Text, Motion* or other meaningful terms.

Project Management Tool

With the project manager all users are able to prepare tasks which could be allot to oneself or other team members on **time schedules**. The time schedules are connected with the

calendar tool and task lists. This tool differs from the calendar by project management features. Detailed project plans are possible with information about phases, tasks, due dates, milestones and creators of the tasks. The tasks can be allotted to users and the users are able to mark the tasks with the states in progress, on hold and done. The form for tasks includes information about principal, compiler, due date (with the connection to the calendar tool), affiliation to one of the five project phases, description of the task, state and details about stakeholders who are able to observe the tasks. Tasks could be created in a hierarchical order. That means that one (main) task could consists of different smaller (sub)tasks. This situation displayed with one page about the main tasks and a kind of **check-list**. On the one hand the check-list links to the sub-tasks and on the other hand one can check off the single subtasks if one has done them.

Community

The second chapter of this thesis gave exposure about the need of a feeling of togetherness for every single user of the system. The feeling is very important for a well working cooperation between parties. Therefore, every user has a own profile which has similarities to well known social media platforms but with a with a smaller extent. Every user is able to upload for the own **profile** an avatar and personal information about professional and private circumstances. A personal data sheet and skill matrix is also a part of users profile. Beside this professional details, a **timeline** for sharing interesting links and information or for commenting is also covered. This support the exchange between users and give the chance to build up a feeling of togetherness. Last but not least, there is an setting and login area for users **account**.

4.4.2 First Phase – Project Start

The first phase includes tasks and elements of a project start. In the beginning there is a **briefing** in more or less detailed form of explanation. The briefing stays in connection with the communication with the principal and other stakeholder like members of the design team. There are following **project management tasks** like planning, team constellation, time planning or budget management. Another important point in the beginning is **sharing of documents** of various types. Finally the first phase should also includes the possibility for a **kick of meeting** with all relevant parties of the project to clarify open questions, objectives and requirements.

Briefing

The Briefing consists often of documents, text messages and notes from calls. It is helpful to offer more than just a upload for documents. Additionally, briefings could change during the starting phase and the customer or principal could add new information to a later date. The briefing tool includes options to **upload** text documents, files like PDFs or other files like JPGs or PNGs. To a comprehensive briefing belongs also screens of good precedents or mood boards which show a first impression of customer's perceptions and wishes. **Whiteboards** are helpful at this point of process. Ultimately the briefing module is a list with all relevant files and documents and the user has the option to upload files or to create new text documents and whiteboards with the possibility to upload pictures and other snippets of examples.

- **Coordination and Cooperation**

  All members are able to upload documents, notes and files and to create text documents and whiteboards. To address relevant team members and other stakeholders it is possible to invite them with the right to edit, add and to create new elements. Additionally, the creator of the briefing module is able to invite users which are only able to view elements. So it is possible to give the access of single documents to selected users. Additionally, it is possible to hide elements from users. This is important for projects with non-disclosure agreements (NDAs).

- **Communication**

  It is possible to add notes and comments to all text documents and uploaded files. Through this feature it is possible that the team members communicate beside the ordinary communication channels. The users can mark other users in comments, address them directly.

- **Awareness**

  The user is able to see who created or uploaded elements. All elements have a version control, so that it possible to see who made which element. Additionally, the user is able to see in the briefing module who is invited with which kind of rights. Also the online state is displayed. This has the advantage that users are able to contact other users directly of their online status is marked green.

- **Knowledge Management**

  The briefing list gives information to all users with access. The single elements are tagged with the date of last changes and the user name who made the last changes. So the user has an overview about the currency. A help to highlight especially important information, the user is able to mark text passages or to sign in important points on pictures, so that other users can understand relevant details faster. Also the comment function can give knowledge about agreements between users about certain issues. This functions are important for users who are not involved from the start or for team members who substitutes a colleague due to illness or holiday. All files will also be stored on an overriding level of the system, so that all files are available at one place.

Project Management Tasks

As already figured out in the analysis part of this work, project management tasks are important during the starting phase. A great help for project managers and additional stakeholders are **time schedules** and **plans about team constellations and tasks** for further proceedings. The time schedules give an overview about milestones, deadlines and project phases. Provided are the information about team members, tasks, dates and state. Schedules show the current state of projects due to the possibility to connect the schedule elements with modules of the system. The schedules are able to display whether a curtain module is in progress or concluded. To connect the schedule with system modules they have to exist to the point of time when the project manager is creating the schedule. But of course the project manager is able to plan and create the time schedule and to connect the single phases with the modules at a later time. Also the involved team members give important information for the course of a project. Therefore, also a group list with the names of team members and their individual skills, know how and responsibilities is provided.

- **Coordination and Cooperation**
  The creator of a schedule is able to give access to relevant persons with different rights (reading, edit, add, etcetera...). The schedules are connected with the task of team members and the members are able to mark their tasks with states like *in progress*, *done* or *on hold*. It is possible to connect the schedules with the calendar tools of all team members, so that due dates are automatically listed.

- **Communication**
  Direct exchange in form of synchronous communication is not necessary at this point. The only communication is that the time schedule is connected with the calendars of the team members and every members is able to react on entries of the own calendar with commitments or rejections if the date does not fit.

- **Awareness**
  The time schedule creator and all other members can see which users are involved and which users are online to the current time. Furthermore, the schedule gives information about compilers of certain tasks. The tasks are marked with work status and all booked tasks are linked to the task description. The users can exactly see who make what and have the feeling, that they belong to a well working group. It gives a good feeling if the awareness measures bring the project to life.

- **Knowledge Management**
  A detailed schedule is responsible for a healthy knowledge management of a project. The key is an well structured plan which gives an overview about all phases and the current state. But on the other hand the plan should includes enough details about all elements, so that all users are at a constant knowledge level.

Sharing of Documents

Although this module element is also an overriding feature, the starting phase of a project mostly required the possibility of a **place for documents** which have nothing to do with briefing information. Therefore, the first module of the system includes a place for uploading all sorts of documents. All files and documents are also stored on an overriding level of the system, so that users are able to rediscover the documents at every time of the process.

- **Coordination and Cooperation**
  Every user has the right to upload and to share files of different types. The user is able to give other users right for reading or editing. Additionally, it is possible to send direct links to a certain file to draw the attention on it.

- **Communication**
  This feature does not need especially communication channels. But of course, as already mentioned there is the possibility to comment files and to send links of files via chat tool of the system.

- **Awareness**
  For every user it is comprehensible who uploaded which file at which time. It is also possible to comprehend who deleted files. An archive ensured that is it possible to retrieve files within a certain time.

- **Knowledge Management**

  File sharing is very important for the knowledge management of a virtual team. In connection with dates and statement about the user of uploading or creating it is helpful to ask the creator open questions or to comprehend how old the information are.

Kick-off Meeting

A kick-off meeting is very important for clarifying questions, for meeting other team members and stakeholders and for getting an overview about the project. According to analysis and the interviews with web designers (please note chapter 3.4 Interviews about Needs of Web Designers for more details) the most effective way to meet team members and principals is face-to-face. It is an ordinary proceeding that the first meeting and a final meeting is organised with all relevant persons at one location. Thus it comes that many people have to travel by train, car or plane. However, a journey is not always possible, therefore a video and voice feature in form of **conferencing tool** is indispensable at this point. The conferencing tool have an uploading feature for presentations, a sharing feature for already available or new **whiteboards** and text documents for notes. Of course, the conferencing tool is an overriding feature with more tools. These are described in detail in the chapter 4.4.6 Additional tools in the paragraph Communication Tools.

- **Coordination and Cooperation**

  The room of the virtual conference could be shared through a calendar invitation with all detailed information about times, participations, details about content and additional relevant details. The invitations reach the users via the calender tool. But it is also possible to share meetings via chat channels to reach groups all at once. The users have different rights for using the meeting rooms. The creator of the event is able to select the presenter and can give the rights for video broadcast via web cam and speaking via headset. To divide all participations into smaller groups (for example to divide according to professional field or for brainstorming sessions) there are separate rooms which have to create for these kind of purposes.

- **Communication**

  The communication occurs through voice broadcasting. The users are able to speak which each other. The video function ensures an even closer communication and transmitted also gestures and emotions. Also the text chat is available during a kick-off meeting conference. The chat feature is especially convenient for situations if a user is talking or presenting and other users want to comment something without interrupting the presenter. And if there are information only for selected users it is also possible to send text messages only to single or to a selected group.

- **Awareness**

  All users can see which of the platforms users are online and participate. The system gives information about missing users who were invited but did not appear. The interface of the conference tool displayed who has switched on the web camera and the microphone or who uploaded files or shared screens. For every conference there is a protocol created by system, so that it is possible to track all actions of the participants. Only private messages between users or groups will be not tracked.

- **Knowledge Management**

  All shared and during the meeting created documents are stored centrally so that they do not get lost after meetings. The protocol of the meeting gives also information for users who had not the chance to participate. Thus the user can comprehend which files or whiteboards were involved.

4.4.3   Second Phase – Analysis

To create interfaces and services for companies, the design team needs input from the stakeholders. A lot of questions could be clarified through initial kick-off meetings but it is also important to analyse relevant fields. One way could be conversations with principals and customers and existing material about the products, markets and competitors. A **benchmark** analyse is a well known and necessary measure for this step. Also **interviews** with users are measures which give important information. To design for target groups, the tool for creating **persona** is significant. For several design projects it is necessary to rethink the **corporate identity** and the **corporate design**, for example if there are only style guides which are dimensioned for print products. In the end of the analyse phase there should be objectives which flatten the future way. An **objective matrix** helps virtual teams to focus the same key aspects for further decisions.

Bench-Mark Tool

An exact consideration of the competitors is for every type of design project obviously. After all it is helpful to know how other designers solve problems to get even better ideas. For web projects are the analyse and evaluation from websites of competitors important with consideration of features, brand experience and usability. With this method the designer has the chance to learn from existing projects which elements work well and which aspects need an improvement. The bench-mark method compares several existing products or services from competitors according to different criteria. (Spies 2015, p. 64)

The bench-mark tool of the system consists of a typical bench-mark matrix which could be filled out with own **defined criteria** and evaluation values. Possible criteria are visual design, usability, brand fit or accessibility. The advantage of the bench-mark tool is that a lot of different people with access to the system are able to evaluate and to insert their results into the **matrix**. The more people test competitor's websites the clearer are the results. For example, if there are five users who test and analyse a digital product according to same criteria and fill in their results into the matrix. The matrix calculates automatically an average. The final matrix shows the end results within a cycle via structured model.

- **Coordination and Cooperation**

  As already mentioned the users are able to create bench-mark matrixes and to share these with several other group members. Results of a cooperation of several users are more valuable than results which based on single opinions and perceptions. The coordination is simple and easy. The matrixes can be shared and via calendar or time scheduling tool it is possible to set deadlines for the analysis and evaluations, so that the results are delivered when they are needed.

- **Communication**

  The bench-mark tool has a comment feature, so that users are able to write comments on matrixes. Otherwise there are no special communication tools, but of course, for

close agreements between users there are always video conferences and text chats possible.

- **Awareness**

  The tool has an activity control and logged all entries of users. If necessary it is possible to screen the activities for the involved users, so that they do not influence each other. In this case only the creator of the matrix is able to see the activity protocol.

- **Knowledge Management**

  The knowledge management is not very important at this point. But it is helpful that all parties know the results in the end, so that they are able to consider the outcomes.

Interviews

For a better analysis of circumstances and needs, interviews with stakeholders are typical measures. One distinguishes between single interviews and group interviews, between structured, semi structured and unstructured interviews. The system offers **questionnaires** and **surveys**. The terms of the questions have to do with the company and the brand of the principal/customer, process of project, roles and responsibilities of team members and other involved parties, milestones, target groups, customer insights, digital strategies, marketing, details about corporate design and styleguide and technical requirements. Possible questions for interviews could be:

- What are the main objectives of the project?

- What are the three most suitable words which describe the product or service of the company?

- Why is the product or service better than others?

- What is your job within the team and within the project?

The aim of interviews is to figure out the circumstances and relations between stakeholders and the product/service and the relations between the product/service and external factors. The system gives every question a fix ID, so that every answer could be discussed in consideration of further requirements. Beside, the interviewer is able to give answers values on a scale from one (very important) to four (nice to know) what simplified the evaluation of the answers. The interview tool gives the option to send the questions to the interview partner, so that the interview could be fill out by writing on the digital way. The interview tool is connected with the video and voice conferencing, so that also a face-to-face interview is possible, although if the parties are not at the same location. Therefore, the system gives different interview options, so that quantitative and qualitative interviews are possible.

- **Coordination and Cooperation**

  The user is able to create an interview or a survey form. This form could be send to external parties with and without access to the system. Often it is important that the surveys reach so much people as possible, therefore it would be a great hurdle if all participations have to register on the platform.

