# THE ROLE OF TRUST AND FAMILIARITY IN RISK COMMUNICATION

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**ABSTRACT**

In socio-economics it is well known, that the success of an innovation process not only depends upon the technological innovation itself or the improvement of economic and institutional system boundaries, but also on the public acceptance of the innovation. The public acceptance can, as seen with genetic engineering for agriculture, be an obstacle for the development and introduction of a new and innovative idea. In respect to hydrogen technologies this means, that the investigation, compilation and communication of scientific risk assessments are not sufficient to enhance or generate public acceptance. Moreover, psychological, social and cultural aspects of risk perception have to be considered when introducing new technologies. Especially trust and familiarity play an important role for risk perception and thus public acceptance of new technologies.

## 1. PUBLIC ACCEPTANCE AND RISK PERCEPTION

### 1.1. Public acceptance of new technologies

Public acceptance can be best defined as "the chance to get the explicit or implicit consensus of a group or person for specific concepts, measures, proposals or decisions" [1]. In the context of innovative technologies this includes a variety of behaviours as

- using a new technology,
- buying a product based on the innovative technology
- or simply not opposing a political decision regarding this technology.

The public acceptance of a new technology mainly depends on how a new technology is perceived by the public. The perception of risk hereby is one amongst other parameters influencing the acceptance of technologies. Furthermore the existing information level about a technology, cultural practices in the handling of risks, general values and norms, experiences and former debates in regard to new technologies as well as current incidents are influencing the acceptance of new technologies.

Public acceptance towards innovative technologies is mainly determined by the following factors:

1. Extent of personal concernment: The extent of personal concernment is a main parameter influencing the individual perception of a technology [2] and resulting risk perception. Especially if risks and benefits are unfairly distributed to different sections of the population (real or perceived), societal conflicts are likely. As seen with municipal incineration plants for example, personal concernment indeed strongly influences technology (risk) perception: local population in general opposes the planning process whereas benefitting non-local population usually supports it.

2. Emotions in technology assessment: The role of emotions for people's risk assessment of new technologies is well researched. Technology always leads to emotional responses either positive

(enthusiasm) or negative (fear). Negative associations adhered to a technology can highly influence the evaluation of a technology as observed with nuclear power and genetic engineering [3]. On the other side, positive emotional attitudes may lead people to underestimate risk [4].

3. Intuitive risk-benefit assessments: In risk-related decision situations people tend to use intuitive risk-benefit-assessments [5]. Not the absolute risk or benefit but the relative and individual risk-benefit-balance influences the people's attitude. Risk and damages are accepted as long as the adhered or expected benefit is big enough. As a consequence, the risk is either understated and the benefit overestimated (as with smoking or driving a car) or the benefit is understated/ ignored and the risk overestimated. Especially if benefits are spatially and temporally distinct from risk, people tend to underestimate benefits and overestimate risk (pesticides, genetic food etc.). In this context, Alhakami und Slovic [6] point to the theory of the cognitive consistence. According to this theory, people try to avoid contradictory assessments [7].

### 1.2. Risk perception

Several studies have shown that the perception of risk and benefit dimensions of new technologies are substantially influenced by:

- the perceived context of the risk situation
- the perceived characteristics of damage
- individual attitudes

Risk perception is the „sensual or rational, individual or collective perception process and the connected identification, analysis and verbalisation of risk" [8]. While assessing new technologies and their adherent risks, people typically act along their own experiences, so called heuristics [9] [10]. Heursitic assessments comprise inter alia probabilities (the probability of an event is based on the memory of comparable events in the past) and analogies (unknown risks are often judged in comparison to known risks) [11]. Heuristics enables people to efficiently decide in everyday situations (pressure of time, insufficient information or restricted cognitive abilities, uncertainty), while it risks leading to false or defective estimations.

Especially the psychometric paradigm [12] has influenced risk perception research as it identifies a number of empirical patterns being important for the intuitive estimation of risks. According to the psychometric paradigm, risk perception is primarily driven by two characteristics of risk:

(1) dread risk that addresses a lack of controllability and perceived catastrophic potential and

(2) unknown risk referring to the extent that a hazard is unobservable, unknown to those exposed, new, unknown to science and with delayed effects.

People were willing to tolerate or accept higher levels of risk if the processes involved were voluntary, immediate, known or familiar, and were seen as controllable. People also tend to weight natural risks less strongly than man-made risks.

