

Abstracts of the Conference on
Risk, decision and Human Error

Communications & Poster Session

Communications

(1.1) The affect Heuristic in Presidential Polls, Eric Raufaste, Magali Cariou, Stephane Vautier & Etienne Mullet, *Université Toulouse II-LeMirail & Ecole Pratique des Hautes Etudes, France*

Theoretical framework: Finucane, Alhakami, Slovic, and Johnson (2000) described an “affect heuristic” by which people judge and decide on the basis of “good / bad” feelings. Under a “pleasantness” interpretation of valence, Lerner and Keltner (2000) claimed that valence-based approaches are not rich enough to account for risk judgments. Nevertheless, an object or person may be categorized as “Good” or “Bad” for other reasons than pleasantness. Thus, goodness / badness can generally NOT be reduced to pleasantness / unpleasantness. The present paper claims that “goodness / badness” feelings is the actual level of affective information used in the affect heuristic, and that such feelings result from the integration of several dimensions of affect (not only pleasantness) into a univariate bipolar construct.

General hypotheses: Applying this framework to presidential polls, three hypotheses were derived: H1: It is possible to extract a univariate bipolar construct from multi-dimensional affective appraisals; H2: The univariate construct of a given candidate load positively the judgments of benefits associated with this candidate, negatively the judgments of risks, and positively the vote in favor of this candidate. H3: A negative relationship will be found between risk and benefit judgments about a same candidate.

Method: During the last two weeks before the French presidential election in 2002, 450 participants were asked to provide five appraisals about the two main candidates: pleasantness; certainty; attentional orientation; anticipated effort, and control (see Smith & Ellsworth, 1985). Two-step structural equation modeling (Anderson & Gerbing, 1988) was used to extract univariate latent constructs from the affective appraisals and test whether these constructs predicted judgments and choice. In the first step, only the measurement model (corresponding here to the extraction of the constructs of the candidate from affective appraisals) was fitted to the data. Thus, a set of parameters was obtained. In the second step, parameters of the measurement model were fixed to those values, and dependent variables (i.e., risk/benefit judgments and choice) were introduced. Thus, global fit indices of the measurement model were not influenced by dependent variables.

Results: The measurement model was respecified by adding a new construct independent of the constructs associated with each candidate, “presidential power”. An acceptable fit with the data was obtained and all operational hypotheses about loadings associated with the constructs of the candidates were verified. Reliability of the constructs of the candidates was good (the 95% confidence interval was 80% to 86% of reliability, estimated by means of a 1000 replication bootstrap procedure). The two constructs exhibited a slight negative correlation. When the five dependent variables were added to the model, an acceptable fit was obtained. The constructs predicted 66% to 70% of the variance in risk or benefit judgments and 51% of the variance in choice. Significant negative correlations between risks and benefits were obtained, as predicted by the affect heuristic.

Conclusion: Despite the “presidential power” interpretation of the candidate-independent construct can still be discussed, results show that the affect heuristic can capture sophisticated emotional appraisals not limited to pleasantness / unpleasantness.

(1.2) Nonregressive Predictions vs. Gambler’s Fallacy, Tadeusz Tyszka & Piotr Zielonka, *Leon Kozminski Academy of Entrepreneurship and Management, Warszawa, Poland*

During the last forty years several heuristics which people follow in their judgments have been described. Tversky and Kahneman, who were the first to notice the role of heuristics in human judgments and decision making, described many of them, including non-regressive predictions and the gambler’s fallacy. The first of these consists of the tendency to overlook regression and to believe that a series of independent events with the same outcome will be continued. The second is a belief that a series of independent events with the same outcome will not be continued but will be soon followed by the opposite outcome. These two heuristics in many situations seem to be in transparent opposition. For example, investors in a stock market can adopt one of two opposite strategies: momentum or contrarian. Momentum investors expect that a recent stock price “trend” will continue, while contrarians expect that the stock price “trend” will reverse. It is surprising that little effort has been devoted to finding out under what conditions each of these opposite heuristics is utilized.

