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Scientists' self-presentation on the Internet

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Helena Lovász Bukvová

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Contents

Essays

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Essay 2: Bukvova, H. (2012). A holistic approach to the analysis of online profiles. Internet Research, 22(3).

Essay 3: Bukvova, H. (2011). Information demand on scientists' Internet profiles. Sprouts: Working Papers on Information Systems, 11(173). Available from `http://sprouts.aisnet.org/11-173`.

Essay 4: Bukvova, H. (2011). Online Impression Management for Scientists. Sprouts: Working Papers on Information Systems, 11(140). Available from `http://sprouts.aisnet.org/11-140`.

1   Introduction

This essay discusses the activities and findings of four research projects into scientists' online self-presentation. The four projects documented in Essay 1, 2, 3, and 4, form, together with this essay, a publication-based doctoral thesis in Business and Economics, especially Business Informatics (Wirtschaftsinformatik). This essay explains the context of the research projects, highlighting common focal points and research aims that connect the separate projects to a common cause. Furthermore, the methods and findings are briefly introduced and discussed with regard to their contribution both to science and to practice.

The scientific community is founded on communication (Heimeriks & Vasileiadou, 2008). The advance of research, the evaluation of research results, the reputation of individual scientists - all rest on constant interaction among the community members (David, 2004). Scientists exchange their research experience through publications as well as personal interaction (Fry, 2006). As research collaborations grow more important (Sonnenwald, 2007), interaction within the community becomes crucial to identify suitable partners (Birnholtz & Horn, 2007). Furthermore, considering the growing interest of public in science and research, external communication is of increasing importance (Trench, 2008). Internal and external communication is thus vital for the sustenance and further development of the scientific community and thus for scientific research. The Internet, as a new channel for world-wide communication has a considerable potential for the scientific community (Weigold, 2001). Historically, the scientific community has developed a multitude of platforms that support exchange among its members and with the public. These include publication channels such as journals, books, or magazines and exchange opportunities like conferences, workshops, or conventions. The dynamic development of the Internet has had a noticeable influence on the interaction of the community, providing new opportunities and challenging existing ones (Bukvova, 2011b).

In this thesis, Internet is considered as a communication channel, offering opportunities for flexible content generation and hence suitable for self-presentation (Döring, 2006). The existing research on online communication is often problem oriented, discussing online communication as a potential solution to existing interaction problems (Carroll, Rosson, Farooq, & Xiao, 2009). As a result, the Internet has been

contrasted to existing possibilities, most notably face-to-face encounter (compare media-richness theory, Daft & Lengel, 1984). An alternative approach is to view the opportunities of online communication through a "positive lens" (Avital, Boland, & Cooperrider, 2008), focusing on improving already existing communication practices. In this essay, I will assume such positive lens, concentrating on how the online environment can be used to enhance scientists' individual self-presentation.

Self-presentation is a complex issue, especially in the scientific community, which relies heavily on personal reputation (Heimeriks & Vasileiadou, 2008). Traditionally founded on publications, scientists' reputation increasingly becomes a matter of presentation management (Reychav & Teeni, 2009). The Internet, which is accessible continually by a world-wide audience appears to be a highly suitable platform for this purpose (Reychav & Teeni, 2009). At the same time, however, there are still further presentation vehicles (e.g. journals, conferences), that have to be considered by the scientists. Hence online self-presentation needs to be approached strategically, with regard to the scientists' needs and with a view to an overall communication strategy across all available channels. Furthermore, the Internet provides a multitude of platforms, where scientists can create professional profiles (Hess, 2002). While this leads to a high level of flexibility, it can also be confusing both for the scientists as well as their audience. Firstly, scientists are free to create multiple profiles and connect them by hyperlinks. Secondly, while placed on separate platforms, these profiles coexist in a common space and must thus be considered as a whole (Hansen, Pfitzmann, & Steinbrecher, 2008).

This doctoral thesis was founded on the radical constructivist understanding of reality (see Section 2). The research was classified as connected to three areas: research on science communication, research on digital identity, and research on generation of online content (see Section 3). Viewing the existing literature in these areas, three focal points were identified, which informed and guided the formulation of research aims and the implementation of research projects: focus on Internet self-presentation, assumption of strategic importance, and need for a holistic view. The aims of the thesis were (A) to develop a holistic understanding of scientists' Internet presence, (B) to study behavioural patterns on scientists' Internet profiles, and (C) to develop an instrument to support the development and management of scientists' Internet self-presentation (see Section 4). Based on these aims, four research projects were carried out. Each project pursued own research questions or

objectives using suitable methods (see Section 5), yet all contributed to the overall aims of the thesis (see Section 6). Thus the thesis presents conceptual, empirical, and applied findings resulting from a multi-method approach and contributing both to research on Internet self-presentation as well as to practice in the management of online presence.

2 Theoretical foundation

This section explains the theoretical position that served as a foundation for the thesis. Research efforts in the scientific community are based on direct and indirect collaboration (David, 2004). Scientists can choose to collaborate directly in particular projects, or indirectly by using each other's research results. This interaction among scientists is aided by strict rules that the community applies to the definition of 'scientific research' and 'scientific publication' (Shugan, 2004). At the same time, each scientist is an individual, who holds personal views and has a personal cultural background. Particularly relevant from the academic point of view are views regarding the understanding of reality, truth, and role of science and the academic-culture background. While these views are personal opinions of the scientist and could be thus considered irrelevant to research (Brown & Dowling, 1998, p. 136), they influence the application of methods and interpretation of results. If the personal views and background of two scientists differ, it can prevent them from direct as well as indirect collaboration. Hence in order to foster better understanding, it is necessary for scientists to make their understanding explicit, thus providing their peers with necessary context for interpreting their results.