## 2. THE ROLE OF TRUST AND FAMILIARITY

The most important parameter influencing public acceptance as well as risk perception of new technologies has been shown to be the level of trust in actors or institutions, who are engaged in the development and implementation of the new technology. For citizens the source of information is highly relevant. It has been shown in different studies that the confidence people put into institutions influences the level of risk perception: the higher the confidence in the institution the lower the risk perception and vice versa [13] [14]. The „risk-survey Baden-Wurttemberg 2001“ [15] for example ascertained, that the acceptance or non-acceptance of genetic engineering was determined by the confidence in the problem solution capacities of institutions. Lacking confidence especially in the competency of a government to cope with a problem results in feelings of faint and both the affective and the risk-benefit assessment could change considerably.

Especially in situations of information overload and knowledge-gaps, people are unable to assess whether risks are severe and true [16]. People know from experiences that information on risk differs considerably between sources and that even science does not speak with one voice [17]. People considering taking part in the public discussion or rethinking their purchase behaviour, usually face the problem of imperfect and contradictory information. Therefore their trust in the communicating institutions plays a central role for perceived credibility of provided information [18] [19] [20].

Trust is a crucial concept and a multidimensional variable. Kohring [21] suggests shifting the focus of the discussion from the question "What is trust?" to the questions "What for?" (role of trust) and "How?" (trust influencing parameters). According to Cheskin Research & Studio Archetype/Sapient [22] trust can be seen as a dynamic process and a function of experiences. An important precondition for trust is the perceived consensus of the individual and the stakeholders values [23].

Besides its positive influence on the people's initial information evaluation and risk perception of a new technology, trust also leads to important advantages in the continuous risk perception process [24]:

- It increases efficiency in working processes in and between institutions.
- It fosters cooperative attitudes and networking.
- It mitigates conflicts and transaction costs.
- It supports effective reactions in crisis and conflict situations.
- It has the potential to bridge gaps in information.
- It is a possibility to reduce social complexity.
- It leads to a positive reputation and an improved market position.

Besides trust in institutions and players, the concept of familiarity is the second important factor influencing the individual or public risk perception. First, it is a precondition for trust, especially in the technological context [25] as people get familiar with technologies through daily use and their positive experiences with the functionalities and the reliability of the technology result in trust.

Familiarity can be achieved directly by using a technology (e.g. demonstration projects for new technologies) or indirectly by theoretical discussions (communication platforms, forums etc.). Based on the practical or theoretical experiences people tend to develop individual evaluation patterns.

## 3. TRUST, FAMILIARITY AND HYDROGEN TECHNOLOGIES

Both trust and familiarity influence risk perception and thus public acceptance of a new technology [26]. A review of existing hydrogen acceptance studies reveals a lack of information regarding the level of trust in institutions or stakeholders working in the field of hydrogen technologies and its influencing parameters. The existing studies focus rather on snapshots of the level of familiarity and the expectations people have in regard to the current and future usability of the hydrogen technologies. Therefore at the current state of discussion it is not possible yet to estimate the interrelation of trust and familiarity to risk perception of hydrogen technologies.

Following, the existing acceptance studies on hydrogen mobility have been analyzed in regard to the questions:

- What is the level of trust people put into the people and institutions working in the field of hydrogen technologies?
- What is the level of familiarity with hydrogen technologies?
- How do the level of trust and of familiarity influence the risk perception of people in the hydrogen context?

In general it can be said that

- all studies indicate that there is a relatively high level of acceptance of hydrogen vehicles.
- the perception of risk was rather low [27] [28] [29]
- only little concerns or opposition amongst users and the public exits [30] [31] [32]
- the characteristics of the vehicles running on hydrogen were seen as positive [33] [34].

### 3.1. Trust in institutions

Up to now there have been only very few studies analyzing the level of trust public put into the people and institutions being involved in the implementation or regulation of hydrogen applications in the automotive sector. And most of these snapshot studies base on qualitative surveys or studies about other new technologies:

- In a BMRB opinion poll [35] on "Public Engagement with Hydrogen Infrastructures in Transport" 1003 members of the general population were asked to what extent they agree or disagree with the statement *"Modern science can be relied on to solve our environmental problems."* 40 % agreed that science can be relied on to solve our environmental problems, 33 % disagreed and 25 % were neutral.
- In the same BMRB project 12 focus groups were conducted [36] [37]. Some participants of the focus groups mistrusted the people being responsible to be able to conduct the necessary changes towards a hydrogen society. They questioned the government's will to achieve this change, because of vested interests and the scale of what needed to be done. The participants considered that both the government and the petrochemical industry did not really want this change to take place as they were too reliant on the income generated from the production and taxation of fossil fuels.
- In the assessment of new technologies people often use their experiences with other technologies. The same is true for the assessment of the actors who are involved in the technology implementation. In a German opinion poll from 2007 people were questioned how much trust they would place in different actors when they inform about nanotechnology. An overwhelming share of respondents trusts consumers' organisations and scientists. Trust in environmental organisations as well as authorities responsible for health and occupational safety is lower but at a very high level, too. In contrast, people representing enterprises and the government do not enjoy much confidence [38]. These results are supported by several other studies on nanotechnology worldwide [39] [40] [41]. According to a study of Cobb & Macourbrie [42] more than 60% of respondents said they had "not much trust" in business leaders' ability or willingness to minimize risks to humans.