The purpose of the present study was to examine which of the two tendencies (non-regressive predictions or gambler’s fallacy) prevails in predicting random events. In our preliminary study we used abstract stimuli. A participant observed on a screen a series of arrows pointing either up or down in a random order. The proportion of the two events was pre-established and was close to 2:1. After every 10 events participants were asked to predict the next event (whether the arrow will be pointing up or down). Critical testing points were two series of events with the same outcome, once with arrows directed up and once with arrows directed down. These series were to reveal which of the two tendencies, non-regressive predictions or the gambler’s fallacy, will prevail in the participants’ behaviour. One experimental

manipulation was introduced. The participants either could observe a plot of the past events (a curve plotted step by step) or could observe only the last single event (the arrow on the screen).

As in previous experiments of this type, under both kinds of experimental conditions the phenomenon of probability matching was observed. However, participants from the group which could not observe a plot of the past events needed more time to match the probability than participants from the second group.

As far as the critical points are concerned, the tendency to non-regressive predictions was much stronger than the gambler's fallacy inclination. These prevalence of the non-regressive predictions (following the trend) was however weaker in the group which could observe a plot of the past events, thus the gambler's fallacy seems to be enhanced by the presence of the exact plot of the random events.

A continuation of the experiment is intended. This will be devoted to the question of how the interpretation of the nature of events can influence the prevalence between the two tendencies, non-regressive predictions vs. gambler's fallacy, in predicting random events.

(1.3) Affective and Analytical Basis of SARS Risk Perception: A Study on Travellers, Lucia Savadori, Rino Rumiati & Davide Diamantini, *University of Trento & University of Milan – Bicocca, Italy*

Dual-process theories describing the way people perceive risks distinguish between an "affective/experiential" pathway and a "analytical" pathway. Drawing from the work of Damasio, it is also assumed that the affective/experiential pathway has a direct and straightforward path toward decision and behaviour, while the analytical pathway is likely to need the experiential system in order to work effectively. Patients with an impaired affective system, in fact, were not able to decide rationally. We tested both these assumptions in the domain of traveller's perception of risk from SARS.

In a first experiment we studied frequent-travellers' and infrequent-travellers' perception of risk from a series of potential diseases (eg. SARS) and accidents (eg. car). Frequent-travellers were found to give lower probability judgments of the likelihood for a generic individual to encounter a disease or an accident than infrequent-travellers, and this difference remained significant even when controlling for the level of education. At the same time, the estimate of the number of people infected by SARS was identical for the two groups. This finding reveals an irrationality in the way travellers perceive risk: if the probability of infection is higher then one should also expect the frequency of people infected to be higher. Furthermore, despite the differences in probability, both groups perceived themselves equally vulnerable to SARS and showed the same degree of fear toward the disease. These data can be explained by a dual-pathway to risk perception. On the one hand people judge the probability using the analytical system while on the other hand they judge fear using an affective system.

A second experiment was therefore designed to directly distinguish between the two pathways to risk perception. In this second experiment information concerning the severity of the infection was manipulated in such a way to present individuals with "affect-rich" and "affect-poor" information. In the affect-rich condition the information was presented in the form of percentages, in the affect-poor condition the same information was presented in the form of probabilities. We designed two different but comparable tasks: an "affective-task" and an "analytical-task". Our hypothesis was that if people respond to risk through two separate systems then the weight of the affect-rich and affect-poor information would be different in the two tasks. Specifically, we should find that the difference induced by the affect-rich and affect-poor descriptions should be more pronounced in the affective-task than in the analytical-task. Furthermore, if the affective system can work autonomously while the analytical system needs the affective system to work properly, then, the behavioural intentions should parallel the results of the affective-task in the two conditions. The talk will discuss the results of the second experiment.

