Perceived information technology risks and attitudes[1]

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Abstract

Risk has been a focal dimension in much of the debate about attitudes toward technology. In the present paper, the development of research on risk perception is reviewed, from its beginnings in the end of the 1960's. The received view on factors in risk perception is that of the psychometric model and social trust. It is pointed out that this approach gives only an incomplete understanding of risk and risk acceptance, and some missing elements are delineated, such as Tampering with Nature, which is an important factor in technology acceptance, and trust (or distrust) in science, and the embracing of alternative views on the nature of the world and knowledge (New Age). Several methodological points are also important. Risks should be studied with regard to one's own personal (personal risk), and to others (general risk), because these dimensions often differ and they have different implications. It should also be observed that the most important risk aspect is severity of consequences of unwanted events or accidents, not their probability. When it comes to attitudes toward technology it is argued that the replaceability of a technology is an important factor. IT risks have been investigated in a major survey carried out with a representative sample of the Swedish population. The main finding was that IT risks were seen as pertinent mainly to others, implying that people (rightly or wrongly) perceived that they could protect themselves from IT risks. IT risks are finally regarded in the light of Stigma Theory, which has been devised to understand some social and political reactions to risks, and it is held that it is unlikely that IT will become a stigmatized technology, partly because it is seen as irreplaceable. Yet, many IT risks are very real and many people are aware of them. In particular, personal integrity is threatened and the very novelty of the technology involved is probably

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the cause why ethical and legal developments lag far behind. Initial one-sided positive statements about IT are likely to be followed by more sober assessments of this technology which brings many blessings but also an increasing number of serious risks.

Attitudes toward technology are implicated as an important factor in many policy contexts. Risk is undoubtedly a factor in such attitudes. See Fig. 1 for an example from our own work on perceived risk and attitudes to technologies. There is a whole field of research where risk is in focus, because it is believed that it is the most crucial aspect in technology attitude. However, this may be a hasty conclusion. I will show that other factors enter as well, some of them of special interest in the case of information technology.

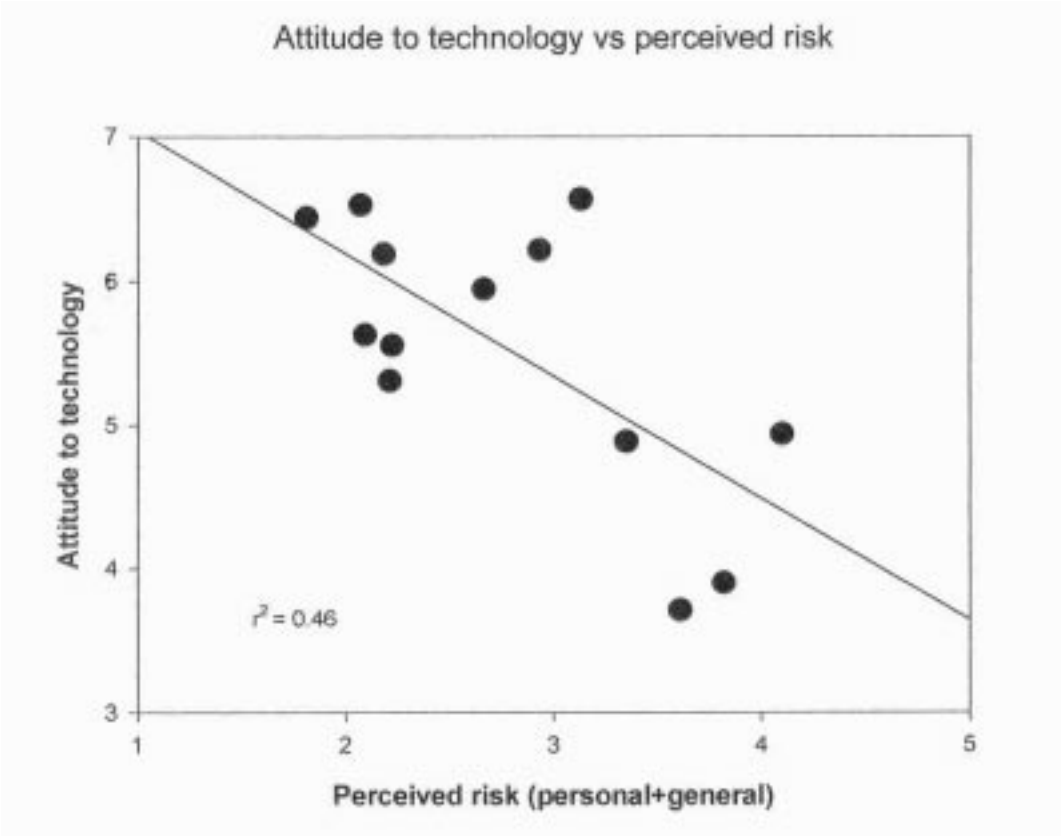

Fig. 1. Mean attitude on a 7-step good -.bad scale, plotted against mean perceived risk. Data for 13 different technologies.

I will start this paper with an exposé of risk perception research. I review some important highlights from this field and then I discuss attitudes toward technology in a more general sense, in order to give a background to our work on IT risks. I will show how IT risk perception has both general properties of technology risk perception, and some unique characteristics as well.

Finally, I relate what we know about IT risk perception to some policy problems and to the present state of uncertainty about some crucial IT risk issues, such as those pertaining to integrity.

