Attitudes towards Online Communication: An Exploratory Factor Analysis

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ABSTRACT
This paper presents the results of an exploratory factor analysis regarding attitudes of professionals towards online communication. Using items based on the theoretical approaches to scientific study of online communication identified by Walther and Parks [20], an attitude survey was conducted with N=100 professionals regarding their approach to online and face-to-face communication. The factor analysis yielded three approaches focusing on 1.) media choice, 2.) the hyperpersonal options of online communication, and 3.) social cues in online communication. These can help understand the use of information technology by today's workforce.

Categories and Subject Descriptors
H.1.2 [Models and Principles]: User/Machine systems – human factors, human information processing, software psychology;
H.5.3 [Information Interfaces and Presentation (e.g. HCI)]: Group and Organization Interfaces – asynchronous interaction, collaborative computing, computer-supported cooperative work, evaluation/methodology, synchronous interaction, theory and models, web-based interaction; K.4.3 [Computers and Society]: Organizational Impacts – computer-supported collaborative work; K.7.0 [The Computing Profession]: General

General Terms
Experimentation, Human Factors, Management, Measurement.

Keywords
attitudes, factor analysis, online collaboration, computer-mediated communication.

1. INTRODUCTION
Communicating online has become normality for today's workforce. Working in the same building or at remote locations and connected through the internet, collaborators cope with numerous challenges. The way people face and cope with these challenges is to some extend influenced by their attitudes towards communicating online. A person's attitude represents the approach he or she takes towards something: Attitudes have affective, cognitive, and behavioral components, they imply feelings, beliefs, and actions.

Take, for example, that someone worries about not being able to establish a friendly relationship if she does not see a person face to face. In this case, "worrying" is the affective component of the attitude, the belief that you have to see somebody face to face to establish a friendly relationship represents the cognitive component, and avoiding having only online communication with a co-worker would be the behavioral component. Thus people's attitudes are a relevant factor in guiding actions, and eliciting attitudes can help understand the use of information technology by today's workforce.

These attitudes do not exist isolated from other attitudes and the overall personality, rather, they are interconnected with an inner logic, offering orientation in the world and continuously integrating the experiences a person makes. They are a basis for everyday understanding, serving functions of explanation and prediction – and can be conceptualized as intuitive or 'subjective' theories [7].

These subjective theories are shaped by a person's experience. But they also shape the experiences a person makes. For example: A person might have the belief that online communication cannot be as personal and close as face-to-face communication. This person will probably try to have face-to-face communication whenever he or she is intending to establish a good relationship with someone. And be cautious when communicating online. This might then lead to this person having better relationships when communicating face-to-face and less personal relationships when communicating online. So in the sense that attitudes guide people's action and their conceptual framework constrains how they make sense of new evidence, subjective theories may lead to self-fulfilling prophecies (cf. [19]). Or, in consequence, choice of media, mode of communication, preferences in collaboration platforms etc. can only be understood if the worker's attitudes are taken into consideration.

To elicit the subjective theories of the workforce towards communicating online, the existing research on computer-mediated communication can provide the groundwork for conceptual exploration. Over the past 30 years, research on communication via computers has developed dramatically and scientific research has taken different approaches to explaining the dynamics of online communication and personal connection [1]. Walther and Parks [20] categorized the different scientific theories which served as a basis for researching computer-mediated communication. Although the number of scientific studies done in the different research traditions has changed over the years, their classification of the different approaches still holds up and yields a fertile ground for exploring subjective theories about online communication.

Their classification is rooted in basic communication constructs, dealing with the way in which communicative cues available in online settings affect communication. Based on this focus of
communicative cues, five clusters of theoretical approaches were identified and labeled "cues filtered out", "cues to choose by", "cues filtered in", "cues about us", and "cues bent and twisted".

In eliciting the subjective theories of people collaborating online, these scientific theories are used as a basis. Since the attitudinal structure of laypeople is not expected to be as differentiated as scientific approaches, the two approaches "cues filtered in" and "cues about us, not you and me" shown by Walther and Parks [20] are considered to be too similar to be differentiated by laypersons' subjective theories and will not be differentiated for the purpose of this study. Hence, four approaches have been focused to identify attitudes in users of online communication which are related to scientific theories [6]: cues filtered out; cues to choose by; cues filtered in/cues about us, not you and me; cues bent and twisted. These four approaches are characterized as follows.

