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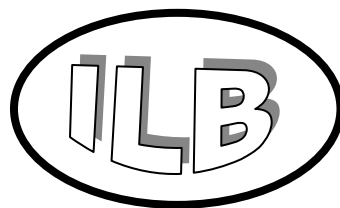
Quality of Communication and Types of Communicators in German Veterinary Authorities

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Abstract

Recent crises in the agricultural sector, such as the 2011 German dioxin scandal and deaths from EHEC or the last swine fever outbreak in Germany in 2006, have caused immense economic damage. As a result, German veterinary authorities at the district, state, and federal levels have been put in charge as crisis managers and leaders of active preventative organizations. To perform their tasks successfully, they require effective communication skills as well as close cooperation with stakeholders in the agribusiness sector. However, despite clear evidence that identifies these relationships as crucial, there is only very little research that directly addresses communication quality and intensity of public authorities responsible for food safety. The relevant literature so far primarily deals with the technical design and implementation of new information and communication systems. However, it often fails to address the particular needs and communication behaviour of individual users. It is the objective of this study to identify determinants of communication quality and to differentiate between types of communicators in order to shed light on the construct of communication behaviour in veterinary authorities. To do so, the determinants of the quality of communication between public authorities and their external stakeholders were identified based on a causal model. These determinants were used as cluster-building variables in a cluster analysis to determine different types of communicators in veterinary services.

Keywords: *communication quality, Structural Equation Model, cluster analysis, veterinary authorities, interactional view*

1   Introduction

Crises in the agricultural sector, such as the German dioxin scandal and deaths from EHEC in 2011 or the last swine fever outbreak in Germany in 2006 have caused immense economic damage (Beer et al., 2007; Luy and Depner, 2006). This is often due to a lack of communication during the crisis. A possible solution to this problem may be found in new technological developments (e.g. Trade Control and Expert System [TRACES], the German national livestock database "Herkunftssicherungs- und Informationssystem für Tiere" [HI-Tier], the Rapid Alert System for Food and Feed [RASFF]), which improve the rapid dissemination of information on food safety and should change the communication behaviour of public administrations (Arne, 2005). These information and communication systems have led to increased expectations regarding the quality and intensity of both general and crisis communications by the competent authorities. These expectations relate primarily to the improved internal coordination of public administrations, but also to improvements in intra- and interorganizational business process organisation (Olsson and Kjellén, 2009). With this and with the above-mentioned crises in mind, interaction with non-administrative recipients of information during a time of crisis can be seen as a key element

in innovative organisational and supply chain models used by public administrations (see Hilgers (2010)) regarding the involvement of external stakeholders in the supply chain activities of public administrations). Veterinary authorities on the local, state, and national level are seen as organizations acting preventatively as well as crisis managers, for instance, in the meat supply chain. In order to carry out their duties effectively, high-quality communication and collaboration with the various stakeholders in the agribusiness supply chains is a prerequisite (Schulze Althoff et al., 2005). Despite this, there has been very little research on the quality and frequency of governmental communication (Breuer et al., 2008; Theuvsen, 2010; Theuvsen and Arens, 2011).

To fill this gap, this article will present results from an empirical study that used cluster analysis to identify various types of communicators among veterinary authorities. Building on a theoretically sound and empirically tested model for communication quality, four types of communicators were identified. Empirical results also indicate that adequate personal communication has a stronger influence on the quality of communication than the actual content of a message. The results could become a basis for development and improvement of user-oriented communication concepts in the observed public administrations.

2 Model and Hypotheses

The conceptual foundation of the present study is derived from research in the field of communication, which has identified various determinants of communication quality (e.g. Frommeyer, 2005; Watzlawick, 1977). The starting point is the "interactional view" in communication theory, in which Watzlawick (1977) describes interpersonal communication as a unity of content and relationship (Figure 1). The relative levels of these two aspects, henceforth referred to as adequacy of personal communication and adequacy of communication content, influence the quality of interpersonal communication.
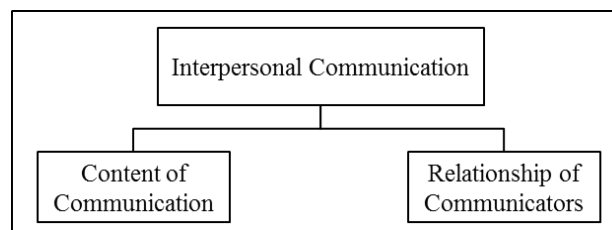
Figure 1. Interpersonal communication (Frommeyer, 2005)