Risk

How do people perceive risk? What are the important factors in such perceptions or cognitions, and what are their consequences, e.g. for policy attitudes and preferences? Since controversies about technologies have been strong and increasing since the 1960's these are questions that call for answers. In the present paper I will review some of the work carried out on these issues internationally and in out own unit. The historical development of the field is briefly described. The review will be selective, of course, but also critical. In a way, it will be construed as a challenge to the received and well-known view as represented by such authors as Paul Slovic (Slovic, 1987). That work has been historically important and stimulated much further research, but my aim is to point to questions it has not answered and ways of improving our understanding of the issues. Risk perception is a young field of research and it is full of interesting and unanswered questions.

The development of risk perception research

Research on risk perception started in the 1970's. There were two main roots of this work: Intense controversy over some kinds of technology, most notably nuclear power, and analytical attempts to grasp the policy problems arising from such controversies. The best known analytical attempts in the 1960's were published by Sowby (Sowby, 1965) and Starr (Starr, 1969).

Sowby attempted a risk comparison strategy. Various activities, such as smoking, entail a risk of serious illness as a function of time spent in them. For example, smoking is, per time unit, according to Sowby much more dangerous than living close to a nuclear power plant. This may or may not be true, depending on the credibility of the risk analyses involved. At any rate, the risk comparison approach, seemingly rational as it was, fell into disrepute, presumably because it was useless in communicating with people having risk perceptions of their own, different from those of experts. Two decades later a new discipline called risk communication was born and the first major treatise in risk communication (National Research Council, 1989) is full of warnings not to employ risk comparison schemes.

Starr’s approach was to investigate, on archival data, risks and benefits at the societal level, of various activities or technologies. Plotting these values (risk against benefit) he found two regression lines to fit data: one higher for what he termed “voluntary” activities and a lower one for “involuntary” activities. An example of the first kind would be sailing in your own boat, and for leisure. An example of the second kind would be traveling in a car ferry.

Surely, the concept of voluntariness did not quite fit the intuitions that many had about such examples. Traveling in a car ferry is not really involuntary. There could be other dimensions that would better fit the phenomenology involved, and at the same time catch the important risk distinctions that Starr had made. Starr's publication was a "good bad" paper: he pointed to a whole new field of research, and did so with some obvious shortcomings that stimulated people to start their own analyses in order to improve on his analysis. A number of books were published in the 1970's, and in 1978 Fischhoff et al. published an important psychological analysis of the concepts that had been proposed as important in understanding perceived risk (Fischhoff, Slovic, Lichtenstein, Read, & Combs, 1978).

Fischhoff et al. found that two major dimensions were important in accounting for perceived risk, and risk acceptance. They were called novelty and dread. Hence, a new technology would be feared because of its very newness. And reactions to some technologies, such as nuclear power, had a strong emotional component to them. Indeed, nuclear power came out as an extreme example of a highly feared, new technology and that seemed to be the explanation for public reactions to nuclear power that many had sought. People were ignorant (novelty) and emotional (dread). Fischhoff et al. backed up their analysis with quantitative analyses of data that seemed to leave little room for doubt that they had indeed been able to explain risk perception. In regression analyses, they found that their basic dimensions explained most of the variance of perceived risk. In later work, Slovic expanded the number of explanatory variables and collected data in many diverse groups (Slovic, 1987; Slovic, Fischhoff, & Lichtenstein, 1985), with very similar results, and others have also replicated this work in several different countries, see an excellent review by Boholm (Boholm, 1998). The model of Fischhoff et al. has been called the psychometric model, which is really a misnomer since psychometrics usually stands for something else (psychological testing) and since it is but one of many possible realizations of psychological models of risk perception.

At the present it is clear that however convincing these results may have seemed, they were not really the final answer to explaining risk perception. There are several reasons for this state of affairs. First, the high level of explanatory power claimed by Fischhoff et al. was really the effect of their working with aggregate data, with means. Aggregation brings with it as a strong effect the diminishing of errors and individual differences, hence data get to look much more "smooth" and can be fitted more easily with simple statistical models. In the social sciences, this effect is well known under the name of the ecological fallacy (Robinson, 1950). Keeping to the level of individuals, we get a much more sober view of the power of the psychometric model. About 20 percent of the variance is explained, not 60 or more (Gardner & Gould, 1989; Sjöberg, 1996a). Later work has shown that a at least one major factor was missed in the psychometric model, viz. Tampering with Nature (Sjöberg, 1997b, 2000c), also called Unnatural Risk (Sjöberg, 1996c). Furthermore, novelty seems to be a weak factor in perceived risk, and the power of dread is at least in some data sets absorbed by Tampering with Nature. Furthermore, dread is probably a consequence of perceived risk rather than a cause. The problem of causal direction has not been faced in the work on the psychometric model. It is apparently assumed that correlations directly inform about causes.

A further complicating factor of great importance is the distinction between general and personal

risk. People rate most risks as larger when construed as risks to others, the general risk. When they are asked to consider a risk to themselves, a personal risk, they see the risk as considerably smaller. However, things are more complicated than that. Sometimes there is a very large difference between personal and general risk, sometimes the difference is small. An example of the former case is smoking, one of the latter is nuclear power.

Hence, the rank order of personal and general risk may not coincide. They may even be reversed as in one study of food risk that we carried out (Sjöberg, 1996b; Sjöberg, Oskarsson, Bruce, & Darnerud, 1997a). The difference between general and personal risk, at the level of means, is usually strongly related to perceived control over the risk (Sjöberg et al., 2000). When control is perceived as large, the difference is also large, meaning that we tend to discount the ability or willingness of others to exert control over a risk. Interestingly, when people are not given a specific instruction to rate personal or general risk, they seem to rate general risk (Sjöberg, 2000b).

