Social media for the purpose of knowledge creation and creativity management – a study of knowledge workers in Germany

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Abstract: Internet users apply social media platforms such as blogs, social networks, and wikis to create and share content. This phenomenon not only dramatically influences sales and marketing but also affects knowledge management and creative collaboration. Social media in working environment seems to be on the verge of establishment due to its potential capabilities. On the other hand, concerns persist that social media use at workplace may reduce productivity, reliability, and work performance. Therefore, the purpose of this paper is to understand if and how the usage of social media in working environments for networking, information search, and idea generation may influence creativity, knowledge creation, and innovation. On the basis of structured interviews with knowledge workers from universities and public research institutes in Germany, the paper aims to examine the sources of information in the course of idea generation as well as the impact of social media on creative processes.

Keywords: creativity; knowledge worker; social media; idea generation; knowledge creation; Germany.

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1 Introduction

External forces such as an increasing international competition, advances in technology, and other macroeconomic influences have escalated demands on all kinds of organisations to be innovative (Andron, 2013; Lawson and Samson, 2001). At the same, time realising successful innovation becomes more and more difficult due to an inexhaustible knowledge base and more complex market requirements. Products and services need to meet customer demands in terms of quality, costs and design as well as sustainability and social responsibility. Therefore firms are pressured to adapt and to use all types of knowledge available in order to realise innovation. Research shows that the diversity of knowledge is positively related to divergent thinking and, consequently, positively related to creativity (Williams, 2004). Thus, personal and situational factors that affect knowledge acquisition and divergent thinking might also influence the creative performance of organisations (Williams, 2004).

The internet and the variegated services obviously represent a substantial source of knowledge and information. This has dramatically changed in line with the emergence of social media technologies. The term social media indicates mobile and web-based communication technologies that are typically used to connect people and communities, as well as to share, discuss, co-produce and modify user-generated content (Kietzmann et al., 2011; Lewis, 2010). Recently social media has been categorised into four main groups (Mao, 2014):

- social networking tools and instant messengers such as Facebook, Skype, Tumblr and so forth
- tools for social publishing, social sharing, bookmarking, and collaborating, including tools like blogs, wikis, Twitter, Delicious, Flickr, Youtube, Picasa, GoogleDocs, Spreadsheets, Slideshare, Dropbox, Gliffy and so on
- social tools for content management as well as calendars, surveys, and polls such as Moodle or Edmondo
- Virtual worlds and gaming environments such as SecondLife, WeeWorld, Webkinz and so forth.

In this study social media is defined as applications that utilise web technologies and allow users to create and participate in communities through functions such as communicating, interacting, sharing, collaborating, and publishing. It is obvious that social media has generated new opportunities to create content and to provide and capture interdisciplinary knowledge, particularly regarding the existence of a wide variety of information (Leftheriotis and Giannakos, 2014). Different social media technologies, like social networking, online forums, wikis, and blogs are becoming reliable platforms for sharing information to target audiences in a contemporary manner (Osatuyi, 2013). In social media networks (e.g., Facebook, LinkedIn, MySpace, Google+) or collaborative communities people share experiences and information, which pertain not only personal interests but also professional matters. Therefore a large number of professional networks have evolved (e.g., ResearchGate, Academia, Mendeley).

Social media becomes more and more important for various types of organisations and in the near future it will probably be an indispensable building block in the innovation management process. By using social media applications, employees gain

access to varied and diverse knowledge, which influence their propensity for original, independent, and unconventional thinking and problem solving (McCrae and Costa, 1997). Reconsidering that the link between openness to experience and divergent thinking is empirically tested (McCrae, 1987), it can be assumed that individuals who have access to diverse knowledge and diverse social networks tend to show divergent thinking and to be more creative (Williams, 2004). Social media may enrich the practices of knowledge transfer, knowledge management and creativity in organisations (Luo et al., 2013).

Aim of the study is to get new insights on how the use of social media channels by knowledge workers affects creativity, idea generation, and innovation management in organisations. It is also intended to understand what triggers knowledge workers to use social media for job-related communication and knowledge exchange.

In Section 2 the related work is introduced as well as theoretical viewpoints upon which this research is grounded. Section 3 includes the research approach and the methodology. Section 4 presents the empirical results and the closing section contains a discussion of the outcomes of the study, and highlights the limitations and the implications that arise for researchers, practitioners, and executives.