(1.4) Biased Probability Judgments do not Necessarily Result in Biased Decisions, Michel Gonzalez & Vittorio Girotto, *Université de Provence, CNR & IUAV, France & Italy*

Do incorrect probability judgments necessarily result in biased decisions? We provide evidence that individuals may make incorrect judgments, but choices consistent with a correct probability evaluation. We use problems, including the notorious three-card problem, in which individuals infer probability extensionally, by considering the possibilities in which events may occur or not occur. We show that individuals fail these problems when they have difficulties in reasoning about an appropriate set of possibilities (Experiment 1), but solve them when they are asked a relative evaluation of the chances for and against a target event, rather than the standard, absolute evaluation of its probability (Experiment 2). Following the hypothesis that decisions are based on a relative evaluation of chances, we show that in these problems individuals make correct bets, even if they fail absolute probability judgments (Experiment 3). These findings are discussed in relationship to the assumption that probability evaluations are stable and determine choices.

(2.1) The Effect of Time on the Evaluation of Decision Outcomes, Ilana Ritov, *Hebrew University of Jerusalem, Israel*

Over the past two decades ample research showed that in evaluating the outcome of their choice, people are affected not only by the utility of the outcome itself, but also by other factors, including the known or imagined outcomes of forgone options, and the route through which the outcome was obtained (through action or inaction). On the other hand, different findings (e.g. Gilovich and Medvec, 1995) suggest that the evaluation of recently obtained outcomes may differ considerably from the long term evaluation of outcomes. Although these latter findings do not offer an opportunity to examine a temporal change in the evaluation of a particular outcome, they raise the possibility that factors affecting short term evaluation may not be as potent in the long term.

In my talk I shall discuss the possible long term effect of the factors influencing outcome evaluation. I shall present some research concerning the time course of decision evaluation by examining satisfaction with specific real choices made by participants at varied times in the past. The research includes both experimental studies and survey data. In the experimental studies evaluation of a small gift immediately following the gift's selection was compared to the evaluation of the gift weeks or months later. The surveys examined retrospective evaluation of important real decisions: the retaking of an exam in introductory psychology class in order to improve one's grade point average, and the choice of the undergraduate major. Taken together, the results of these studies indicate that under some conditions the impact of forgone options on the evaluation of decision outcomes does not diminish, and may even increase with time. Augmented regret for omissions in the distant past can be viewed as a special case of this general effect.

(2.2) The Role of Risk Dimensions and Background Knowledge in Decision Under Risk and Uncertainty: A Comparison of Equivalent Lottery and Sports Gamble Choices, Rob Ranyard & John P. Charlton, *Bolton Institute, UK*

Choosing among lotteries with known, objective probabilities is conventionally described as decision under risk whereas choosing among sports gambles with unknown probabilities is described as decision under uncertainty. Two studies compared choice and underlying cognitive processes in equivalent decision tasks involving risk (lotteries) and uncertainty (sports gambles). In sports gambles, background knowledge was triggered via information on which team was playing home or away. Otherwise, displayed risk information (stake, winnings, odds and outcome probabilities) was controlled across gamble type. In the first study, home win bets were chosen significantly more frequently than draw or away win gambles, compared to lottery equivalents. In the second study, which was similar to the first but involved thinking aloud, evaluations of the main risk dimensions dominated verbal protocols in both gamble contexts. Nevertheless, in sports gambles, participants made fewer evaluations of odds and probabilities, and more statements involving background knowledge. Furthermore, in sports gambles, some statements indicated decision strategies contingent on domain knowledge and modifications of subjective probabilities. It was concluded that theories explaining lottery choices only in terms of risk dimensions do not generalise to decision under uncertainty, even when precise expert probability judgements are given.

(2.3) Similarity, Uncertainty and Time - Tversky (1969) Revisited, Jon Leland, *National Science Foundation, Arlington, VA, USA*

A model of choice building on the approach outlined in Tversky (1969) is presented. In this model decisions are based on comparisons regarding the similarity or dissimilarity of attributes across alternatives. This model explains a number of anomalies observed when risky alternatives are to be played once. The model also explains anomalies observed under repeat play conditions as well as those that occur when the options are intertemporal, as opposed to risky, prospects. To the extent that people wish to recant some of the choices they make as a consequence of relying on such a decision process (e.g., violations of stochastic dominance) suggests that departures from tenets of rationality in choice under uncertainty and intertemporal choice are better interpreted as errors than as revelations of preference.