- **Communication**

  The most important communication feature within this tool is the video and voice conference and the transmission of the interview questionnaire or survey. In the second

case it is not possible to get a synchronous exchange between parties, but it is helpful to reach a lot of users in short time.

- **Awareness**

  The creator of the interview form is able to see statistics of questionnaires and surveys which were conveyed. The statistics give details about how much users opened and filled out the form and how much people ignored the request. Other statements about gender, age and background are possible, if the fields are part of the form. The conferencing tool has several awareness measures and gives all parties a feeling of a face-to-face meeting to the extent deemed possible.

- **Knowledge Management**

  The evaluation from systems side is very important for the creator of the interviews. The creator has the option to give access to other group members, so that they also can see the results of the interviews. This is important for the knowledge management of the entire group to consider the outcomes for further process steps.

Corporate Identity and Corporate Design

While concept developers work on user requirements, structured contents and meaningful contents, designers have the job to use existing corporate designs and to understand the corporate identity of principals and customers. Often there are styleguides for print and digital environments but also to analyse existing printed and digital material is important to get an entire overview about the brand environment.

For the design process the customer delivers often several **documents** or give access to online platforms where all details about CD and CI are available. These details have to be stored at the system. The importance of this step illustrate the cooperation of several designers. Although if styleguides give clear instructions, it is a fact that every designer interprets the statements with other eyes and with other interpretations due to different backgrounds and experiences. Therefore, the CD and CI tool gives the option to the user, to create kinds of **libraries** with indications to colours, fonts, font sizes and typical elements like buttons, input fields, radio buttons, check boxes and much more. These predefined elements help the several designers to create designs which fulfil the CD requirements, so that layouts from different designers look as if made from one piece.

- **Coordination and Cooperation**

  Every user is able to create new libraries for design projects and to share these libraries with other group members with different options of access (add, edit, read). It is helpful if also other users have the possibility to complete libraries with creating corporate design conformed elements.

- **Communication**

  The communication factor is not high for this tool, because the exchange between users is focused on the creating of CD elements. But an important feature is that if there are new element within in a library, all members with the access to this library get a notification through the text chat tool in the respective CI/CD channel.

- **Awareness**

  As already mentioned, all involved users get notifications about changes in libraries.

The libraries have an action control, and additionally, it is possible to undo changes, and to load earlier versions.

- **Knowledge Management**
  The CD/CI tool is important for the knowledge management. Especially, if one considers, that designers often work for different customers with different corporate designs. It is often difficult to remember at every details of certain CDs, so this tool is a great help to support the knowledge of every involved designer.

Persona

For web projects it is important to know the user. The user is often described as a stranger with individual needs. This needs have to identified. Web projects set the focus on user oriented approaches and not on organisational solutions. Even if the designer knows the user, good interactive solutions are ensured which satisfy the user. A common method to become more familiar with the user are persona. Persona are individual and lively representatives of the target group of customer segment. (Spies 2015, p. 74) Persona are constructed with socio demographical and behavioural aspects. The behaviour is mostly difficult to define but has a high value and meaningfulness.

The tool gives the opportunity for users to create persona in cooperation. With a persona **configurator** the user can create persona on a visual way with the selection of hair colour, hairstyle, eye colour, shape of face and other details which characterize the appearance. The system user can create a **profile** for every persona.

- **Coordination and Cooperation**
  The user is able to create persona and to share the creations with other team members. Also here the creator is able to give different access settings (add, edit, read) to other members. System users could work on persona time-displaced or synchronous to the same time.

- **Communication**
  For the synchronous work on persona it is important that the users are able to communicate with each other. Of course a comment feature is activated. Additionally, video and voice conferences are available for a direct agreement.

- **Awareness**
  For a close cooperation the users can work to the same time on same profiles and appearances. The users see what the other users do and an activity protocol ensure that activities could roll back.

- **Knowledge Management**
  This issue is not very relevant for this tool but beside, it helps for further projects and is interesting to see which persona were created in the past. One can learn from past decisions and is able to optimise persona for further projects. Additionally, created persona give exposure about views, perspectives and backgrounds of the creators.

Objective Matrix

In the end of analysing there is a document with the results. On the one hand this document is a official file for the customer or principal and on the other hand it leads to objectives for

all further activities. The objectives are ordered within a matrix. Matrixes are well suited for the virtual work, because they set the focus on relevant details. Also the customers have the option to control the objectives before the creativity process starts and can compare these with the objectives from the initial briefing.

The tool gives the option to fill out **input fields for objectives** concerning the company, the user and the brand. For a focused proceed with the project the objective matrix should not be too complex.

- **Coordination and Cooperation**
  The matrix could be full out from all involved users. Often it needs many improvements before the objectives are fixed. A cooperation is very important and need often agreements between team members and customers/principals.

- **Communication**
  Here are the same circumstances as for the the persona tool. The tool offers synchronous and asynchronous communication with the support of the comment and conference tools.

- **Awareness**
  Additionally, to the typical awareness measures it is important that also the customer or principal is involved in the process. The insights are marked as content from customer/principal and has to be noted with priority from the other stakeholders.

- **Knowledge Management**
  The team member can comprehend the development of objective matrix, what often gives important exposure about the backgrounds and importance of the single aspects.

4.4.4   Third Phase – Creativity

The creative phase is advised on creative input. The best way is to cooperate to know new perspectives and views to get innovative ideas. **Idea generation** is a necessary measure and could be taken place with a appropriate tool within the virtual working place. On the way to the perfect design an **information architecture** is needed. Thereby the customer and principal is able to check the user guidance, first design which represent the product concept, could be illustrated via **wireframing** and **prototyping**. Although if the creative work on pixel basis takes place on the local computer, there are possibilities to layout and **design** digital products on vector basis in a virtual environment.

Idea Generation

Good ideas can develop everywhere at all times. The development of ideas is a process which takes time and is the central point of the entire design process. A few ideas already develop through the starting and analysing phase. It is important to collect them and to use these ideas later during the creativity phase. The user has the option to use the idea generation tool for this purpose. The brainstorming tool consists of a whiteboard where it is possible to label post-it notes like in real life or to create mind-mappings. The advantage of the idea generation tool is the connection to the persona tool. The created persona from the analysis phase could be displayed at the whiteboards, so that the ideas also can create around the persona.

A design project needs two different types of ideas. The first focus lies on the guiding principle which illustrate the strategy of the project. The other type are innovative ideas which are part of a solution approach. To find a solution there are different creative methods. Brainstorming is only one of many. The advantage of the tool is, that the **whiteboard** offer the possibility to use the surface diverse. Beside the well known brainstorming method with all the rules of using (discuss close to the topic, without criticism, also insane ideas give important input, etcetera) there are also other methods like storytelling mind maps and role playing games which are supported of the tool.

The end of the idea generation phase is mostly the evaluation of all collected ideas. Therefore, the tool offers the possibility to vote on ideas.

- **Coordination and Cooperation**
  Due to the most important rule of idea generation, that everyone of participants have to speak or write every idea which cross one's mind, the exchange between team members is very important. But nevertheless, the brainstorming groups should not be too large. Groups of four to five participants are ideal. Within the tool all members have the same rights to write, draw or upload images to fill the white- or mood boards. An unfettered exchange is very important for the flow of new ideas.

- **Communication**
  The generation of ideas need exchange between parties and the exchange lives from communication. The best way to communicate within a virtual environment to generating ideas is the video and voice conferencing. Additionally, all ideas have to record in writing, therefore also the writing function is necessary for idea generation sessions.

- **Awareness**
  If a user write something on the white board or upload pictures for a mood board, the other users can see who the author is or was. All participants are visible during brainstorming sessions.

- **Knowledge Management**
  The users can comprehend idea developments through a vision protocol. Through using different possibilities of idea generation and the protocols it is possible to evaluate the procedures afterwards to learn from them for further projects. Additionally, the whiteboards and mood boards can be shared after idea generation with other users, to inform and bring them on the current state of the project.

Wireframing

Wireframes are schematic layouts of web products. Wireframes show structures, types of content, functionality and the hierarchical order of the elements and the connection of elements to each other. The tool is a kind of **drawing tool** with pre-defined typical modules of websites and the option to create these modules by the user. Also mobile devices are considered, so that the designer is able to create wireframes for different breakpoints. Wireframes are suitable for the agreements between designer and principal. In this early stage the principal can give important hints for further design tasks. It is advisable to make the most changes at this point. But it has to be considered that wireframes only show contents, their order and functionalities. If the designer work to closely on wireframes the results are mostly not innovative enough and show not the best possible solution. (Spies 2015, p. 64)

- **Coordination and Cooperation**

  Wireframes are part of the tasks of designers and concept developers for agreements between other stakeholders like coder and principal. A sharing function for presenting the results to stakeholders is here important for the cooperation.

- **Communication**

  The main communication between stakeholders takes place via sharing function and comments within the tool for possible change requests. Of course, beside that, there is always the conferencing tool available for presenting the results in a simulated face-to-face situation in real time.

- **Awareness**

  The presence of the users is shown by notifications about new comments within the tool or via notification that they received the links to the wireframes.

- **Knowledge Management**

  All comments and changes are recorded via action protocol, so that other users are up to date about and have the chance to learn from complex structures of websites or platforms.

Information Architecture

A deeper form of creating websites or online platforms is the preparation of information architecture. The main components are the identification of content and fundamental order of single sites of a web page. The information architecture also gives exposure about the connection of the single elements. The information architecture is important for the agreements with the principal and with the coder, who have to link the elements after implementation. The tool offers all elements which are needed for creating an information architecture in form of a **diagram** consisting of square input fields and connecting lines.

- **Coordination and Cooperation**

  The information architecture is mostly an issue between designer, concept developer, coder and principal. The cooperation group is relatively small what makes the coordination easier.

- **Communication**

  The communication is focused on comments and messages which are transmitted via message with the share link. Due to the mostly complex structures of information architecture it is also possible to use the conferencing tool if necessary.

- **Awareness**

  The users are able to see who received the shared links and commented the drafts. The initiator of the information architecture gets a notification if there are new comments available.

- **Knowledge Management**

  All comments and changes are recorded via action protocol, so that other users are up to date about and have the chance to learn from complex structures of websites or platforms.

Designing

The main design job is very complex. Every design process starts with several drafts which bases on analysis about brand and their environment, mood boards from the idea generation phase, guiding principle, wireframes and material by principal/customer like images, texts, videos and so on.

The tool supports the designer with a **layout tool** which is based on vectors. This ensures small data amounts. Tasks like image editing via programs like Photoshop are not supported by the system, because of the complexity of the requirements. It is more suitable for the system to focus on layout. It is possible to **upload images** and to insert them into the layouts, colours and other elements can be selected or created. It is possible create entire web products without constraints with the exception of image editing. This task should be takes place on the local stage of every designer. The designer can start with the creation of a grid and a page structure. To fill the structure with life the creation of look and feel needs enough time. Additionally, the tool supports layout of typography and all web based and standardised fonts are available. Websites and other web based products mostly almost always include interactive elements which are often difficult to animate via layouts. The tool offers the possibility to create **simulations** of mouse-over effects for buttons or other interactive interfaces. Additionally, the designer is able to use the created design elements from the **styleguide tool**. This is a great work simplification, especially for a cooperation.

- **Coordination and Cooperation**
  Some projects demand that several designers are working on one product to the same time. The cooperation is not so easy if one considers that all elements of a website should look like it is made of one piece. Therefore, a close cooperation is very important. The designing tool offers to work with several users at one layout. The users are able to upload pictures into the layout and to insert text.

- **Communication**
  For close agreements it is possible to communicate via comments and via video and voice conference tool. If one knows the other designer than it is easier to work on one layout than the designers are almost strange. A close communication avoids misunderstandings and deviations from design patterns.

- **Awareness**
  If more than one designer is working on a layout it is very important that the actions of the users are visible in real time. Also the position of working tools of the designers are visible, so that the designers do not work at the same element. Although, if this function makes the tool very complex, it is especially adapted for the agreements between designers, if they want to show in real time other versions of layout details.

- **Knowledge Management**
  To know which designer created which element of the layout a vision protocol is very important.

Prototyping

For presenting the final results to the customer the best way is to implement the layouts via prototypes. With prototypes the customer/principal has the feeling of a almost finished product thereby consists prototypes mostly only of images which are linked. Another well

known term for this kind of prototype is **Click-Dummy**. Beside there are also other types which support for example videos or on base of service-experience in form of role playing games. But the tool only supports the creation of click-dummies, because they have the most important relevance for web projects and the type is most suitable for a web based system like this one.

The tool offers linking of images which show designs of single webpages or other web product elements. The designer can link from one image to another with different options like link to a special point on the same image or to a point on another image. There are much more settings like fixed header and footer, opening of layers or navigation flyouts which give the user a feeling of a real coded website. The implementation of a prototype costs time but in the end it is worthwhile because all discrepancies can be clarified at this point of process and the customer can compare the result with the requirements and objectives from the starting phase, so that the coding phase will go smoothly.