2 Social media and work creativity – literature review and theoretical framework

There is a lot of existing research on how social media is generally used in a professional or corporate environment (Kaplan and Haenlein, 2010). There have been studies on the values of using social media for work purpose (Leftheriotis and Giannakos, 2014). Many studies analyse a specific social media tool, e.g.: corporate community weblogs (Liao et al., 2012), micro-blogs in a corporate context (Riemer and Richter, 2010), social bookmarking (Millen et al., 2006), social networking (DiMicco et al., 2008; Morris et al., 2010; Skeels and Grudin, 2009), and enterprise wikis (Grudin and Poole, 2010).

2.1 Social media for work purposes

Different social media channels are becoming integral parts of work environments. Expected advantages consist of maintaining external professional networks, creating and strengthening ties with colleagues, gathering professional information, and promoting knowledge sharing (Leftheriotis and Giannakos, 2014; Skeels and Grudin, 2009). Social media applications seem to have the potential to provide knowledge and communication, and to increase work performance as a consequence (Tsay et al., 2012). They offer peer-based communication and collaboration. Recent studies of user behaviour show that employees use internal social networking to build stronger bonds with their weak ties and even to reach out to employees they do not know (Leftheriotis and Giannakos, 2014). Thus, social media not only reinforce ties but also create new ones. Motivations in doing this include connecting on a personal level with co-workers, advancing their career, and campaigning for their projects (DiMicco et al., 2008). Although the contribution of weak ties to productivity is difficult to prove, some authors anticipate a fast uptake of social networking applications by organisations (Skeels and Grudin, 2009).

Other studies argue that social media use at workplace may reduce productivity of employees due to the fact that they spend long periods of time online and chatting (GFI, 2011). Moreover some authors examine major potential risks and call attention to the fact that social media may be time-wasters and security traps (Turbana et al., 2011). Altogether, we still know very little on specific social media's impact on work principles and work performance.

2.2 Knowledge workers, their sources of inspiration, and social media usage

Research scientists from universities and non-university institutes are ideal types of the so-called knowledge workers. Scientists can be seen as specialists with the main task of creative performance, which may be defined as the use and combination of knowledge, imagination, and skills to invent a novel process, product, or procedure (Amabile, 1997; Scott, 1995). Scientists primarily offer knowledge and creativity to their employers, partners, and customers. Therefore scientists need to manage knowledge and creativity as their strategic resources. In order to create new knowledge, researchers seek to combine and exchange information and know-how with colleagues and must often go outside the boundaries of their institutes to obtain the needed resources (McFadyen and Cannella, 2005). As knowledge creation is affected heavily by exchange with others, both within and outside the organisation, social media may enrich work practices. Although McFadyen and Cannella (2005) argue for a curvilinear effect between distance and knowledge, in that spatially close and distant exchange partner locations will have a greater effect on knowledge creation than middle-size distances.

Social media have dramatically changed the way how people work and interact socially and professionally, impacting scientific research in a number of ways. The free and rapid flow of information, ideas and documents both requires and fosters new habits of collaboration among researchers (Rinaldi, 2014). Worldwide many scientists recognise the potentials of social media tools for visibility and constructive conversation. Science blogs for example have sprung up over the past few years. Pioneers like Christie Wilcox, a biologist from the University of Hawaii, argue that scientists have the responsibility to bring to the public the results of their studies and that blogs seem to be a straightforward method (Wilcox, 2012). Others see blogs and social networks as eligibly tools to reach a wide audience, which is seen as an integral part of science (Fenner, 2012). One of the most popular twittering scientists with more than 210,000 followers – the British physician Stephen Hawking (2014) – does not only tweet his research results but also expose parts of his personality to get stronger personal connection between his follower and himself (VanEpperen and Marincola, 2011).

Research scientists currently use social media for two primary reasons. The first reason is networking with colleagues, partners, and customers; the second reason is making results more visible to funders, policy makers, and even the public (Rinaldi, 2014). Social media helps to build dialogue and constructive conversation with the public, particularly about sensitive topics, like genetic engineering and stem cell research (Rinaldi, 2014). Therefore social media channels are bearers for communication strategies for universities and major scientific corporations.