In light of this approach and further relevant literature, a concept was formulated which encompasses the major influences on the quality of communication in public administrations. It sees the quality of communication as a result of five determinants (Figure 2). Hence, the quality of communication depends first of all on whether the exchange of information is adequate on the content and personal levels. The content of communication is adequate if the recipients' expectations are fulfilled in regard to the correctness, relevance, timeliness, understandability, etc. of the information. On the other hand, the personal adequacy of communication has to do with interpersonal aspects in the communication process. Here, elements like sympathy, trustworthiness, openness, and honesty determine the quality of relationships between communication partners. These two aspects of communication are supplemented by the determinants communication medium, experience and frequency of communication. The choice of communication medium

depends on the complexity of the problem at hand (Daft and Lengel, 1984). Veterinary authorities communicate not only when attending to routine duties, but also in times of crisis, for example, during periods of extreme time pressure when fighting highly contagious animal diseases. Considering the highly complex duties during a crisis, it seems that the working situation—daily routine tasks or crisis management—should have an impact on the choice of communication medium; therefore, it is assumed that the quality of communication is influenced by the adequate choice of communication medium. Similarly, the frequency of communication is expected to be greater during a crisis than during routine communication (Taylor, 2002). Finally it can be assumed that the experience of the veterinary authorities with everyday communication as well as with crisis communication will have an influence on communication quality (Militello et al., 2007).
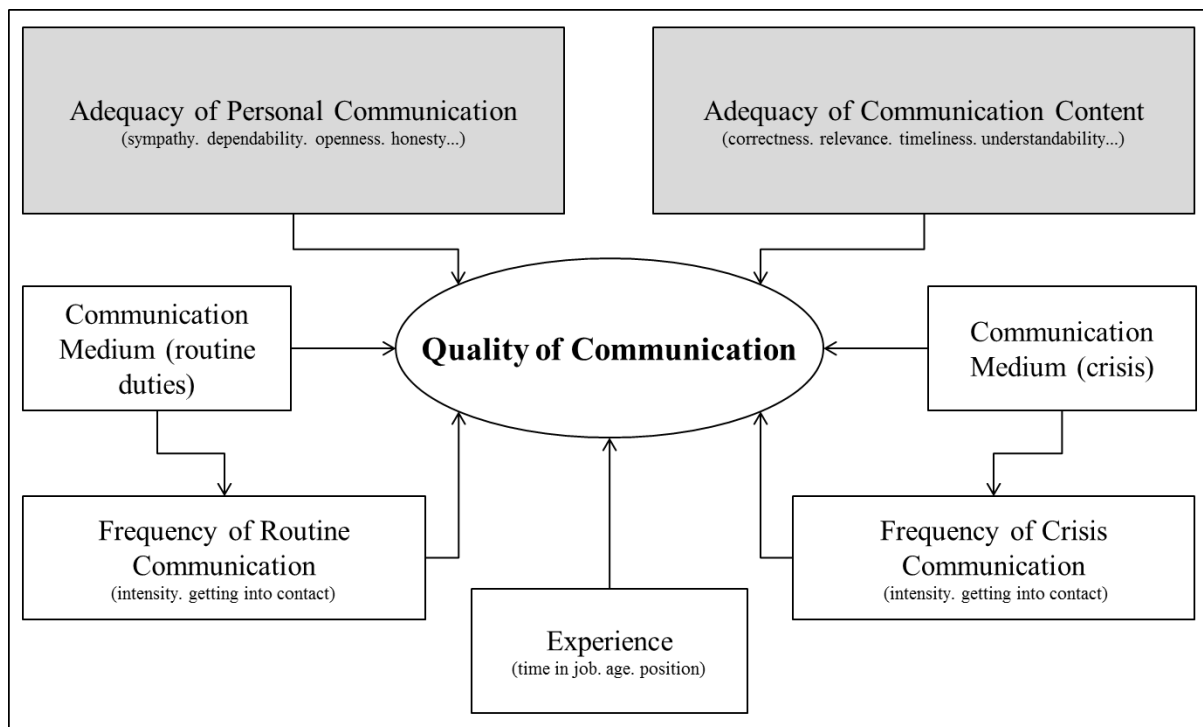
Figure 2. Determinants of communication quality

With regard to the considerations about the determinants of the communication quality of public authorities as summarized in Figure 2, the following hypotheses were derived:

H1: The personal adequacy of communication (sympathy, openness, honesty, etc.) influences the quality of communication.