- **Coordination and Cooperation**
  The cooperation for this tool is relevant and easy to implement. All prototypes can be shared with other users who can get the right for editing. In this case the user is able to upload new screens and to links them with different options. The cooperation for this point of project has the advantage that every user is able to upload the own screens if the layouts were created in cooperation of several designers. Additionally, every activated designer is able to change something, if principal or customer has change requests.

- **Communication**
  Although, if the creation of prototypes belongs to the creative process, here is the communication between designers not so relevant because the most details are clarified. The comment feature stands in the foreground.

- **Awareness**
  If more than one designer is working on a prototype it is important that all actions are visible. Every involved designer gets notifications about new uploaded screens and if designers are located at the same screen all detailed actions are marked.

- **Knowledge Management**
  The protocol is an important element for the knowledge management at this point, too. In addition, the prototypes can be copied for other projects if the overall structure is suitable.

4.4.5 Fourth Phase – Implementation

All tools of the implementation phase should support primarily coder and designer. A tool for **visual elements** support the designer for providing entire image material for a project. Also for this step is the sharing of files important. An especially convenient tool is the **styleguide** tool. The designer has the option to insert in an interface all relevant specifications about fonts, font sizes, colours and other design elements.

Visual Elements

The designer accompanies the coder during the implementation phase with delivery of all **graphical elements**. All images, icons and other visual elements have to be shared through

the visual elements tool. It is often necessary to edit images because of responsive designs or other changed circumstances which were not clear during the creativity phase. The changes have to communicate through the visual elements tool.

- **Coordination and Cooperation**
  The involved users are coders and designers. This makes the coordination of the cooperation easier. The exchange is between two parties and both stay in direct contact.

- **Communication**
  The coder has the option to comment the visual elements which need changes. The tool offers drawing tools, so that the changes could be marked. The agreements can be complex therefore also here is the conferencing tool important.

- **Awareness**
  During a conference session it is possible that both, designer and coder can comprehend who is drawing or commenting on the visual elements in real time.

- **Knowledge Management**
  All change requests will be recorded, so that also other designers of the team are up to date about the implementation and open tasks for supporting the coder.

Styleguide

This tool is similar to the CI/CD tool of the analyse phase with the additional that all elements of the styleguide is edited for the purpose of programming. The programmer need hexadecimal colour definitions, dimensioning in pixel values and sometimes there are elements like buttons, navigations, header, footer already pre-built in HTML and CSS. These code snippets are a great help for coders, because they are always implemented in the same way and does not need to program anew.

The requirements of this tool are input fields in form of text edit tools for the **HTML and CSS snippets**, so that the coder only have to use copy and paste.

- **Coordination and Cooperation**
  The styleguide tool can be connected with the CI/CD tool respectively the elements can be copied from one to the other tool. This is a work simplification for all parties. The coder has the option to mark missing elements, so that the designer can deliver these.

- **Communication**
  This tool is only based on the basic communication tools like text chat and comments, because at this point there are now complex agreements necessary.

- **Awareness**
  The coder is informed about new content within the tool. Also if there are later changes due to new circumstances. This has the advantage that the tool can always be up to date for the current projects.

- **Knowledge Management**
  Another advantage of this tool is, that styleguides could be copied for new projects. For example, it is relevant if designers and coders are working regularly for the same brand with a constant corporate design.

4.4.6   Fifth Phase – Improving

Finally **quality checks and testings** help to improve products. A digital product has the requirement that it is improved steadily. If the product is online, also **surveys** with stakeholders like customers and users are helpful to figure out the details which need an improvement.

Quality Check and Testing

The quality check and testing tool provides the testing of web projects with the **simulation** of different devices (from mobile phones with a resolution of 320 pixels to large monitor resolutions of 1920 pixels) and different browsers. Another method of testing and checking the quality is the performance test. With input of the URL of the web product the tool is able to check the performance and to figure out weak spots like images with a high data volume or basic faults in source code. Additionally, the designer has to check the implementation according to design and architecture. If there are things to change, the designer can write all points on a **to-do list**.

- **Coordination and Cooperation**
  This tool can be shared with internal and external stakeholders like users or customers. These persons bring a high potential for good input for further improvement. The testing as itself does not take place in cooperation, because the individual opinion and perception is crucial.

- **Communication**
  This tool only needs possibilities to exchange testing results. All other agreements could be handled with the superordinated tools.

- **Awareness**
  The initiator of this tool gets notifications about new delivered testing results, but the other participations can not see the results of others. The initiator is able to give access to the results to selected users of the platform which have to work with the outcomes.

- **Knowledge Management**
  The results give important information for the current and for further projects. The results are able to trigger the learning effect of team members.

Surveys

To get more input for improving measures surveys help to figure out **possible weak spots** of web projects. The initiator can send the surveys to a large number of users in short time. Although the initiator of surveys has to reckoning that only a small number of users will fill out the survey, the results are mostly revealing. The tool as itself is building up similar to the interview tool of the second phase of the system, which includes the feature to create surveys. The feature is the same, but with different purposes, therefore the results should be stored in different phases and in different folders within the data management tool.

- **Coordination and Cooperation**
  The platform user is able to share surveys with external parties which are not registered on the platform. This makes sharing easier for all parties.

- **Communication**

  The communication takes place via transmission of the survey. If there is the need for more communication it is helpful to invite single stakeholders to a conference.

- **Awareness**

  The initiator of the survey gets messages from the system if there are new results from participations which are ready for evaluation. The participations have not the possibility to see other results unless the initiator gives the access.

- **Knowledge Management**

  The circumstances are similar to the knowledge management of the quality check and testing tool. The learning effect through the results is the important key aspect.

4.4.7 Trust Building Measures

The second chapter of this work figured out that the issue about trust within virtual teams is important and has a great impact on successful project results. To support the trust building within virtual teams it is important to build up a communication philosophy. That means that it is helpful to ask questions from time to time during the working day in form of *"How was your lunch time?"* or *"How is the weather at your location?"*. These questions are often stamped as small talk and superficial, but in the end such questions help to learn new details about the distributed team member and they are door opener for a well working exchange. (Iacono & Weisband 1997) Also work-related questions can support the trust building process. It is for every user a good feeling if other users need their consult. Also if managers are not happy to hear the following measure, to include fun talks via chat or during video conferences are very important. If there is a similar humour, the team members have the feeling to be on the same wavelength.

If virtual team members do not know each other, the kick-off meeting of a project can be used for introduction of participants. Additionally, all further meetings via conferencing tool could be also used for *Take-5-Talks*. (Ferrazzi 2012) The participants have 5 minutes to talk about personal issues like happenings in professional and private life. Thus the team members are able to find similarities. Similarities are able to build up empathy because if one has the feeling that there are connections to others, it is easier to know how they will react in situations and it is easier to understand the actions of others. According to Ferrazzi team building is also built with communal meals. Also if the situations are strange, it would be a good measure, also if the situation is at the beginning strange, if the team members eat together in front of the computer via video conferencing tool. Additionally, community features like timelines, private profiles and sharing of things which cover the own interests are a great help for trustful cooperations.

The communication between team members is the most important connecting element. Another important issue in this context is the regularity. The contact should be regular and often. Because if team members do not hear from each other, they have the impression that the other participator is not present and is not part of the project. Also the reaction on messages should happen in short time, so that no team lacking takes place.

A virtual team needs a leader for organisational tasks and a kind of mentor who moni-

tors the team activities during a project. But the most important measures for virtual, distributed teams which communicate via technical tools, is the allocation of responsibilities. The team members often have professional skills which they particularly distinguish. It is helpful to give the people responsibilities and power in this special fields, so that they are automatically counterparts for the others and a close exchange is the natural consequence.

4.5 Prototype

The following prototype completes the concept of the design-process-based cooperation system which is described in detail in the last sections. The solution approach is complex and has a depth across several levels. It is important that the user can reach all functions of the system on an intuitive way. Usability and user experience are the key terms. To elucidate the system concept an information architecture in the next section shows all levels and connections of all modules and elements. The information architecture gives information about the side map of the system, names all contents, shows possible navigation through the system and clarifies the order of all elements.

The last part of this chapter gives a visual impression how the system might look like. The subchapter about the interface design shows snippets of the system with a modern look and feel and a structured disposal. The following paragraphs include a first draft of a system prototype. It is not to understand as a final version which is ready for implementation. The screens show a possible direction as a basis on which can be built up.

4.5.1 Information Architecture

The information architecture of the system consists of two different levels with in each case five sections (coloured boxes). All sections composed of up to two levels (light and middle grey boxes) which then again offer detailed features (dark grey boxes) which support especially the aspect about the cooperation. One has to consider that only the most important features are listed. A more detailed information architecture would be part of further implementations.

The first level is composed of tools which support the general work of web designers. It is important that these tools are available at any time during the utilization. Due to the main purpose of the system – the creative work for cooperations in distributed working situations – the communication tool ranks first. For the communication there are three different methods available at the platform and every method is suitable for different purposes and different design-process-tasks. Furthermore, there are also other tools, like a calendar for coordinating appointments, a data management tool for all the shared files, a project management tool for an organisational cooperation and community features for trustful and casual interactions between users. The elements of these tools can be rediscovered in the tools from the second level.

The second level is especially created for the support of the design-process-based tasks of a designer. The user can build up the structure of a design project in five categories: Project start, analysis, creativity, implementation and improving. The sections include different solution approaches for the single steps of a design process. The tools of the categories in turn consists of several components with different cooperation features. The advantage of
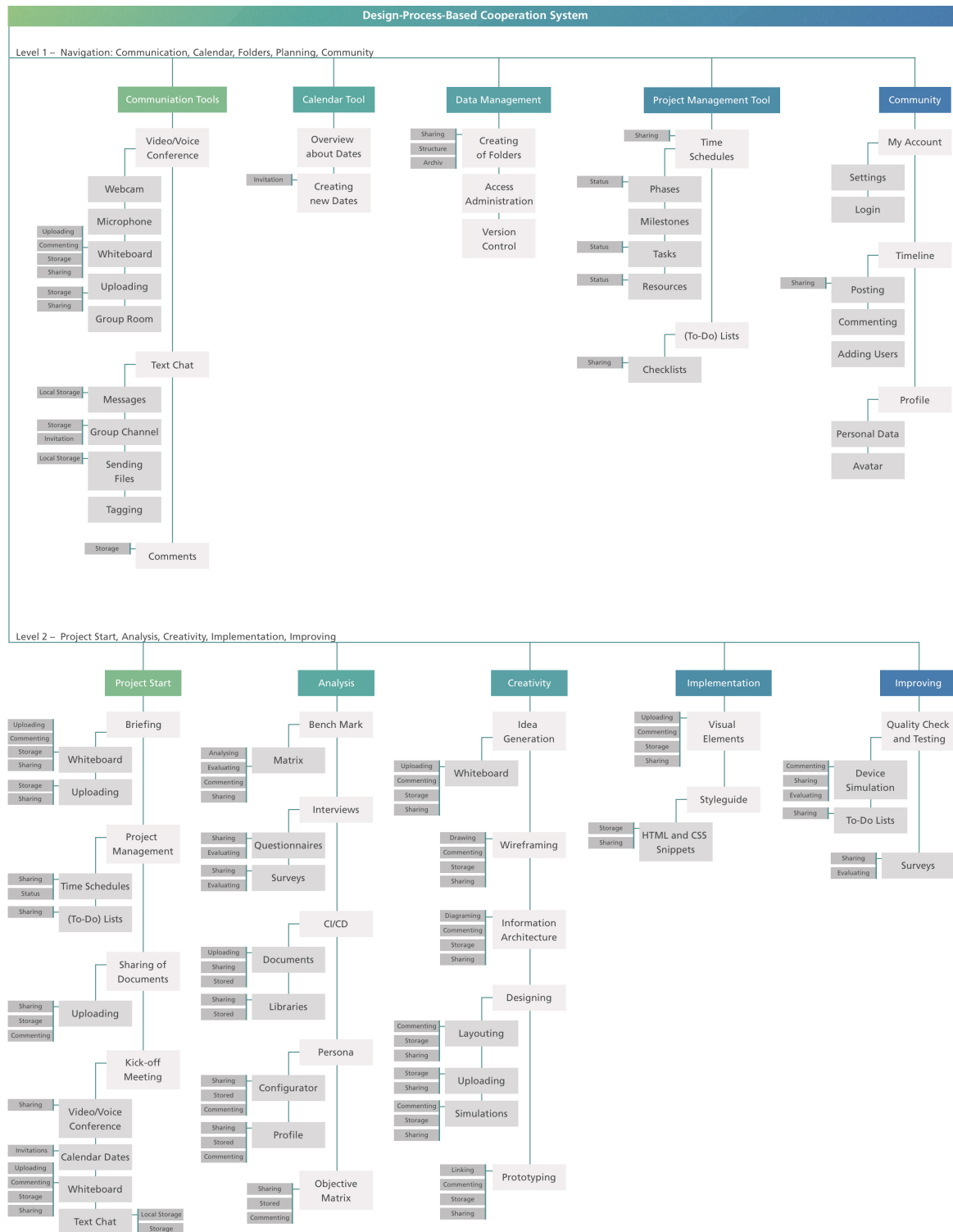
Figure 15: *Information Architecture of the System.* (own resource)

this structure is that the user is able to choose the tools which are best suitable to the current project. Additionally, also for the systems provider this structure is appropriated, because it is possible to add or delete tools if necessary. The provider is able to react on current requirements and proceedings.

