

## **Multi-route models of trust in risk communicators**

Nigel Harvey and Matt Twyman

University College London

Acknowledgement: This research was supported by Economic and Social Research Council Grant R 000 230114.

**Abstract**

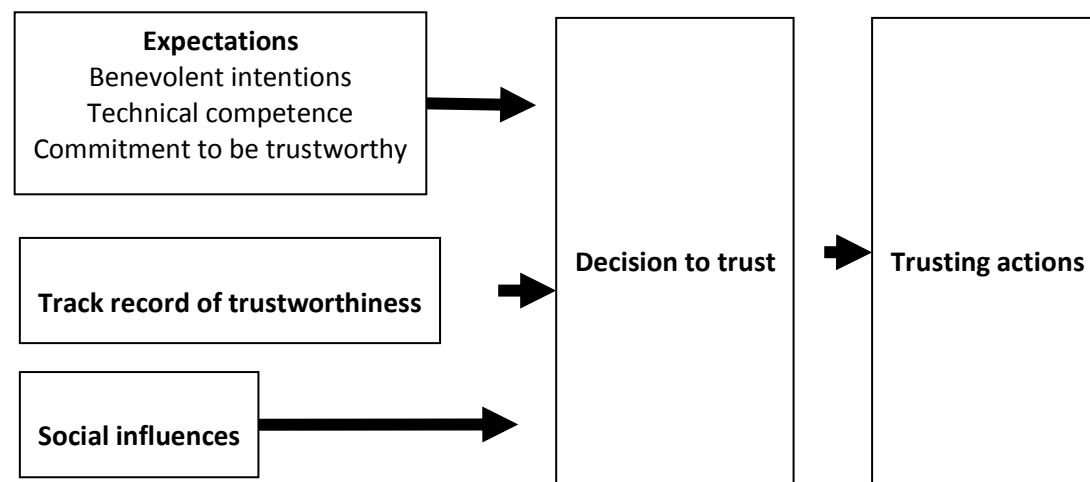
We discuss trust in different domains but focus on studies of trust in risk communication. Trust appears to have two main components: trust in the motives (benevolence, integrity, honesty) of an agent (e.g., a source of advice about risk) and trust in the agent's competence. Siegrist, Earle and Gutscher (2003) refer to these components as (social) trust and confidence, respectively. In their Trust-Confidence-Cooperation (TCC) model of risk communication, these separate types of trust jointly determine a person's degree of cooperation with the source of advice (expressing trust in it, using its advice to form personal assessments of risk, acting on the basis of its advice). We discuss evidence suggesting that different types of cooperative behaviour are not associated and assess the implications of this both for the TCC model and, more generally, for the study of trust.

Trust is a focus of study in many areas of the social sciences, including economics (Camerer, 2005), politics (Markova, 2004), organizational behaviour (Kramer and Tyler, 1996) and sociology (Fukuyama, 1995). It has been defined in various ways but is broadly seen as a willingness to make oneself vulnerable to the views, decisions or actions of another person or an organization. Here we shall be concerned with its psychological foundations.

### Multi-route models of trust

All multi-route models of trust imply that people assess a number of different trust-related features of an agent and then combine these assessments in some way to produce an overall estimate of its trustworthiness. Trusting behaviour depends on this overall estimate. We shall outline models of trust conforming to this broad outline in a number of different domains.