The latter fact is important for understanding the power, or lack of power, of many studies of risk perception where target was not specified (or specified as general). When risk policy attitudes are studied explicitly, e.g. by means of ratings of demand for societal risk mitigation, it is found that such demand is most strongly related to general risk for lifestyle risks, such as smoking, where a high level of control is believed to exist. In the case of technology or environment risks, with a small perceived level of control, policy attitude is determined more by personal risk. In risk policy work it would therefore be unwise to leave the target unspecified, or specify it as general. This may even be seen as paradoxical since policy attitude in a way seems to be most naturally tied to the target of people in general .

Risk as a concept is somewhat elusive. It has components of probability and severity of consequences. It can even be *defined* with an emphasis on one or the other of these aspects, and Drottz-Sjöberg found, in her thesis, that people who define risk with an emphasis on consequences tend to rate risks as larger than those who stress probability (Drottz-Sjöberg, 1991). Later work supported this finding (Sjöberg, 1999a, 2000a). It has become quite clear that the most important risk aspect is severity of consequences, if an accident or otherwise unwanted event were to happen, not probability beyond a certain, quite low, threshold value (Sjöberg, in press-c). (It must obviously be possible for the unwanted event to happen, otherwise we would not speak about a risk). It is interesting to note that this is the sort of thinking that was central to nuclear opposition already in the 1970's. A risk was undesirable to some people no matter how small it was, as long as it existed (Energikommissionen, 1978).

Enters a new factor: Trust

The psychometric model was quite successful in the 1980's, probably because its message was so close to common sense. But in spite of its claims to having fully explained risk perception and risk acceptance, something seemed to be missing. What?

The suggestion was made around 1990 that an important additional factor might be trust (Slovic, Flynn, & Layman, 1991). It seemed quite reasonable that if people would trust experts

and authorities, and corporations, they would also accept risks that were officially assessed to be very small. A frequently made assertion is that it is easy to lose trust but very hard to regain it (Slovic, Flynn et al., 1991). While this may be true, it was not really established empirically be Slovic, who simply presented data on students' folk psychology about trust, which as one might expect coincided with the general common sense notions.

Yet, trust is not that easy to get at. Consider, first, the issue of general and specific trust. General trust would entail such notions as people in general being honest and trustworthy. Specific trust would be about the trustworthiness of those responsible for risk management in a certain respect, such as nuclear waste. One might believe that specific trust is a more potent explanatory factor than general trust, in accounting for any specific perceived risk, yet Viklund in an extensive empirical study involving four countries in Western Europe and a large number of hazards, found the opposite (Viklund, 2002). General trust, measured as devised in one of my papers (Sjöberg, 1999b), was found to be a more potent factor than specific trust.

Second, how important is trust anyway? It turns out that most studies of the relationship between trust and risk perception have reported fairly low levels of correlation between these two dimensions (Sjöberg, 1999b). A common figure is about 10 percent explained variance, with some variation across types of hazards. The figure is usually statistically significant, of course, but that is not a very interesting piece of information. Statistical significance can very easily obtained even with very small levels of explanatory power, given that the samples are big, which they usually are in survey research on risk perception.

So something seemed not quite the way it should be with the conception of trust as an important factor in risk perception. The data simply did not support the notion, and some authors appeared not to have scrutinized their own data sufficiently for their conclusions about the importance of trust. One exception was a study by Siegrist (Siegrist, 1999) where a strong relationship was found, but it turned out that this was apparently due to a common methodological component. Siegrist measured both perceived risk and trust with Likert-type attitude scale items, while most other work used separate ratings of risk and trust. It seems intuitively likely that a strong relationship may occur when both dimensions are measured with similar attitude scale items. This suspicion was confirmed in a recent study of mine (Sjöberg, in press-b).

Another clue to the matter occurred to me from Drottz-Sjöberg's work on nuclear waste siting in Sweden (Drottz-Sjöberg, 1996, 1998). She had interviewed people in two small Swedish communities in the aftermath of local referenda, which had, by the way, returned a negative response to the proposal of further feasibility studies. The interesting thing about these studies were that some people did not really distrust the industry, experts or authorities. They *still* did not want their communities to be hosts of a nuclear waste repository. There were probably several reasons for these findings, but one possibility that struck me was that *people may distrust science*. Previous work on trust had been concerned with what may be called *social trust*, i.e. trust in experts, administrators or organizations. The factor now in focus was *epistemological trust*.

In fact, this suspicion was also confirmed in my work on New Agers' risk perception

(Sjöberg, in press-d). People who subscribe to New Age beliefs have their own ontology and epistemology. The world is construed as spiritual rather than material, and knowledge comes from sources other than science, such as insight, feeling or ancient wisdom or magic. Two studies confirmed the importance of New Age beliefs to risk perception (Sjöberg, in press-c, in press-d). They were, indeed, considerably more important than Cultural Theory dimensions, which had been discussed extensively in the literature[2] but met with little empirical success. So it was a logical step from these observations to assume that the notions that people have about the limitations of science may play an important role in risk perception. This suspicion has been amply confirmed in empirical work (Sjöberg, 2001). The belief that science does not have all the answers, as it were, is a more important kind of distrust than distrust in experts or organizations. Perhaps it is also more interesting, since it is of course true that science does not have all the answers, and it never will.