The thesis was based on a radical constructivist understanding of reality (Glasersfeld, 2005). Under this understanding, all individuals possess their own subjective reality. The radical constructivism neither asserts nor denies the existence of objective reality, pointing out that it is not in our power to experience anything beyond our subjective realities (Glasersfeld, 2007). The understanding of reality that each individual holds, however, is not the objective reality, nor can any conclusions be drawn from it regarding the objective reality (if there is one) (Kenny, 2007). As such, radical constructivism complements other existing theories, most notably those of Giambattista Vico, George Berkeley, and Jean Piaget (Glasersfeld, 2007; Le Moigne,

2011).

Acknowledging that we have no knowledge about the objective reality means, that the understanding of 'truth' as matching the reality is not applicable (Kenny, 2007). Based on the perceptions and the constructed reality, each individual can only determine if something is 'viable' (Glasersfeld, 2007). Thus instead of 'truth', the essays employ the notion of internal and external consensus by Pörksen (2009). Internal consensus describes the agreement between what a person holds to be real and what he or she communicates to others. In science, this influences the understanding of ethical principles. The external consensus refers to the acceptance of the communicated statement by others. In context of scientific community, this influences the understanding of the role of peer review and acceptance. In contrast to the theories by Jürgen Habermas (Habermas, 1999, 1973), Pörksen (2009) neither calls for an informed, discourse-based consensus nor does he insist on its being absolute. On the contrary, the radical constructivism acknowledges, that no knowledge can be considered a unique answer (Glasersfeld, 2007).

The radical-constructivist position and its understanding of truth apparently challenge some basic rules of science. Firstly, the aim of scientific research cannot be to provide a 'true' understanding of reality, but rather viable solutions. The viability can only by judged subjectively, from the point of view of each individual (Glasersfeld, 2007). Secondly, communication of results among peers is not a straightforward transfer of knowledge. While understanding and to some degree a 'co-construction' of reality is possible, this can be only achieved through communication (Rusch, 2007). Simple dissemination is however not sufficient to ensure understanding, as each individual is free to interpret the disseminated information subjectively. Hence intensive scientific discourse is necessary to foster understanding and negotiate an external consensus in the community.

The radical-constructivist position influences the approach of the thesis discussed here and presented in subsequent essays. While the theoretical position does not hinder the selection of research methods (Scholl, 2010), it has an impact of their understanding and application and the interpretation of results. Firstly, the research was focused on the description of presentation practices, using observation-based methods for data collection. The reason for this was the understanding, that scientists can merely describe and work with their perceptions of reality, making no

inferences to the realities of other individuals. Secondly, the methods are acknowledged to be subjective and no objective value is claimed for the findings. Thirdly, the results were 'validated' through discourse within the scientific community. This included a critical comparison to existing literature, discussions with colleagues, as well as solicitation of feedback from peers through publication. Finally, the findings related to practical application are composed in such way, as to acknowledge the subjective opinions of the target users. Although partially prescriptive, the findings acknowledge complexity and individuality and do not attempt to provide any absolute statements about 'correct' or 'incorrect' approaches. Thus each individual wishing to apply the results is encouraged to reflect on their applicability and validity for himself or herself.

3 Research areas

This section explains how the current state of research has influenced the selection of research aims of the doctoral thesis. The thesis has focused on the use of Internet by individual scientists, where scientists are defined as members of academic institutions for the purpose of professional self-presentation (i.e. the creation of content related to their role as scientists). Of particular interest was content created by scientists on their online profiles. This research object has been approached in existing literature from different directions: science communication, digital identity, and generation of online content. In the following, the research directions of each area are briefly introduced:

Science communication. Science communication in a broader sense is defined as "the communication processes both within the sciences and between the sciences and the society" (Leydesdorff, 2005, p. 66). Literature on science communication can thus be divided into research focusing on scholarly communication (within the sciences) and science mass communication (between the sciences and the public). Studies on scholarly communication discuss formal, mainly publication-based communication and its impact (e.g. Pautasso & Schäfer, 2010; Young, Ioannidis, & Al-Ubaydli, 2008; Tenopir, King, Edwards, & Wu, 2009), but also informal communication (e.g. Fry, 2006). Science mass communication (often termed simply as science communication) is concerned

with communication of scientific activities and findings to the general public (e.g. Weigold, 2001; Trench, 2008). Individual scientists are mostly concerned with scholarly communication (Suleski & Ibaraki, 2010, compare also Bentley & Kyvik, 2011), while science mass communication is often institutionalised (Logan, 2001). The development in information and communication technologies, especially the Internet has had an important impact on science communication (Logan, 2001; Borchelt, 2001), offering new communication channels, but also posing new questions regarding for example the reliability (Treise, Walsh-Childers, Weigold, & Friedman, 2003) or accessibility (Müller, 2009) of science-related information from the Internet.

Digital identity. The research on digital identity asserts, that the self is not a homogeneous and stable entity but "a multiple, distributed system" (Turkle, 1996, p. 148). The digital identity is one of many identities created as a part of self (Döring, 2003) and as such, though connected to the 'offline' identities, an entity of its own (Wynn & Katz, 1997). The Internet, with its high level of flexibility, presents a suitable environment for the development of digital identities (Döring, 2006; Wessels, 2009). The creation of a digital identity is a conscious process, based on individual decisions, that can be triggered and motivated by an array of factors (Jensen Schau & Gilly, 2003). However, the creation of a digital identity is more than the generation of content. Digital identity (just like an offline identity) is formed through interaction with others (Grasmuck, Martin, & Zhao, 2009; Mesch & Talmud, 2006; Strufe, 2010). Beside being a part of a particular self, a digital identity is also a technological entity, hence connected to very pragmatic issues of authorship and security (Allison, Currall, Moss, & Stuart, 2005).

Generation of online content. The content generated by users on the Internet has been subject of research by numerous authors. The studies have addressed the content from virtual platforms of different type such as web pages (Miller & Arnold, 2003; Hine, 2001; Dillon & Gushrowski, 2000), social networking systems (Boyd & Ellison, 2008; Pearson, 2009), blogs (e.g. Fullwood, Sheehan, & Nicholls, 2009; Gunter, Campbell, Touri, & Gibson, 2009; Kjellberg, 2009; Herring, Scheidt, Bonus, & Wright, 2004), microblogs (Boyd, Golder, & Lotan, 2010; Honeycutt & Herring, 2009), focusing on the description of content as well as aiming to explain the behaviour of online users. The research objects were both profiles of scientists and the general public.