H2: The adequacy of the content of the communication (correctness, relevance, timeliness, etc.) influences the quality of communication.

H3.1: The communication medium used for routine duties influences the quality of communication.

H3.2: The medium used to communicate during crises influences the quality of communication.

H3.3: The communication medium used for routine duties influences the frequency of communication.

H3.4: The communication medium used to communicate during crises influences the frequency of communication.

H4.1: The communication frequency regarding routine duties influences the quality of communication.

H4.2: The frequency of communication during crises influences the quality of communication.

H5: The experience of the communicator with information exchange in various situations influences the quality of communication.

3 Methods and Sample

The proposed model provides the foundation of an empirical study on the communication behaviour of public authorities in Lower Saxony and North Rhine–Westphalia. Both German states are major livestock production areas. A survey that included the latent constructs of the model was used to interview a total of 102 respondents on varying government levels regarding their communication activities concerning daily duties as well as crises. The rate of return was 86 % (N=88). On the local level, veterinary authorities were surveyed. On the state level, the responsible departments as well as the state offices responsible for veterinary and agricultural matters were incorporated in the research. The empirical data was analyzed for causal relationships with the help of the component-based structural equation method PLS. In addition, a cluster analysis was used to assess the various strengths of the determinants of communication quality among diverse groups of communicators. The software used for the analyses was SmartPLS Version 2.0. M3 and SPSS 19.

The random sample encompassed 57 participants from German local and regional veterinary authorities and 31 interviewees from higher veterinary authorities (state authorities, governmental departments). Of those interviewed, 60 % are male; the mean age of all participants is 42 years. The mean career experience is 11 years; the high standard deviation (22.7 years) indicates a great difference in career experience among the participants. Of those questioned, 37.9 % hold positions in upper management, 24.1 % are in middle management and 29.9 % are in a lower position (no answer given: 8.1 %).

4 Results

4.1 Descriptive Results

Figure 3 illustrates the frequency of communication of the interviewed authorities with diverse stakeholders. It is not surprising that communication during a crisis is more intense than during the course of routine duties. In everyday affairs, frequent communication only occurs with other German authorities. Despite the intensive interrelationships between the German and Dutch agriculture and food industries, the exchange of information with Dutch authorities occurs at a very low frequency.
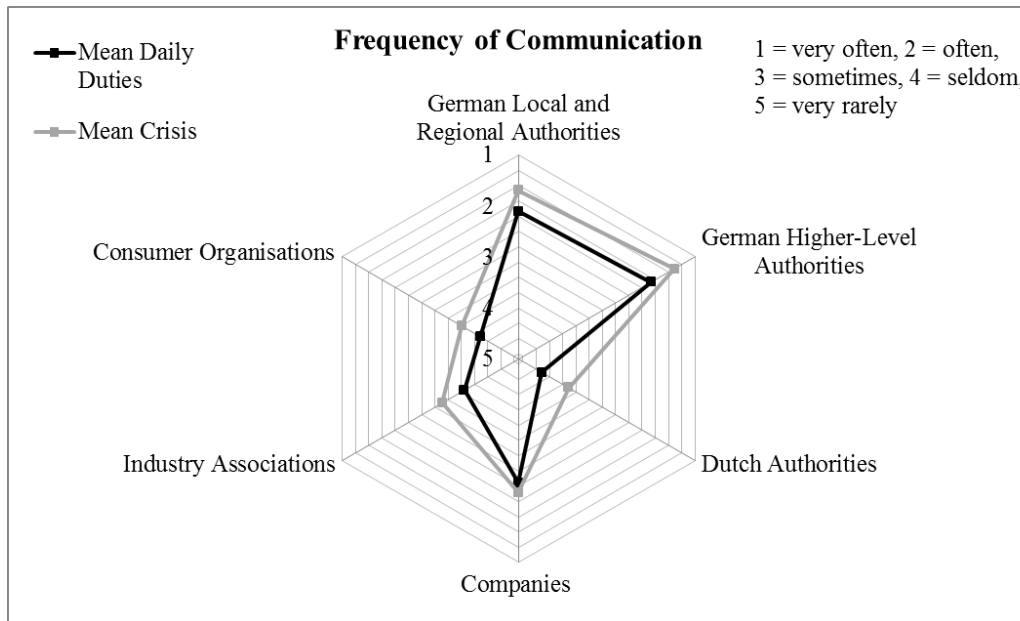
Figure 3. Frequency of information exchange with different stakeholders