The credibility of the original trust concept, was probably largely based on the notion of a dichotomy of people, some of which were considered to be experts and some lay persons. Original work on a very small group of risk assessment experts has been repeatedly cited as showing the truth of the common sense idea that experts give an objective and correct assessment of risk, while the public's risk perception is fraught with many biasing factors - those that are accounted for in the psychometric model (Slovic, Fischhoff, & Lichtenstein, 1979). However, this work was not really based on topical experts but a group of risk assessment professionals who apparently professed to have expert knowledge of widely different types of hazards. That claim was simply not credible. In studies of topical experts, e.g. of nuclear waste experts, it was later found that experts' risk judgements have *structural* properties similar top those of the lay public, while they judge the *level* of risk differently as long as it is a risk in their own field of responsibility (Sjöberg, in press-a). Experts in nuclear technology were found to judge nuclear power risks as much lower than the public did, but not necessarily risks of ionizing radiation. As an example, they judged the radon risk at the same level as the public did (Sjöberg & Drottz-Sjöberg, 1994). Food risk experts judged some food risks as much lower than the public, but other risks at the same level as the public, viz. risks that were not under their responsibility (Sjöberg, Oskarsson, Bruce, & Darnerud, 1997b).

Information technology risks perceived by the public

Information technology has developed in several stages. In the wake of the PC revolution, in the beginning of the 1980's, there was much worry about what the PC would do to office work. Presumably, such worries stemmed from people who felt that their jobs were threatened or at

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[2]. This theory of risk perception was proposed by Douglas and Wildavsky in a rather opaque text in 1982 (Douglas & Wildavsky, 1982). The theory amounts to assertions about people "choosing" to worry about certain hazards because such worries support their social needs, which in turn prescribe risk beliefs on the basis of certain abstract properties of groups they belong to. Hence, there is a big step between the driving factors and the contents of risk perception, too big as it would seem since data give only the most flimsy support to the theory (Sjöberg, 1997a, in press-c).

least that they would have to learn many new and difficult procedures when PC's were introduced in offices. However, it did not take long to discover that such functions as word processing are not difficult to learn at a sufficient level for most jobs, and that the PC even made those jobs more pleasant and stimulating. Even if secretarial jobs were phased out in many cases, that was of course a gradual development and the secretarial jobs that were kept became enriched.

Hence, early suspicions about IT technology risks were not supported by later experiences. Yet, other risks were, and are, apparent - not least due to the development of the Internet. How did people see these risks in the end of the 1990's?

We conducted, in the spring of 1999, a study with a representative sample of the Swedish population, and a very extensive questionnaire
(Sjöberg & Fromm, 2001; Truedsson & Sjöberg, 2000). Sweden is a good country for doing this type of work because it is usually relatively easy to get the data with a decent response rate. In ths case the response rate was 65.7 percent, and that with a questionnaire of 25 pages. The many findings of that study will not be repeated here since they are available in separate publications cited above. A few words about the findings are, however, called for.

We found that only few people, perhaps 2-3 percent, had had some negative experiences with IT. Even if this is a small percentage, it means that there were many people in the population with such experiences, perhaps 50,000 - 60,000. In that sense, the problem was not trivial.

Forty percent of the respondents avoided using e-mail and the Internet altogether. There were worries about such things as computer viruses and credit card fraud when shopping on the Internet, less about social isolation and depression due to "Internet addiction". Data on trust and confidence showed that people trusted fairly well the authorities (the Computer Inspectorate), less so commercial agents of various kinds. This is a common type of finding in many fields of technology. And the respondents had a *very* positive attitude towards computers.

One of the findings stands out as crucial and will be discussed in some detail. This surprising finding was a very clear difference between personal and general risk, see Fig. 2. It was quite surprising since, in most cases of technology risks earlier studied, the two have tended to coincide. A large difference between personal and general risk has otherwise been found mainly for so-called lifestyle risks, i.e. smoking, drinking too much alcohol and the like. In these cases, the difference between personal and general risk can be substantial and general risk is the factor driving policy attitudes, not personal risk (Sjöberg, 2000b). Also, there is a component of perceived control over such lifestyle risks, people seeing themselves as having control over them.