Viewing the aims of each area, I have identified three focal points to be addressed in the thesis: focus on Internet self-presentation, assumption of strategic importance, and need for a holistic view of profiling. These points were selected, because I found that they have been insufficiently treated in existing research and that dealing with them would offer a new viewpoint to and thus further the research in the three areas.

Focus on Internet self-presentation. This point was identified based on the study of literature on science communication and content generation. The focus of science communication, both in scholarly communication and in science mass communication has been on publication of content (Bukvova, 2011b; Weigold, 2001; Trench, 2008). Yet, at the same time content publishing, particularly in scholarly communication, has a considerable influence on reputation within the scientific community (Heimeriks & Vasileiadou, 2008). Hence science communication could also be viewed as a form of self-presentation. Using a 'positive lens', i.e. contemplating potential positive influence of information and communication technologies, I have identified Internet web presence as means of supporting scientists' self-presentation (Reychav & Teeni, 2009). The thesis focuses mainly on self-presentation among peers, as this appears to be of major interest to scientists (Suleski & Ibaraki, 2010; Bentley & Kyvik, 2011). By viewing self-presentation rather than publishing, the thesis strengthens the individual point of view of each scientist in science communication. Focus on Internet self-presentation contributes through the exploration of the potential of this communication channel.

Assumption of strategic importance. This point was identified based on the study of literature on science communication and digital identity. While a person's digital identity can be considered in many cases as independent of other offline identities (e.g. a fully anonymous avatar in an online game) (Turkle, 1995), digital identities in science communication are closely linked to offline identities of corresponding researchers. In the now global scientific community, a scientists' digital identities can be better accessible than offline identities (Genoni, Merrick, & Willson, 2005; Farooq, Ganoe, Carroll, & Giles, 2007; Carroll et al., 2009). Given the role of reputation in science community (David, 2004) and the world-wide availability of professional digital identities, I consider it necessary to view scientists' Internet presence as a strategic part of individual self-presentation and communication strategy. The assumption

of strategic importance of Internet self-presentations in this thesis shows the need to align Internet self-presentation with offline activities.

Need for a holistic view. This point was identified based on the study of literature on digital identity and content generation. Empirical studies regarding both digital identity and content generation are typically focused on platforms of a single type. Digital identities on separate platforms however coexist in the same virtual space and cannot be viewed as fully independent (Hansen et al., 2008). On the contrary, many scientists choose to connect their profiles through hyperlinks (Bukvova, 2011a). Hence in this thesis scientists' Internet self-presentations are understood as consisting of all their Internet profiles, forming a directed, hypertextual network. The holistic view connects descriptive research on generated content to the platform-independent notion of digital identity and its connection to self.

The focal points informed and directed the formulation of research aims of the thesis, as well as the selection of concrete research objectives and questions in each essay (see Section 4).

4 Research aims and questions

The thesis was classified as informing the research areas of science communication, digital identity, and online content generation. In order to contribute to these areas, three focal points have been identified to direct further research: focus on Internet self-presentation, assumption of strategic importance, and need for a holistic view. Beside concentrating on these points, I also recognised a commitment to contribute both to research as well as to practice, derived from the applied character of Business Informatics (Wirtschaftsinformatik). Therefore, given this research context and the theoretical foundation, I have formed following research aims for the thesis:

A Contribute to the existing research on online self-presentation by fostering and applying a holistic understanding of Internet presence,

B Contribute to the existing research on scientists' use of the Internet by describing scientists behaviour on their own as well as peers' Internet profiles, and

C Foster understanding and provide a suitable instrument to support scientists designing or managing an Internet profile for the purpose of professional self-presentation.

The research object was the Internet presence of scientists, operationalised as individual Internet profiles connected to their scientific profession. Particular focus was on web pages, social networking systems, blogs, and microblogs. Wikis were not included, as they are meant mainly for collaborative work (Leuf & Cunningham, 2001, pp. 14 et seq.). Similarly, resource management systems (e.g. for photos, videos, presentations, citations) were not explicitly included, as the profiling methods offered on these platforms resemble those on social networking systems.

The thesis consisted of four research studies. Each study focused on separate research objectives or questions that contributed to the fulfilment of the overall research aims.

The first study was concerned with the structure of scientists' online profiles independent of platform. The study has been documented in *Essay 1, A framework for the analysis of internet profiles.* The findings in the study addressed the research aim (B). The study had the following research objectives:

- Identify dimensions that can be applied to classify the content on scientists' Internet profiles and
- Describe the structure of scientists' multi-platform Internet profiles.

The second study was concerned with the analysis of the content of scientists' Internet profiles, applying the analytical framework developed in Essay 1. The study has been documented in *Essay 2, A holistic approach to the analysis of online profiles.* The findings in the study addressed the research aims (A) and (B). The study had following research objectives:

- Develop an analytical framework suitable for providing foundation for data collection and analysis across multi-platform profiles of Internet users,

- Develop an approach suitable for a structured analysis of the collected data, and
- Apply the approach to a heterogeneous sample of Internet profiles of European scientists.

The third study was concerned with the analysis of the search behaviour of scientists using the Internet to find information about their peers. The study has been documented in *Essay 3, Information demand on scientists' profiles*. The findings in the study addressed the research aims (A) and (B). The study dealt with following research questions:

- On what platforms do scientists search for information about their peers and does the selection of platforms differ with regard to the tie strength?
- How do scientists arrive on the profiles of their peers and do the search ways differ with regard to the tie strength?
- What information about their peers do scientists seek and does the information demand differ with regard to the tie strength?
- What impact does the information search have on the interpersonal ties?

The fourth study was concerned with the impression management of scientists' Internet profiles. The study has been documented in *Essay 4, Online impression management for scientists*. The findings in the study addressed the research aim (C). The study had following research objectives:

- Identify and apply a relevant theory suitable for the description of online profiling behaviour and
- Develop a framework to support the decision making of scientists designing or managing an individual, professional online presence.