4.5.2   Layouts

The following layouts show a possible structure and order of all elements of the platform. From a design perspective the layouts show more depth as wireframes, so that the imagination of the beholder can be stronger. The layouts are about the first stage and do not display the final solutions for all single tools. This would be the task for further elaboration which will go beyond this thesis.

The first page of the system respectively platform behind homepage with details about the provided offer and the login area (the layouts are placed in the appendix) is the dashboard of the user. The dashboard displayed relevant information for the user.
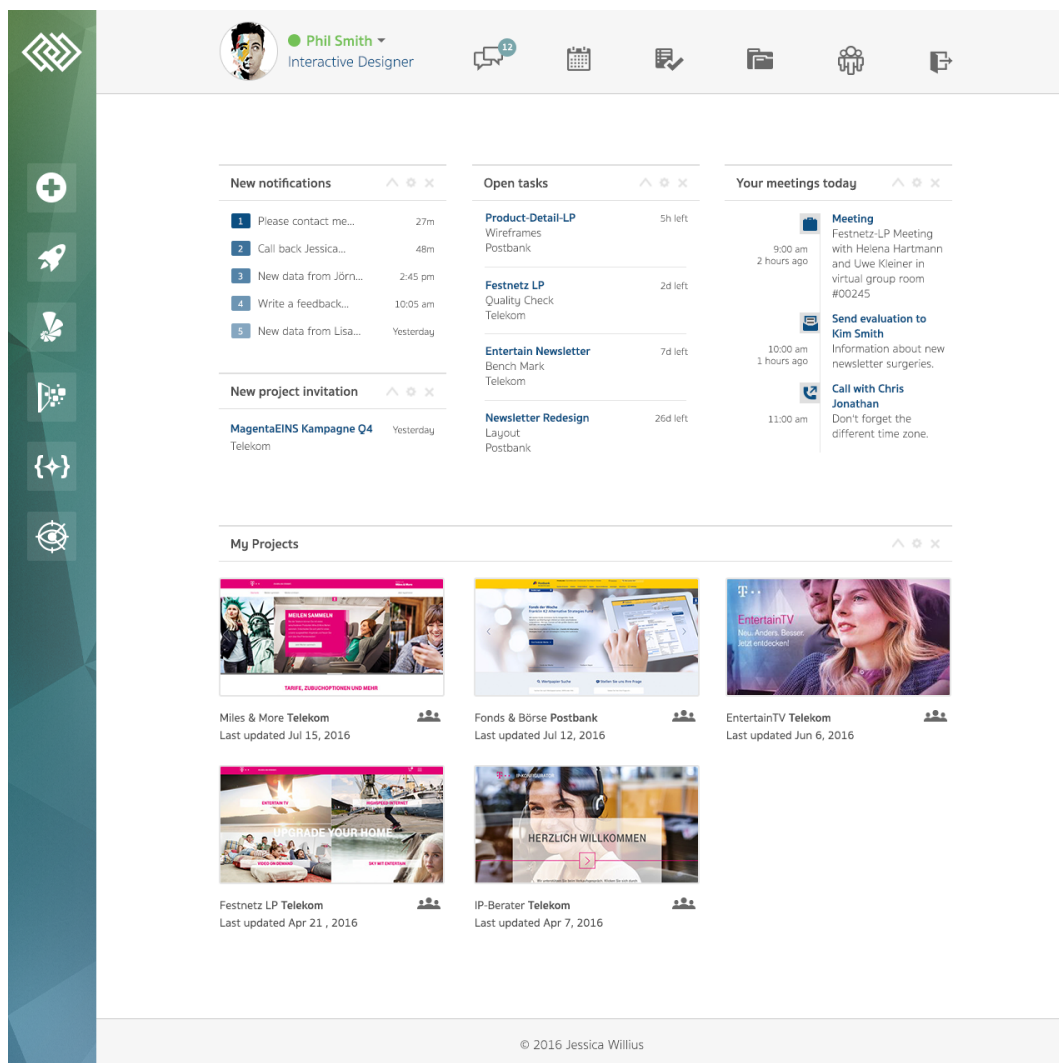
Figure 16: *Starting screen and dashboard of the cooperation system.* (own resource)

The frame of the platform consists of two areas for the navigation which is the same on all levels and all stages. The logo of the platform is placed in the left corner and is at the same time a navigation point which leads back to the first page of the system, to the dashboard of the user. In the top there is the main navigation with the display of profile avatar, name, job title and the online status of the user, the overriding tools and the navigation

point for the logout. All navigation points have a dropdown menu (examples are shown in figure 17) to reach the deeper stages. It is important that the user is able to reach these navigation points at any time while using the system. Therefore, these navigation points are prominently positioned. If there are new messages in form of text chat, comments or via conference tool, the user is informed through a small bullet at the navigation point which displays the number of new messages. Also the community menu point is marked with a small bullet if there are new events like new comments on the timeline. On the left side there is the second navigation bar. These points open respectively a layer to create new projects or to open and allocate new tools to already created projects. At the same time, it is possible to invite team members alternatively platform users. Otherwise, the starting dashboard is also an important navigation tool for the user. The user can reach all projects through the dashboard. An on the single tools are reached through the project detail-pages, so that the all tools are adjusted to the correct project and all elements are clearly arranged. The user is able to adjust the dashboard individually. Figure 16 shows a dashboard with the focus on notifications, open tasks and meetings of the day. The part about the current projects are a fixed component of this page.
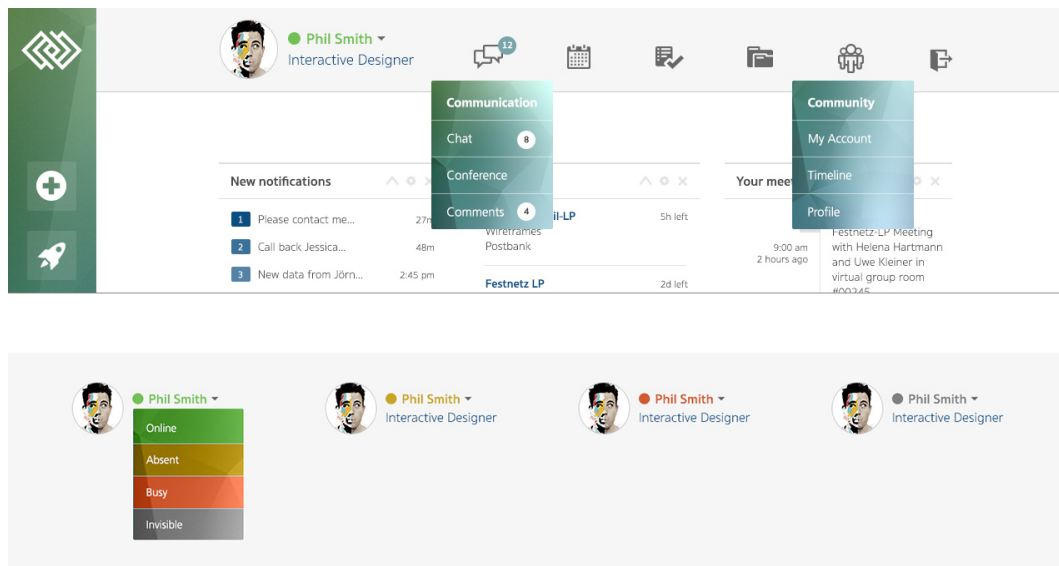
Figure 17: *Dropdown navigation and online status of users.* (own resource)

Awareness is an important issue at the platform, therefore an online status is placed always visible at the top. The user is able to select a status according to the current working circumstances. The system recognizes automatically whether the user is online, not online or not available due to the inactive mode of user's computer. Furthermore, if the user has a stressful working day it is possible to select the status by oneself. Options like online, absent, busy and invisible can be selected. The advantage is as a result other users can adjust their communication behaviour. If the working day is especially stressful it is possible to select the invisible status, so that other users think the user is not online, but on the other hand the user will not miss any messages. Thus the user is able to select important messages and can decide on which messages it is necessary to react on time and which messages have time to wait. This status should only be used in exceptional situations, because the most important aspect is the open communication, so that it should only be an exception to avoid communication.
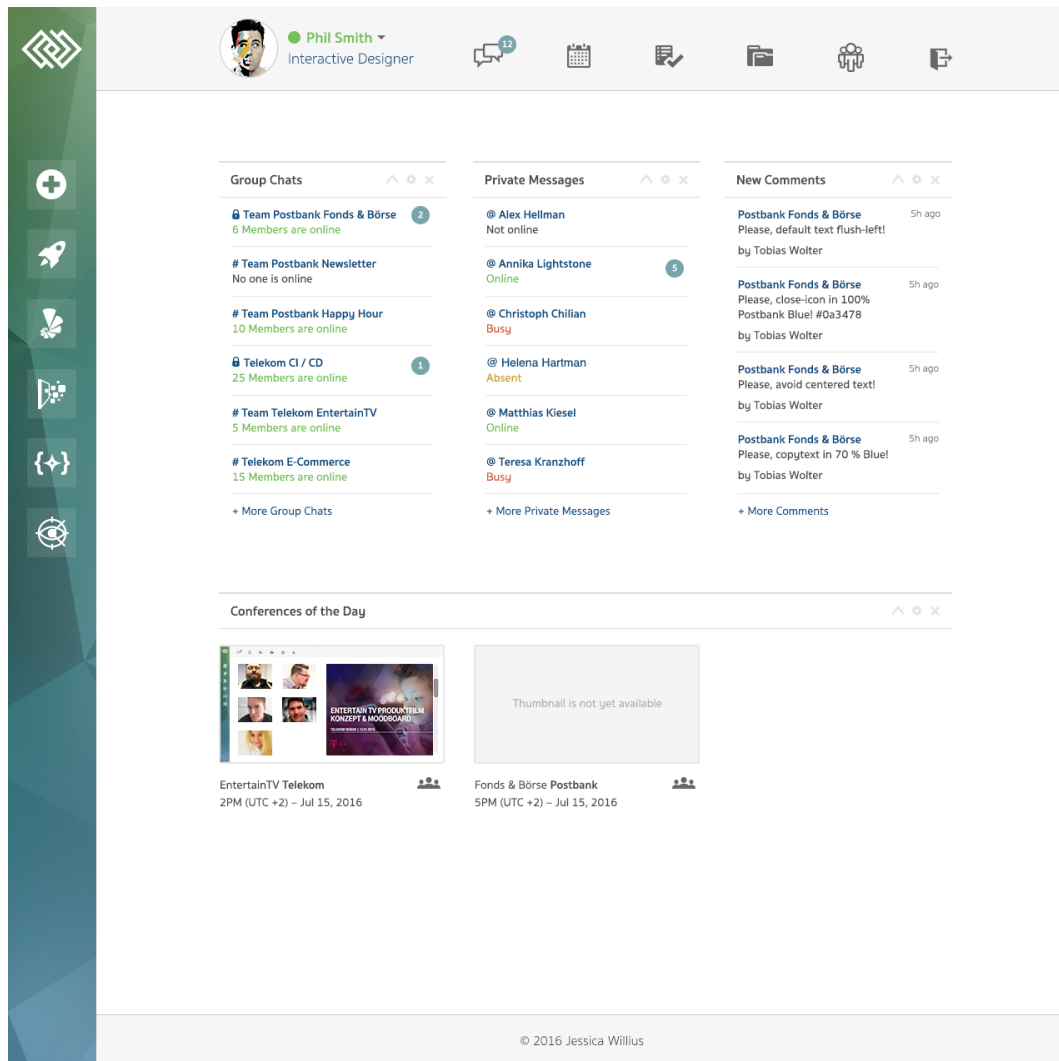
Figure 18: *Communication dashboard of the cooperation system.* (own resource)

Figure 18 shows the communication dashboard. Every dropdown menu from the top leads to the first point to another dashboard which shows an overview about all relevant information of the sector. The other point from the dropdown menus leads to the individual sections. The communication dashboard displays the newest group chats, private messages and new comments. New messages which were not already seen are marked. Via text links the user can reach the single chats on a direct way. In the lower area of the communication dashboard are current conferences displayed. This function is very convenient. The user can see all relevant conferences of the day for which the user has received invitations. These conferences which are proceed just at the moment are displayed with thumbnails of a current situation. The figure shows a typical situation where different users are streamed via web cam and a presentation is shown on the right side of the screen.