Cues filtered out
The basic assumption is that online communication has a deficit compared to face to face communication because nonverbal cues in a face to face conversation cannot be replicated in an online environment. Cues filtered out approaches [2] focus on the cues which are not being transmitted in computer-mediated communication. The basic assumption is that there are certain communicative functions which cannot be accomplished without the signals that accompany physical copresence and proximity. It is thus assumed that face to face interaction is necessary to relate and work together effectively [11]. The ability to monitor one another's attention and availability are critical processes which cannot take place in computer-mediated communication, the exchange is missing social presence [14] and lacking social context cues [8].

Cues to choose by
This approach is based on the notion that there has to be a match between information richness and media richness [4, 5]. The basic assumption is that people choose a medium according to the cues they need. Some types of messages might be conveyed more efficiently in one medium than in another – thus it is important to match the message and the medium. A cue system or bandwidth is taken as a causal property: As bandwidth gets lower, certain aspects of communication are assumed to change. These differences include a decline in civility, coordination, empathy, and friendliness. There is assumed to be an optimal match between the message equivocality or uncertainty and the chosen media such that efficiency and effectiveness is optimal.

Cues filtered in/Cues about us, not you and me
These approaches focus on the fact that online communication brings in new cues which are not available in face to face communication – thus offering more or other ways to communicate. For example, communicators can exchange social information through style (spelling, signature, emoticons etc.) and timing (e.g. night versus day time) of verbal messages online. This line of research has shown that the absence of certain cues can enhance communication because cues present in face to face interaction might actually have negative effects: Physical appearance can lead to negative attitudes towards a person based on the physical attractiveness, markers of taste, age, habitus, signs of out-group membership etc. Thus the absence of cues in online communication can, under certain circumstances, forge stronger group identities than face to face interaction [15, 16]. Based on the theories of social identity and self-categorization (e.g., [17]) individuals are conceptualized to have multiple layers of self that become relevant depending on which social identity is salient. When personal identities are salient, the person behaves according to the norms, beliefs and standards which correspond to his or her unique identity. When social identities are salient, the behavior is based on the norms of the group with which one is identified. This process is enhanced by online communication that lacks multimedia cues and renders the partners visually anonymous: Under conditions of visual anonymity, people act in ways more normative to the salient group [12, 13, 15]. When pictures or videos are added, these effects diminish: Individualizing information conveyed through physical appearance leads to the individuals being evaluated independently and with less group bias [9, 10]. Based on this approach, online communication makes group memberships and social identity more salient and promotes greater group identification.

Cues bent and twisted
Online communication can be even more personal that face to face communication ("hyperpersonal"), because in an asynchronous online setting, sender, receiver, channel, and feedback can work together to promote more socially desirable levels of interaction than face to face communication [18]: In online communication, individualizing cues such as appearance, which are necessarily available in face to face interaction are not readily available. The cues available can be manipulated by the sender to customize his or her self-presentation. In asynchronous interactions, the sender can mindfully compose the message, edit and review the content before sending it to the receiver. The focus of all cognitive resources can be on the message construction and the cognitive load can be divided over a longer time than in face to face communication. In combination with these identity optimizing effects, the receiver tends to formulate idealized perceptions of the sender, interpreting the information available in terms of a common identity with the sender. Thus a positive feedback loop can lead to an interaction which is more positive than a face to face interaction might have been.

2. RESEARCH QUESTION
The research question that guided this investigation is: Based on a factor analysis, is there evidence that the attitudinal structure of professionals towards online communication is similar to the scientific theoretical approaches differentiated in this field.

3. METHOD

3.1 Participants and Procedures
The research was conducted in Germany, the questionnaire was completed online by N=100 participants which were professionals in the fields media, public relations, and pedagogy. 631 individual emails had been sent out by the author asking the addressee to participate in the survey, i.e. the response rate was 15.8 %. Data for the current study were collected in the spring of 2012 via online surveys. The online surveys were constructed using web-based data collection software. For the online data collection, possible participants were identified, emailed a link to the survey, and urged to respond.

3.2 Measure
The questionnaire comprised 16 attitudinal items (see appendix). They were constructed based on the four different approaches to computer-mediated communication in order to develop a measurement which reflects attitudes towards online communication based on the four theoretical approaches. For each approach there were four items. All of the measures utilized were Likert-type scales that contained positively- and negatively-formulated items. Participant responses were converted to numerical scores and ranged from 1, indicating “strongly disagree” to 5, indicating
“strongly agree”. The questionnaire included four questions regarding the participants' online experience and four demographic questions.

3.3 Analysis

Responses to the questionnaire were converted to numerical scores. Negatively phrased questions were inverted such that a positive response always corresponded to a higher numerical value. Underlying dimensions in the attitudes towards online communication were evaluated with exploratory factor analysis. Following principal-components extraction, factors were rotated with Kaiser's varimax criterion. Factor extraction was specified for eigenvalues larger than 1.00.