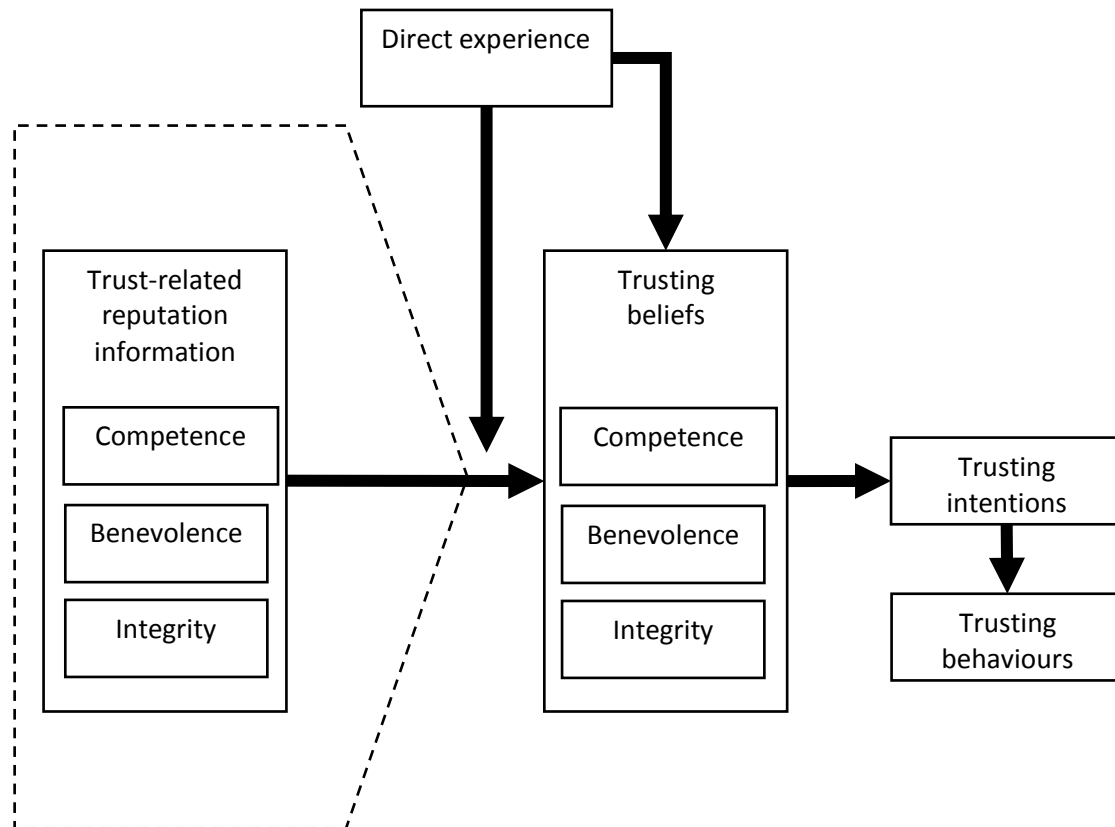
One domain in which trust is important is that of financial investment. This has been made salient recently by the reported activities of Bernard Madoff, Allen Stanford, and others. The figure below shows Currall and Epstein's (2003) model of trust in organizations in the face of risk to investments. This model suggests that people take account of the agent's motives and past history of trustworthy behaviour, as well as constraints on the agent's behaviour imposed by society, when deciding whether to place trust by investing with the agent.



A second domain in which the psychological determinants of trust have been studied empirically is that of electronic commerce (e.g. Grabner-Kräuter and Kaluscha, 2003; Corritore, Kracher and Wiedenbeck, 2003). Internet shoppers must decide whether they can trust those running commercial websites to provide the goods once they have been paid for (or once credit card details have been provided). If they are not trusted by consumers, trustworthy electronic business will fail. Conversely, the effects of consumers' trusting untrustworthy retailers may be detrimental for the success of electronic commerce in general. Thus, studies have investigated relations between website characteristics, consumers' ratings of trust in retailers, and the likelihood of a completed transaction (e.g. Pavlou, 2003).

Fuller, Serva and Benamati (2007) have proposed a three-route model of trust in e-vendors in the face of the risk that they will not deliver goods for which monies have been paid. According to this model, people base their beliefs about the

trustworthiness of an agent on their assessments of that agent's competence, benevolence, and integrity. These beliefs then determine whether they form an intention to trust the agent. This intention, in turn, determines whether they show trusting behaviour towards the agent. This multi-route model is shown below.



A third domain is trust between managers and professionals within organizations in the face of the risk that other people will not behave cooperatively. McAllister (1995) used the affect-cognition dichotomy as the basis for his dual-route model of trust in this domain. The cognitive route relies on processing information about the knowledge, competence, reliability, and dependability of the source. In contrast, the affective foundations of trust depend on emotional bonds: "People make emotional investments in trust relationships, express genuine care and concern for the welfare of partners, believe in the intrinsic virtue of such relationships, and believe that these sentiments are reciprocated" (McAllister, 1995, p. 26). Others have developed and generalized this dual-process approach (e.g. Rousseau, Sitkin, Burt and Camerer, 1998).

A fourth domain in which investigators have examined the psychological determinants of trust is that of risk communication. Increasingly, we seem to expect governments to manage the various risks to which we are exposed (Beck, 2006). Such management can be accomplished in two main ways. Legislation can be enacted to control risks. For example, laws against using handheld mobile telephones while driving have been introduced in many countries. Alternatively, levels of risk associated with various hazards can be communicated to the public via electronic and traditional media. For example, people have been informed of the likelihood of dying from smoking-related diseases in this way.