5 Methods

Although contributing to a particular set of aims and sharing the same research object - scientists' Internet profiles - the research objectives or questions of each study were unique. Hence to address the specific needs of each study, the thesis used

a selection of different of methods rather than a uniform approach. As a consequence of the multi-method approach, each set of objectives or questions could be addressed with focus and precision. Furthermore, potential method-induced biases would be isolated in a single study and not pervade the entire research effort. The methods applied in each study are outlined below.

Study 1: A structural framework

The study method was founded on the principles of the constructivist grounded theory (Mills, Bonner, & Francis, 2006). The grounded theory method is "a systematic qualitative approach to data collection and analysis, that is concerned with generating theory" (Holloway & Todres, 2006). Its aim is to generate theories not only using, but fully based on empirical data. Thus the method renounces the application of a-priori prepared codes or concepts (Glaser & Strauss, 1967). Instead, codes are generated through in-depth interaction with the data (Charmaz, 2003). The codes are further categorised, aiming to identify core issues that serve the description of theories. Constructivist grounded theory further stresses the subjective character of the analysis, acknowledging the resulting codes, categories, and theories as results of the scientists' interpretation (Charmaz, 2003).

The constructivist grounded theory method was selected due to the absence of existing literature concerning the holistic analysis of Internet profiles. Hence as no a-priori framework existed, a new framework had to be developed mapping the structures in the online profiles, focusing on scientists. The grounded theory was particularly suitable as it can be applied to data of different formats. The method also focuses on an in-depth, iterative analysis, stressing the need for immersion in the data (Glaser & Strauss, 1967). The original grounded theory method is, however, based on a positivist understanding of reality (Charmaz, 2000; Glaser, 2002; Bryant, 2003). It is based on assumptions and approaches that would not agree with the theoretical foundation of the research (e.g. discovering patterns in data, letting data talk for themselves Glaser, 2002). Therefore the constructivist approach to the method was applied instead.

The study was carried out in three iterative steps in agreement with the principles of the constructivist grounded theory method. In each step, a small sample of

five scientists was selected, analysed and the results used in the next iteration. The selection of scientists was purposive, based on the needs of each iteration (theoretical sampling, Morse, 2007). In total, the study was based on 79 profiles belonging to 15 German scientists. The selection criteria was based on the scientists' engagement on the Internet. As the aim of study was to analyse possible structures, it was necessary to view profiles of scientists who created large amounts of content and used different platforms. Furthermore, a the study focused on identifying structures, not patterns within the content, the selection did not bias the results. The online presence of the selected scientists was viewed and analysed in-depth using iterative coding. After the third iteration, the codes and categories were stable, resulting in a final structural framework.

An exact description of the method applied in this study has been documented is Essay 1, *A framework for the analysis of internet profiles.*

Study 2: Content of scientists' Internet profiles

The study employed the structural framework described in Essay 1 in combination with a framework for blog analysis by Schmidt (2007) as a foundation for a structured analysis of patterns on scientists' Internet profiles. The frameworks were applied both for the data generation as well as the data analysis and interpretation. The collected data were studied using approaches from the qualitative comparative analysis. The qualitative comparative analysis aims to bridge qualitative and quantitative methods (Rihoux, 2003). It supports a detailed analysis of semi-structured data from a limited number of cases (Ragin, 1987). The data is coded and calibrated and studied using Boolean algebra to determine causal relationships and identify relevant combinations of characteristics (Ragin, 2008).

The qualitative comparative analysis was applied in order to take advantage of the a-priori structuring provided by the analytical networks without forgoing the complexity and richness of the available data. The qualitative comparative analyses acknowledges the influence of pre-existing assumptions and experiences of the researchers as well as their subjectivity. Hence it is in concurrence with the theoretical foundation. With regard to the research objectives, the procedures of the qualitative comparative analysis were adapted in order to yield rather than test profiling pat-

terns. As this approach could lead to biases (Hug, 2009), qualitative methods such as peer discussion and interpretative pattern identification were used to maintain validity of the findings. This agrees with the qualitative understanding of validity (Maxwell, 1992) and the understanding of 'truth' as an external consensus (Pörksen, 2009).

Due to a lack of a sampling frame, the scientists for the study were selected using a convenience sample based on a sampling matrix. The sampling matrix controlled for the dimensions position (assistant, professor), sex (male, female), and research area (natural sciences, social sciences, linguistics and cultural sciences), resulting in 48 fields of scientists to be sampled according to the particular characteristics. The 48 scientists were sampled in equal portions based on their use of platforms of a particular type (web page, social networking systems, blogs, microblogs). The result was a highly heterogeneous sample of 48 European scientists owning 188 Internet profiles. The content on all profiles was described using the pre-existing categories from the analytical frameworks. The data were then calibrated using a fuzzy-set approach (Ragin, 2006) and analysed with Boolean algebra. Based on this categorisation, patterns were identified on three levels: content units on each profile, publishing patterns of the profiles, and profile networks.

An exact description of the methods applied in this study has been documented in Essay 2, *A holistic approach to the analysis of online profiles.*

Study 3: Search for scientists' online content

The study was carried out using the qualitative comparative analysis (Ragin, 2008, 1987) and quantitative association measures. The study was based on an existing theory, that individuals are connected by ties of different strength (strong ties, week ties, latent ties, or absent ties) (Granovetter, 1973; Haythornthwaite, 2002). Thus the character of the study was descriptive, rather than explorative. Furthermore, the pre-existing concepts were applied in order to structure the data. The data generation was based on a critical incident technique (Tenopir et al., 2009).

The data were generated from an online survey of European scientists. The survey collected 123 responses from European scientists using a 10-minute questionnaire,

based on a recall of the last time that the scientists visited a peer's Internet profile (compare the approach in Tenopir et al., 2009). The data were coded and calibrated using a crisp-set approach (Ragin, 2006). The data were then studied using quantitative association measures, to determine the influence of tie on search behaviour. Furthermore, the qualitative comparative analysis was employed to identify behavioural patterns. The study yielded conclusions about the influence of existing social ties on search behaviour as well as patterns describing sought information, access ways, viewed platforms, and search impact.