4. RESULTS

This section begins with a description of the participating population. This is followed by the results of the factor analysis on attitudes towards online and face to face communication.

4.1 Description of the Sample

A total of 100 participants had answered. Of these 42 were female, 53 were male (in the numbers reported here, the difference to 100 always represents the missing data due to the fact that respondents chose to not answer a question). Regarding their age, 11 respondents were 21-30 years old, 16 were 31-40 years old, 34 were 41-50 years old, 27 were 51-60 years old and 10 were older than 60 years.

Of the respondents, 18 had a vocational training, 78 had a University degree. The professional branches represented in the sample are shown in table 1.

### Table 1. Respondents' Professional Backgrounds

<table>
<thead>
<tr>
<th>Professional Background</th>
<th>No. of respondents</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>26</td>
<td>26 %</td>
</tr>
<tr>
<td>Social Science/Arts</td>
<td>11</td>
<td>11 %</td>
</tr>
<tr>
<td>IT</td>
<td>4</td>
<td>4  %</td>
</tr>
<tr>
<td>Pedagogics</td>
<td>26</td>
<td>26 %</td>
</tr>
<tr>
<td>Engineering</td>
<td>4</td>
<td>4  %</td>
</tr>
<tr>
<td>Interdisciplinary</td>
<td>8</td>
<td>8  %</td>
</tr>
<tr>
<td>Other/no answer</td>
<td>21</td>
<td>21 %</td>
</tr>
</tbody>
</table>

Regarding the items dealing with online communication the results showed that 81 respondents were online every day, 14 were online several times a week. In terms of mobile devices, 49 respondents had a mobile phone which did not allow them to access their emails, 43 had a mobile phone which did allow them to access their emails and 5 did not have a mobile phone at all.

### Table 2. Results of the Factor Analysis

<table>
<thead>
<tr>
<th>Item</th>
<th>extracted communalities</th>
<th>factor 1</th>
<th>factor 2</th>
<th>factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2 Communication via mail or online has many disadvantages compared to face to face communication.</td>
<td>.528</td>
<td>-.644</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D3 The main problem regarding online communication is that so much information gets lost – because there is no voice, body language, etc.</td>
<td>.581</td>
<td>.659</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D4 I see quite a few advantages in online communication compared to face to face communication. (inverted)</td>
<td>.579</td>
<td>-1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M1 Problems with online communication usually occur when the technology does not match the task – e.g. when you try to brainstorm using email.</td>
<td>.445</td>
<td>.653</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M2 The key to successful online communication: Deciding, whether it is necessary to see one another to solve an issue – and the either call for a meeting or solve the issue online.</td>
<td>.695</td>
<td>.670</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M4 The greater the danger of a misunderstanding, the more important is a face to face talk.</td>
<td>.499</td>
<td>.682</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1 One of the major problems of online communication is that the social aspects of collaboration get neglected. (inverted)</td>
<td>.577</td>
<td>-1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S2 People working together find appropriate ways to socialize, even in online communication.</td>
<td>.611</td>
<td></td>
<td>.760</td>
<td></td>
</tr>
<tr>
<td>S3 Online communication in a professional setting offers many options to build up a positive relationship with someone.</td>
<td>.638</td>
<td></td>
<td>.691</td>
<td></td>
</tr>
<tr>
<td>S4 When trying to establish a positive relationship with someone online you have to watch out for different things than in face to face communication.</td>
<td>.485</td>
<td>.650</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1 In international teams, a face to face meeting can actually be negative. It might make sense to only communicate online.</td>
<td>.764</td>
<td></td>
<td>.799</td>
<td></td>
</tr>
<tr>
<td>H2 Online communication can lead to a better understanding and better collaboration than seeing one another face-to-face.</td>
<td>.556</td>
<td></td>
<td>.647</td>
<td></td>
</tr>
<tr>
<td>H3 Online communication can actually improve collaboration in virtual international teams: Because you do not hear and see one another, many problems of face to face meetings take a back seat, e.g. non-stop talkers, misunderstandings due to accents and dialects, being influenced by how someone looks.</td>
<td>.590</td>
<td></td>
<td>.755</td>
<td></td>
</tr>
<tr>
<td>H4 Face to face contact is important for collaboration, because only face to face can you develop a common identity as a team and a true team spirit. (inverted)</td>
<td>.436</td>
<td></td>
<td></td>
<td>-.558</td>
</tr>
</tbody>
</table>

Letters in front of the item number represent the scientific approach that this item was based on, see "sources" in Appendix.
Regarding the experience with online communication, 8 respondents reported they had no or little experience collaborating online, 84 reported the communication with their colleagues was partially online and partially face to face and 5 reported the majority of their professional communication took place online.