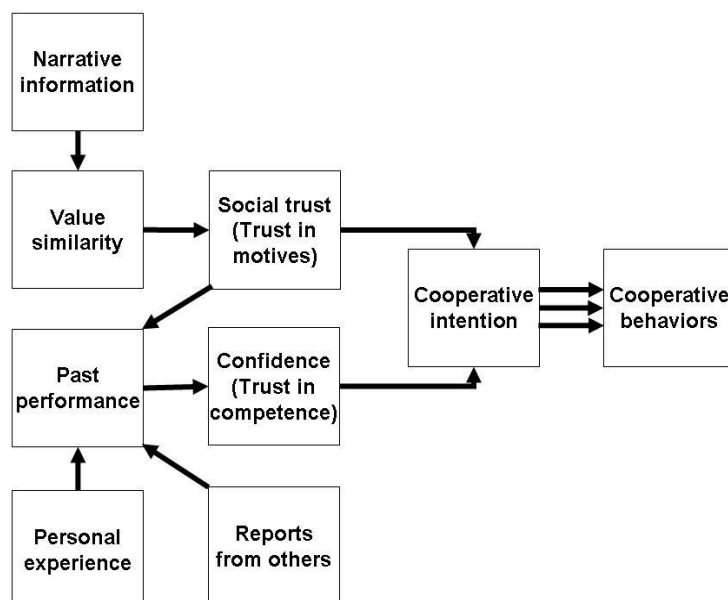
These four domains are not the only ones in which multi-route models of trust have been proposed. For example, Chen (2008) has recently proposed a two-route model of trust in suppliers of food.

In the rest of this paper, we shall focus on theories of trust in risk communication but we hope that what we have to say will generalize to some extent to other domains.

### The trust-confidence-cooperation model of risk communication

Factor analytic studies of questionnaires containing items relating to different potential influences on trust have identified different features of sources of information as factors that determine trust. For example, Renn and Levine (1991) identified competence, objectivity, fairness, faith (goodwill) and consistency, whereas Mayer, Davis and Schoorman (1995) isolated ability, benevolence and integrity. As a result of these studies, various models of trust in risk communication have been developed. Differences between these models reflect differences in the way two broad (groups of) factors determining trust have been labelled.

Siegrist, Gutscher and Earle (2005) argue that the factor related to the benevolence, honesty and integrity of the source corresponds to trust in motives of the source. Also, the factor related to ability, competence and knowledge of the source corresponds to confidence in the source. On the basis of these assumptions, they developed their Trust-Confidence-Cooperation (TCC) model, shown below. Receivers' trust in the motives ('social trust') of a source depends on how similar they judge that source's values to be to their own. This judgment depends, in turn, on narrative information provided by the source. Their trust in the competence ('confidence') of the source depends on their assessment of the quality of information provided by the source in the past. This, in turn, depends on their personal experience of the source and/or on reports that they receive from others about the quality of information that it has provided in the past. Social trust and confidence in the source jointly determine the level of cooperation that the receiver intends to have with the source. This intention can produce a variety of cooperative behaviours, such as expressing trust in the source, accepting advice about risk levels from a source (risk perception) and acting on the basis of that advice (risk acceptance or rejection).



An important feature of all multi-route models of trust is that the different routes converge on a final common pathway. As the above figure shows, the TCC model is no exception to this: trust in motives and trust in competence both converge on cooperative intention, which then determines all cooperative (trusting) behaviours. As a result, cooperative behaviours should differ or change in a coherent way. For example, if someone expresses more trust in a consumer organization than in a government agency, then they should also be more inclined to take advice from the consumer organization than from the government agency. Similarly, if someone says that they have lost trust in a government agency, then they should be less inclined to take advice from that agency than they were before. Some of our work has been concerned with testing the final common pathway assumption. Before describing it, however, we shall outline some of the evidence that supports the TCC model.