An exact description of the methods applied in this study has been documented in Essay 3, *Information demand on scientists' profiles.*

Study 4: Online impression management

The study employed the design-research approach. Design research (also design science or design science research, Baskerville, 2008) is concerned with the development and evaluation of artefacts that lead to solution of practical problems (Cole, Purao, Rossi, & Sein, 2005). This approach is used in engineering and computer science, but has been also applied in other disciplines (Simon, 1996). Unlike approaches from the natural sciences, design research is not concerned with the discovery and description of underlying mechanisms and causal relationships in an empirical setting (Hevner, 2007; March & Smith, 1995; March & Storey, 2008). The aim of design research is the development of problem-solving artefacts, defined as constructs, models, methods, and instantiations (Hevner, March, Park, & Ram, 2004).

The approach was selected due to the practice-oriented focus of the study: the development of a decision-support framework to help scientists design or manage their Internet profiles. Existing empirical research on scientists' online self-presentation and the results from Essays 1, 2, and 3 were used to describe the environment and the needs of the scientists. Instead of defining a problem, a 'positive lens' was used (Avital et al., 2008), aiming to enhance existing communication channels with Internet self-presentation. Beside the empirical findings as descriptive components, the study used a complex sociological theory, impression management by Erving Goffman (1959, 1963), as an explanatory approach. Hence beside deriving the decision-support framework, the study also presents a detailed discussion of

online self-presentation behaviour.

An exact description of the method applied in this study has been documented in Essay 4, *Online impression management for scientists.*

6   Findings

The research object of the thesis was the Internet self-presentation of scientists. This object was studied from three distinct perspectives: (A) a conceptual perspective focusing of establishing a holistic understanding of online profiles; (B) an empirical perspective aiming to describe the behaviour of scientists on their own or peers' profiles; and (C) an applied perspective addressing the decision needs of scientists designing or managing an Internet presence. Each of the four studies contributed to at least one of the research aims. The specific results of each study are described in Essays 1, 2, 3, and 4. This section summarises the overall findings and presents their contribution to the three research aims.

(A) Research on online self-presentation

There is a considerable body of research discussing self-presentation and creation of personal content on the Internet. Some authors have discussed the topic from a theoretical point of view (e.g. Wynn & Katz, 1997; Miller & Arnold, 2003; Sherman et al., 2001) while others provide descriptive studies of published content (e.g. Honeycutt & Herring, 2009; Marwick & Boyd, 2010; Blood, 2002). However, this research is often focused on a single type of platform (e.g. web pages, social networking services, blogs, or microblogs). Given the diversity and connectivity within the virtual environment, this does not appear sufficient. Therefore, the aim of the thesis was *to contribute to the existing research on online self-presentation by fostering and applying a holistic understanding of Internet profiles*, that would be applicable to profiles regardless of the host platforms. The aim was addressed in the study of the structure of scientists' online profiles (see Essay 1), in the analysis of profiling patterns (see Essay 2), and in the study of scientists' online search behaviour (see Essay 3).

The first contribution to this research aim was a framework structuring scientists' online presence (see Essay 1). The framework recognises three profiling levels (see Figure 1): (A) content units, which are snippets of content placed on a platform by the owner (e.g. contact data, curriculum vitae, publication list); (B) profile instances, which aggregate all content units created by one scientist on a particular platform (e.g. a profile on institutional web pages, a blog, a microblog); and (C) profile networks, which are hypertextual networks containing all profile instances belonging to one scientist (e.g. an institutional web page, blog, and microblog viewed as a network connected with hyperlinks). The levels are hierarchical, so that lower levels form the higher levels (i.e. content units are aggregated into profile instances and profile instances into profile networks). Hence the profiling patterns on each level influence the next level. The structural framework further recognises three dimensions that can be used to describe the content of scientists web pages: (1) topics, describing the focus of the discussed content, (2) verbosity, evaluating the depth with which a topic was discussed, and (3) placement, related to the position of the content.
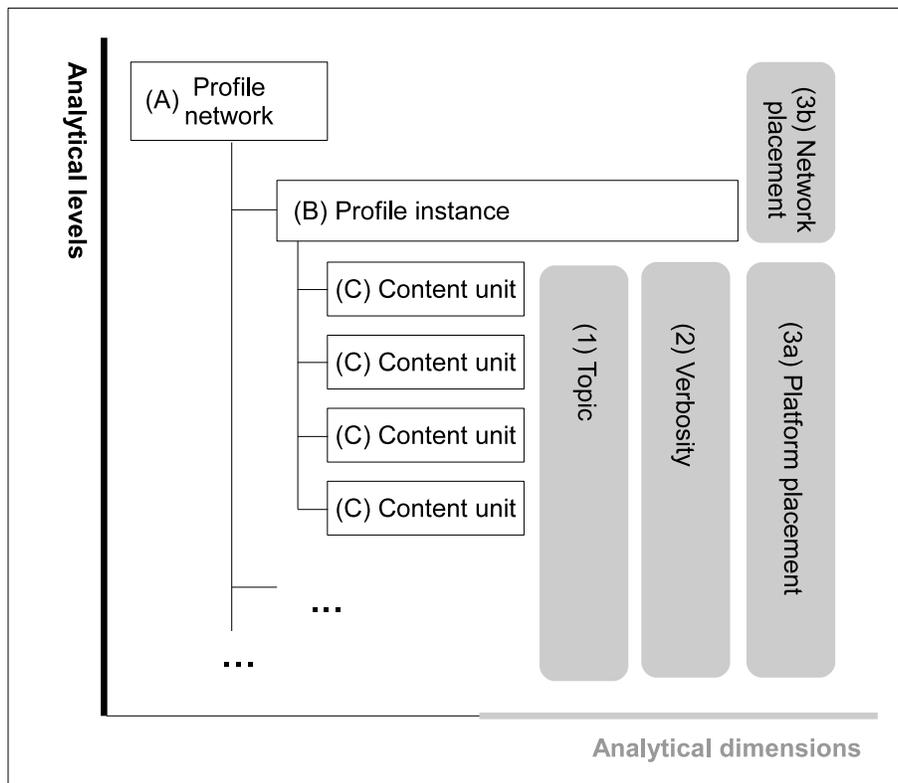

