

An integrated model of EMF risk debate

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Abstract— This paper presents the results of a study aiming to develop an integrated model of the risk debate on electromagnetic fields (EMF) in Switzerland. Based on a literature analysis and a Delphi survey we synthesized available scientific knowledge and practical experience in EMF risk communication to build up a network model. It defines the sources and variables as well as their interactions that, together, form the risk debate around mobile communication. The developed application software “riskTool interactions” is based on this model. It allows recognizing and comprehending the effects caused by different communication strategies of public authorities, mobile communication industry, and non-governmental organizations (NGOs) on the public risk debate. Based on this, the application of resources can be optimized and targeted. riskTool interactions can be applied in practice as a didactical instrument to review own assumptions (made by authorities, industry, and NGOs, respectively) on the status and the dynamic of the risk debate, as well as to deduce adequate strategies.

I. INTRODUCTION

Since years, the public debate on potential health risks of mobile communications is characterized by controversies and conflicts. Actors in this debate (public authorities, companies and NGOs) keep struggling with the question of appropriate strategies for risk communication to foster informed-decision-making. On this background, in our study we developed an integrated model of the EMF risk debate.

The actors of this debate are embedded in a network of complex interactions. In this context, risk communication is not a single action or a series of them coming from one side but it is an interactive process of exchanging information and arguments between all involved groups. The dynamic of the debate is influenced by the communication of the actors and affected by such different variables as, e.g., risk perception, media coverage, and ambiguity in scientific researches. If the involved organisations aim to a goal-oriented communication, it helps to include different perspectives of different social groups. Furthermore, one has to communicate the complexity of the risk appropriate, comprehensible and adequate to time and audience. This task is non-trivial and, therefore, the requirement for continuative approaches for risk communication is high in German speaking area.

II. OBJECTIVE

Research in risk communication in the area of EMF addresses this demand on several levels:

1. It describes and collects variables, e.g., the knowledge of the society, the perception of use and of risk in the society.

2. It describes and analyzes interdependencies between variables, e.g., the influence of knowledge to the risk perception [1], the relation between trust, confidence and risk perception [2] or between the communication of the precautionary principle and the risk perception [3].

3. Finally, research in risk communication proposes recommendations and guidelines for risk communication in practice (e.g. [4], [5], [6]). Therein, it is discussed which contents in which form – depending on the goal – are recommended to communicate to which target group.

All three aspects – the particular formative variables, their interdependencies as well as the consequences for risk communication – are significant for the risk debate and the choice of communication strategies, respectively. The presented model is intended to connect these three levels and to put them into a context. The model represents the significant variables of the risk debate, their interdependencies as well as the influence of different communication strategies used by the relevant actors. This overview of the net of complex relations in the risk debate shows in practice the connections more clearer and more understandable and supports the choice of adequate communication strategies. In the context of science, our model improves the current focus on particular variables and interdependencies to a more general view with stronger connections and important additional context variables.

III. DESIGN AND METHOD

To identify the relevant influence and internal variables as well as the network of relations in the risk debate of mobile communications, an expert Delphi was done based on an analysis of literature.

A. Literature Analysis

Based on the analysis of literature in psychology, communication science, and sociology theses for the central variables and interactions were evolved. Included are communication science theories of the public society (e.g., the three level model: 1. encounter level, 2. public topic and assemblage, 3. public media) and specific media theories (e.g., newsworthiness, agenda setting). Likewise, theories in social psychology for information processes (e.g. [7], [8]). for cognitive dissonance [9], for emotions, and appraisals [10], respectively, are incorporated in the theses, as well as findings from the psychometric research on risk perception [11], [12].

B. Expert Delphi

Thereon, a three-phase expert Delphi was designed and implemented. Expert Delphi's are known in particular for predicting complex future developments. More and more, this method is, however, used to gain expert opinions of particular issues. This was the case in our expert Delphi too, where we focused on theses about the dynamic of the risk debate about mobile communications. It includes experts from science and practice (from universities, mobile communications enterprises, authorities, NGOs) in the German speaking area.

In the first qualitative interview round (number of persons $n = 19$) general dynamics in the debate on mobile communications were questioned, i.e., the relevance of particular variables as well as the interdependencies of these variables. In the following two quantitative survey rounds ($n = 19$; $n = 17$) theses about the impact of different communication strategies on particular variables as well as their interdependencies were reviewed.

C. Model Design

The design of the model is based on an action theory approach. It focuses on the actors (public authorities, companies and NGOs) and their communicative actions. Besides this, the model consists of input variables, state variables and their interdependencies. Focused are 1. communicative actions, 2. the health debate on mobile communications, i.e. not the entire mobile communications debate which would also contain, e.g., the product communication, and 3. the debate of the whole of society on a national and non-local level.

1) Actors

Actors are considered as relevant, if they want to influence the risk debate on mobile communications directly with their communication. These are on a national level authorities, mobile communications industry, and NGOs, who all intend an impact of their risk communication.

The debate is also strongly influenced by science and media. However, they are assumed to have less intention to influence the risk debate itself. Media rather orient themselves according to newsworthiness and take up mobile communications as a subject for this reason. Science is called in as an expert by all three actors [13].

The communication of the three actors, authorities, industry and NGOs is defined in the model in more detail by the point in time, the extent of participation, and the balance of the content. Based on these criteria, two different strategies of communication (pragmatic and proactive) were defined for each actor and the impact of these strategies on the risk debate was analyzed.

2) Input Variables

Besides actors, so called input variables determine the risk debate on mobile communications.