(2.4) Information Organization in Multiattribute Choice: Towards a Fair Comparison, Fabio del Missier, Vera Falcon, Walter Gerbino, *ITC-IRST, University of Trento & University of Trieste, Italy*

The research on information display and choice processes has shed some light on the ways in which the different properties of the display affect specific stages of the decision process (Kleinmuntz & Schkade, 1993; Schkade & Kleinmuntz, 1994). According to Kleinmuntz & Schkade (1993), the comparisons of graphs and tables had typically confounded the manipulation of form and organization, contrasting graphic organization with pictorial form and tabular organization with numeric form (cf. Jarvenpaa & Dickson, 1988). Kleinmuntz & Schkade (1993) suggested that a better comparison should involve an orthogonal

manipulation of organization (for instance, 2D Cartesian graph vs. table) and form (for instance, numeric vs. pictorial form).

We report the results of an experiment in which the display organization was varied (2D Cartesian graph vs. table), keeping constant the form of the attribute values (numeric). Two contextual factors manipulated in the experiment were the presence of dominated options in the choice set and the relative importance of the attributes (uniform importance weights vs. two-level importance weights). Sixty participants were required to perform a series of multiattribute choices in problems with four alternatives and four attributes. Their task was to choose a flight for a series of customers with different preferences. The decision problems were delivered through a computer and both the choices and the decision times were recorded.

Our main hypotheses on the impact of the contextual factors were supported: (a) the choice is significantly more accurate and faster when dominated options are included in the choice set, and (b) the decision in the conditions without dominated options is either significantly slower or less accurate.

However, the comparison of the two different types of organization provided counterintuitive findings: the graphic display did not facilitate decisions in the conditions in which such a facilitation was expected. The results are explained by the analysis of some verbal protocols, showing the specific decision strategies used by the participants. The participants did not exclusively rely on perceptual operations, performing instead explicit evaluations of the numeric information. Processing the attribute values contained in the graphic display seem to demand greater cognitive effort than processing the values presented in the table (Jarvenpaa & Dickson, 1988).

A follow-up study with verbal protocols is currently being conducted, in order to replicate these findings and to gain a more detailed account of the choice strategies used by the participants. In this new study, the familiarity of the participants with the display is manipulated also by varying the amount of training. Old and novel results will be presented in the final version of the paper.

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(3.1) The effects of emotion on skilled performance and judgment in men and women David Hardman, London Metropolitan University, London, UK

How do emotions affect our behaviour and judgments? Much previous research has focused on the role of positive or negative affect, e.g. the observation that positive affect makes people more cautious about high-risk situations (Isen & Gava, 1987). More recently, Lerner & Keltner (e.g. 2001) have focused on the effects of specific emotions, rather than generalized affect. They report different effects of fear and anger on people's judgments. However, most of the research into emotion and judgment involves the use of hypothetical vignettes or estimates of the likelihood of future events. The two studies reported here examine (a) the level of risk that people took on a task involving skilled performance, and (b) people's predictions of their own performance. By comparing predictions with actual performance it was possible to determine how well-calibrated participants were. The task adopted was the ring-toss task, in which participants decide how near or far they will stand to a peg prior to attempting to throw rings over the peg.

In Experiment 1 we tried to induce anger or fear into participants using the procedure reported by Lerner & Keltner (2001). Following emotion induction we took a second rating of emotion and then asked participants to engage in the ring-toss task. Because a manipulation check revealed pre-existing group differences for women, and little effect of the procedure on them, we were only able to look at between-groups differences for men. Compared to anger, fear led men to stand closer to the peg. Controlling for distance, there were no effects of emotion on men's predictions of their performance. There were separate patterns of performance in the Anger, Fear, and Control groups in relation to the variables Prediction, Accuracy, and Distance. In particular, the Predictions and Accuracy of the Anger group did not show a relationship to Distance, but nonetheless Prediction and Accuracy were correlated with each other. Self-rated dispositional anger related to judgments for women but not for men, leading them to stand further from the peg and estimate a higher score.