4.2 Factors yielded regarding Attitudes

In constructing the questionnaire the attempt was made to test whether the four different theoretical approaches classified by Walther and Parks [20] can also be found as attitudes towards online communication.

The exploratory factor analysis showed that based on the eigenvalue a solution with four factors had the best fit. Yet these factors did not correspond to the four theoretical approaches to computer-mediated communication. With a cut-off at 0.4 the fourth factor had only one item loading on it: Item M3 "Even with team-member distributed all over the world, you should have face to face meetings to work on complex tasks – the advantage of a face to face meeting justifies the high travel expenses which result from this."

Attempts to find a suitable solution with two, three or five factors did not fulfill the eigenvalue criterion. These analyses showed that two items did not differentiate between the factors: Item M3 had communalities below 0.2 in the two- and three-factor solution and represented a separate factor in the four- and five-factor solution (see above). Item D1 "In general, face to face communication is better than online communication." had communalities below 0.5 in all solutions.

Consequently, items M3 and D1 were excluded from the analysis. The best fit yielded a three-factor solution which is presented in table 2. Considering factor loadings above 0.5 to be salient, each of the remaining 14 items loads on one of the three factors. The rotation was converged in five iterations.

4.3 Correlation of Age and Gender

For age and gender, analyses of variance were used to analyze differences regarding the three factors. The analyses did not yield any significant results.

5. DISCUSSION

The exploratory factor analysis conducted to investigate the structure of professionals attitudes towards online communication showed a three-factor solution having the best fit after items that worked poorly had been removed. In interpreting the factors, it seems they represent the following focus on certain aspects of online communication:

- Factor 1 represents an attitude which focuses on the necessity to make the right choice of media: The loss of (social) information is considered crucial and face to face has a decisive lead over online communication that can not be replicated (item D3, S1, H4). Thus it is important to choose an appropriate mode of communication for the task at hand (item M1, M2, M4) and watch out for different things online and face to face (item S4).

- Factor 2 represents an attitude which focuses on the new chances and advantages of online communication: Face to face communication is considered as something that can actually be negative (H1, D4) and online communication is taken to offer possibilities for communication which are even better than face to face communication (item H2) and can improve communication (item H3).

- Factor 3 represents an attitude which focuses on relationships to others: It is assumed that people working together find appropriate ways to socialize, even in online communication (item S2), that online communication offers many options to build up positive relationships with others (item S3) and the idea that communication via mail or online has many disadvantages is rejected.

While the factors only partially represent the way the items were parcelled in sub-scales, they can still be interpreted as representing the theoretical approaches differentiated by Walther and Parks [20]:

- "Cues to choose by" in factor 1, with the attitude which focuses on deficits of online communication and the necessity to make the right choice of media,
- "Cues bent and twisted" in factor 2, with the attitude which focuses on the new chances and advantages of online communication,
- "Cues filtered in"/"Cues about us, not you and me" in factor 3, with the attitude which focuses on relationships to others.

For each factor, the majority of the items loading on it were also developed to describe this attitude. Yet there were also items loading unexpectedly. The subscale developed to represent the "cues filtered out" attitude (item D1-D4) did not yield an independent factor at all, i.e. it seems that the "cues filtered out" approach, which simply focuses on the deficits of online communication, is not one of the participants’ attitudinal dimension: Item D1 was left out of the analysis since it did not differentiate between the factors at all. Item D2 loads negatively on factor 3 "cues filtered in"/"cues about us, not you and me" and can be interpreted as challenging the notion that negative communication originates in the media rather than the relationship itself. Item D3 loads on factor 1 "cues to choose by", suggesting that the loss of information like body language or voice seems to be taken as an issue which can be dealt with in terms of media choice. Item D4 was developed as a negatively formulated item representing the attitude that "cues filtered out" is a problem in online communication. Rather, it turned out to be a building block of the "cues bent and twisted" factor.