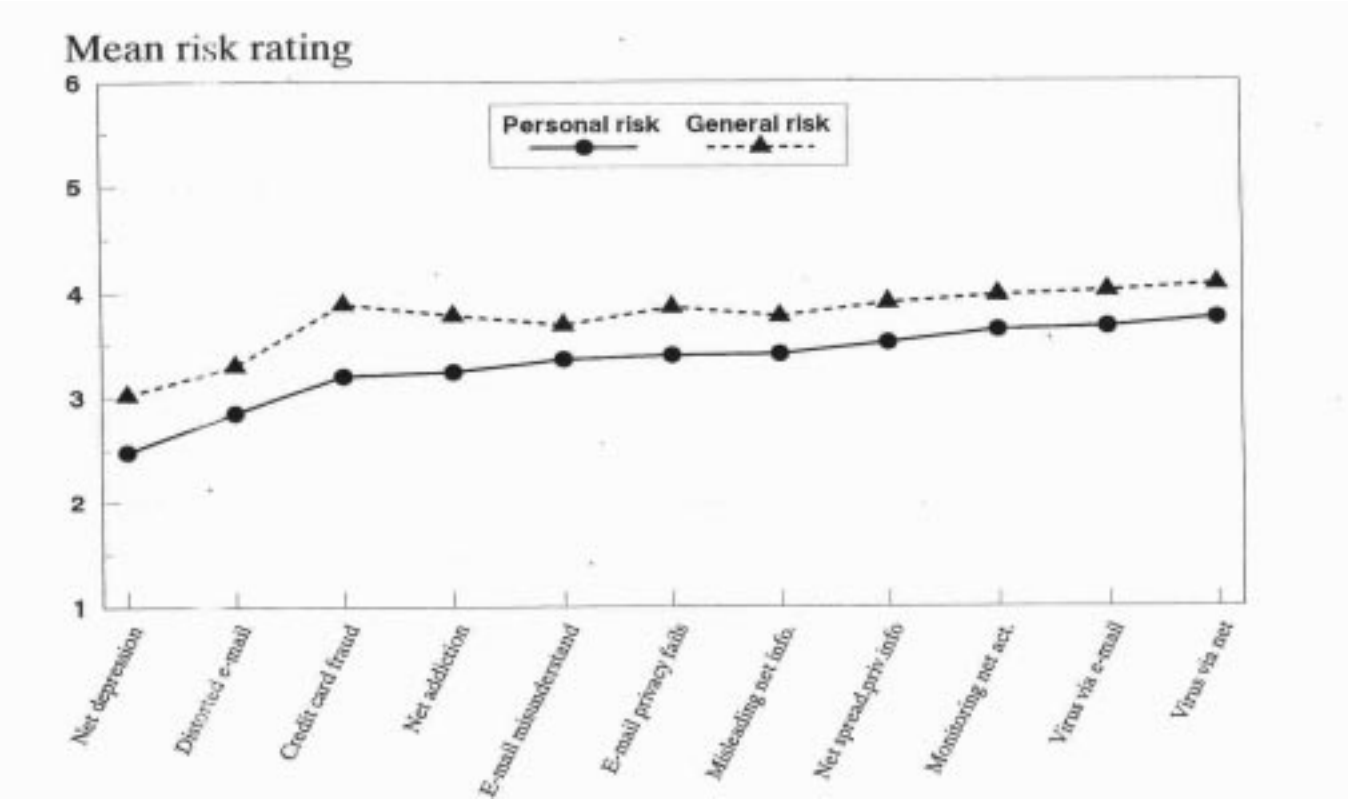

Fig. 2. Mean ratings of general and personal risk for a number of IT hazards.

IT was clearly grouped with lifestyle risks in our data, implying that the risks of information technology are not seen as risks of technology usually are, i.e. something one is exposed to unwillingly and which is very hard to protect oneself from. On the contrary, IT risks were apparently seen as possible to protect oneself from, hence mostly a risk to others, not to oneself. Once this is pointed out, it seems obvious. Work on a computer would seem to be an archetype of man-machine interaction, the "hacker" is indeed an active agent in the process. And hence he or she may perceive a large measure of control, however illusory that perception may be. It would be interesting to compare with a mature electronic technology such as television, where there is typically little interaction beyond turning the TV set on or off, or zapping between channels. TV risks are frequently discussed, in particular the risks of creating a violent tendency in some of the viewers, but I have a suspicion that this too is a risk that is seen to be threatening others, not oneself. Possibly, the development of TV will strengthen that conclusion as TV becomes more interactive and TV watching is becoming more similar to working with a computer, and some computer functions such as e-mail are becoming available to your TV set.

Since people see little risk to themselves from IT, and at any rate believe that they are in control of such risks, they are not likely to demand risk reduction as strongly as they do in other cases of risks of technology, such as nuclear power or genetic engineering. This does not mean that all

risks are just accepted, of course. There is widespread skepticism in Sweden about the use of credit cards while shopping on the Internet, to take one example, and considerable vigilance as to the possibility of having one's computer contaminated by viruses. Each new major virus does get a lot of attention in the media. People are also aware of the threats to integrity imposed by the current views on the matter regarding e-mail integrity, or lack of it. Swedish employers have the right to read an employee's e-mail, while they certainly cannot eavesdrop on telephone conversations or open an employee's regular mail. The introduction of new technology has thus not been coordinated with a consistent view on integrity so far, but maybe things will change once we get to be more accustomed to the trials and tribulations of e-mail[3]. The psychology of e-mail seems to many people to involve some potentially dangerous temptations. It is a quick and easy way to formulate and send a message, and since the recipient is not present as in face-to-face communication there are not the usual social inhibitors at work. E-mail easily becomes too personal and too aggressive under such circumstances.

Attitudes toward technology

Let us step back and take another look at the reasons for studying risk perception in the first place. The impetus came from controversies over technology, and such controversies almost inevitably involve risk. But they do not involve *only* risk. There is much more to say.

Benefit is an obvious additional dimension, and it does play a role in attitudes toward technology, even if it seems to be, at times, secondary to that of risk (Sjöberg, 1999c). What else could be of importance? I had one idea from a historical case study we conducted some time ago, of the first railway disaster in Sweden (Sjöberg & af Wåhlberg, 1996). It happened on 23 December 1864, in Sandsjö in the south of Sweden, on the then very new railway link between Stockholm and Malmö. A freight train ran into a passenger train which had stopped at the Sandsjö station, and was somewhat late in leaving due to the heavy traffic just before the Christmas holidays. Seven people were killed and many injured.

The railways were very new in Sweden at that time, and the major connection between Stockholm and Malmö had been inaugurated just a few weeks before the accident, with much pomp and circumstance, members of the royal family traveling on the new line, and extensive attention in the media. The accident apparently came as a shock and was given enormous media attention during several months, starting on the very next day, Christmas Eve of 1864.

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[3]. Another interesting kind of integrity violation occurs when the recipient of an e-mail message of a personal nature discloses it to a third party such as the sender's employer. This may be as legally acceptable as eaves-dropping on e-mail by an employer, yet of course it is morally highly questionable. The ethics of the new communication technologies are surely in need of thorough discussion and reflection. Some people try to stop receivers from abusing their e-mail by including explicit disclaimers in their mails, but the legal status of these is unclear. Maybe they function at least as a moral deterrent to integrity violations.