Table 1 shows the media of communication preferred by the interviewees. Despite the differing communication challenges faced by the authorities in times of crisis in comparison to routine situations, no differences can be seen in the preferred medium of communication. This contradicts the hypothesis of Daft and Lengel (1984) that the varying communication challenges would influence the choice of communication medium.

Table 1.
Preferred medium of communication

Communication Medium / Stakeholder	Modal	
	Routine Duties	Crisis
German Local and Regional Authorities	Telephone	Telephone
German Higher-Level Authorities	Email	Email
Dutch Authorities	Email	Email
Companies	Telephone	Telephone
Industry Associations	Telephone	Telephone
Consumer Associations	Email	Email
Possible Choices: Personal Contact, per Telephone, Email, Letter, Fax		

The quality of communication with various communication partners was perceived very differently (Figure 4). Exchange of information with other authorities was judged to be the most positive, whereas communication with consumer organizations and Dutch authorities was seen as only average. This is in no way surprising, for it is known from organisational theory that communication becomes increasingly difficult with increased cultural distance between the communication partners (Frese et al., 2011; Lawrence and Lorsch, 1967). The communication-hindering effect of cultural distance applies not only internally within organizations, but also in the context of inter-organizational information exchange (Frese, 1996).
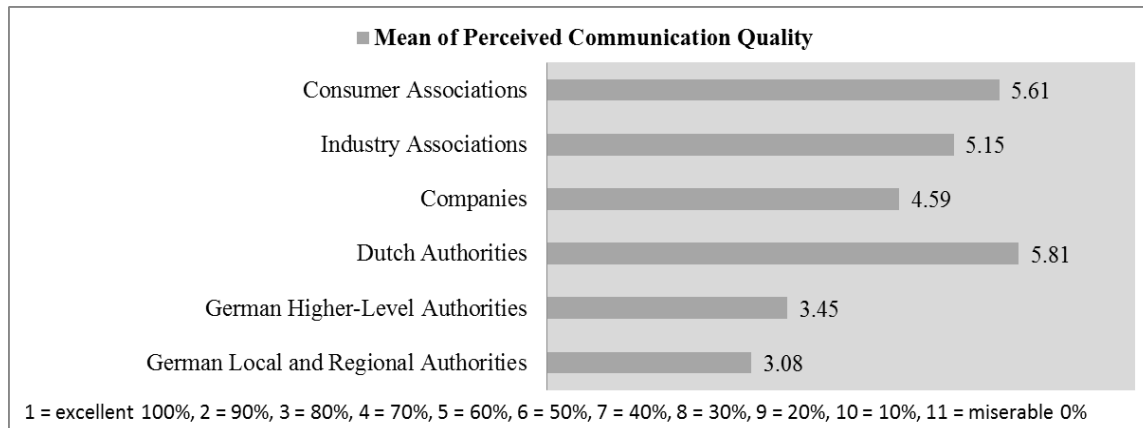
Figure 4. Perception of communication quality

4.2 Structural Equation Model: Determinants of Communication Quality

The causal analysis applied in this study is a combination of path analysis, main component analysis and regression analysis. In a two-step process, first, the goodness of the measuring model is tested by considering its reliability and validity, then the structural model is analyzed. The PLS method is characterized by its good applicability for complex models; furthermore, it allows an exploratory approach in an area that has rarely been subjected to empirical research.