From a theoretical perspective social influence plays an important role in the field of using information and communication technologies. Many studies have explored a significant effect of social influence on technology adoption in general (Olschewski et al.,

2013). It can be assumed that social media usage by knowledge workers and other employees is evidently influenced by role models and by the perceived organisational support. The former can be defined as the degree to which employees perceive that important colleagues use social media in their everyday work. The latter – perceived organisational support – can be defined in terms of the extent to which employees perceive encouragement, respect, and recognition from the organisation for those who use social media. Wilcox (2012) stated that scientists may feel a "need to be engaged in new media platforms because everyone else is already talking about their thoughts and feelings, having discussions about things they care about, and generally – as the name implies – being social".

Beyond networking, visibility, and public dialogue, social media may also help in collecting information, gathering knowledge, and getting in conversation with customers and partners. As research scientists are always in search of knowledge and science-related news, social media may be an interesting source of information. Information sharing among individual researchers is assumed to be benefit-oriented (Osatuyi, 2013). According to social exchange theory people evaluate costs and benefits before sharing information with others. Therefore social media could offer timesaving and cost-effective ways to get access to a wide range of different information in particular. Benefits anticipated by social media information exchange have been found to be the building of social capital and reputation (Constant et al., 1996). Osatuyi (2013) stated "sharing information socially also gives an intrinsic benefit to the provider by confirming their ability to provide information that is considered useful by the social network in which they belong". This applies even if there is no personal connection between information provider and information seeker (Constant et al., 1996). Social media affects networking ability and might have an impact on the formation of domain relevant skills, which according to Amabile (1997) can be seen as an important factor associated with individual creative performance.

Despite the evident pros of social media usage, information shared on social media sites face a credibility problem (Osatuyi, 2013). Therefore from a users perspective, verifying the information provider and the information itself is necessary and increases the costs of sharing information. Trust and authenticity issues might be reasons why some professional user groups still use social media very moderately. Many scientists show a critical scepticism and perceive mainstream social media sites (e.g., Facebook) as unprofessional platforms that firstly do not provide an environment conducive to productivity and secondly may even compromise serious research (VanEpperen and Marincola, 2011). Although, other authors state that social networking sites hold a huge potential for sharing information among scientists (Osatuyi, 2013).

Thus a high level of social media activities can have a positive impact knowledge worker's information base as well as on their ability to adapt existing knowledge. On the other hand habitually users of social media platforms need large time resources for their social media activities, which may shrink productivity, in particular when these activities are done during working hours. These assumptions indicate an ambiguous relationship between social media activity level and creativity of knowledge workers. Moreover, it can be assumed that this relation is influenced by their personal characteristics (such as motivation) as well as the type and quality of social media interactions.

2.3 Research questions

Research scientists are prototypes of knowledge workers. They need to combine different knowledge to solve challenging problems. Therefore, research scientists are permanently in search of new knowledge and up-to-date information on very interdisciplinary topics. Many authors state that most scientists use social media for networking and visibility (Rinaldi, 2014), but it is still not clear if and how social media usage enhanced the development of creative ideas. Moreover there is still a lack of knowledge on factors influencing social media usage in everyday work, like acceptance and organisational support. Therefore recommendations for practice and research cannot be given. In order to close existing research gaps the aim of the paper is to find answers to the following research questions through a qualitative study on knowledge workers employed in the scientific sector.

RQ1 To what extend do knowledge workers use social media?

RQ2 For what purposes do knowledge workers use social media?

RQ3 Which opportunities and threats feel knowledge workers in connection with the use of social media?

RQ4 What influences social media usage by knowledge workers?

RQ5 Does social media usage have an impact on knowledge management and idea creation?

3 Research approach and methodology

3.1 Case study research

To get more information about the use of social media tools for the purpose of knowledge creation and idea generation a qualitative case study is undertaken among a specific sample of employees, namely research scientists, which can be seen as prototypes of knowledge workers. The case study method is affirmed as an appropriate research method as a 'critical case' for testing a theory if a clear set of propositions may be seen as occurring within a specific setting (Yin, 1994). A single case may be able to make an important contribution to knowledge and theory-building by providing the appropriate conditions for testing the theory by confirming, disconfirming or extending it. Sometimes a full picture of the social interaction can only be obtained from a careful scrutiny of a practical, real-life instance (Remenyi et al., 1998). Thereby conclusions are drawn from single observations to general phenomenon, a practice which is denominated as induction in qualitative research (Przyborski and Wohlrab-Sahr, 2010).