Experiment 2 used the same task, but simply measured trait anxiety and also analyzed sex differences. Overall, there was widespread overconfidence. Men were riskier in their behaviour (stood further from the peg), predicted the same level of success as women, but were less successful. Despite this, the measure of calibration did not show a significant sex difference. Women's predictions and calibration were related to their anxiety: high anxiety was associated with standing nearer the peg and - controlling for distance -

being less confident (though still overconfident). However, men's predictions were not related to anxiety, although - like the female participants - high anxiety was associated with standing nearer the peg.

Possible directions for future research will be discussed.

(3.2) An experiment in subjective Probability Revision Among Military Officers, Ken R. McNaught and Sophie O' Biern, *Cranfield University, U.K.*

This paper presents the results of an experiment into the revision of subjective probabilistic judgments by military officers. The scenario for the experiment describes a land-based military operation. In particular, the experiment requires the participants to judge the probability that an enemy outpost has been reinforced. The focus of the experiment is on how the participants' beliefs about the status of the outpost change in response to information that they receive. For example, they can be told that various military assets have been detected by a reconnaissance patrol or by sensors. Each participant completed two questionnaires. One of these permitted the elicitation of conditional probability tables in order to populate a Bayesian network model of the situation being considered. The other questionnaire required each participant to make more complicated probabilistic judgments based on various pieces of evidence presented to them. For each question in the second questionnaire, it was possible to compute (using the Bayesian network) what each participant's 'rational' or coherent response should have been, based on their answers to the first questionnaire. Of interest are the differences between the direct, intuitive judgments and those arrived at based on logical manipulation of simpler judgments.

Analysis of the experimental results reveals which of these differences are statistically significant, and we try to relate these to judgmental biases. We conjecture that in making complicated probabilistic judgments, people are unable to take appropriate account of dependencies between different pieces of evidence, and that this contributes to errors in those judgments. We also found interesting differences between the participants' stated preferences for sensor or reconnaissance reports in helping them make particular judgments, and their 'logical' preferences implied by their answers to the first questionnaire.

(3.3) An Informative Pamphlet: Framed Message Effect as Formative and Preventive Instrument, *Pedron Francesca and Donatella Ferrante, University of Trieste*

Prospect Theory proposes that choice problem formulation affected people's decision (framing effect). As a result, individuals respond differentially to information presented as gains or losses (Kahnemann & Tversky, 1979, 1982, 1984; Tversky & Kahnemann, 1981). Outcomes are commonly perceived as positive or negative in relation to a reference outcome that is judged neutral. Variations of the reference point can therefore determine whether a given outcome is evaluated as a gain or as a loss.

Numerous works in the psychology of decision making provides a background for understanding people preferences about health care decisions. Specially concerning message framing and health behaviour as taking a surgical treatment (McNeil, Pauker, Sox & Tversky, 1982), performing breast self-examination (BSE) for prevention of cancer (Meyerowitz & Chaiken, 1987), or using sunscreen with a high sun protection factor (Banks, Silvermann, Schwartz e Tunnessen, 1992).

But these researches show contradictory findings: negatively framed message promoted BSE, but positively framed message increased the use of sunscreen. A variable that may clarify the influence of message framing on health behaviours is the nature of the behaviour being promoted. Previous research has revealed that distinguishing between prevention and detection-oriented health behaviours can have important implications for predictions about risk assessment, decision and maintenance of behaviour changes (Fielding, 1978; Kirscht, 1983; Weinstein, 1988). Perhaps characteristics of these different behaviour types moderate the effectiveness of positively or negatively framed messages.

The perceived risk associated with a detection behaviour is assumed to be the prominent reason why negatively framed messages are effective: risky options are preferred when people are considering losses. However prevention behaviour is a less-risky option; because risk-averse options are preferred when people are considering benefits or gains, positively framed messages may be more likely to facilitate the performance of preventive behaviour.