Especially, the question of blame was discussed intensely[4].
One of the interesting things about the reactions to the Sandsjö accident was the very lack of demands to close or have a plan for phasing out the railways. Compare with the reactions to the Harrisburg and Chernobyl accidents. At least in Sweden, demands to phase out nuclear power were very strong after these accidents. In 1980, there was a nuclear referendum in Sweden and *all* options called for the phasing out of nuclear power. Why did not people demand, in 1864, that railways be phased out? I suggest that the crucial factor was the lack of a good alternative technology. Railways represented a quantum leap in transportation technology. Sweden is a large country and travel before the railways was expensive, slow and risky. Hence, the factor of availability of an alternative technology may be important in attitudes toward a technology. Nuclear technology is clearly not that necessary since there are other ways of producing electricity, or many people believed that there were, or would soon be, such means available. How about information technology? Can we live just as well without it?

In two studies people were asked to rate the extent to which technologies could be replaced, or of they were irreplaceable
(Sjöberg, in press-b; Sjöberg, Hansson, Boholm, Peterson, & Fromm, in preparation), see Fig. 3. Two findings stand out from this work and will be mentioned here. First, the substitutability of a technology was an important factor in attitudes toward most technologies studied. It was not the most important factor, this being either risk or benefit, but it did contribute to the explanation of attitude. Second, IT was one of the technologies where a substitute was not considered to be clearly available. Opposite findings were found for, e.g., genetic engineering where substitutes apparently were considered by the respondents as very much available. This is reasonable since food production has always been an activity of humankind and there is no clear reason why we may not go on growing food in a similar way as it always has been done[5]. But, again, IT is a different story. Perhaps this is so because IT and the Internet really do represent a quantum leap in the availability and production of information, something like Gutenberg's invention of the printing press which made books available to many more people than they had been before, or the railways in 1864.

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[4]. The engineer of the freight train was indicted and convicted; no other person was brought to trial although the discussions of the events clearly implicated several others, including the top management of the railways. Railway safety was clearly insufficient and many faults of the system of safety were pointed to in the discussions. It seems that the railway company took these criticisms seriously because after the Sandsjö accident the Swedish railways had an excellent safety record for many years, the next major disaster was to occur only in 1916 (with a smaller one happening in the 1870's) and that was a case of a natural disaster rather than slack safety management, known in Sweden as the Getå accident.

[5]. I am aware that this argument is superficial and neglects important economic benefits from genetically modified food.

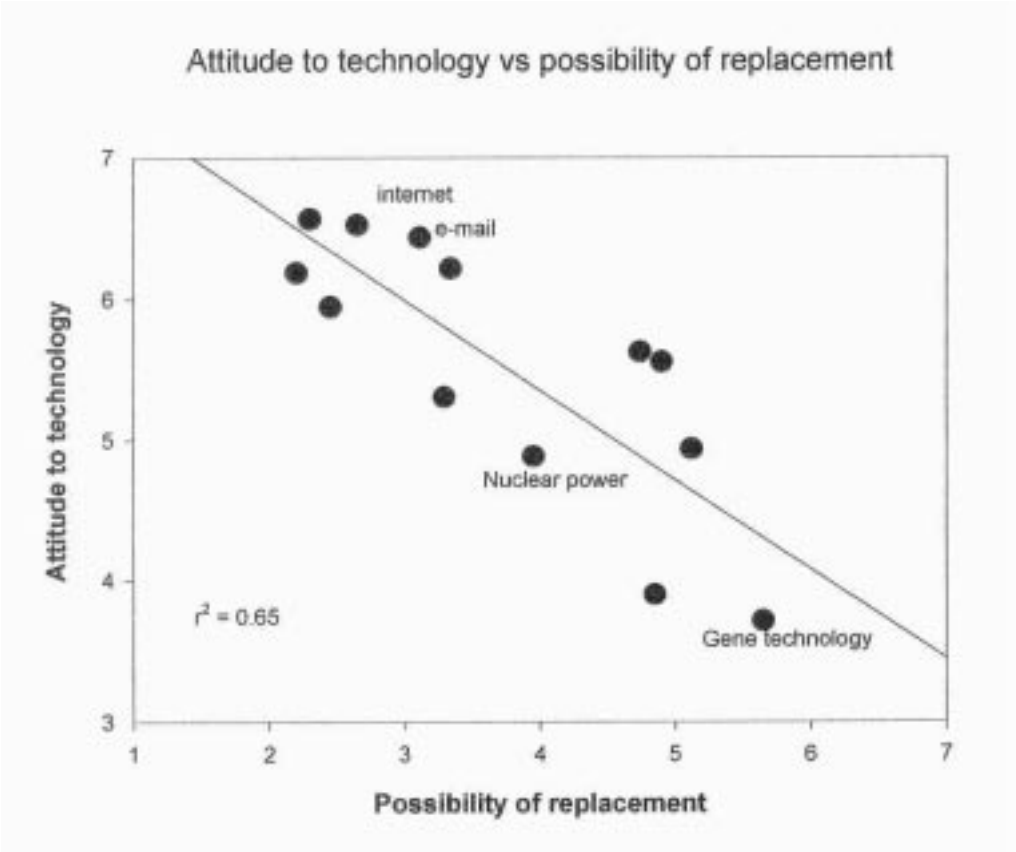

Fig. 3. Mean rated possibility of replacement of a technology. Data for 13 different technologies. Note the two IT technologies, nuclear power and gene technology.

Conclusions

Attitudes toward technology and risk perception have been studied by researchers from several social sciences. Psychologists were early on the stage, but they have been joined by researchers with backgrounds in sociology, political science, geography and anthropology. The difficulties in relating these different levels of discourse to each other are great. Psychologists, and I am one of them, are most at ease when studying individuals while those who have their background in other social sciences find it most natural to work at a higher level, such as organizations or even culture. A few attempts have been made to delineate what it would take to try to tie these levels together. A well known example is that of the theory of amplification of risk (Kasperson, 1992; Kasperson et al., 1988). A special development of that theory is stigma theory (Kasperson, Jhaveri, & Kasperson, 2001).