### **Evidence supporting the TCC model**

Earle and Cvetkovich (1999) presented people with a fictional story (framed as a simulated newspaper report) about a prospective high-level nuclear waste management policy. The story described in some detail a new decision-making procedure that would be used. (The nature of this procedure varied between conditions.) Respondents were told that the proposed new federal organization that would carry out the procedure was the Nuclear Waste Management Agency (NWMA). They were asked to rate the extent to which they would trust the NWMA. They were also asked to complete a six-item scale that asked them to assess how similar their values, goals, views, and thoughts were to those of the NWMA. A similarity-of-values index was extracted from these six items. In a first study, this index had a 0.66 correlation with the level of trust that people expressed in the NWMA. In a second study, the corresponding correlation was 0.68. Given that expressions of trust are cooperative behaviours, these results show that similarity of values influences such behaviours, just as the model suggests that it should (via the mediation of trust-in-motives).

Siegrist, Earle and Gutscher (2003) used a questionnaire to measure the constructs in the model in the context of the electromagnetic field risks associated with mobile phone antennae. Each construct had a number of items associated with it. For example, one of those associated with confidence in the model was: "Mobile phone companies possess the competence necessary to assess any health risks associated with their antennas." Respondents rated their agreement with each item on a five-point scale. The plausibility of the TCC model was tested using structural equation modelling. The structure of the model was broadly supported. However, the hypothesized link between past performance and confidence was weak and there was a direct effect of social trust on confidence. Siegrist et al. (2003) argued that these differences between model and data occurred because respondents knew too little about the electromagnetic field risks to use past performance of the source as a guide to their confidence in it. As a result, they had to use their trust in the source's motives as a proxy for past performance.

To test this familiarity-based account, Earle and Siegrist (2006, Study 1) carried out a study similar to that of Siegrist et al. (2003) but using Arctic Oil exploration risks (unfamiliar to respondents) and risks associated with freeway expansion in Seattle (familiar to respondents). Results for Seattle traffic were similar to those obtained by Siegrist et al. (2003). However, because respondents had enough familiarity with the risks to use past performance to assess confidence, there was a stronger link

between past history and confidence – just as predicted. Results for the Arctic Oil exploration scenario had been expected to be similar to those obtained by Siegrist et al. (2003) because respondents were unfamiliar with the risks in both cases. However, there was a strong link between past performance and confidence but confidence had no effect on cooperation. It is unclear why the effects of being unfamiliar with the risks should have had different effects in the Siegrist et al. (2003) and in the Earle and Siegrist (2006) studies.

Twyman, Harvey and Harries (2008) have recently provided experimental confirmation that similarity of values and past history of providing advice quality independently affect the level of trust that people place in their advisors.

### **Testing the final common pathway assumption**

As we pointed out above, the final common pathway assumption implies that cooperative behaviours should differ or change in a coherent way. For example, someone who expresses more trust in one source of risk information than in another should also be more inclined to take advice from the source that they say they trust more. However, O'Neill (2002) has argued that verbal expressions of trust may be dissociated from the way that trust is revealed in behaviour: "Are the opinions we divulge to pollsters backed up by the ways in which we *actively* place our trust in others... The evidence suggests that we still consistently place trust in many of the situations and professions we profess not to trust" (pp. 11–13). She argues that this is not because people have no alternative but to behave the way they do. They place their trust in agencies that they say they do not trust even though they are free to place it elsewhere. O'Neill's (2002) distinction between expressed and placed trust is not dissimilar to the distinction between that Samuelson (1948) introduced into economics between stated and revealed preferences. Indeed, adopting his terminology, we can refer to stated trust as a level of trust described in words or numbers (e.g. via a rating scale) and to revealed trust as a level of trust that is evident in (non-verbal) behaviours.

Clearly, there are a number of reasons why stated and revealed trust may dissociate. For example, consider people who shop for their food in supermarkets: their behaviour reveals that they trust supermarket food. However, they may still have serious concerns about various aspects of the food that they buy. They may be worried about the safety of genetically modified food and suspect that supermarkets include some food of this type among their produce without clearly labelling it as such. As a result, when questioned by pollsters, they may say that they do not trust supermarket food and that the reason for this is that they are not sure what is in it. Even though their worries are not sufficient to change their supermarket shopping habits, they will express them when given the opportunity to do so by a pollster – perhaps in the knowledge that their concerns will eventually be communicated to supermarket managers, who may act on them. In other words, people may use their statements of trust as opportunities to express their concerns or as warning signals that they will withdraw their actual placement of trust if some aspect of the situation does not improve.