The fact that the dimension "cues filtered out" does not directly correspond to a factor in this exploratory factor analysis suggests that the simplistic deficit approach to online communication is not part of the attitudinal structure of professionals. This is interesting because it has been argued that the cues filtered out model has a high face validity and "still rings true for many" [1, p. 57; 5] and thus should be popular as a basis for subjective theories. But it seems there is another parallel between the subjective theories and the scientific approaches: The cues filtered out theories, which were the first ones to attempt to explain computer-mediated communication, have been eclipsed by the other approaches in the scientific literature. Likewise, the attitudinal structure discovered in this study shows that the participants who focused on the deficits always considered these relative to the message being conveyed: Based on the "Cues to choose by" approach represented in factor 1, the deficits of online communication are only considered an issue if there is a mismatch between the complexity of the message and the media richness. The simplistic deficit approach does not seem prevalent in today's workforce's attitudes about online communication any more.

Overall, the attitudinal structures found in this study show that individuals using the same media might differ in the perception of
these media. Drawing on the idea that these attitudinal approaches represent subjective theories, they frame the experiences a person has with online communication and guide his or her sensemaking [22] regarding the experiences made communicating online. These approaches can turn into self-fulfilling prophecies, thus they are highly relevant for online communication, e.g. by individuals obtruding their choice of media upon others, withdrawing from online communication or building impressions of others based on their personal approach to online communication rather than other attributes they might have.

6. CONCLUSIONS AND FUTURE WORK
The findings from the exploratory factor analysis with 100 participants show that there are three different attitudinal approaches which people take to online communication: First, a focus on media choice, second, a focus on the hyperpersonal options of online communication, and third, a focus on social cues in online communication. These subjective approaches roughly mirror the scientific approaches that have been used to explain the dynamics of online communication. In employing and designing online communication, these attitudes should be considered: As a basis for sensemaking these attitudinal approaches can influence the communication itself, having an impact on the use and the quality of online communication.

This exploratory factor analysis can only give a first hint at which attitudes might be relevant for successful online communication. Further work needs to be done to confirm these factors and develop an instrument for diagnosing attitudes towards online communication. A valid, reliable and objective measure can serve as a basis for researching the correspondence to diversity criteria such as gender, experience or professional background. Further work could also elicit the subjective theories represented by these attitudinal dimensions and implications for the actual online communication could be examined.

7. REFERENCES

## APPENDIX

Items were administered in German, translated by the author.

<table>
<thead>
<tr>
<th>Item</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>In general, face to face communication is better than online communication.</td>
</tr>
<tr>
<td>D2</td>
<td>Communication via mail or online has many disadvantages compared to face to face communication.</td>
</tr>
<tr>
<td>D3</td>
<td>The main problem regarding online communication is that so much information gets lost – because there is no voice, body language etc.</td>
</tr>
<tr>
<td>D4neg</td>
<td>I see quite a few advantages in online communication compared to face to face communication.</td>
</tr>
<tr>
<td>M1</td>
<td>Problem with online communication usually occur when the technology does not match the task – e.g. when you try to brainstorm using email.</td>
</tr>
<tr>
<td>M2</td>
<td>The key to successful online communication: Deciding, whether it is necessary to see one another to solve an issue – and the either call for a meeting or solve the issue online.</td>
</tr>
<tr>
<td>M3</td>
<td>Even with team-member distributed all over the world, you should have face to face meetings to work on complex tasks – the advantage of a face to face meeting justifies the high travel expenses which result from this.</td>
</tr>
<tr>
<td>M4</td>
<td>The greater the danger of a misunderstanding, the more important is a face to face talk.</td>
</tr>
<tr>
<td>S1neg</td>
<td>One of the major problems of online communication is that the social aspects of collaboration get neglected.</td>
</tr>
<tr>
<td>S2</td>
<td>People working together find appropriate ways to socialize, even in online communication.</td>
</tr>
<tr>
<td>S3</td>
<td>Online communication in a professional setting offers many options to build up a positive relationship with someone.</td>
</tr>
<tr>
<td>S4</td>
<td>When trying to establish a positive relationship with someone online you have to watch out for different things than in face to face communication.</td>
</tr>
<tr>
<td>H1</td>
<td>In international teams, a face to face meeting can actually be negative. It might make sense to only communicate online.</td>
</tr>
<tr>
<td>H2</td>
<td>Online communication can lead to a better understanding and better collaboration than seeing one another face-to-face.</td>
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<td>H3</td>
<td>Online communication can actually improve collaboration in virtual international teams: Because you do not hear and see one another, many problems of face to face meetings take a back seat, e.g. non-stop talkers, misunderstandings due to accents and dialects, being influenced by how someone looks.</td>
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<tr>
<td>H4neg</td>
<td>Face to face contact is important for collaboration, because only face to face can you develop a common identity as a team and a true team spirit.</td>
</tr>
</tbody>
</table>

Letters in front of the item number represent the scientific approach that this item was based on, see last column. 
"neg" means that this item is formulated negatively.