

Perspectives on Interaction with Society and Associated Risks and Uncertainties

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What can be taken for granted?

 Knowledge, familiarity and attitude to your subject matter will differ across individuals, settings and societies

• The core of communication lies in the **perceived meaning**, or significance, of the message



Themes: Interaction with Society Challenges in communicating risks and uncertainties

- Objectives for interaction
- Knowledge and contents
- Interaction dilemmas
- Time perspectives
- Cultural contexts
- Information, communication, effects; Societal change



Example: Assumptions in risk assessment; experts' view



2004:23.

Assumptions in risk assessment / a larger picture?



Figure 3. Additional aspects involved in the model to interpret the results.







 Consider a larger perspective, including the point of view of the recipient(s), when formulating messages including risk and uncertainty



Knowledge and contents

- Safety Data Sheets
 - Ambiguous terms
 - Omission of information
- The AGREE-project:
 Achieving GReater
 Environmental Efficiency

http://www.infra.kth.se/phil /agree • Aim: To provide guidance for improved risk communication through safety data sheets; i.e. how professional users understand information on health, environment and safety produced by manufacturers of chemical products.



Design (part)

Table 4. The concepts and specific terminology given in the two versions of the questionnaire for the respondents to define or explain in their own words.

VERSION 1	VERSION 2	Same or Different
Acute effect	Chronic effect	Different
Environmentally hazardous	Health hazardous	Different
Carcinogenic	Carcinogenic	Same
The substance is not classified	The substance is not classified	Same
Scientific uncertainty	Risk	Different
Repeated exposure	Ordinary caution	Different

Report in the AGREE-project, KTH, 2004.

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Table 24. Frequencies of categorised definitions of the expression "the substance is not classified" as used in safety data sheets. Groups of rescue personnel, safety personnel and personnel in the chemical industry.

"The substance is not classified" Summarised contents of responses:	Group 1: Rescue personnel	Group 2: Safety personnel	Group 3: Chemical industry
That the substance is not approved	2		
According to rules / standards			1
That the substance is not investigated / tested	4	1	5
Less dangerous. Not classified according to KIFS criteria			2
The substance is relatively harmless			1
Does not have known handling risks			1
That the substance might be dangerous	2		
That the substance is dangerous / detrimental	1		
That it is a warning		3	
That it should be avoided		1	
Should be handled with great care until I know how dangerous it is			1
That the substance is not dangerous / little risk to use the substance	3	5	
That the substance is new / unknown	1	1	
That there is no information about the substance / that one does not know the content of the substance	1	1	
That the substance is uncertain / that it is unclear	3	4	1
Tricky. Usually harmless but could be dangerous			1
That researchers do not know whether it is dangerous or not		2	
That the substance does not belong to a class / that the substance lacks classification	3		
That the substance was not purchased		1	

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Example:

"the substance is not classified"

¹ This concept was used in both versions of the questionnaire (n=70).



Salety and health at work is everyone's concern. It's good for you. It's good for business.







Practical tools and guidance on dangerous substances in workplaces

Key Points

Providing tools and guidance to prevent risks from dangerous substances is key to supporting enterprises to reduce workers' supports and thereby the risks.

You will find handmids of descriptions and links to resolution covering faileling, dia assessment, lingshafes and ejectific groups of worken, including weaters and inspirat worken, in EU-OSIM database Practical dool and guidances on dispersis substances, (https://oshu.acspit.ou/um themail.dorgences. substances/practical-look dargences.abstances/

Note use of the tools and guidance in the database. Using resources that others have thoughtfully prepared will have you a lot of time. You may learn sereching new and have even better ideal about how to reduce and manage the risks from dangenous autobarces!

Healthy Workplaces Manage Dangerous Substances

The European Agency for Safety and Health 24 Werk (31) OSU69, a narring a Europe-wide campaign during 2212 and 2014 to promote the powerkion of risk from dangenon substances in workplaces. The sim is to reduce the presence of and oppowerk to dangenon sub-laces in workplaces by nating assumess of the risks and of effective ways of preventing them.





Toxique Gift Vergiftig Tossico Toxic



Comburant Brandfördernd Oxyderend Comburente Oxidising



Cultural challenges in use of Symbols

Reading from Left \iff Right







Words and numbers

Mean ratings for verbal expressions (%)



X-----X

Expression	Mean
	(10 studies)
Rare	5-14
Very	9-29
unlikely	14-32
Unlikely	27-55
Possible	63-77
Likely	64-75
Probable	71-83
Good chance	56-82
Frequently	72-77
Usually	79-87
Very	
probable	



From: http://en.wikipedia.org/wiki/Uncertainty



"One cannot be certain about uncertainty." (Knight, 1921)



Dimensions of uncertainty

(based on Rowe, 1994; Schneider, et al., 1998)