Figure 1: Structural framework

The first, structural framework (see Figure 1) focused on describing the structure

of scientists' Internet profiles without attempting to explain it. In the second step (see Essay 2), the findings about the structure were applied to an analytical framework by Schmidt (2007). Schmidt (2007) suggests that profiling occurs in episodes, where each episode is the result of a conscious decision made by the individual and based on particular communication goals. Hence the structural framework was combined with Schmidt's episode-based approach, resulting in a decision-based analytical framework (see Figure 2).
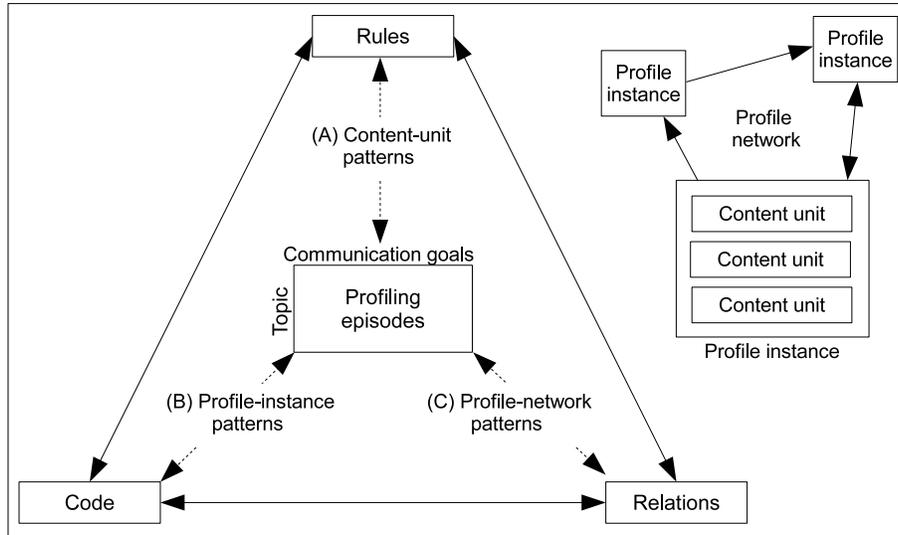

Figure 2: Decision-based analytical framework

The decision-based analytical framework (see Figure 2) is founded on the assumption, that Internet profiling is a conscious activity. Thus each profiling episode is connected to a clear choice of a publishing platform, topic, and communication goals. To offer a further explanation of scientists' online profiling behaviour, Essay 4 applied the impression management theory by Erving Goffman (1959, 1963) to online self-presentation. The impression management theory is founded on the assumption that self-presentation is a deliberate act of performance and thus in agreement with the assumptions of the decision-based framework. The theoretical discussion identifies further factors beyond platform choice, topic, and communication goals that influence online profiling decisions: strategic communication objectives, setting, performance, personal front, regions, teams, and disruption prevention.

The thesis thus contributed three theoretical concepts to research on scientists' Internet presence: first an understanding of Internet profiles as a complex, three-level phenomenon, with content addressing different topics that can be discussed

with varying verbosity and placed on different platforms; second an approach to the analysis of online profiles founded on the view that content is published in decision-based episodes that are guided by clear communication goals; and third an application of a relevant theory to the self-presentation on the internet, helping to identify further factors that can influence the decision-making with regard to the scientists' Internet presence.

(B) Scientists' behaviour on Internet profiles

The thesis aimed *to contribute to the existing research on scientists' use of the Internet* helping to establish how scientists use their profiles to present themselves on the one hand and how these self-presentations are utilised by their peers on the other hand. Essay 2 describes the exploration of publishing patterns on scientists' profiles. Essay 3 presents a study of scientists' search behaviour on their peers' profiles.

The study of scientists' Internet profiles, as presented in Essay 2, used a holistic decision-based framework for the analysis. As a result, profiling patterns were described on each of the three analytical levels of the framework: in content units, on profile instances, and in profile networks (see Figure 3). The patterns complement the existing studies on content typologies and set them into perspective of multi-platforms settings. They also illustrate the variety of profiling behaviours, stressing the need for flexible presentation opportunities for scientists.

Essay 3 presents the demand side of profiling: the behavioural patterns of scientists looking up information about their peers on the Internet. The findings show, that Internet self-presentation is a suitable instrument not only to maintain but also to strengthen existing ties with peers and create new connections. Online profiles are frequented mainly by peers with existing weaker ties. Scientists tend to digitalise their social networks and then use the created paths to access their peers' content. If they lack direct access paths, scientists will also use platform and Internet searches. Depending on existing ties, scientists are likely to seek different information on their peers' profiles. At the same time, there is little connection between tie strength and viewed profiles. Thus an effective impression management needs strategic delibera-

(C) Profile network	Patterns in profile networks	**Platform types in networks**		**Profile instances in networks**	
		C_1a	Static-content networks	C_2a	Simple presence
		C_1b	Dynamic-content networks	C_2b	Presenting facts
		C_1c	Complex networks	C_2c	Presentation through dissemination
				C_2d	Active engagement

(B) Profile instance	Patterns on profile instances		
		B_1	Presence
		B_2a	Visit Card, personal identification
		B_2b	Visit Card, curriculum vitae
		B_3a	Knowledge Base, dissemination
		B_3b	Knowledge Base, personal opinion
		B_4	Personal Journal
		B_5	Notebook
		B_6	Coffee House