There are, however, other reasons why stated trust and revealed trust may dissociate. People may lack full insight into how they place trust. For example, when deciding whether to expose themselves to some hazard (motorcycling, taking heroin), they may not be aware of how they are weighting different sources of

information about the risks associated with that hazard. When asked about the level of risk, they may recall a particular media report or conversation with a friend and say that is a source that they trust. However, their decision about whether to take a particular risk may depend on a much wider sample of advice – without them necessarily being aware of this.

Wagenaar (1992) has argued that people who become involved in risky activities may do so after consciously assessing risks on the basis of available information (including advice) or they may do so without such conscious assessment. In the latter case, we could say that people run risks rather than take them. People running risks may still process some relevant information (such as advice) but do so at a non-conscious level. Wagenaar (1992) argues that accidents often occur when people run risks: they have not consciously assessed the level of risk associated with the activity they are participating in.

Cognitive psychologists have carried out experimental studies that do appear to confirm that people do not always have full insight into the processes underlying their behaviour. We may be no more aware of our mental processes than we are of our digestive ones. As a result, the 'explicit' processes underlying what we say about why we make a judgment or decision may be quite different from the 'implicit' processes that actually determine that judgment or decision. For example, Berry and Broadbent (1984, 1988) either gave people practice at a decision-making task or provided them with verbal information about how to perform it. Those with experience at the task learned to perform it but could say little about how it should be performed or what they were doing to achieve their success. Conversely, those given verbal instructions were able to say something about how the task should be performed but showed little evidence of being able to transform this theoretical knowledge into success at the task.

Most people are familiar with dissociations between implicit and explicit processing in the domain of motor skills. Telling someone how to ride a bicycle or walk a tightrope based on information about the physics of the task can provide them with correct theoretical knowledge but no competence in the task. However, after years of practice at the task, people may well be highly competent at it while having little knowledge of the physics underlying their performance: as a result, they cannot say much about what they are doing to achieve success. Work by Berry and Broadbent (1984, 1988) and others before them (Reber, 1967) is important because it suggests that we should consider the possibility that similar dissociations between implicit and explicit processing can occur in cognitive tasks.

Twyman and Harvey (2009) provided people with advice from a government agency and a consumer organization about risks associated with a variety of hazards and asked them to use this advice to form their own assessment of the risks. The emphasis or weight that they placed on each type of advisor was assessed using a relative distance measure. For example, the closer that someone's assessment of risk was to government advice (and, therefore, the further it was from advice received from the consumer organization), the more they relied on – and, hence, trusted – the government advisor relative to the consumer organization. This was our measure of revealed trust. After people had made their estimates, they were asked to use a rating scale to express their level of trust in each type of advisor. The greater their rating of trust in the government advisor relative to that in the consumer organization,

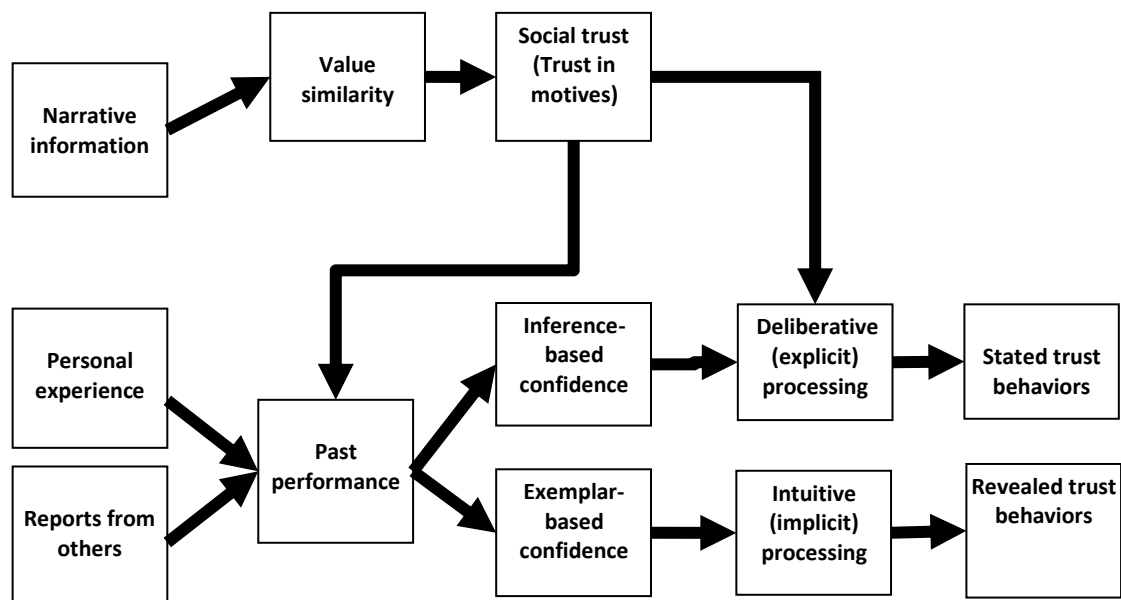


the greater their stated trust in the government advisor relative to that in the consumer organization. This served as our measure of stated trust.