Primary source	Temporal (past & future)	Structural (due to complexity)	Material (in measurement)	Translational (derived in explaining uncertain results)
Underlying variants	Spread of pa behavior,	arameter values, ra chaotic or non-line	indomness, incor ear dynamic syste	nsistent human em behavior.
Collective /individual membership assignments	Distinct a sir	tion between collengie instance of be	ctive system beha havior for a para	avior and meter.
Value of diversity	Varying	perspectives and v	alue systems amo	ong people

Implications: Exemplify or Specify terms or expressions

- Scientific terminology
 - e.g. effective dose, etc.
- Generality
 - e.g. "city" (does not specify details)
- Vagueness
 - e.g. "good" (several interpretations)
- Ambiguity
 - has several paraphrases which are not paraphrases of each other
- Fuzziness/Fuzzy qualifiers
 - e.g. about 20 students; "safe", "weak", "adequate" (inherent lack of boundary; "indeterminate referential boundary")

Interaction dilemmas

Experts vs. Experts and vs. Non-experts

Ratings by

nuclear experts (\blacktriangle) engineers (+) and the public (_)

of 21 risk dimensions of nuclear waste



Figure 16. The 21 risk dimensions of nuclear waste judged by expens and the public.







Implications: Interaction dilemmas

«Rule»

 $\mathsf{E}(\epsilon_i)=0$

- Do not take for granted
 - that others have your knowledge, background or interests
- Listen

Time perspectives

- 1. He who saw The Deep, the earth's basis,
- 2. he experienced all, understood all.

Gilgamesh, who saw The Deep, the earth's basis

he experienced all, understood all.

- 3. He explored the earth's four corners.
- 4. He got complete knowledge of there is.
 - (Gilgamesh, approx. 2800 BC.)









Data from Svenson & Karlsson (1983); Svensson & Nilsson (1986) NTNU

Overview of categorised responses to open ended questions asking for estimates of when prehistoric events took place: (1) the withdrawal of the glacial ice covering Sweden, (2) the development of man, Homo Sapiens, (3) the extinction of dinosaures, and (4) the creation of the universe.

Categories of				
responses:	1	2 Homo	3	4
No. years ago	Glacial	sapiens	Dinosaurs	Universe
0-100	8	7	2	1
101-250	10	4	3	1
251-500	9	5	6	3
501-750	3	0	2	0
751-1 000	61	15	14	1
1 001-2 000	56	15	18	7
2 001-3 000	38	37	21	4
3 001-4 000	15	18	14	3
4 001-5 000	38	34	16	9
5 001-6 000	9	17	8	3
6 001-7 000	9	6	5	3
7 001-8 000	10	7	4	2
8 001-9 000	7	0	ο	1
9 001-10 000	144	39	32	13
10 001-50 000	44	68	32	7
50 001-100 000	15	56	24	17
100 001-500 000	4	31	18	2
500 001-1 million	12	37	48	37
1.1 mill-5 mill	11	43	66	25
5.1 mill-10 mill	5	11	16	31
10.1 mill-50 mill	1	8	19	15
50.1 mill-100 mill	4	2	89	19
101 mill-500 mill	0	0	22	13
501 million-1				
billion	0	0	3	25
> 1 billoin	1	4	7	138
N	514	464	489	380
No response	100	150	125	234





RESULTS

Thinking about "the times past" and "the future", where are we in the time perspective?

Time interval	Times pa	ast	Future			
	N (=578)	%	N (=55	57) %		
SUM ≤ 1 år	5	< 1	124	22,3		
SUM >1-10 år	70	12,1	250	44,9		
11 år – 20 år	61	10,6	70	12,5		
21 år -30 år	69	11,9	26	4,7		
31 år – 40 år	47	8,1	11	2,0		
41 år – 50 år	126	21,8	27	4,8		
51 år – 60 år	43	7,4	0	0,0		
61 år – 70 år	13	2,2	2	< 1		
71 år – 80 år	21	3,6	5	< 1		
81 år – 90 år	3	< 1	0	0,0		
91 år – 100 år	82	14,2	29	5,2		
SUM 11-100 år	465	80,4	170	30,5		
SUM > 100 år	38	6,6	13	2,3		
No response	36		57			

Data: Drottz-Sjöberg (2003)



RESULTS

Judgements* by the public and the experts of the importance of SSI's evaluation of SKB's research program; 5 separate time periods

		Work period	To 1 000	To 10 000	To 100 000	To 1 million	
All#	Mean	4.67	4.39	3.79	3.21	2.75	
N=614	SD	0.78	0.99	1.28	1.48	1.64	
Experts	Mean	4.15 ⁵	4.62	4.38	3.33	1.92	
N=13	SD	1.28	0.65	1.19	1.44	1.08	

*Scale: 1="Unimportant" to 5="Very important".

⁵ Public – Experts, p<0.02. Sex differences, p<0.02 – 0.003





Different kinds of Trust

- "Social trust" (trust/distrust in others, e.g. authorities, experts)
- "Epistemic trust" (trust/distrust that Science or the technology utilized for risk management can/cannot solve a problem)

Perceived risk related to long-term nuclear waste management is often connected to Epistemic trust



RESULTS

Ratings of our generations' responsibilities for the future generations life conditions (Scale: 1="None at all", 2="Very little", 3="Rather little", 4="Rather large", 5="Very large").