Stigma theory posits that certain properties of hazards predispose them for strong “ripple effects” in case of an accident, but perhaps also otherwise. Such ripple effects strengthen and expand the

negative attitudes and heightened risk perceptions with regard to a given technology such as the nuclear one. Stigma theory has been most extensively applied to nuclear waste management and it has been asserted that a high level nuclear waste repository would bring about very negative reactions at many societal levels (Slovic, Layman et al., 1991). The theory is cited in courts as an argument for trying to stop the siting of radwaste repositories in the USA. It can be debated, however, just how secure a basis there is for these assertions
(Broström, Kessling, Krafft, & Sjöberg, 2002). Only a few concrete cases of stigma have so far been observed, mostly short-lived ones such as the Goiania radiation panic in 1987 (Drottz-Sjöberg & Persson, 1993; Petterson, 1988). In most cases of siting of nuclear facilities, little or no social and political problems have arisen (Metz, 1994). The big exception is that of Yucca Mountain in Nevada, where the state has been trying for almost two decades to stop the federal program. Another, internationally less well-known, example is the Swedish nuclear power plant at Barsebäck, close to Copenhagen, and unacceptable to many Danes.

Is IT a case for potential stigmatization? There are several reasons why this is unlikely. First, IT is a unique technology which cannot easily be replaced. People may ask for increased safety, and they have of course already done so e. g. due to Internet fraud, but they do not demand that the technology be phased out. Second, IT is not really a health threat in the same sense as several other technologies are construed to be. You do not have to fear to get cancer from using the Internet. Third, IT is perceived to be a risk to others, not to oneself. Although stigma theory does not develop the distinction between personal and general risk, it is reasonable to believe that if stigma happens, it is about foremost about personal risk. IT is not seen as a personal risk.

All of this does not mean, of course, that IT risks can be safely ignored, nor that anyone demands that they be ignored. I have pointed to the serious integrity risks of e-mail and to viruses, and stories about Internet fraud abound. Even more ominous uses of the Net have often been discussed, such as the spread of criminal information of various kinds, of pornography and prostitution, and even the facilitation of terrorist acts. In the first years of widely spread use of the Internet many one-sided optimistic statements from some leading politicians regarding the Internet and all the good things it would bring about were heard. It should by now be realized that the good things are there, but so are the risks.

References

Boholm, Å. (1998). Comparative studies of risk perception: A review of twenty years of research. *Journal of Risk Research, 1,* 135-164.

Broström, L., Kessling, A., Krafft, G., & Sjöberg, L. (2002). *Psykosociala effekter av ett djupförvar för använt kärnbränsle. Litterturöversikt och intervjuer med Uppsalabor. (Psychosocial effects of a depth repository for spent nuclear fuel. Literature review and interviews with residents of Uppsala)* (SKB Rapport R-02-13). Stockholm: SKB.

Douglas, M., & Wildavsky, A. (1982). *Risk and culture*. Berkeley, CA: University of California Press.

Drottz-Sjöberg, B.-M. (1991). *Perception of risk. Studies of risk attitudes, perceptions and definitions* (Vol. 1). Stockholm: Stockholm School of Economics, Center for Risk Research.

Drottz-Sjöberg, B.-M. (1996). *Stämningar i Storuman efter folkomröstningen om ett djupförvar* (Projekt Rapport PR D-96-004). Stockholm: SKB.

Drottz-Sjöberg, B.-M. (1998). *Stämningar i Malå efter folkomröstningen 1997* (Projekt Rapport PR D-98-03). Stockholm: SKB.

Drottz-Sjöberg, B.-M., & Persson, L. (1993). Public reaction to radiation: Fear, anxiety or phobia? *Health Physics, 64,* 223-231.

Energikommissionen. (1978). *Riskvärdering: Säkerhetsbedömning och riskpsykologi*. Stockholm: Industridepartementet, Energikommissionen Ds I 1978:15.

Fischhoff, B., Slovic, P., Lichtenstein, S., Read, S., & Combs, B. (1978). How safe is safe enough? A psychometric study of attitudes towards technological risks and benefits. *Policy Sciences, 9,* 127-152.

Gardner, G. T., & Gould, L. C. (1989). Public perceptions of the risk and benefits of technology. *Risk Analysis, 9,* 225-242.

Kasperson, R. E. (1992). The social amplification of risk: progress in developing an integrative framework. In S. Krimsky & D. Golding (Eds.), *Social theories of risk* (pp. 153-178). Westport: Praeger.

Kasperson, R. E., Jhaveri, N., & Kasperson, J. X. (2001). Stigma and the social amplification of risk: Toward a framework for an analysis. In J. Flynn & P. Slovic & H. Kunreuther (Eds.), *Risk, media, and stigma. Understanding public challenges to modern science and technology* (pp. 9-27). London: Earthscan.

Kasperson, R. E., Renn, O., Slovic, P., Brown, H. S., Emel, J., Goble, R., Kasperson, J. X., & Ratick, S. (1988). The social amplification of risk. *Risk Analysis, 8,* 177-187.

Metz, W. C. (1994). Potential negative impacts of nuclear activities on local economies: rethinking the issue. *Risk Analysis, 14,* 763-770.

National Research Council. (1989). *Improving risk communication*. Washington,DC: National Academy Press.

Petterson, J. S. (1988). Perception vs. reality of radiological impact: The Goiania model. *Nuclear News, 31,* 84-90.

Robinson, W. S. (1950). Ecological correlations and the behavior of individuals. *American Sociological Review, 15,* 351-357.