In three experiments, people were given simulated but realistic advice about the risks associated with various hazards from a government agency and a consumer organization. Initially, feedback provided them with some indication of advice quality. When advisors were of similar quality and reasonably good, stated and revealed trust were both higher in government agencies but there was no correlation between them. When advice from different sources varied considerably, revealed trust (but not stated trust) was higher in consumer organizations. There was still no correlation between trust types. Only when advisors in the experiment were reasonably good but differed in quality did we obtain a small but significant correlation between stated and revealed trust. Furthermore, across experiments, advice quality affected revealed trust more than stated trust. These results have implications for models of trust and the way that it is studied.

**Implications for the TCC model of risk communication and other multi-route models of trust.**

The lack of (or poor) association between stated and revealed trust in Twyman and Harvey’s (2009) experiments implies that the final common pathway assumption of the TCC model requires some modification. As similarity of values influenced stated trust more than revealed trust and advice quality influenced revealed trust more than stated trust, one possible way of modifying the model to account for our data is shown below. This modification relies on recent work that distinguishes conscious (deliberative) and non-conscious (intuitive) modes of making judgments and decisions (e.g., Hogarth, 2005) and research within cognitive psychology that suggests that the former is based on inference-based processing whereas the latter derives from exemplar-based processing (e.g., Gilbert, 1999; Juslin, Olsson and Olsson, 2003).



It is reasonable to expect that these conclusions should extend to multi-route models that incorporate the final common pathway assumption in other trust domains but empirical research in those areas is needed to confirm that supposition.

### **Implications for the study of trust**

Trust is studied in different ways in different domains. Behavioural game theorists study trust-related behaviour (revealed trust) without asking participants to report their levels of trust in those with whom they are interacting. But in many negotiations expressions of trust (or lack of it) between those on the same side or on different sides may well influence trust-related behaviours. Behavioural game theory may be enriched and be given greater applicability by incorporation of statements of trust into some of the studies carried out within its framework.

Within risk communication, trust is studied by polls, surveys and questionnaires in which people are asked to express their trust using words, numbers or rating scales. This approach may inform us about the mental models or lay theories that people have of their trust-related behaviour (cf. Morgan, Fischhoff, Bostrum and Atman, 2002). However, if those mental models or lay theories lack validity, an approach based on studying stated trust alone may tell us little about their trust-related behaviour. If we want to know about trust-related behaviour, it is perhaps best to measure it directly.

## References

- Beck, U. (2006). Living in the world risk society. *Economy and Society*, 35, 329-345.
- Berry, D.C. and Broadbent, D.E. (1984). On the relationship between task performance and associated verbalisable knowledge. *Quarterly Journal of Experimental Psychology*, 36, 209-221.
- Berry, D.C. and Broadbent, D.E. (1988). Interactive tasks and the implicit-explicit distinction. *British Journal of Psychology*, 79, 251-272.
- Camerer, C.F. (2003). *Behavioral game theory: Experiments in strategic interaction*. New York: Russell Sage Foundation.
- Chen, M.-F. (2008). Consumer trust in food safety – A multidisciplinary approach and empirical evidence from Taiwan. *Risk Analysis*, 28, 1553-1569.
- Corritore, C.L., Kracher, B. and Wiedenbeck, S. (2003). On-line trust: Concepts, evolving themes, a model. *International Journal of Human-Computer Studies*, 58, 737-758.
- Currall, S.C. and Epstein, M.J. (2003). The fragility of organizational trust: Lessons from the rise and fall of Enron. *Organizational Dynamics*, 32, 193-206.
- Earle, T.C. and Cvetkovich, G. (1999). Social trust and culture in risk management. In G. Cvetkovich and R.E. Löfstedt (Eds), *Social Trust and the Management of Risk*. London: Earthscan (pp 9-21).
- Earle, T.C. and Siegrist, M. (2006). Morality information, performance information, and the distinction between trust and confidence. *Journal of Applied Social Psychology*, 36, 383-416.
- Fukuyama, F. (1995). *Trust: The Social Virtues and the Creation of Prosperity*. London: Penguin Books.
- Fuller, M.A., Serva, M.A., and Benamati, J. "S". (2007). Seeing is believing: The transitory influence of reputation formation on e-commerce trust and decision making. *Decision Sciences*, 38, 675-699.
- Gilbert, D.T. (1999). What the mind's not. In S. Chaiken and Y. Trope (Eds.), *Dual process theories in social psychology*. (pp3-11) New York: Guildford.
- Grabner-Kräutner, S. and Kaluscha, E.A. (2003). Empirical research in on-line trust: A review and critical assessment. *International Journal of Human-Computer Studies*, 58, 783-812.
- Hogarth, R.M. (2005). Deciding analytically or trusting your intuition: The advantages and disadvantages of intuitive and analytical thought. In T.Betsch and S. Haberstroh (Eds.), *The routines of decision making* (pp 67-82). Mahwah, NJ: Erlbaum.