Groups		Future genera- tions chances,	Future genera- tions chances,	Stop animals from extinc-	Protect plants from extinc-	Stop human suffering	Equilize economc differences	Stop the spread of	Good education for childern	Fight crim- minality	Construct a safe reposi- tory
		as I see	as others	tion	tion			HIV			
All public	Mean	4.45	4.28	4.59	4.56	4.58	4.07	4.46	4.62	4.52	4.76
N=614	SD	0.81	0.79	0.68	0.72	0.74	0.97	0.70	0.60	0.79	0.58
Experts	Mean	4.23	4.00	4.54	4.31	4.77	3.92	4.46	4.69	4.62	4.46
N=13	SD	1.09	0.91	0.52	0.63	0.44	0.95	0.88	0.48	0.51	0.88
Men	Mean	4.33	4.20	4.50	4.45	4.44	3.91	4.50	4.56	4.43	4.71)
N=336	SD	0.90	0.79	0.74	0.78	0.82	1.02	0.80	0.64	0.86	0.62
Women	Mean	4.59	4.37	4.71	4.70	4.74	4.26	4.75	4.69	4.63	4.82
N=262	SD	0.65	0.77	0.59	0.61	0.59	0.86	0.53	0.54	0.67	0.52
18-25 y	Mean	4.17	3.95	4.58	4.44	4.56	3.97	4.62	4.58	4.31	4.57
N=64	SD	0.98	0.74	0.85	0.96	0.73	0.96	0.63	0.69	0.89	0.71
46-55 y	Mean	4.55	4.37	4.63	4.61	4.56	4.10	4.72	4.60	4.52	4.74
N=125	SD	0.74	0.83	0.65	0.69	0.77	1.04	0.59	0.64	0.79	0.65
66-78	Mean	4,54	4.30	4.49	4.49	4.65	4.21	4.70	4.66	4.68	4.79
N=57	SD	0.80	0.93	0.85	0.80	0.74	0.93	0.65	0.61	0.71	0.59

Data: Drottz-Sjöberg (2003)



Implications: Time perspectives

 We are not good at remembering – or time estimating – events of the past

• Predicting the future is even worst

• Seems like «Beliefs» enter when ability fails

 «Beliefs» relate to attitudes, world views, moral values



Cultural contexts Example of Similarities and Differences: ARGONA (WP4); Type of wastes



- Sweden: SFR working (low & medium short lived), CLAB works (interim storage for spent nuclear fuel). Planning Final geological repository (spent nuclear fuel) and SFL (low & medium long lived).
- Slovak Rep: Mochovce working low-level and intermediate short-lived (LILW-SL), low-level and intermediate long-lived (LILW-LL), Interim spent fuel storage high-level (HLW) to be planned. Decommissioning: (JAVYS) plans.
- UK:National repository Drigg (LLW) has not enough capacity (LLW+ILW)



Differences & Effects, ARGONA (WP4)

- Types of wastes
- Historic events
 - Early developments
 - Accidents
 - Legacy wastes
- National economy
- Funding of repositories

Require information and communication about different wastes

Reprocessing; cold war; secrecy (early) significant accidents etc. provide different challenges to waste management; Different historic developments

National production important Availability of funds vary Different public attitudes and management conditions & style





Differences & Effects, ARGONA

- Social system
 - Access to information
 - Transparency
 - Communication processes
- Future orientations

Governance diffrences (structures and apporaches) Different administrative traditions Different public awareness and different national use of communication

> New power plants Separation "legacy" and "new" wastes National or regional repository



Implications: Cultural contexts

 Better to adjust the communication to the given context than try to adjust the context to the presented facts





Information, communication & effects



Figure 2. Observed ratios between total body concentration and average deposition level of ¹³⁷Cs for men and women in the respective regions studied. Error bars indicate standard error of means.

Data from: Ågren, Drottz-Sjøberg, Enander, Bergman & Johansson (1995).

Perceived PERSONAL RELEVANCE & information handling



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"Codability": "a property of the stimulus".



Societal change

- Scientific findings
- Upgrading
 - Monitoring capabilities
 - Measurement devices

Improvements?

Conflicts?

 New communication means and uses



Guiness Book of Records: 20 years of tenacity

Kynnefjäll – a record of tenacity. For 20 years they guarded their mountain day and night. Finally the state promissed that Kynnefjäll would never be used as a final repository for spent nulear fuel. The guarding, 1980-2000, has entered the Guiness book of records.







Summing up

- To related to the context is essential – it shapes the perceived meaning of communication
- Challenges include
 - How to place oneself in someone elses shoes



In the middle of difficulty lies opportunity. Albert Einstein

Thank you for your attention!