The next stage of the communication dashboard is a detail-page with all chats, comments or conferences. The detail-page of all chats is shown in figure 19. The chat tool contains private messages as well as group chats. The user is able to add new chats with other users or groups via text link. The visible chats in the left column are also clickable. The chat tool
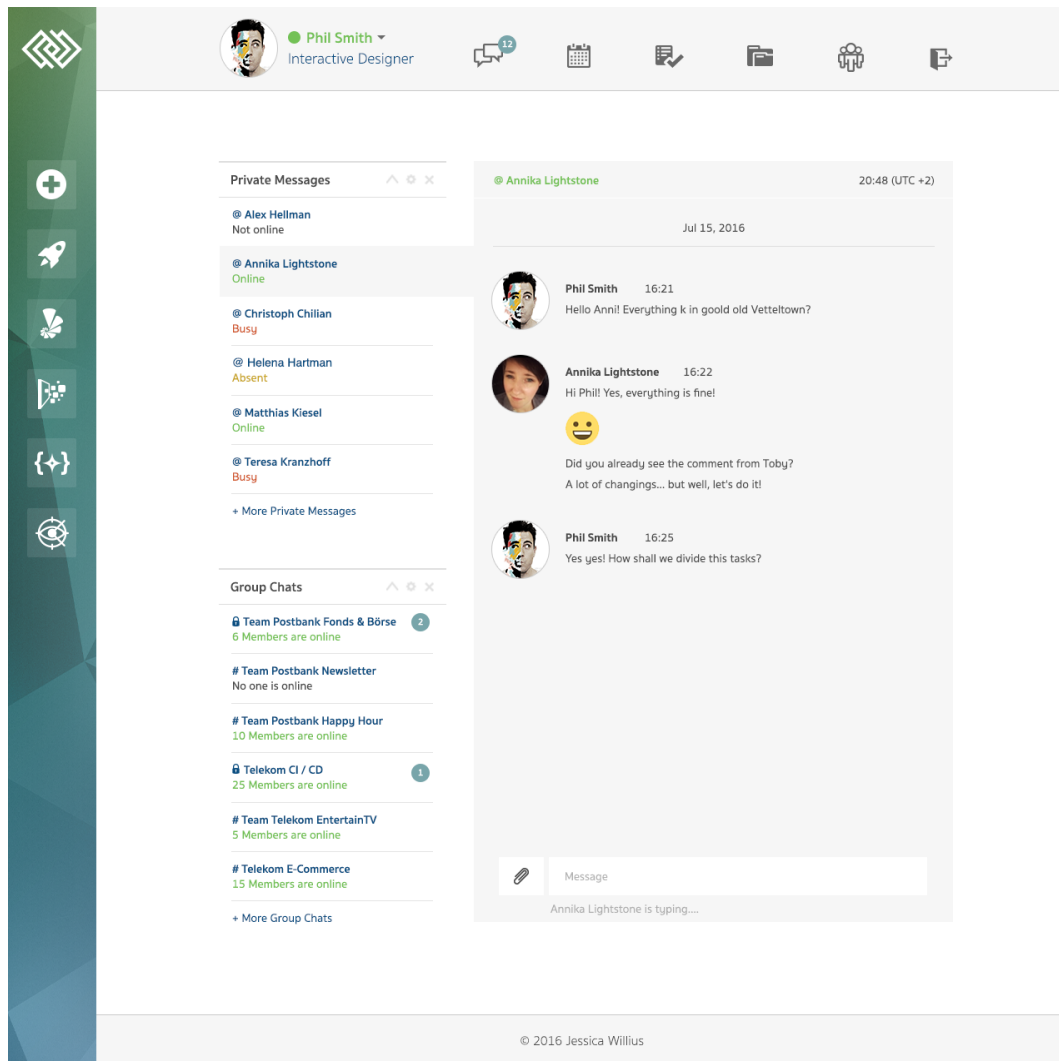
Figure 19: *Chat tool of the cooperation system.* (own resource)

offers a visibility of online status of all parties at different places. The issue about awareness is here very important, because the user can only communicate without hurdles if the user does not think there is nobody else available for exchanging information. the main feature of the tool is learned and well known. The conversations are marked with date and time. Also the time zone of the user is shown. This is helpful for communication with international colleagues. Another helpful, visible feature is the display at the bottom of the chat box, is the status whether the chat partner is typing respectively answering at the moment.

The following figure shows the layer for creating a new project. With this layer the user implements new project detail-pages where all details about the project are placed. The layer offers to assign a project name and to invite team members. At this time it is also possible at this point to select phases of the project (project start, analysis, creativity, implementation and improving) with the appropriated tools (like briefing, bench mark, wireframing and so on). But of course the tools can be selected at a later point of time if the plan is to the creating time not completed. To select tools at a later time the left sidebar is always available. If the user clicks on the button with the rocket icon, a layer will open with similar

options. The user can select tools of the respective phase, is able to invite team members to solve the tasks which have to do with the tool and it is of course possible to allocate the tools to an existing project.
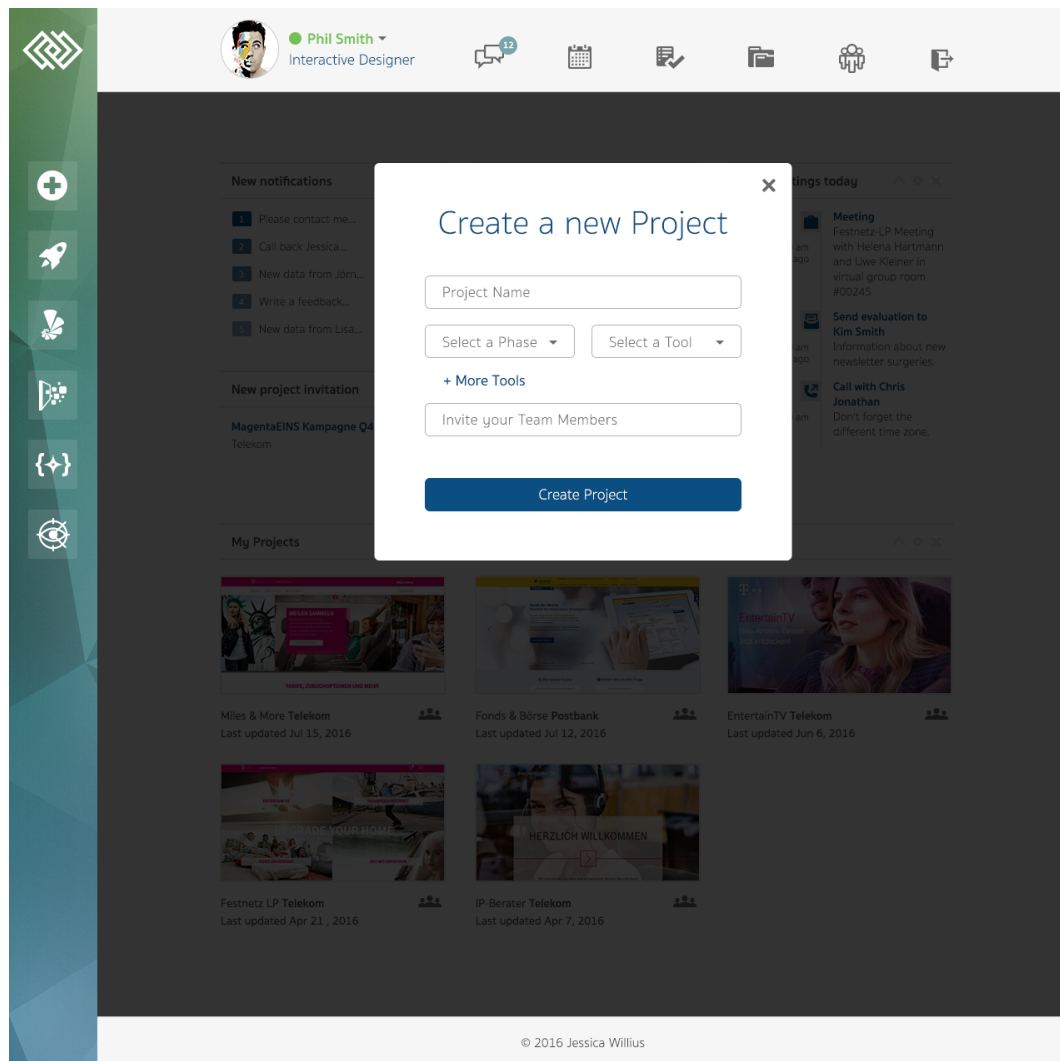
Figure 20: *Layer for creating a new project at the cooperation system.* (own resource)

The project detail-page provides an overview about relevant information of project elements. The user has the option to choose a picture for the header, which is also displayed at the starting dashboard. If there is no picture available, the system will create a thumbnail of already created tools. The selection will be arbitrary. Between top navigation and header there is a row with title of the project, date about last update and an icon which makes the list of involved team members available (this feature is also integrated at the starting dashboard in the part of the project list). Additionally, in the upper row is a status bar which shows in which extent the project is completed. Below the header there are all tools which are allocated to the project. The boxes are clickable and displayed thumbnails of the tool's content. On the right side is a column which is connected to the do-list tool of the project management section and shows with open tasks, with due date, short description and the team member who work on the task.

The structure of the system is overseeable and as possible flat. The user should have short

Figure 21: *Project detail-page of the cooperation system.* (own resource)

ways to the needed features. Of course, a new system always needs a certain time for the acclimatisation, and due to the complexity of the system, it is difficult to create a complete self-explaining structure. But all elements of the systems are easy to understand and easy to use, if the user has had a bit of time to achieve orientation. Additionally, due to the overall structure, that the user is able to choose the tools according to own needs, it is possible that arise new needs of the customers which demand new tools or new phases. Therefore, the provider of this platform always has to consider, that the structure has to be flexible and extensible. For further implementations it has to be tested whether the structure is suitable and support the needs of the users.

5 Conclusion and Outlook

Design needs passion and exchange. The Web sector brings new impulses for creative processes and from time to time, at increasingly shorter intervals, new opportunities. These new opportunities bring new requirements, new needed know how and especially new digital products which need to be defined and designed. These circumstances make the everyday work of a web designer very diverse and exciting. The web design job is connected with new challenges and uncertainties. The best way to respond to new challenges is to work closely together with other experts with different skills and experiences. Due to globalisation, the experts may be located everywhere in the world. For employers, it is often difficult to find the needed experts for different topics at the regional market. In the past, cooperations were often connected with business trips. On the one hand it has a great advantage if all parties get to know each other within a face-to-face meeting, especially valuable during early stages and kick-off. But these business trips are mostly limited in time and connected with cost-intensive travel and accommodation. Additionally, for employers it is also often difficult to offer such good conditions that experts from further away are willing to move the location. If one considers the ideal form of creative cooperation, it is clear that it is a great advantage to sit next to each other and to work in the same office. The team members are able to express their thoughts spontaneously and also interpersonal relationships can arise if the team members see each other five days a week. But current times demand more flexibility and the usage of technical support in form of cooperation systems. Although distributed cooperations are certainly considered a critical component, cooperations which are based on a virtual working environment have strong potential for projects where special skills are needed. Distributed working situations are also an important issue for companies with different locations that operate in an international environment.

Co-located cooperations have different effects on several professional fields and various team constellations. It is interesting to see which impact these circumstances have on creative cooperations. The creativity-aspect brings different hurdles than the other sectors. Creativity lives from exchange and is dependent on people to communicate with each other. Of course, every designer is able to create ideas by themselves, but innovative ideas always need different perspectives, backgrounds and meanings. Designers' work benefits from feedback and should always be seen from different views, with considering different requirements and wishes from principals and especially with the focus on the web sector also the view of the user is very important. Additionally, within an entire design process, there are many more stakeholders involved which have different impact on the various process phases. The examination from the second chapter figured out that the different design process approaches have a lot of steps and tasks in common. Some processes are more suitable for complex Web projects and others are suitable for projects with clear circumstances and requirements. With the view on current web projects, the more flexible processes for complex task descriptions move into focus. They are the most relevant approaches for creative distributed cooperation. Therefore, the structural requirements of a system which supports the work of web designers in a virtual environment are characterised through flexibility and adaptability. For an ideal support of web designers, it is necessary that a suitable solution will cover all single steps of a design process. Of course, it is not possible to provide a tool for every single task of the project, but it is realistic to create solutions for these tasks which are based on cooperations and are suitable for implementing within a virtual working environment.