Siegrist, M. (1999). A causal model explaining the perception and acceptance of gene

technology. *Journal of Applied Social Psychology, 29*, 2093-2106.
Sjöberg, L. (1996a). A discussion of the limitations of the psychometric and Cultural Theory approaches to risk perception. *Radiation Protection Dosimetry, 68*, 219-225.
Sjöberg, L. (1996b). Goda kunskaper om mat och föda. (Good knowledge about food). *Vår Föda, 48*(1), 10-13.
Sjöberg, L. (1996c). *Risk perceptions by politicians and the public* (Rhizikon: Risk Research Reports 23). Stockholm: Center for Risk Research.
Sjöberg, L. (1997a). Explaining risk perception: An empirical and quantitative evaluation of cultural theory. *Risk Decision and Policy, 2*, 113-130.
Sjöberg, L. (Cartographer). (1997b). *Perceived risk and tampering with nature: An application of the Extended Psychometric Model to nuclear disaster risk*
Sjöberg, L. (1999a). Consequences of perceived risk: Demand for mitigation. *Journal of Risk Research, 2*, 129-149.
Sjöberg, L. (1999b). Perceived competence and motivation in industry and government as factors in risk perception. In G. Cvetkovich & R. E. Löfstedt (Eds.), *Social trust and the management of risk* (pp. 89-99). London: Earthscan.
Sjöberg, L. (1999c). Risk perception in Western Europe. *Ambio, 28*, 543-549.
Sjöberg, L. (2000a). Consequences matter, "risk" is marginal. *Journal of Risk Research, 3*(3), 287-295.
Sjöberg, L. (2000b). The different dynamics of personal and general risk. In M. P. Cottam & D. W. Harvey & R. P. Pape & J. Tait (Eds.), *Foresight and precaution. Volume 1* (pp. 1149-1155). Rotterdam: A. A. Balkema.
Sjöberg, L. (2000c). Perceived risk and tampering with nature. *Journal of Risk Research, 3*, 353-367.
Sjöberg, L. (2001). Limits of knowledge and the limited importance of trust. *Risk Analysis, 21*(1), 189-198.
Sjöberg, L. (in press-a). The allegedly simple structure of experts' risk perception: An urban legend in risk research. *Science, Technology and Human Values*.
Sjöberg, L. (in press-b). Attitudes to technology and risk: Going beyond what is immediately given. *Policy Sciences*.
Sjöberg, L. (in press-c). Distal factors in risk perception. *Journal of Risk Research*.
Sjöberg, L. (in press-d). New Age and risk perception. *Risk Analysis*.
Sjöberg, L., & af Wåhlberg, A. (1996). *Sandsjöolyckan. (The accident at Sandsjö)* (Rhizikon: Rapport från Centrum för Riskforskning 6). Stockholm: Centrum för Riskforskning.
Sjöberg, L., & Drottz-Sjöberg, B.-M. (1994). *Risk perception of nuclear waste: experts and the public* (Rhizikon: Risk Research Report 16): Center for Risk Research, Stockholm School of Economics.
Sjöberg, L., & Fromm, J. (2001). Information technology risks as seen by the public. *Risk Analysis, 21*, 427-442.
Sjöberg, L., Hansson, S.-O., Boholm, Å., Peterson, M., & Fromm, J. (in preparation). Attitudes toward technology and bias in attention to technology risks.
Sjöberg, L., Jansson, B., Brenot, J., Frewer, L., Prades, A., & Tönnesen, A. (2000). *Radiation risk perception in commemoration of Chernobyl: A cross-national study in three waves* (Rhizikon: Risk Research Report 33). Stockholm: Center for Risk Research.
Sjöberg, L., Oskarsson, A., Bruce, Å., & Darnerud, P. O. (1997a). Riskerna med att äta mat.

Allmänhet och experter bedömer riskerna olika. (Food risks. The public and experts make different judgments). *Vår Föda, 49*(7), 3-9.
Sjöberg, L., Oskarsson, A., Bruce, Å., & Darnerud, P. O. (1997b). *Riskuppfattning hos experter inom området kost och hälsa. (Experts' risk perception with regard to food and health)* (Rapport 24/97). Uppsala: Statens Livsmedelsverk.
Slovic, P. (1987). Perception of risk. *Science, 236,* 280-285.
Slovic, P., Fischhoff, B., & Lichtenstein, S. (1979). Rating the risks. *Environment, 21*(3), 14-20,36-39.
Slovic, P., Fischhoff, B., & Lichtenstein, S. (1985). Characterizing perceived risk. In R. W. Kates & C. Hohenhemser & J. X. Kasperson (Eds.), *Perilous progress: Managing the hazards of technology* (pp. 92-125). Boulder, CO: Westview.
Slovic, P., Flynn, J. H., & Layman, M. (1991). Perceived risk, trust, and the politics of nuclear waste. *Science, 254,* 1603-1607.
Slovic, P., Layman, M., Kraus, N., Flynn, J., Chalmers, J., & Gesell, G. (1991). Perceived risk, stigma, and potential economic impact of a high-level nuclear waste repository in Nevada. *Risk Analysis, 11,* 683-696.
Sowby, F. D. (1965). Radiation and other risks. *Health Physics, 11,* 879-887.
Starr, C. (1969). Social benefit versus technological risk. *Science, 165,* 1232-1238.
Truedsson, J., & Sjöberg, L. (2000). Information technology and risk perception in Swedish society. In M. P. Cottam & D. W. Harvey & R. P. Pape & J. Tait (Eds.), *Foresight and precaution. Volume 1* (pp. 49-56). Rotterdam: A. A. Balkema.
Viklund, M. (2002). Trust and Risk Perception: a West European Cross-National Study. *Manuscript.*