3.2 Research design

Research questions expressed in Section 2 are used to guide the analysis and to detail the investigation (Gläser and Laudel, 2010). In implementing the case study method, the aim is to understand the case at hand. It is necessary to demarcate case study research from representativeness in a statistical sense of meaning, which due to a limited number is neither possible nor intended by the time inductive practices are used (Kleemann et al.,

2007). Therefore sampling is theoretically driven and purposive in order to select information-rich cases that manifest the phenomenon deeply (Patton, 1990). This involves selecting cases on purpose rather than on representativeness such that the basis of the sample is not random (Silverman, 2000). In this study structured in-depth interviews with four research scientists from university and non-university institutions were conducted.

Nevertheless qualitative research has to be based on performance criteria in empirical studies. Turning special attention to qualitative research, Mayring (2010) defined necessary criteria, which are supposed to guide the present investigation. Therefore content analysis seeks to proceed systematically, to follow specific theoretical guidelines (rule-governed as well as theory-governed); the procedure has the requirement to be intersubjectively comprehensible, to compare the results with other studies in the sense of triangulation and to carry out checks for reliability.

The research study described in this paper uses structured in-depth interviews to gather individual perceptions toward the idea generation and the use of social media sites for that purpose. Consequently, information on individuals' creativity, sources of information and inspiration, as well as social media activities were collected and analysed. Moreover, information on the personality and the institutional affiliation of the scientists were collected. The interview transcripts were subjected to a content analysis in order to systematically examine the qualitative data. Empirical categories were developed concerning the emergence and development of ideas, social media experiences of knowledge workers, social media for profession-related communication and knowledge exchange, and the general conditions for social media usage for work purposes.

4 Results

Participants were research scientists in the field of photonics from a university and a non-university institute in Germany ranging from 30 to 45 years of age. Researchers in the field of photonics typically work profoundly interdisciplinary and application oriented. They need to process information from very different fields of application. Therefore the photonics research domain represents a proper test field. In contrast to universities, non-university institutes are partly private-funded. They operate similar to private firms or private research companies because of a competitive environment. The sampling is casual, in order to include persons of different age, gender, hierarchy levels, and subareas of research. Due to the gender ratio of photonics research, most of the participants were males. Although the unfavourable gender ratio the photonics area of research is an appropriate test sector due to its interconnectedness with many other disciplines.

In the following sections results are presented regarding

1 the emergence and development of ideas

2 the social media experiences of knowledge workers

3 the social media usage for profession-related communication and knowledge exchange

4 the general conditions for social media usage for work purposes.

4.1 Emergence and development of ideas

The results show that research scientists are knowledge workers because their main capital is knowledge. Their work is characterised by the primary task of project-based and non-routine problem solving, which need a combination of different knowledge. Interviewees spend a high amount of their time searching for new information. All interviewees have at least university graduation; half of them have a PhD, which shows that they all have a deep background in education.

All respondents state their high dependence on information technology. Even though, the sources of knowledge and the inspirations for new ideas differ. Main sources of information and inspiration are four:

1 the internet especially search engines – e.g. Google, Google Scholar – and relevant websites, newsletters, newsfeeds, and magazines but also Wikipedia and different specific databases

2 direct (and e-mail) contact with colleagues and meetings with partners from industry and science

3 scientific conferences and congresses

4 requirements from industry and other partners, previous research results.

Apart from the internet, newspapers and broadcasting seem not to be noteworthy sources of knowledge and inspiration. Also patent specifications are of secondary importance as idea providers, given that interviewees look at patents not until a problem or an idea is on hand. The results also show that knowledge workers demand leeway for ideas and freedom of action to show the best results. Good ideas frequently appear outside the office, on business trips, on the way to work, and even during leisure time and sport activities. Table 1 summarises the main sources of information and inspiration.