The current market offers a wide range of web-based systems and tools for supporting web designers and other stakeholders of a design process. It is conspicuous that most providers only offer solutions for single tasks, like wireframing, prototyping or brainstorming. But a system which supports different tasks of the several steps of design process is still missing. The movement of the market clarifies that there is a strong need of such tools and a few providers currently work on enhancements for their tools. A good example is the platform *InVision App*. The provider started in the beginning of 2011 with a pure prototype tool with a lot of helpful features to create almost realistic click-dummies. In the last weeks and months the provider published a variety of add-ons. Thus, now it is possible to connect the accounts of the user with an application which allows the life streaming of working within the program Photoshop. Additionally, there are also solutions for brainstorming sessions in form of whiteboards and task-lists. Also the major software provider *Adobe* works at the Adobe Creative Cloud and plans adding several cooperation tools. These are all good indicators for the relevance of this issue and the need on the side of web designers. On the other side, through the analyse phase of this thesis, it becomes clear that the most important target group – web designers – often do not come in contact with cooperation system for supporting the distributed, creative work. The reason for this fact has not been discovered. The answers of the interview partners let suspect that the need for cooperation systems is existing, but that the available offer does not convince them or that they did not think intensively enough about the option of using such systems. This open question has to be clarified for further deliberations, because answers are able to show a direction to establish a design-process-based cooperation system successfully at the market.

The structure of the envisaged system outlined in chapter four is based on the outcomes of the second and third chapter of this thesis. The cooperation between web designers during the design process phases are the key aspects for the concept. According to the results of interviews, web designers set their focus on the most important processes which necessarily need cooperation-oriented measures, towards own experiences, at different phases. Also the examination of different design processes resulted in different emphases. The structure of the system shows that the most contact points of stakeholders lie in the starting and end phase of a project. The suitable tools for theses sections covered the most important tasks which are relevant for cooperations. The importance of the exchange during the creative process is the reason for the quantity of available tools. The creativity phase needs different options for creating, idea generation and presentation of results. Therefore, the system provides the most tools for this section, so that the creative process would be no hurdle for distributed cooperations. The other two sections, analysis and implementation are also important, but do not require cooperations necessarily in such a scope like the other three sections. The overriding tools for communication, project management, data management, calendar and community support the main cooperation separated from design-process-based aspect. Communication and the building of trust are the most important aspects for a successful cooperation. The communication problematic has, according to the concept, three solution approaches, video/voice conferences, text chat and comments, which are often already well known and established. The trust issue is more complicated to solve and is for sure a relevant issue for further examinations. There are also well established measures which have to do with a regular communication between all parties and an active exchange, but it has to be figured out, how these measures can be implemented in detail.

Considering the future and further examinations, it would be necessary to work out the details about the single tools. Additionally, it would be advantageous if parts of the system will be implemented as a beta version, to test the product at the market. The opinion of the users is very important and with the help of user tests, it would be possible to figure out which tools of the systems are relevant, which are only nice to have or which are completely superfluous. Usability tests and surveys with the focus of the target group needs are conceivable. The best result would be to create a design-process-based cooperation system which only consists of relevant tools which are easy to use and support cooperation and the creative work of web designers at a high level. The progress status of the introduced concept is seen as a first draft with the potential of relevance at the market. The issue would be more and more relevant for projects of the future, not least because of companies which consolidate with other international companies or because modern agencies have international customers. The reasons for more globalisation and distributed, virtual working situations in this context are numerous and versatile. The development of the current movement must be monitored can already be identified to the current moment, that major corporations will invest in own cooperation systems for their individual workflow, independent from the sector. Additionally, new technologies like virtual reality spark interest about the future. It is conceivable that designers work together with the support of virtual reality glasses like *HTC Vive* or *Oculust Rift* within virtual rooms where they are able to draw on whiteboards or to layout with suitable tools. The drawing on whiteboards in cooperation with other users is already possible with the *HTC Vive*, so that the way to more complex design tools is not so far away. One can be in eager anticipation of what results are developed and produced in the future.

6 Glossary

The following paragraphs inform about the definition of important technical terms which are used in the thesis and are to be understood in the whole as a reference book.

Awareness

Awareness deals with the activities of another group member in a common field of work. It makes the coordination easier and allows the cooperation. Awareness is relevant always where a common field of work is used for the groupwork. This applies above all on the system classes *common rooms of information* and *workgroup computing*. The parts of awareness are knowledge about the information objects (which objects are new, old and which were extinguished), knowledge about changes of information objects and knowledge about persons who work with the information objects (who works with who and who is active online to the current time). The advantages of a good working awareness within a group is that all persons are up to date about group activities and that they are able to make decisions in regard to own activities. (Markopoulos & Mackay 2009)

Awareness Cues

Awareness cues, also called computer-mediated cues are indicators for reflecting the habits and actions of group members of a virtual team. Awareness cues also give exposure about locations, intentions and active commitments. The cues come in different appearances. (Oulasvirta 2009)

Briefing

The term Briefing described generally a short installation (brief consultation) with the most important elements before an important event. It consists of a short summary of a subject or subject area, a report of all essential facts. Who would like to provide a good briefing, who should know which information and facts are important and which are secondary. In the context of offer inquiries at web agencies one understands by a briefing the written fixation of the demands of the customer. The briefing is a sort of demand catalogue, or instruction list to the web agency by which the single orders can be better estimated quantitatively and qualitatively. The base forms the marketing strategy which fixes in general which products at which markets with which methods are offered for which target groups. Additionally, it describes the specific setting of tasks and contains information about competition, competitive advantages, developments as well as the schedule and budget plan. (Spies 2015)

Computer Supported Cooperative Work – CSCW

CSCW denoted the cooperation in teams with help of technology to the fulfilment of a common task. Above all communication, coordination, organisation, making of decisions within the group and the common treatment of objects are supported. CSCW deals with the question how the cooperation of teams at work can be supported by information technologies and communication technologies suitably to increase the efficiency and effectiveness of the cooperation. (Randall & Salembier 2010)

Crowdsourcing

From the terms *Crowd* and *Outsourcing* compound the term *Crowdsourcing*. It is a web-based form of labour division. The single duties which were worked out internal up to now are "outsourced" to a huge number by users or prospective customers and are often explained in the form of a competition. This mostly take place in the form of a call on an Internet platform on which the users can co-operate voluntarily – and often free of charge. The main difference to social machines is the level of interaction between social and technical parts. Besides, the job can refer on an innovation or, however, already existing surgical activities or products. (Shadbolt et al. 2013)

Design Thinking

A special approach is understood by Design Thinking for the treatment of complicated problem formulations. Besides, Design Thinking is at the same time a method, a set in principles and a process with a huge number of supporting tools. Essential sign is the focused user orientation. Design Thinking is based on some basic signs or principles which are often summarised under the terms: Team, Process and Space. The process steps of Design Thinking are in the literature, the university education and in practice not uniformly defined and differ according to resource slightly of each other. The process by Stanford University from 2010 forms the basis exemplary with the following contents: Empathize, Define, Ideate, Prototype and Test. (Plattner 2010)

Groupware

Groupware could be software, hardware or services to support teams via technical solutions to solve working tasks. Main differences to other software is that groupware illustrate the presence and availability of all group members and give the choice to all members to stay in contact. Through groupware could arise awareness of all parties within the virtual room and gives information of activities. Also the group membership can be strengthened, so that every member has the feeling to belong to a group. Groupware could have several and diverse characteristics, because of different group constellations, purposes and requirements. Therefore, an important quality attribute of groupware is the adaptability. (Grudin 1994)

High-fidelity (hi-fi) Prototyping

High-fidelity prototypes are characterised by a very detailed illustration of the design concept. The prototype shows almost the entire functionality and gives an overall impression of the product. Such prototypes are effective but expensive and need much time for implementation. (Egger 2000)

Kaizen

The Japanese concept Kaizen calls the striving for permanent improvements in the achievement production process as well as concerning the achievement result. In particular, small, well dominating improvement steps are aimed. Kaizen is a basic setting of an employee to the own work, to the job and to the quality of expiries and products. Who lives the concept, is firmly persuaded, that it is always possible to improve something. It is no method and no tool, but a way of thinking which all employees should internalise and realise at their activities. (Imai 1986)

Low-fidelity (lo-fi) Prototyping

Low-fidelity stays for a simple and fast transmission of complex design concepts. The prototypes could consist of cardboards, drawings on papers or post-it notes. The method is economical and implemented easily and quickly. (Egger 2000)

Look and Feel

The concept Look and Feel is often used to describe originating perception impression in case of first-time consideration of a website. This first impression determines whether a visitor makes the decision to deal closer with the shown contents or not and is decisive therefore for the success of every website. (Spies 2015)

Media Richness

The media richness theory connects the choice of media with the task of the designers which they want to solve in cooperation. The choice depends on circumstances and the characteristics of the medium. Additionally, the theory divided tasks according to uncertainty and equivocation. Uncertainty tasks can be solved if all information are available. Against it, equivocal tasks cannot be solved although if a lot of information are figured out. It is helpful to use media with a high level of information for the equivocal tasks. For uncertainty tasks are rich media, like meetings, more suitable. The richness of a medium depends on the number of channels and their informative content, on personality of communication and on variety of intermediatory language. The better the media suits to the tasks the better will be the result and effectiveness of the team. (Daft & Lengel 1983)

Project Sign Off

The Project Sign Off is a document which is shared with the customer or principal during the last phase of the project, if all results are fixed. The document gives information about the accordance between initial briefing and the final product. Furthermore, the customer or principal give the agreement that all results are satisfying and reach the goals. (Design Council 2005a)

Style Guide

A style guide contains all relevant design elements of a brand. These fixed elements serve as directives and determine how certain print or digital products have to look. The aim is that products should be perceived as related to each other and if necessary be associated with the linked brand. (Spies 2015)

Team

A team is a special form of interacting groups and can be also defined as a small group by people to complement abilities to each other and to be involved in a common thing, common achievement aims and a common deployment of labour and to take mutually responsibility. The members of a team need the following similarities:

- Common objective

- Common performance measurements

- Complementary abilities

- Suitable composition

User Experience Guidelines

User Experience defines all experiences of the user with a digital product before, during and after the use. The design, functionality and achievement signs of the utilization have impact on the user's experiences and therefore also impact in the success of the product. (Spies 2015)

User Journey

The journey of the user means the behaviour and handling of the user in connection with a digital product like software or website. Important is to figure out how the user interact with the digital elements and how could this influenced by certain designs, orders or information architecture. (Spies 2015)

Virtual Team

Virtual teams are goal-oriented and have the purpose to fulfil tasks which need special knowhow from experts, which are not collocated on-site. Virtual teams often work together only for a shorter period, (Jarvenpaa et al. 1998) what make the team building difficulty. The characteristics of this type of teams be composed of (Huang & Lambotte 2010, cf.)

- Open network organization

- Temporary team affiliation for the term of a project

- Locally separated team members

- Main communication and social interaction takes place above technical ways

- Time zone, place and cultural background are the differences between team members

7 Appendix

7.1 List of Design Tools for Distributed Teams

The following list gives an overview about current design tools which include more or less many cooperation elements. The purpose of this list is not to show all products at the market. The list shows relevant tools to give an overview for demonstrating that the issue about design tools for distributed teams is very topical and important.

Antetype:
High-fi Design, Applications, Responsive Design, Interactive Prototypes
http://www.antetype.com

Axure:
From Sketchy to High-fi, Responsive, Interactivity
http://www.axure.com

Balsamiq:
Desktop and Web-based, Sketchy Wireframes, Linking of Screens
https://balsamiq.com

Basecamp:
Scheduling, Commenting, File Sharing, Message Boards
https://basecamp.com

Cage:
Prototypes, To-Do Management, Commenting
http://www.cageapp.com

Conceptboard:
Prototypes, Project Management Tools, Commenting, Whiteboards
https://conceptboard.com

Concept inbox:
Prototypes, Feedback Features, Commenting
http://conceptinbox.com

FlairBuilder:
From Sketchy to Low-fi, Interactive Prototypes
http://www.cageapp.com

FlairBuilder:
From Sketchy to Low-fi, Interactive Prototypes
http://www.cageapp.com

Flatsies:
Sharing Concepts, Linking Screens, Commenting
http://flatsi.es

GoVisually:
Sharing Designs, Feedback Features, Commenting
http://www.govisually.com

HotGloo:
Web-based, High-fi, Responsive, Interactive Prototypes

`http://www.hotgloo.com`

Invision:
Linking of Screens, Live Sharing, Whiteboards, Commenting, Versioning
`https://www.invisionapp.com`

iRise:
Prototypes, Database Connection, for large companies
`https://www.irise.com`

Justinmind:
Linking of Screens, Low-fi Wireframes, Web-based
`http://www.justinmind.com`

Marvel:
Responsive Design, Prototypes, Communication
`https://marvelapp.com`

Marvel:
Responsive Design, Prototypes, Communication
`https://marvelapp.com`

MindMeister:
German Language, Mindmapping, Presenting Mood, Project Management
`https://www.mindmeister.com/de`

Mural:
Whiteboards, Idea Finding Tools, Commenting
`https://mural.co`

Notism:
Prototypes, Commenting, Live Time Communication
`https://www.notism.io`

OmniGraffle:
Static Wireframes, only for Macintosh
`https://www.omnigroup.com/omnigraffle`

Pencil:
Low-fi Wireframes, Linking of Screens, Diagrams, Open-Source
`http://www.pentotype.com`

Pentotype:
Drawing for iPad and graph tablet, Linking of Screens, Commenting
`http://www.pentotype.com`

Pidoco:
German Language, Sketchy Wireframes, Interactive Prototypes
`https://pidoco.com`

Pixate:
Application, High-fi, Animations, native Prototypes
`http://www.pixate.com`

PowerMockup:
PowerPoint-Plugin, Wireframes, Widgets

`https://www.powermockup.com`

Proto.io:
Application, Wireframes, Interactions und Animations, Commenting
`https://proto.io`

RedPen:
Showing Designs; Feedback Functions, Commenting, Versioning
`https://redpen.io`

Solidify:
Linking of Screens, Commenting, Remote Testing with Analysis
`http://www.solidifyapp.com`

Trello:
Project Management, Checklists, Communication
`https://trello.com`

UXPin:
Interactive Prototypes, Templates and Patterns
`https://www.uxpin.com`

Visio:
Static Wireframes, Part of MS Office
`https://products.office.com/visio`

Wireframe.cc:
Static Wireframes, Web-based, minimal Interfaces
`https://wireframe.cc`

7.2 Interviews

The following paragraphs include the more detailed answers of the five interviews. Each designer answered 11 questions. The evaluation and summary of the interviews can be found in chapter *3.4 Interviews about Needs of Web Designers*.