The measuring model is comprised of constructs derived from the theoretical model above (cf. Figure 2). The constructs are measured by assigned observable items with five-point Likert scales. The indicator reliability reflects which part of the variance of an indicator is explained by the associated latent variable (LV). In general, over 50% of the variance should be explained (Hair, 1998); that is the case here. The construct reliability or internal consistence indicates how well the construct is measured by the indicators. Construct reliability can be measured with the help of the quality criterion Cronbach's Alpha (CRA) (Nunnally, 1978) which suggests a good reliability for values of 0.6 and above. In addition, Fornell und Larcker (1981) speak of good reliability if the construct reliability (CR) has values of 0.7 or greater. Both criteria were fulfilled in the foregoing analysis (see Table 2). The only exception is the Cronbach's Alpha value of the constructs "communication medium (routine duties)" and "communication medium (crisis)". However, these deviations can be justified in light of the good construct reliability (CR) (>0.75) and the low number of indicators (two respectively) (Garson, 2011).

In order to evaluate the discriminant validity, the average variance extracted (AVE) and the Fornell-Larcker criterion have to be measured (Fornell and Larcker, 1981). The AVE describes the entire determined variance between the construct and its particular indicators and should not fall below a value of 0.5 (Chin, 1998a). In the measuring model this value is achieved for all constructs (see Table 2). The Fornell-Larcker criterion is fulfilled if the AVE of latent variables is greater than the square correlations between the latent variables (Fornell and Larcker, 1981). This value criterion is also fulfilled without exception. In addition, the model was examined on cross loadings. Here, the loading of an indicator on its latent variable should be greater than its loading on the rest of the latent variables. No cross loadings could be identified. Thus, in general, the measuring model shows satisfactory results for all quality criteria.

Table 2.
Quality criteria of the causal model

Constructs	AVE	CR	CRA
Adequacy of Communication Content			
Expectation	0.54	0.90	0.88
Status Quo (routine duties)	0.85	0.97	0.95
Status Quo (crisis)	0.92	0.98	0.97
Adequacy of Personal Communication			
Expectation	0.51	0.84	0.77
Status Quo (routine duties)	0.82	0.96	0.95
Status Quo (crisis)	0.93	0.98	0.96
Medium of Communication (routine duties)	0.60	0.75	0.34
Medium of Communication (crisis)	0.69	0.82	0.55
Frequency of Routine Communication	1.00	1.00	1.00
Frequency of Crisis Communication	0.76	0.86	0.69
Routine Contact	0.89	0.94	0.88
Contact during Crises	0.65	0.88	0.83
Hierarchical Position	1.00	1.00	1.00
Experience	1.00	1.00	1.00
Quality of Communication	0.66	0.88	0.82

The structural model depicts the investigated relationships between the possible influencing factors and the endogenous variable. The second step examines the coefficient of determination of the endogenous variables (R^2) as well as of the degree and significance of the path coefficients. The latter can be interpreted as the standardized beta-coefficients of a regular regression analysis. A good structural model is characterized by a well explained variance and statistically significant t-values (see Figure 5). The t-values are determined via the jackknife method and the significance of the path coefficients via the bootstrapping method using 1,000 resamples.