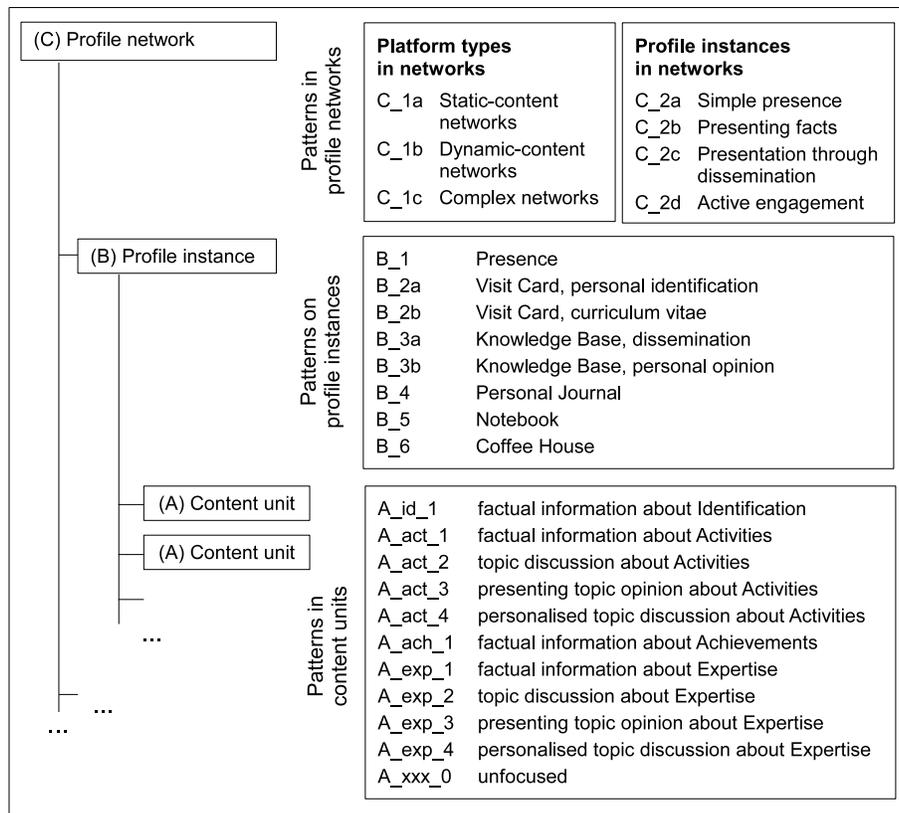| (A) Content unit / (A) Content unit ...	Patterns in content units		
		A_id_1	factual information about Identification
		A_act_1	factual information about Activities
		A_act_2	topic discussion about Activities
		A_act_3	presenting topic opinion about Activities
		A_act_4	personalised topic discussion about Activities
		A_ach_1	factual information about Achievements
		A_exp_1	factual information about Expertise
		A_exp_2	topic discussion about Expertise
		A_exp_3	presenting topic opinion about Expertise
		A_exp_4	personalised topic discussion about Expertise
		A_xxx_0	unfocused

Figure 3: Scientists' profiling patterns on different levels

tion with regard to content placement, connectivity, and target audience definition.

The thesis contributed findings from two areas concerning scientists' behaviour on Internet profiles: a description of patterns on scientists' own profiles and a description of search behaviour of scientists accessing their peers' profiles. Profiling patterns were identified within the published content, on profile instances, and in hypertextual profile networks. Search behaviour was shown to be connected to existing social networks within the scientific community.

(C) Support of individual scientists

The aim of the thesis was *to support scientists designing or managing an Internet profile for the purpose of professional self-presentation.* Indirectly, Essays 1, 2, and 3 contribute to this aim by offering scientists information about profiling and search patterns on the Internet. The findings can encourage scientists to reflect on

their own online presence. A direct contribution to this aim is made in Essay 4, where a framework is presented to support decision-making connected to online self-presentation (see Figure 4)
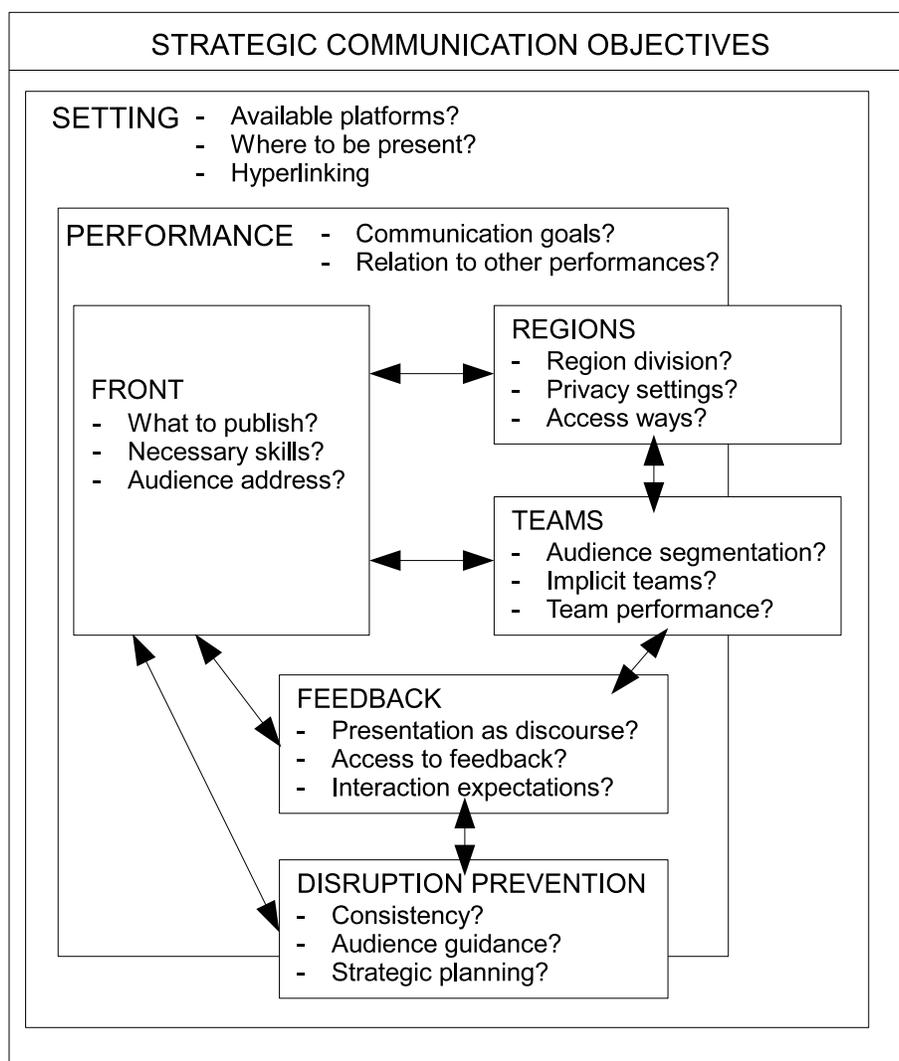