7.2.1 Interview Partner: André – Web and Motion Designer

André is 25 years old and has more than 5 years working experience in an Internet agency with overall more than 80 colleagues on two locations in Cologne and Bonn. He creates animations, program websites, is able to layout designs and is an expert for virtual reality.

How important is collaboration within a design team?
It is very important. Without one does not get to the desired results. The people have to talk with each other, have to exchange ideas and have to inspire each other. With collaboration the best ideas start. But positive results are not limited to ideas, also products benefit from teamwork. The exchange is also responsible for the fact that people scrutinize thoughts and that they proceed with thoughts in a different manner.

How relevant are distributed working situations at the current time in the design sector? How relevant is this form of team especially for your working situation?
For me and my work this form is not really relevant. Unfortunately. But this concerns

only me personally. For others in the company it is different. The system is important for companies, because they do not need to restrict themselves due to the regional employment market. One is flexible which concerns the competencies of the employees and one have the possibilities to work with other talents from all over the world. Due to the close networks this form is good to implement. I know this form primarily from game developer who build on talents from all over the world.

Do you have experiences with distributed design teams? If so, what went well and what wrong?

I am working together with external motion designers from time to time. In the beginning of a project one meet for a first to get to know each other and to get an impression of the working style of the external team member. Face-to-face meetings are not always necessary but were, nevertheless, helpful. After this kind of kick of meeting we worked on different locations due to organisational and distance issues. The presence of the other designer was not absolutely necessary and the work on separate locations was more efficient on the basis of organisation and journey. The cooperation went well without bigger problems. The communication through phone, Skype and mail worked well. To clear things, we used screen transmission tools like TeamViewer. In certain distances we have exchanged our results of working, have improved mutually and at the end have delivered a harmonious final result. I can report nothing of negative. But of course this goes not always in such a way. This depends of course on the people and personalities. But in such situations one must expect that the people are professional and get engaged with the situations.

In which phases of design process are collaborations especially importantly?

It depends on the working method of the team. If one developed a product, then I have the opinion, that too many cooks spoil the broth. It is more helpful to search the exchange after creation of ideas, for example during the development of prototypes or for final testings.

What are your key elements for a well-integrated team?

To be a team player. The people have to be open for team work. As next, clear areas of responsibility and competencies should be clear defined and distributed. But the people should not be focused too much on their competencies and working areas. Team members should be open for feedback. It is important that the people communicate with each other but I assume this. Trust is another important point. Furthermore, it complicates the work, if one is not on the same wavelength, or opinions and tastes are completely different. Overall in the design sector, where it is about design questions and ideas, it is important to speak the same language.

What is with the communication within teams? Which ways are common for you? What went well and what wrong?

Close agreements are important. The worst cases that could happen, are misunderstandings through lacking communication. The mistakes which could be prevented, actually originate from it. This happens here often with project managers who lose the overview about the project and decide then independently.

How does the perfect virtual team look for you?

The best people from the whole world are gathered at a virtual table. However, this is

always depending on the respective project or product which has to be developed.

What collaboration systems do you know? What systems do you use for your everyday work?

Rocket.Chat is a communication tool and helps me the everyday work communication with other colleagues. Otherwise regular e-mail and the company internal Wiki. But I do not use a tool which covers everything, but rather many small tools, as for example Skype or TeamViewer to ensure more complex virtual meetings. Additionally, the tool TeamViewer is convenient for screen sharing and to make notices during virtual presentations.

What technologies did you know or use, which support the creative work of web designers?

I know Invision, but do not use it. I am using Adobe libraries together with my colleagues, but I do not create new content with the purpose to share this new stuff. Otherwise I do not know or use other systems which support the creative process.

What kind of technology do you miss in connection with distributed working situations?

I was actually satisfied like it has run up to now. On the one hand, it is convenient to have a lot of small tools, because a large system means that there are automatically limits. And usually systems have weak spots. On the other hand, a large system which covers all relevant needs is very helpful, because all team members have one platform and the ways of communication are clear. There are no misunderstandings about which channel is used for which kind of information. One guarantees that the system functions with the individual computers and everybody in the team uses the same system. A given frame of a system, besides, can be also positive, because one can concentrate thus upon process phases which are really relevant.

If you could create the perfect collaboration system for creative design processes, which elements are important?

In principle, to outline roughly it should unite different tools... Trello, Skype, TeamViewer, Dropbox, Invision, ticket systems. It is important to have the opportunity to make notices, to clarify circumstances via polls, managing of tasks, creating prototypes and the possibility to save everything within a cloud like Dropbox. Then still the option to talk about things live for a synchronous exchange. Additionally, also important are feedbacks, roadmap manager with meeting function and a voting system. When I think about it in more details, than I can give you a long list with more and more ideas and needs.

7.2.2 Interview Partner: Garry – Motion Designer

Garry is British citizen and 45 years old. He is a 3D Designer and works in an Internet agency in Bonn with a second much smaller location in Cologne. Garry has over 20 years job experiences and creates beside 3D animations also websites and digital ads. Furthermore, he has experiences in developing concepts for creative online campaigns.

How important is collaboration within a design team?

Very important. Collaboration gives me input, other views and opinions from other people.

Maybe you get insight into other areas, one has not thought up to now. Other angles and other perspectives. Furthermore, one can work faster. Group dynamic is an important keyword. And working in a group is more fun.

How relevant are distributed working situations at the current time in the design sector? How relevant is this form of team especially for your working situation?
I am a fan of cooperation at one place and of a face-to-face communication. The best way is sitting together. But of course, remote working could work, but the cooperation could be very stiff. If the team is sitting in one room the cooperation could be more spontaneous and one could drink a cup of coffee together and thereby create new ideas. The entire process is more fluid. More organic. On this way teams can develop. We had a survey last week at work, if I want to work at the other location of the company in Cologne. I live in Cologne and the way to work every morning and evening would be much shorter, but I do not want to work there. Here in Bonn is my team. During the design process there are phases where it is not necessary to work with other colleagues, but basically the cooperation is very important. On the other hand, there are good reasons for distributed working situations. For example, if you need the skill of an expert who is living in another city. In this case it makes sense. From the view of the employer it makes sense. If there are no other options, the digital communication is very important and there is the chance that it works well. But it should be always the second solution. Only if the expert could not be on site. Another good reason for work from home office is illness. But, well, on such days you should not work actually at all. But the real life is different.

Do you have experiences with distributed design teams? If so, what went well and what wrong?
Yes, we made in cooperation with Ford a touch screen project. We worked with the Ford team in a distributed situation, because their office was in London. Here in Bonn we created the concept and did graphical groundwork for the team in London. This was a very successful project. We communicated via mail, phone and Facetime. In the beginning and in the end of the project we had a face-to-face meeting. For such a team it is important to know each other. You have to know how the others work and think and have to know what kind of types the other team members are. So you have a better understanding for decisions made by the others. I already knew one of the designers from London. This was a great plus for our cooperation. For example, if you have time pressure it is easier to understand the other team member if there is not the time for much details of explanations. Furthermore, it is an advantage for avoiding misunderstandings and displeasure.

In which phases of design process are collaborations especially importantly?
It is important during the concept and defining to work together. But before, kick-off meetings are very important. If after the concept everything runs and the direction is clear, and one knows what designs must be provided, then one can provide the layouts oneself. Only afterwards one have to collaborate again for aligning.

What are your key elements for a well-integrated team?
Talking, regularly talking. Fun and an easy feel to get an unburdened everyday life. So that one can say at the end of the day "I have had a great working day!". The tasks should not be complex and difficult. It is much better to enjoy the tasks, otherwise the mood will be

at the bottom of their socks.

What is with the communication within teams? Which ways are common for you? What went well and what wrong?
Through text messages can arise misunderstandings quickly. Face-to-face communication if is still the best method for communication.

How does the perfect virtual team look for you?
A good mood! Regular contact! Short feedbacks about state, so that all parties are involved and up to date. If problems arise it is important that all team members get the information about it. All team members should know the current state and should know all working details about the other team members.

What collaboration systems do you know? What systems do you use for your everyday work?
WebEx, this is a video and screen sharing software. Facetime, Skype, and an online conference tool by the Telekom. The last tool has the advantage that you are able to invite a lot of people. I know InVision, but I do not use it actively. Then we are using Rocket.Chat. Oh, it was at the beginning difficult for me. The interface was confusing and not well structured. I have already overlooked news. But meanwhile one has got used to it. But WebEx is also not bad. It functions perfectly, with a good quality. The advantage is that other users can interoperate with the screen and for example are able to paint on it. One can make notes and one can these save from the programme.

What technologies did you know or use, which support the creative work of web designers?
We create JPGs or PDFs for the agreement, or we upload our 3D animations as video files on a private YouTube channel, so that the customer can give feedback. Otherwise the communication runs a lot through mail.

What kind of technology do you miss in connection with distributed working situations?
Start Track Beaming! That's all.

If you could create the perfect collaboration system for creative design processes, which elements are important?
Video Conferencing are practical. But even better would be a Virtual Reality binding. Then one has the feeling one is present directly. And one can provide different rooms for drawing, presenting etcetera. And one can properly meet in virtual rooms.

7.2.3   Interview Partner: Lisa – Web Designer

Lisa is designer with the focus on web products, but also print products are part of her everyday work. She works in a company with 15 other colleagues and two locations in Cologne and Mannheim.

How important is collaboration within a design team?

It is very important, because often one comes to a point within a design process where it is difficult to get to results by oneself. Ideas by other colleagues can be a great help. Even with small subordinate clauses one can deliver new impulses.

How relevant are distributed working situations at the current time in the design sector? How relevant is this form of team especially for your working situation?
In general, it will be more and more important. Personally, I find it more pleasant if one is not distributed so far of each other. If one is sitting next to each other it is easier to show sketches or to discuss other things. Of course, it is also possible to handle these things through digital tools, but it is different.

Do you have experiences with distributed design teams? If so, what went well and what wrong?
I work for a company with two distributed locations. The positive thing is that we can support each other without loosing the focus for our own tasks. At the beginning our procedures were different. We did the work from our location for the colleagues in Mannheim and neglected our own projects. If we are in exchange now, we elaborate the tasks in cooperation at one of the two locations. This works better than before. But of course, it is not the best solution. We are still searching for solutions, that both locations are able to cooperate in better way. Agreements and committals do not work well. I believe it has to do with the unorganised processes and that we have no kick off meetings or such things. Another big problem is, that only the project manager is talking to all parties. But through this communication style a lot of information are lost for people who are in holidays, ill or not available at the moment. For example, if people are one week not at their working place they will miss important news. There are also no mails to all the employees and no meetings where all parties are sitting at one table. This are points which we try to improve. And sometimes I think that it would be better, if all parties use technical communication channels to exchange information, to discuss and so on. This is a possible step in the right direction.

In which phases of design process are collaborations especially importantly?
I cannot answer this exactly. Sometimes it is important to talk about ideas at the beginning. If one starts for oneself and acts according to his own gusto it is risky to go in the wrong direction. It is important to agree the ideas with others which have another view on the thinks. Later during the process, it could be important to discuss details.

What are your key elements for a well-integrated team?
I find faithfully criticism very important. It doesn't achieve anything if one says that everything is nice. One has to be critical as a colleague, because one does not create for oneself, the result is for the customer. It is an advantage if another colleague has a look at the own work, because it is possible to loose the focus. An important rule is, the person who gets the criticism may not be in a huff. Furthermore, it depends of the project. According to project I find a clear distribution of roles useful. For example, a project manager who has the view about everything, so that the designer is able to concentrate on creating without additional tasks like customer communication.