Table 1 Sources of information and inspiration of scientists

Internet	*Direct conversations*	*Conferences*
• Search engines • Websites • Newsletter, newsfeeds • Wikipedia • Professional and scientific journals are widely read online and not as print versions	• Conversations with colleagues (at the office or at the break room) • Presentations and question-and-answer sessions within own organisation • Conversations with partners from industry and science	• Knowledge on what others do • Information can be combined with own work • Sharing of interesting problems and challenges with others

In the following statements are shown, which are given by the interviewees relating to the sources of knowledge, inspiration, and ideas (interview number and age of the interviewee in parentheses).

> "Ideas result from requirements. Like when partners say what they need or want. First ideas often evolve in the course of the conversation. […] Conferences and talks are good. There I get input. I think about it and sometimes I try to combine it with my own stuff. […] I do sports; that clears my mind. (No. 1, 33 years)."

> "Somehow ideas are result of previous projects. […] Exchange with long-standing partners helps a lot. […] Photonics is a small sector, people know each other and relationships are often long-lasting. It seems like a big family. This can be good and bad for idea exchange and for cooperation (No. 2, 45 years)."

> "There [at conferences] … I pick up ideas and I ask myself how can we do this better with our own means. […] I don't start with patents; I start with an idea or a problem. Patent language is not my much-loved language (No. 3, 35 years)."

> "Stimuli come from outside the institute; firms ask for solutions and we try to find them. […] We need this external perspective to get new inspiration for our work (No. 4, 32 years)."

Knowledge workers not only have to collect information and to think by themselves, they also are involved in teams, have to communicate, to exchange knowledge, and to network with colleagues and partners for enhancing and refining ideas. Knowledge exchange happens both within and outside the organisation. Although department meetings seem improperly for substantial knowledge exchange but rather suited for organisational instructions. Interviewees prefer small groups and recognise the value of outsiders, which are not directly involved in projects.

> "Most of the time we meet for a coffee in the break room. That's always a good choice when you are at a loss (No. 1, 33 years)."

> "I know many people. I just go there and ask. Most of the time I get an answer, or at least a recommendation. […] Sometimes it's good to have outsiders in the discussion; they open up new vistas and bring new ideas (No. 2, 45 years)."

> "Our group leader has the most part of customer relations. He supplies us with task and we try to solve and to implement (No. 3, 35 years)."

> "Large meetings of 30 people or more are too big. They are just to organise duties and responsibilities. […] Once a while we meet groups from other disciplines like material science or chemistry; we tell them what we do and they tell us what they do. These kinds of meetings are very helpful to get inspiration (No. 4, 32 years)."

4.2 Social media experiences

All respondents state that they have personal experiences with social media to a certain amount. It also appears that a strict separation of private and work-related social media use is irrelevant for scientific researchers. The interviewees justify this behaviour with two main reasons. First of all social media are seen as one communication channel with same content and same rules of conduct due to the fact that often friends are colleagues or partners at the same time and some colleagues are close friends. Second, the interviewees state that many parallel social media profiles by one person might be tremendously time-consuming, inefficient, and with no added value for information chasing. Anyhow all interviewees keep in mind not to share any confidential information on social platforms. The respondents of the study are using all four main groups of social media (Mao, 2014):

- *Social networking tools and instant messengers*: All respondents have at least one profile on a social network, where Facebook and Xing (a German version comparable to LinkedIn) are the most common. Some respondents state a request for a corporate or enterprise social network (ESN), which works like Facebook but is restricted to use by employees and protected by firewalls – in accordance with

Jarrahi (2011). The interviewees argue that people could foster connections with other members of the same organisation or strategic partners by creating online semi-public profiles (Leftheriotis and Giannakos, 2014).

- *Tools for social publishing, social sharing, bookmarking, and collaborating*: scientific researchers use predominantly blogs, wikis, social bookmarking, although the use of this kind of tools seems not to be very intensive. Some respondents use collaboration platforms frequently, in other cases administrators consider these tools as security traps and restrict the usage.
- *Social tools for content management and calendars*: group-scheduling tools (e.g., doodle) are used frequently and very informally. This could be connected to the little amount of information, which is shared by such kind of tools. Moreover, some respondents have some experiences with platforms like Moodle, especially those who are engaged in university teaching. The interviewees do not use other tools.
- *Virtual worlds and gaming environments*: Virtual worlds do not attach any importance to the interviewees in both, private and profession-related circumstances. Indeed most of the respondents have heard about Second Life but do not fully understand the operating mode of virtual worlds.