- Juslin, P., Olsson, H. and Olsson, A.-C. (2003). Exemplar effects in categorization and multiple-cue judgment. *Journal of Experimental Psychology: General*, 132, 133-156.
- Kramer, R.M. and Tyler, T.R. (1996). *Trust in Organizations: Frontiers of Theory and Research*. Thousand Oaks, CA: Sage.
- Markova, I. (2004). *Trust and Democratic Transition in Post-Communist Europe*. Oxford: Oxford University Press.
- Mayer, R.C., Davis, J.H. and Schoorman, F.P. (1995). An integrative model of organizational trust. *Academy of Management Review*, 20, 709-734.
- McAllister, D.J. (1995). Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations. *Academy of Management Journal*, 38, 24-59.
- Morgan, M.G., Fischhoff, B., Bostrom, A. and Atman, C.J. (2002). *Risk Communication: A Mental Models Approach*. Cambridge: Cambridge University Press.
- O'Neill, O. (2002). *A Question of Trust*. Cambridge: Cambridge University Press.
- Pavlou, P.A. (2003). Consumer acceptance of electronic commerce – integrating trust and risk with the technology acceptance model. *International Journal of Electronic Commerce*, 7, 69-103.
- Reber, R. (1967). Implicit learning of artificial grammars. *Journal of Verbal Learning and Verbal Behavior*, 5, 855-863.
- Renn, O. and Levine, D. (1991). Credibility and trust in risk communication. In R.E. Kasperson and P.J.M. Stallen (Eds), *Communicating Risks to the Public*. Dordrecht: Kluwer, pp 175-218.
- Rousseau, D.M., Sitkin, S.B., Burt, R.S. and Camerer, C. (1998). Not so different after all: A cross-discipline view of trust. *Academy of Management Review*, 23, 393-404.
- Samuelson, P.A. (1948). Consumption theory in terms of revealed preference. *Economia*, 15, 243-253.
- Siegrist, M., Earle, T. and Gutscher, H. (2003). Test of a trust and confidence model in the applied context of electromagnetic field (EMF) risks. *Risk Analysis*, 23, 705-716.
- Siegrist, M., Gutscher, H. and Earle, T.C. (2005). Perception of risk: the influence of general trust, and general confidence. *Journal of Risk Research*, 8, 145-156.
- Twyman, M., Harvey, N. and Harries, C. (2008). Trust in motives, trust in competence: Separate factors determining the effectiveness of risk communication. *Judgment and Decision Making*, 3, 111-120.

Harvey and Twyman: Multi-route models of trust

Twyman, M. and Harvey, N. (2009). Trust in sources of risk information: Do people place it where they say they do? Manuscript under review.

Wagenaar, W.A. (1992). Risk taking and accident causation. In J.F. Yates (Ed.), *Risk-taking behaviour*. New York: Wiley.

Harvey and Twyman: Multi-route models of trust

Address for correspondence:

Nigel Harvey  
Department of Psychology  
University College London  
Gower Street  
London WC1E 7BT  
UK  
Tel: +44 (0)20 7679 5387  
Fax: +44 (0)20 7436 4276  
Email: [n.harvey@ucl.ac.uk](mailto:n.harvey@ucl.ac.uk)

Running head: Multi-route models of trust