### 3.2. Familiarity with hydrogen technology

As trust interrelates with the level of familiarity, a closer look to studies investigating the level of familiarity with the technology could be helpful in closing the information gap that exists in regard to trust. There are different ways to measure familiarity with hydrogen technologies in the public. So it is possible to use the awareness of hydrogen technology as an indicator for familiarity, because awareness is the precondition for familiarity. In practice, familiarity can only be gauged when there are real demonstration projects, which enable people evaluating the new technology in everyday live, coping their needs and expectations.

Meanwhile more than 400 different hydrogen vehicles exist, that either powered by hydrogen fuelled internal combustion engines or by fuel cells. Hydrogen mobility covers cars and buses as well as ships, bikes and utility vehicles. There are several studies interviewing passengers of hydrogen buses and taxi drivers about their experiences with this new technology. Despite the increasing number of hydrogen vehicles und demonstration projects, the possibility for people to get familiar with a hydrogen vehicle on an everyday life base is still very low. The importance of such personal experience with the new technology and the resulting familiarity for the risk perception of the people has been shown in two studies

- Comparing attitudes of students on board of a hydrogen bus and students in the classroom towards hydrogen technologies, the students on the bus showed greater acceptance and were more likely to associate “hydrogen” with positive assessments, such environmental benefits, than the ones in the classroom. Associations of hydrogen with danger were more frequently mentioned first by the classroom students [43].

- The AcceptH2 project investigated public attitudes and preferences for hydrogen buses in different cities one year prior to the introduction of hydrogen bus trials and six months after them. The study revealed that unconditional support to a large-scale introduction of hydrogen buses in each city increased in the ex-post survey [44].

### 3.3. To sum up

Summing up the results of the reviewed studies about hydrogen acceptance it is obvious that the public is still largely unaware of hydrogen and fuel cell technologies in the automotive sector and the room for individual experiences with hydrogen powered vehicles is still very small. The use of hydrogen buses could help to increase the personal affiliation with the technology. Although the public seems to generally have a positive attitude towards hydrogen technologies at the moment, they do not really know much about it. This is an especially dangerous situation, as people get vulnerable to influences by media or news relating hydrogen technologies to specific risks or damages. In this situation the role of trust in the people behind the technology becomes important, as it influences the risk perception of the public. They put more weight on the information they get from trusted sources than by those they do not know or trust the intention behind it.

Unfortunately there are hardly any studies analyzing public trust in different actors who are engaged in the implementation of hydrogen technologies in the automotive sector. But results from other technology fields and social sciences indicate that a pro-active approach in trust building could be helpful to support a positive risk perception of hydrogen technologies.

## 4. CONCLUSIONS FOR RISK COMMUNICATION

The above mentioned analysis of existing studies together with first project results investigating the current state of trust in actors and institutions working in the context of hydrogen technologies, lead to the following suggestions on how to communicate safety and risk issues in the public to enhance the acceptance of hydrogen technology:

1. Demonstration projects are a good possibility to generate familiarity with hydrogen technologies. Familiarity is important because it has a positive influence on public acceptance.

2. Though risk awareness is low, fears can be triggered easily by news connecting hydrogen technologies to risks and damages, as the current lack of knowledge hinders people to comprehensively assess risks. Therefore it is important, that all actors who are involved in the implementation and regulation of hydrogen technologies transparently communicate from the very beginning. Providing information is not enough, the information must be offered in a way it helps interested people to be informed independently of formation, age and background knowledge.

3. Public participation processes should be installed, as they increase the trust level. Especially new participation methods as consensus conferences assist people in forming a comprehensive opinion on hydrogen technologies. At the same time participation prevents people from feeling powerless and being at the mercy of a technology they neither control nor understand.

4. Even if people gain more insights into the concept of hydrogen technology and its application in the automotive sector, the problem of information overload and ambiguous information remains. Therefore, it is important to involve trusted institutions into the risk communication process. This could help people to accept the information because they do not suspect the communicator having hidden interests and deceiving the audience by fraudulent and incomplete information.

5. The development of coherent communication strategies should take place before possibly negative news emerges. Given that it takes time and profound research to develop such strategies and to disseminate them to the relevant institutions, the development should begin immediately.

6. The success of all communication efforts and the credibility of the communicating institutions should be monitored regularly.

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