In the following statements are shown, which are given by the interviewees relating to the use of social media applications.

> "A friend of mine moved to Florida. That's when I stared using Facebook and Skype. He works in the same business and it's just good to see what he is doing. Most of the time it's not related to work. […] Private or work, it does not make much of a difference for me (No. 1, 33 years)."

> "Google, Goolge Scholar and some newsletters – that's it. […] I am on Facebook and on LinkedIn. My profile on LinkedIn is kind of abandoned; I arranged it for some international cooperation partners, but now this project is over. I used Xing at the time when I was looking for a job; now I just try to keep my profile up-to-date (No. 2, 45 years)."

> "I am on Facebook. I used to be sceptic but now I agree. It's nice to stay in contact with old friends; sometimes they also work in the same field. […] I don't use Facebook for official business. Project-information has no right to be on Facebook (No. 3, 35 years)."

> "I'm also on ResearchGate, but just at the beginning, my track is not very long. But it looks interesting for me (No. 4, 32 years)."

Altogether the results show that knowledge workers use social media applications like any other professional guild members. They probably are worried about vulnerability and security issues much more than other users. Therefore it seems also that knowledge workers pay attention not to spread any or as little as possible of both personal data and confidential information on social media channels. An exception is probably made by social collaboration platforms such as GoogleDocs or Dropbox, given the fact that these tools are often seen as protected areas.

The results also show that the intensity of private and work-related use of social media applications seems to be related directly. The more and the manifold knowledge workers use social media for their private needs, the more intense and multifaceted is social media activity for work purposes. However the sample size is too little to draw conclusions on other influencing factors such as age, gender, and other demographical

factors. Nevertheless a general tendency seems to be a negative relationship between age and social media activity. This could be also named as 'digital native effect', which could be noticed in the next years when more workers who where born after the introduction of digital technologies poor into executive positions.

4.3 Social media for profession-related communication and knowledge exchange

The interviews show some trends and commonalities with regard to the application of social media for knowledge management, idea generation, and other work-related issues. First of all, social media is understood as natural tool for information search, especially when it is about particular information on specific technologies, processes, products, or applications. In this case, knowledge workers use newsletters, newsfeeds, blogs, as well sharing platforms such as Youtube. Sometimes the numerous sources are brought together on one particular social media platform (e.g., Facebook). Especially young users appreciate the easy ways of forwarding and sharing information with colleagues.

Social network platforms are moderate popular among the respondent knowledge workers. This refers not to the simple question 'yes or no' but to the nature and modality of application. Knowledge workers use profiles in social networks primarily to offer information to others and not to interact with others. The profiles are used as substitutes for traditional offline business cards or as public accessible personal data sheets. By this means scientists try to improve the visibility of the own person, group, and research topic. The interviewees use predominantly Xing and ResearchGate for work-related purpose as well as Facebook for both work-related and private purpose. LinkedIn is known by all interviewees but not in use regularly since it is seen suitable for international partners and somehow inappropriate for national partners. One main reason for using social media platforms is to consolidate contacts made occasionally on business meetings. A social media relationship makes it easy to keep in touch on a long-term perspective with new 'friends', even if the persons change their employers or affiliations. Such weak relationships may shorten the restraints of contacting others with questions or even project proposals. Insofar social media contributes to cross-linking and interconnectedness of stakeholders, which is an essential requirement for co-creation and diversity of ideas. Some interviewees use advanced functionalities and create groups within a social network to provide well-arranged networks within larger and more diverse social networks. Groups allow for closed or open access, invitation and joining by others outside the group. In some cases, social networking groups have become important to maintain a structure in ones personal social and professional life (e.g., study groups). The study shows some evidence that a small group with less than 8 people may also be used for work-related discussions.

In the following some statements are show, which are given by the interviewees on the profession-related use of social media.

> "It's just to keep the contact if people move to other places (No. 1, 33 years)."

> "I don't do much. It's just for information search. […] I'm member of a Facebook group. There I get some news, like fairs and exhibitions. It could be used for recruitment, because the right people are there (No. 2, 45 years)."