The causal analysis shows that the explanatory model describes 75.5% of the quality of communication (Figure 5). These results can be considered to be very good in light of the exploratory nature of the empirical study (Chin, 1998b). Of the two main constructs, "Adequacy of communication content" and "Adequacy of personal communication", each of which consists of expectations, status quo during crises and status quo during everyday situations, personal aspects of communication in everyday situations, such as trustworthiness, openness, and honesty, have the strongest influence on the perception of communication quality (0.309*). Therefore, Hypothesis 1 can be accepted for routine duty situations. The second strongest determinant of communication quality is the hierarchical position of the person, which reflects experience (0.181**); Hypothesis 5 is thus confirmed. The chosen medium of communication during times of crisis accounts for the third strongest influence (-0.117*). Hypothesis 3.2 is thus confirmed; however, the negative value is striking. This is possibly due to the inappropriate use of communication media. In contrast, the remaining hypotheses could not be confirmed.
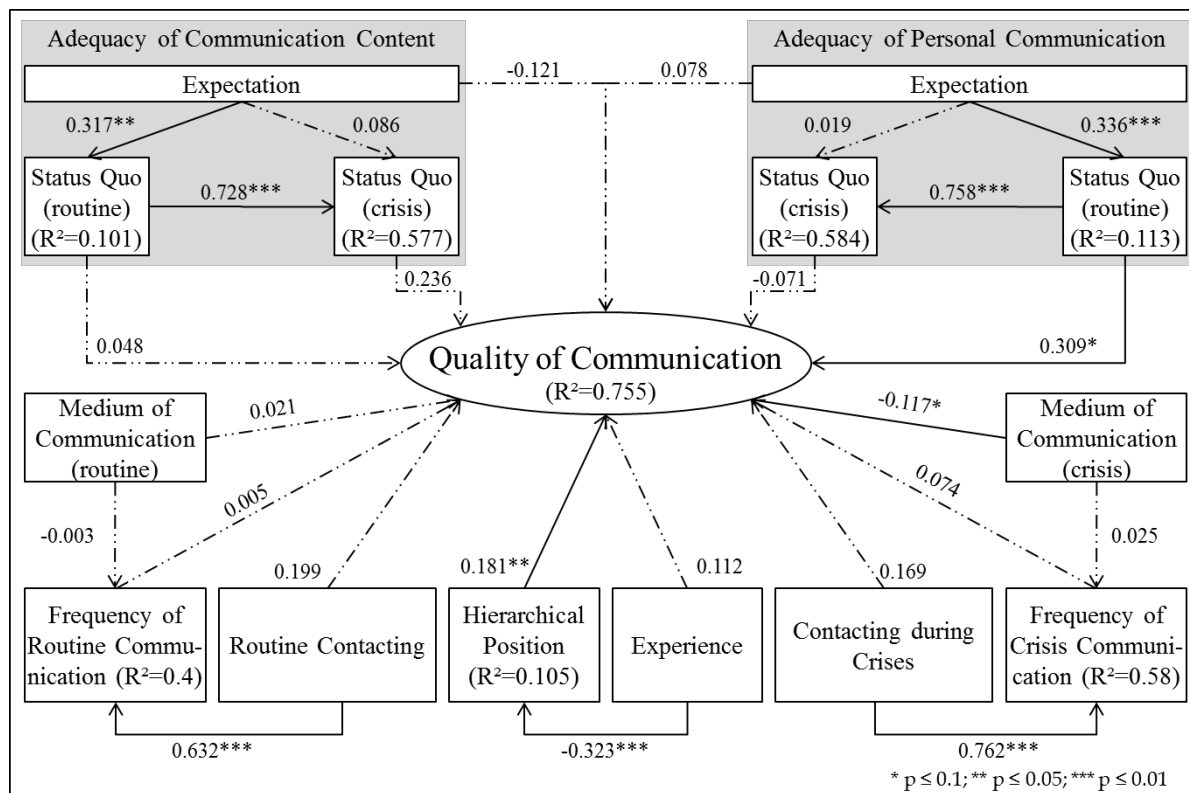
Figure 5. Degree of influence on communication quality

4.3 Factor and Cluster Analyses: Types of Communicators

After identifying the determinants of communication quality, factor and cluster analyses were conducted to identify types of communicators. This is due to the need for customized communication strategies to improve communication quality. A more differentiated view of communicators could help to implement these strategies in practice.

In order to get a distinct result in the cluster analysis, 12 aspects of the quality of communication had to be concentrated into three reliable factors (Cronbach's Alpha >0.6) by using a factor analysis (main component method: varimax rotation). The factors extracted were "adequacy of communication content", "adequacy of personal communication" and "amity/honesty". The quality of these results was tested using the Kaiser-Meyer-Olkin (KMO) coefficients and the Bartlett tests of sphericity. The KMO coefficients show whether substantial enough correlations exist to justify the running of a factor analysis. In this case, the value was 0.799, which is classified as "pretty good" (Backhaus et al., 2008). The Bartlett test examines the null hypothesis, meaning that all correlations are equal to zero. The test statistic is Chi square distributed with a value of 404.68 and 66 degrees of freedom; according to this, the correlations deviate significantly from zero (sig. = 0.000). The results of both tests reveal that the variables in the factor analysis are very suited for it. The factor analysis led to a good result with an explained total variance of 64.46 %.