Figure 4: Decision-support framework for scientists' online impression management

Acknowledging the complexity of online impression management and the individual needs of each scientist, the framework does not have a form of a deterministic procedure model. Instead, it identifies eight factors that influence online self-presentation and describes questions that have to be considered with regard to each factor. The framework is based on the impression management theory by Erving Goffman (1959, 1963) and grounded in existing empirical findings on online self-presentation, including Essays 1, 2, and 3. The application of the theory to online environment and the construction of the framework are discussed in detail in order to foster under-

standing and trigger reflection. Furthermore, the Essay 4 provides case examples to increase the clarity and applicability of the findings.

The thesis contributed a decision framework to support individual scientists. The framework identifies key factors that influence online impression management and presents them together with a theoretical discussion as well as exemplary application. The findings thus support reflective, strategic approach to scientists' Internet impression management.

7 Conclusions

The thesis was motivated by the opportunities for scientists' self-presentation offered by the Internet. Using a positive-lens (Avital et al., 2008), it had three research aims, (A) a conceptual contribution to research on online self-presentation, (B) a study of scientists' behaviour on online profiles, and (C) a support of individual scientists managing their online presence. The aims were addressed through a series of studies that have been documented in Essays 1, 2, 3, and 4. While each study had its own research objectives or questions and employed own methods, each also contributed directly to at least one of the overall aims. The thesis project derived validity and reliability through the complex multi-method approach and a non-linear design. Stemming from the area of Business Informatics (Wirtschaftsinformatik), the findings contribute both to research as well as to practice, thus satisfying the applied character of the discipline.

The thesis contributed to research in its field through introduction of theoretical concepts, findings from empirical studies, and theory application. Firstly, the thesis introduced a holistic understanding of online profiles and derived theoretical framework as a foundation for structuring content analyses of personal online presence. Focusing on the self-presentation of scientists, the frameworks were applied as a foundation of an empirical study. Secondly, while the applicability of the concepts was thus demonstrated, the study also yielded a complex set of patterns describing the scientists' online profiling behaviour. Thirdly, to complement these findings, a further empirical study was carried out, providing findings about scientists' search behaviour. Fourthly, the findings from the empirical studies were used in an ex-

tended discussion of the application of a sociological theory of impression management (Goffman, 1959, 1963) to virtual environments. The application further lead to identification of eight factors influencing online self-presentation.

The thesis made a contribution to the practice through description of existing online practices and through development of a decision-support framework. Firstly, the empirical studies describing the profiling behaviour and search behaviour of scientists offer a valuable inside into Internet activities for individual scientists, but particularly for decision makers. Individual scientists can use this findings for reflection on their own online profiling practices. Developers in scientific institutions or in organisation targeting scientists who are active online can use the findings as a foundation for requirement analysis. The findings show the variety in behaviour and thus motivate the decision makers to take into account users needs, and consider different views on scientists' online presence (in particular the supply-demand interplay). Secondly, the decision-support framework serves as an instrument to help individual scientists consider and plan their Internet presence.

The procedures and findings documented in the thesis can form a foundation for theoretical as well as applied research research in different areas:

- The analytical frameworks from Essays 1 and 2 can be used as a foundation for studies in the creation of multi-platform digital identities, especially regarding scientists' online presence. As the thesis has shown, scientists not only use different platforms for profiling, but they also connect them through hyperlinks. Thus a single Internet profile cannot be seen as a single identity (Hansen et al., 2008). This approach is also related to the notion of 'e-portfolios' as web-based collections of individuals' contents (compare e.g. Love, McKean, & P. Gathercoal, 2004). Stressing the different levels of profiling, the frameworks serve as a guidance for multi-platform analyses.
- The analytical frameworks from Essays 1 and 2 and especially the approach demonstrated in Essay 2 can be used to carry out phenomenological studied with larger samples to establish online behavioural patterns across disciplines. This would help understand different needs of different research groups. Similarly, the approach used in Essay 3 could be applied to larger sample and used to differentiate between scientists from different disciplines.
- The analytical frameworks from Essays 1 and 2 together with the decision-

support framework can be used to evaluate institutional profiling opportunities. The thesis shows, that institutional web pages play an important role in scientists' self-presentation on the Internet. At the same time, the profiling opportunities on these pages are often limiting (Hess, 2002). The thesis offers instruments to evaluate whether and how institutional web pages support the heterogeneous self-presentation needs of the scientists.

- The decision-support framework from Essay 4 can be used as a foundation for explanatory research into scientists' self-presentation. This would include both the application and evaluation of the framework and its use as a foundation for the development of research instruments, such as interview guidelines, observation schedules, and questionnaires.

The focus of the thesis was on the description of scientists' behaviour on online profiles. As such, the research relied strongly on observation methods, both by analysing existing content and by collecting subjective behavioural descriptions as a form of self-observation. Thus the research cannot offer any explanatory findings. At the same time, it relies on the assumption, that scientists have subjective motives (though uncovered) to be active online and that their online behaviour is deliberate and governed by decisions. Viewing the methods, the findings of the empirical studies were based on limited samples, resulting in a limited generalisability. However, care was taken to compare the findings with existing literature. Through this analytical generalisation, the findings are considered applicable beyond the local empirical settings of the studies (Falk & Guenther, 2007; Hammersley, 2001).

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