> "Xing, Facebook, all that has little impact on my job. It would be more interesting if the whole organisation would be on; everybody with it's own profile. That could help to get in touch with more people. Maybe also with some other institutes, but then it's always a question of competition (No. 3, 35 years)."

> "On Facebook I have a closed group together with some friends. We are just four. On this place we talk and debate – sometimes also some professional issues (No. 4, 32 years)."

Within universities and research organisations the main application of social media with practical relevance still are public relations, marketing, and recruitment. Some interviewees use their own private social media network to invite others to conferences, or to inform others about interesting job offers and contests.

4.4 General conditions for social media usage for work purposes

Results show that knowledge workers use social media for networking activities in their personal context and also in their institutional context. Regarding the general conditions for social media usage it is necessary to distinguish between an individual perspective and a more institutional perspective. From the individual perspective the results show that knowledge workers have many options to integrate social media activities in their work processes. However it seems that a professional and creativity-supporting handling of social media application s not a normal case but makes an exception. Employees use social media mainly for self-profiling and information search and minimally for idea development and co-creation. Therefore it can be assumed that social media is only to a certain extent integral part of the everyday workflow of most knowledge workers.

From an institutional perspective it seems that degree of management level is negative related with social media activity. This of course could be also a question of age, but nonetheless it has an impact on the organisation. Directors, heads of departments, and heads of research groups seem to be very conservative with social media application. Interviewees state that top management does focus solely on offline networking. Workers have the feeling that top management does not appreciate social media activities; in fact social media is often seen as waste of time. Middle management instead uses some social media applications in a very passive way, such as profiles on research-related social networks (e.g., ResearchGate). However the results show that social media is not associated primarily with value generation but rather with security issues and time issues.

In the following I show statements given by the interviewees relating to the general conditions for social media applications.

> "My Boss does not use social media. However, there are no rules or guidelines. So we use dropbox quite often to share and collaborate (No. 1, 33 years)."

> "It's more an object of the younger colleagues. I know some people who do blogs or something alongside. But it's more for fun. It's always a question of time and one's own initiative (No. 2, 45 years)."

> "I would allege that our department chief is sceptical and does not see much benefit of social media applications. For him it's more like a waste of time or additional work with little value. Otherwise we never gave it really a try. […] Also the IT-department has some reservation due to the security issues. […] We should try some internal applications (No. 3, 35 years)."

> "Facebook, Xing and all that does not play a big role. That's my opinion. Department head is very sceptic on it. My group leader is on ResearchGate with a nice publication list. It's like a digital publication list with some cross references. ResearchGate is accepted, as well as Xing is (No. 4, 32 years)."

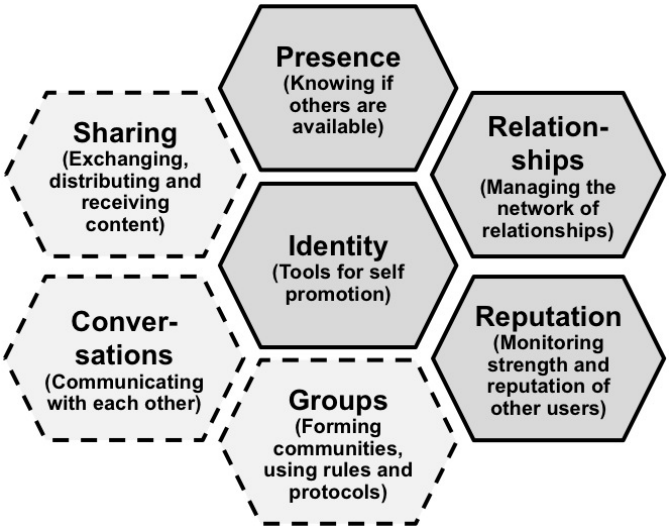
In university and non-university research institutes, which explicitly are hubs of knowledge work, social media is still considered as a 'secondary theatre of war'. Social media activities are not appropriate actions to earn stripes in the professional career of most research scientists. However, all interviewees state that social media activities are widely accepted or at least tolerated by their group leaders, but in no way requested. Some social networking platforms with a focus on work-related use are accepted while others are associated with fun, leisure, and pastime. Work groups to facilitate internal and sometimes external cooperation, however, use social collaboration services. Altogether, the results indicate that leaders focus on security risks and time issues, and underestimate the prospects of social media usage to improve creativity and idea generation.