In order to extract the types of communicators in public administrations, a cluster analysis was run using the three previously identified factors as cluster-building variables. In this way, it was possible to assign study participants to homogeneous groups. The members of a

group should be homogeneous with others in the same group and heterogeneous with members of other groups with regard to their characteristics (Backhaus et al., 2008). In a three-step procedure, the outliers were eliminated with the single linkage method; then the starting partitions were determined by the Ward method, before finally deciding on the final partitions using the K-means procedure. The Elbow criterion showed clearly that four clusters were appropriate here. Figure 6 illustrates the differences between the clusters regarding the factors determined above. The averages of the cluster-building variables (factors) vary significantly among the groups (sig.=0.000). The values in the spider web graphic display the standardized mean values of all respondents' factor scores. The scale of the factor-forming variables is designed so that the lower the number, the more positive it is. The examination of the internal criteria is carried out using the F-value for the homogeneity and the eta^2 for the declared variance. For all factors in all clusters, the criterion F-value < 1 was fulfilled, allowing all clusters to be viewed as fully homogeneous in themselves (Backhaus et al., 2008). The average eta^2 is around 0.661, meaning that around 66.1% of the variance of the factors can be explained by the differences between the groups (Janssen and Laatz, 2007).
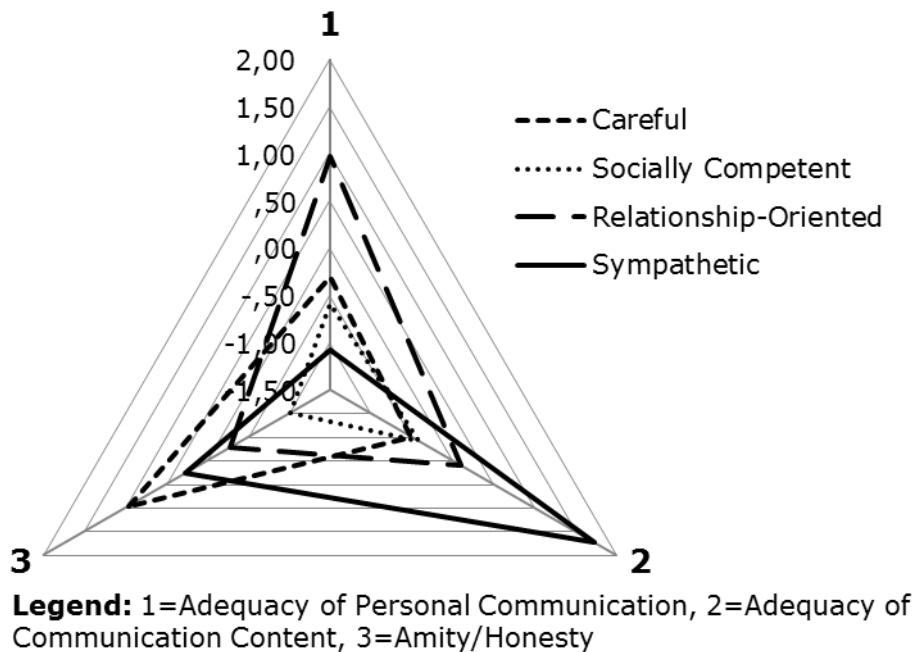

Legend: 1=Adequacy of Personal Communication, 2=Adequacy of Communication Content, 3=Amity/Honesty

Figure 6. Communicator types in public administration

Cluster 1 is comprised of 23 people who can be described as "careful". In light of the communication adequacy, they expect the least friendliness and the least social competency of all the groups. However, when considering the content of the communication, they expect the utmost accuracy. During crises, they communicate significantly more frequently than in routine affairs with German veterinary authorities on all government levels as well as with industry associations. In contrast, the frequency of communication with Dutch authorities, companies, and consumer organizations does not increase significantly. This group consists of 74% district-level veterinary authorities. On average, they have comparatively little experience and are working in middle management.

The "socially competent" group is found in cluster 2. The members of this cluster place high value on the content of communication and their perception of communication quality is most greatly influenced by the perception of the social competence of their communication partners. They communicate significantly more frequently during times of crises only with domestic veterinary authorities. This could be due to the generally mediocre accessibility of the communication partner as well as to the perceived mediocre allocation of the proper contact. This problem is expressed most strongly regarding the Dutch authorities and industry associations. With 46%, Cluster 2 (n=22) comprises the highest percentage of members in the state and national level veterinary authorities. On average, they have 15 years of experience in the relevant field and three out of four are in upper management positions.

Those who are "relationship-oriented" (n=23) do not expect mere sympathy but are looking for friendships among their communication partners. The adequacy of communication content is less relevant for them. They also have significantly more frequent communication only with domestic veterinary authorities during times of crisis. Out of the 30% of those interviewed who had contact with authorities in neighbouring countries, 57% see language differences as a barrier. This cluster consists of almost 90% district veterinarians. On average, they had the most experience; 65% fill a middle management or specialist position.