Relevant input variables are at one hand features of the risk situation as they are known by psychometric risk research: familiarity and controllability of the technology. In the same manner, ambiguity in scientific statements as well as activity by local organisations of affected people are taken as relevant input variables.

On the other hand, there are long-term general prevailing moods which influence the debate on mobile communications.

They include risk readiness of the society, technological affinity and the relevance of health subjects in the public discourse.

3) State Variables

The input variables as well as the communication of the actors affect the so called state variables. These are dependant parameters and are strongly connected. The state variables include, e.g. risk perception, willingness to cooperate, and acceptance of mobile communications. Further state variables are the degree of escalation, the trust of the society in industry and authorities, or the intensity of media coverage and the political pressure for regulations.

4) Interconnections

After identifying the relevant actors and variables, the connections between particular elements of the model were analyzed. It was specified how actors and input variables affect each state variable. Likewise, the interconnections between the state variables were set by a weight (intensity of the impact) and a function (mode of the impact, e.g., exponential).

E.g., it is assumed that the trust of the society in authorities and mobile communication industry has a strong impact on the risk perception. If the trust increases, the risk perception decreases and vice versa. Another example is the assumption that the level of escalation of the debate influences the intensity of media coverage on health risks. Media favour conflicts (newsworthiness negativity). Therefore, the more the conflicts escalate, the more the media covers them. If the level of escalation decreases, the media coverage decreases too.

The description of all these interconnections was done on the basis of the literature analysis, the expert Delphi, and the know-how of 20 years of practice in risk communication of the Foundation Risk Dialogue.

5) Evaluation-Workshop

Finally, the model, i.e. the application software based on the model, was evaluated in a workshop with the experts from the Delphi interviews to review its use for practice as well as its scientific importance.

IV. RESULTS

Created was a model that offers an overview over the net of complex interconnections in the risk debate on mobile communication.

The expert Delphi showed that different influence capabilities on the risk debate are attributed to the different actors. This is reflected in the model too.

A significant stronger and more direct influence on the media coverage and the public attention for the topic is assigned to NGOs than to other actors. This is the case especially if NGOs embark on a proactive communication strategy, where they inform early and one-sided, i.e., warn offensively and emphasize danger. Furthermore, this can reduce the trust in authorities and industry directly and minimize the willingness of the actors to cooperate with each other. Thereby, they raise variables indirectly like the level of escalation or the political pressure for regulations. The model shows that especially with the proactive warning strategy, NGOs are able to achieve effects. However, in a later phase of

the debate, they can afford – if they are positioned – to temporarily retract to a pragmatic strategy and optimize their resources with this. If they step back, risk perception, level of escalation, etc. do not immediately decrease.

The situation is different for mobile communication industries and, to a lesser extent, also for authorities. If they want to keep the level of trust by the society, they have to communicate frequently in the risk debate, i.e., they have to pursue a proactive strategy. If they lean back too much in their risk communication the trust in them and the willingness to cooperate decreases, as the results from the expert Delphi shows. Therefore, there are elements in the risk debate which industry and authorities have to take care of steadily to make sure the risk debate does not intensify and escalate. This includes, e.g., trust as well as willingness to cooperate. Although a stronger influence on trust is attributed to authorities than to industry.

In a later state of the debate, industry, authorities and NGOs have less influence on the level of information in the society. The same applies to the risk perception. Independent to the communication strategy these variables turned out to be less influenced by the communication. However, they can be influenced indirectly through trust or willingness to cooperate. This result might have practical importance for their risk communication. Primary goal will then not be (any more) the influence on risk perception (as it was often intended and tried in practice – with results often described as frustrating by the involved persons) but a direct influence on trust. The use of existent resources could be optimized with this.

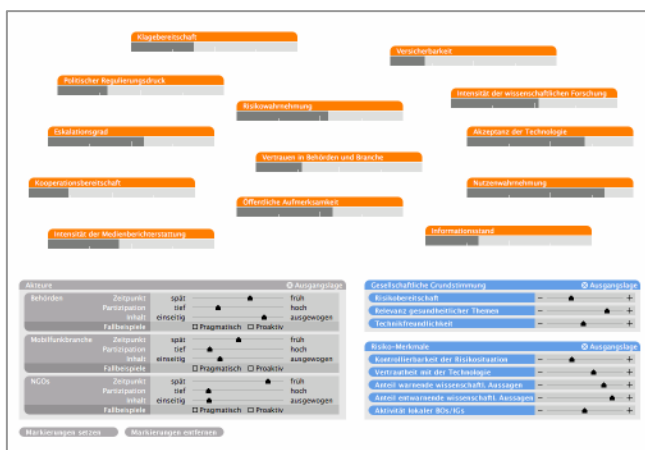


Fig. 1 riskTool interactions

V. CONCLUSIONS

Based on the results of the literature analysis and the expert Delphi, this model allows to give recommendations for the risk communication and to show the expected effects.

The results of the expert Delphi have shown that the experts agree to a large extent on the effects in the debate caused by the communication of NGOs. In contrast, the effects of authorities and industry are estimated very differently. E.g., there are huge controversies in literature and between the experts how the explicit statement for uncertainty affects trust and risk perception etc. Similarly, influences and interconnections to risk perception are mainly disputed. In this regard, future research is needed.

Furthermore, the model is useful as a didactical tool, as an instrument for communication to reflect the own assumptions on the state of the risk debate, on the interconnections between the variables, and the factors of influence. This allows deducing advices for an adequate strategy in risk communication.

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