What is with the communication within teams? Which ways are common for

you? What went well and what wrong?

We are communicating via mail, phone and face-to-face. If we do not make progress through calls, we go in the next office to the respective colleague. Mail works well, but sometimes the circumstances are not described correctly or detailed enough. Than we have to ensure, that the persons with a lower level of knowledge get all relevant information. We do not use chats. But sometimes we use sticky notes.

How does the perfect virtual team look for you?

So, if we talk of virtual teams, then there should be a platform, where all team members are able to cooperate. It could be like a forum for exchange. Where one can look at written notices. A place where the members can discuss about designs, therefore there has to be virtual solutions to show the own creations to the others. We do not use such tools. But if such a system would really exist, it should be so simple as possible with a good usability. For this concept all parties have to be open for this working situation. They should want to use such systems. Constructive, active cooperation is there the headword.

What collaboration systems do you know? What systems do you use for your everyday work?

I know communication tools like Skype. Team Viewer is sometimes used but within design processes we do not use these systems.

What technologies did you know or use, which support the creative work of web designers?

I do not know such systems but it is interesting to think about this options for the future.

What kind of technology do you miss in connection with distributed working situations?

Shared screens are a nice option, to see what the other team member is doing at the moment, to give feedback for improving. Now spontaneously only this occurs to me.

If you could create the perfect collaboration system for creative design processes, which elements are important?

Screen sharing, as already mentioned. To see other screens. Another convenient feature could be to have access on other screens to show the other team member something in a program like Photoshop or to work together on a design. Additionally, something for the communication. Maybe a chat is convenient for fast agreements. For complex thinks with more details would be a kind of forum a good idea. For uploading and sharing pictures. I do not know if there are other forms, but something in this direction would be convenient. Maybe a display about the team capacity. And sometimes there are also processes where one begins with a briefing. It would be helpful to know, at which point the project is to the current time.

7.2.4 Interview Partner: Tijen – UX Designer

Tijen is 28 years old, and has more than fife years working experience. She worked in an agency in Cologne covering the online and print magazine sector. The company has a second location in the Turkish city Izmir. Tijen works there as a art director and is responsible for

parts of a digital magazine.

How important is collaboration within a design team?
Very important. One has to be able to harmonise with each other. The team must be suitable. If the team does not harmonise it will be exhausting. During the project there are often problems with things like the customer or project phases. In this situations it is not conducive if also the team itself is problematic. One must not be close friends but one has to be on the same design level.

How relevant are distributed working situations at the current time in the design sector? How relevant is this form of team especially for your working situation?
Because I work twice per week still for the location in Cologne and I always communicate about email, WhatsApp and phone. The good thing is, that they know me. The colleagues in Cologne know me, because I worked there for two years. The cooperation via technical tools is easy because they know my working style and my design style. It would be more difficult if we did not know ourselves. I mostly get a briefing and a deadline. And then in this period I create the designs. Therefore, it is very relevant.

Do you have experiences with distributed design teams? If so, what went well and what wrong?
Yes, I have such experiences. It is easier, if one is sitting together with colleagues in the same office for agreements. But on the other hand, it is also easier to work in a distributed working situation from another view. If I am sitting in the same office, then all colleagues have an own opinion to a design and gives feedback in form of "Please take that and this two pixels to the left, and this more to the right." or "Oh no, please choose another picture." But if I am working far away in another office, the agreements work well via mail or phone and the feedbacks are not so detailed. On the one hand it is negative with the view on quality, but on the other hand, if three persons have three different opinions about a position of a button, it is clear that the feedback is time-wasting. And these situations are avoided through the agreement via phone or mail. Another negative point is that I sometimes have no Internet because of electricity cut. This is ordinary for Turkish circumstances.

In which phases of design process are collaborations especially importantly?
In the final phase. Shortly before implementation. The communication is much narrower there and more frequent than at the beginning. If one is at the same place, we have once the week meeting. If we have stress, we help ourselves mutually. This is loosely and gives pleasure. This is loosely and gives pleasure. And at the end the cooperation is also enormous.

What are your key elements for a well-integrated team?
Harmoniously, structures. There the German in me breaks out. I still spin here in Turkey. One must work after a plan and keeping times. Milestones! What we have learnt during our studies. I never would have thought that, but one needs milestones in the real life. Plans are very important to me. Being disciplined, punctuality! Here in Turkey I have experienced already things... incredible! We do not only have one to two-hour delay but rather two weeks. They are simply much more comfortable here. But we still work extra hours.

What is with the communication within teams? Which ways are common for

you? What went well and what wrong?

Through the distributed situation with the location in Cologne, we communicate mainly via mail. If there are time bottlenecks we communicate via text chat through WhatsApp. Via WhatsApp we also send pictures. But before we are writing back and forth and it is urgent, we call ourselves.

How does the perfect virtual team look for you?

Anyway motivation, strength, energy. Because it is more difficult to work with each other when one is sitting next to the other team member. Also time and patience is necessary. I must accommodate myself also, for example, because of time difference. Then I accommodate myself to the colleagues of Cologne. One must show mutually consideration.

What collaboration systems do you know? What systems do you use for your everyday work?

Skype. And we have an internal section on our website where we can upload or download things. Also communication is possible. Furthermore, we use mails, WhatsApp and phone. WhatsApp is a great help. Earlier I have never used this, now, however, it is rather helpful. I also used the app Tango, but otherwise only mail. TeamViewer. We work with also sometimes with TeamViewer.

What technologies did you know or use, which support the creative work of web designers?

I do not know right now at all. I'm drawing a blank on that one. However, it is interesting.

What kind of technology do you miss in connection with distributed working situations?

I do not know. I believe it would be good to use more digital tools in general. For example, to use digital tools to convert drawings and scribbles. That would be make some tasks easier.

If you could create the perfect collaboration system for creative design processes, which elements are important?

The system should have functions with which the other person at the other location could see me, hear me, and see my desktop. It is important that we are able to talk to each other directly. So that it does not seem that we are separated miles from each other. The fact that one has everything on one platform. For example, drop box irritates me. It does not function as well as I need this. Everything must be easy. So as if one hands over an USB flash drive with data through the calculator directly to the other person and one would stand face-to-face in front of the other.

7.2.5 Interview Partner: Sören – UX Designer

Sören is a junior art director and work in an agency with 250 people at the location in Hamburg and has over 5 years working experience. He creates ideas for campaigns and other purposes for the customer *Paulaner*. Among the rest, his fields are social media, aids, below the line measures, researches and team organisation. He cooperates closely with the location in Munich, where his boss is located.

How important is collaboration within a design team?
I believe that cooperation should be always included in the plan and a project have to operate on all communication channels. One should have experts in all disciplines to be able to extend campaigns to several fields. It is important to work hand in hand and to develop together processes which are suitable.

How relevant are distributed working situations at the current time in the design sector? How relevant is this form of team especially for your working situation?
We communicate almost only internal. Or we invite external parties. We call up a lot. And we send designs via mail to the other location in Munich. Changes and improving agreements come via phone. We are using the Google Cloud story. But using the Hangouts really seldom. Otherwise, we use only mails, or group chats via Hangouts. But as mentioned not so often. It simplifies the work, but it only optimises the work flow and not the agreements within the team.

Do you have experiences with distributed design teams? If so, what went well and what wrong?
My boss is located in Munich. The situation is difficult. We make agreements but afterwards he does not respond. Or one talks at cross purposes and misunderstandings arise. Agreements are pointless.

In which phases of design process are collaborations especially importantly?
If the basic idea is developed, it is important to inform all parties about current status and results. From this point all parties have to sit together to develop a mutual guideline. Afterwards everybody is working for themselves. And of course, it is also important to sit together in the beginning of the project, so that all parties are working in the same direction and nobody wastes time. In the meantime, one must also agree, to work out the same comprehension for a common mission.

What are your key elements for a well-integrated team?
Carefulness. Timeliness. That somebody is showing initiative. That somebody not only illustrates problems but rather that he/she delivers solutions. I can make problems by myself. Ability to think for oneself is necessary. There everybody is demanded. It is simple, it has to be a team. Not only one member of the team can decide this. The care is sought-after of everybody.

What is with the communication within teams? Which ways are common for you? What went well and what wrong?
We have a status meeting every morning. The consultants talk about new planned things and which projects are in progress. Than one can plan the time of the day. Afterwards there is a meeting for the creative design team where all tasks will be allocated. We work together on tasks and support each other. Ok, sorry, that was not all about our communication, but you see, that we try to avoid technical tools. It is more comfortable to meet at the coffee machine as talking via Hangout or other tools. Furthermore, we are sitting in an open space office. We work flexibly on demand and one find always a person with who one has to talk about project issues.

How does the perfect virtual team look for you?

Everybody is on schedule. Everybody have to answer enquiries. The communication should not be inhibited. I have often experienced that through inhibition things swept under the table. Arrangements must be demanded openly. I do not need video conferences. But everybody must be always accessible. Somebody has to be available to answer my questions.

What collaboration systems do you know? What systems do you use for your everyday work?

So I know some, but we make everything about GoToMeeting. This is screen sharing to present for customer. One dials in via phone and is able to present designs to the customer by screen sharing. Otherwise, we make everything about Google.

What technologies did you know or use, which support the creative work of web designers?

Quite honest answer. Our schedules are knitted so closely. Creative technologies are difficult to integrate because the meetings are too closely clocked. We simply develop and create and hope it fits.

What kind of technology do you miss in connection with distributed working situations?

I need an airplane. I have never seen my boss. It is ridiculous. I also learn nothing from him. Only if he says to me at the phone "Yes" or "No". Actually we could use more technology, but thus a cooperation is like a long-distance relationship. It simply wont work about a long time.

If you could create the perfect collaboration system for creative design processes, which elements are important?

Difficult. I am still a friend of spatial nearness. No software can offer this to you. You must simply be able to interoperate with the people. You sell ideas also about body language. For me a system cannot substitute the spatial nearness. It is about design and communication! Why should I renounce this during the creation phase?

7.3 Prototype Layouts

The following screens are part of the prototype which were prepared for the colloquium but not relevant for the cooperation system concept. The prototype for the presentation is online available at:

`http://bit.ly/29QWnKj`
Password: VirtualCooperation

Figure 22: *Homepage of the cooperation system.* (own resource)
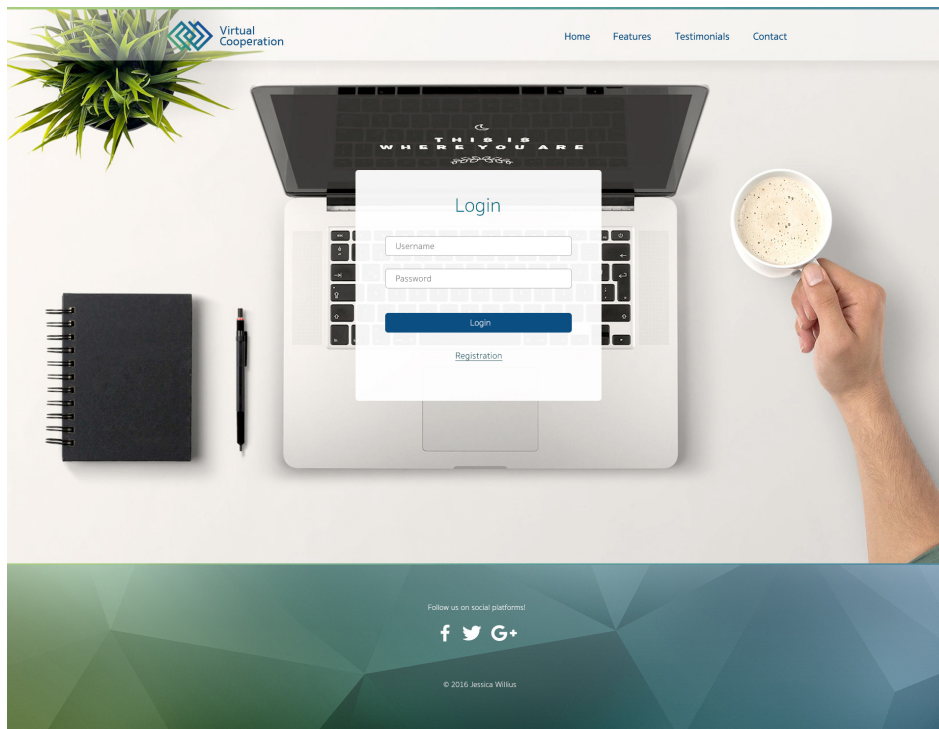
Figure 23: *Login screen of the cooperation system.* (own resource)

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Statutory Declaration

I hereby declare that this master thesis was independently composed and authored by myself. All content and ideas drawn directly or indirectly from external sources are indicated as such. All sources and materials that have been used are referred to in this thesis. The thesis has not been submitted to any other examining body and has not been published.

Jessica Willius	Bornheim, 24.07.2016
Signature	Location, Date