5 Conclusions

The findings of this exploratory study allow drawing some conclusions with regard to the research questions posed in Section 2. Referring to the fundamental question if and to what extend knowledge workers use social media tools (RQ1) the study shows that knowledge workers use social media applications like any other professional craft members. Social media is certainly an additional but nonetheless important element of knowledge work processes. The knowledge workers are completely aware of the importance and potentials or social media for their processes. However, some actors – internet agencies, marketing offices – overestimate the current meaning of social media for knowledge work, whereas the knowledge workers themselves and their managers are often unable to utilise its full potential and to promote them. Therefore it is necessary to develop concepts for an integration, exploitation, and promotion of social media activities in creative and knowledge-based work environments.

Asking for what purposes do knowledge workers use social media (RQ2), the study provides variegated findings. First, social media activities are adequate to expand profession-related networks and to strengthen weak network ties. These activities, moreover, assure visibility, traceability, and relevance of single researchers, research groups and research topics. Indeed it could be shown that knowledge workers use social media to gather information, get stimuli for research, exchange knowledge, and improve their ideas. Although it can be seen that there are a number of uncertainties associated with social media usage. And finally, the results provide evidence to support the claim that social media technologies are structurally different; hence they are used differently to convey different purposes. The findings from this study suggest that scientific and technology-related websites, newsletters, and blogs show a great potential for supporting creativity. In addition, social networking sites are used not only for profiling but also as pin of a personal social media framework, when people integrate blogs and newspapers to their personal social network account.

Figure 1 Honeycomb of social media user experience by scientists



Kietzmann et al. (2011) provided a honeycomb framework of seven social media building blocks: identity, conversations, sharing, presence, relationships, reputation, and groups. The building blocks are not considered as exclusive, nor do they all have to be present in a social media activity. However the blocks serve as constructs, which describe specific facets of social media user experience. The results of the study show that knowledge workers currently assign their priorities on four of the seven building blocks: identity, presence, relationships, and reputation (Figure 1). The other blocks – conversations, sharing and groups – require a better understanding of challenges and opportunities, and need more elaborated concepts how to integrate these blocks in a typical workday of knowledge workers.

Referring to the perceived opportunities and threats in connection with the usage of social media tools (RQ3), the results show that knowledge workers are worried about vulnerability, efficiency, and security issues probably more than other users. Knowledge workers spend a high amount of their time on both searching for new information and dealing with – confidential – Information. Therefore they are aware of the fact that social media may be security traps and call attention not to spread any or as little as possible of both personal data and confidential information on social media channels.

With regard to the influencing factors on social media usage (RQ4) the results provide indications for a negative relationship between the intensity and variety of social media activity on the one hand and the age of the users on the other hand. The expected 'digital native effect' should provoke more workers who where born after the introduction of digital technologies to poor into managing positions. In fact, the acceptance of social media technologies by supervisors and executives is an important issue to consider, due to the fact that knowledge workers often emulate their supervisors or other senior employees.

Finally, social media usage seems to indirectly influence knowledge management and idea creation (RQ5). To support creativity and innovation in organisations, managers of creative groups need to focus on providing individuals with opportunities to develop their networking skills (Baer, 2012; Ferris et al., 2007). In particular, networking and different

types of social relationships gives people access not only to like-minded colleagues but also access to a wide range of different information. Therefore social media supports cooperation and idea creation in an indirect way.

Of course the study has some limitations. First of all it is reckoned that the results of exploratory research are not usually generalisable to the population at large. In particular, the restricted number of interviews strongly limits the generalisability of the results. However, the results provide significant insight into how a small group of knowledge workers use different types of social media technologies. This could lead to the formulation of theories to model knowledge management and creativity on social media. Moreover this study was conducted in the photonics sector, an environment with unbalanced gender population, in favour of men. However, prior research has shown that women constitute an important part of social media users.

Since the study has its restrictions further research should continue investigation social media usage of employees for the purpose of information sharing, communication, and idea generation using a larger dataset. There are still a number of uncertainties associated with the use of social media sites for sharing information. The most important one seems to be the credibility of both, the information itself and the information source (Osatuyi, 2013). Therefore further studies should include additional aspects such as the necessity to provide means of verifying information and the costs of sharing information on social media sites.

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