Cluster 4 is labelled " sympathetic" (n=9). In contrast to the cluster above, sympathetic persons expect sympathetic communicators, but do not seek friendly relationships. The content of the communication is deemed to have the least relevance of all the clusters. This group is comprised almost equally of members from district veterinary authorities and members from higher-level veterinary authorities. On average, they have the least experience and belong either to higher management (44%) or to specialized personal (56%).

The questionnaire offered the participants the opportunity to formulate their own views about problems and possible solutions in regard to communication. The first cluster in particular proved to be especially involved; almost 90% offered their opinion. In all other clusters, around 60% did so. A main point of criticism turned out to be the lack of opportunity to develop personal contacts with members of other authorities. In this regard, it was recommended to provide opportunities for expert conferences, joint exercises (regarding, for instance, crisis management in the case of animal disease outbreaks), visiting other offices, and the use of communication platforms. The second most common criticism is about staff shortages and the resulting lack of time. Especially for those in clusters 3 and 4, it was considered very time-consuming to be flooded with unfiltered E-mails. The bad availability and insufficient communication of relevant communication partners was a complaint of cluster 1. The concealment of information and the lack of transparency in communications from companies and lobbying groups is perceived by all clusters as a hindrance to building trust and cooperation.

5   Discussion and Conclusions

The descriptive results show based on mean values that some communication partners of veterinary authorities have low levels of experience, which affects their communication quality. Even during crises, their communication quality does not really improve. This is also seen in the missing adjustment of the communication medium regarding different requirements during crisis and routine situations. These problems are analyzed more deeply

in the causal model and cluster analysis. In the causal model, determinants of communication quality are analyzed to derive opportunities to improve communication quality within veterinary authorities and between them and their communication partners. Personal aspects of the communication, differences in hierarchical positions and experience, as well as the communication medium are identified as the main determinants. The cluster analysis was established to take a closer look at different communicator groups within veterinary authorities. The four clusters confirm the findings of the structural equation model in that the personal aspects of the communication seem important to communication quality.

When considering the whole complex of communication quality, the question arises whether the content of the message is more important than personal relationships. The causal model and the cluster analysis reveal that the adequacy of the personal communication is of greater relevance. This knowledge could be used to help identify measures that could be taken in order to improve the quality of communication of public administrations. A starting point could be the improvement of personal adequacy of communication during routine duties. This also applies to the non-administrative stakeholders as well as to the Dutch authorities. Possible solutions might lie in common epidemic prevention training across borders as well as low-level access to common information systems by all stakeholders, which could help prevent crises. Such measures could improve communication during crises, as the highly significant influence of the status quo (routine duty) on status quo (crisis) in Figure 5 suggests (0.758***). Moreover, greater attention should be paid to the chosen communication medium during times of crisis. The empirical study reveals a negative influence of this variable on the quality of communication. Therefore, the current technical organization of communication in times of crisis should be critically reviewed. Using more sophisticated information management systems might greatly aid administrative veterinarians, especially in times of crisis, by providing improved coordination and documentation. Such information systems are, however, not yet available.

The results of the cluster analysis reveal four types of communicators in veterinary administrations. A factor-based description discloses the heterogeneity of the different clusters. Therefore, communication concepts should take different communication types into consideration when developing improvements for intra- as well as interorganizational communication. the development of new communication systems should focus on personal instead of technological aspects (Theuvsen and Arens, 2011; Theuvsen and Plumeyer, 2007). Looking more closely, three of the four clusters prefer cordiality, but not greater friendliness. However, because only a distinct personal adequacy in communication exerts a positive influence on the quality of communication of veterinary authorities (cf. Figure 5), possible activities to develop mutual acquaintances, such as joint cross-border crisis exercises or roundtable meetings, might be possible measures.

The results of this study provide various starting points for future research. Further studies should be dedicated to a deeper analysis of communication types and a more differentiated consideration of indirect and direct determinants of communication quality in the causal model. Furthermore, in addition to the main determinants, moderators should be considered in the causal model. For this, it will be necessary to enlarge the random sample in order to improve the limited representativeness of the empirical results to date.

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