According to the literature on the framed message effect, we plan to explore the relative influence of framed information on health behaviours within a "real" context as working ambit.

Consistent with INAIL (Institut for Prevention of Working Accidents) data, some working fields, as buildings or shipyard, presented a high number of accidents and professional diseases. Consequently, is necessary to promote effective professional training and fitting information.

Using a sample of people working in dangerous and risky contexts we want to explore the relative influence on choice framing effects of two potential moderating variables: level of involvement and level of natural tendency to engage in and enjoy thought (referred to as *need for cognition* (NC, Cacioppo & Petty, 1982).

Research has established that high levels of NC are associated with greater tendencies toward thoughtful analysis of written messages. Especially important for the present purposes is evidence indicating that compared to those scoring high, individuals low in NC are less likely to process information in a careful, elaborate fashion, paying more attention to superficial cues and framing of message (Levin & Smith, 1996).

In the present study, we want to examine the influence of positively or negatively framed information on health behaviours in a "real" context as working field.

We intend exploring framing messages effect on:

- a prevention behaviour (using safety devices);
- a detection behaviour (complying with a screening for lung cancer detection).

The research provides for two groups, one for prevention behaviour (exp. 1) and one for detection behaviour (exp. 2). For both experiments, each subject is assigned to a condition of positive or negative framed.

EXPERIMENT 1: subjects are provided with either positively or negatively framed pamphlets about safety devices. After reading this and completing several ratings, workers are given a post-card in requesting, as free sample, a safety disposal as well as more information about risks in working fields.

EXPERIMENT 2: subjects read information about lung cancer that is either positively or negatively framed. Immediately after reading this information, individuals' attitudes, cognitive reactions and behavioural intentions are measured.

For both experiments, all subjects completed the *Need for Cognition Scale* (Cacioppo & Petty, 1982). Preliminary results have shown as presenting information in terms of gains (positive framing) or losses (negative framing) can shape how an individual thinks about a behavioural domain.

(3.4) Ambiguity and Conflict Aversion: Insurers' Attitudes to Imprecise Probabilities, Laure Cabantous, *LEERNA-INRA University of Toulouse, France*

This article is about ambiguity aversion and conflict aversion in the field of insurance. Data from professional insurers (i.e. experts) were collected via a mail survey of members of the French Actuaries Institute, between December 2002 and March 2003. 78 questionnaires were collected (response rate 6%). This questionnaire is quite similar to the questionnaire Kunreuther and alia. sent to US underwriters (Kunreuther and ali. [1995]). Each questionnaire contains two scenarii: "Pollution" and "Earthquake". In each scenario, three kinds of situation are proposed. One situation is called the risky situation: the probability is precise and well known. In the two other situations, the probability is imprecise and vague, $p \in [pmin; pmax]$ and the mean probability of this range is equal to the probability of the risky situation. Unlike many experiments on ambiguity aversion, this study follows Smithson's distinction between two different kinds of ambiguous situations and argues that the source of the imprecision matters. In the ambiguous situation, the probability is ambiguous but consensual (the experts agree on the range) whereas in the conflicting situation, the probability is ambiguous and conflicting (50% of the experts predict the lower probability $pmin$ and 50% of the experts predict the upper bound of the probability range, $pmax$). In each situation, the insurer is asked the premium he would charge to cover the risk (refusal is allowed) : the degree of ambiguity aversion (resp. conflict aversion) is measured through the premiums the insurer set up to cover the risk: the higher the premium proposed to cover the "ambiguous" risk (resp. conflicting risk) is -compared to the premium proposed for the precise (resp. ambiguous) risk-, the more ambiguity averse (resp. conflict averse) the insurer is. One other feature of this study is to examine the comparative ignorance hypothesis in a field study with experts (Heath & Tversky [1991], Fox & Tversky [1995] and Fox & Weber [2002]). This hypothesis is divided into two parts: a context effect that consists in an inter-event comparison and a familiarity effect. The final original aspect of this study consists in a comparison between the economic concept of ambiguity aversion and the psychological construct of tolerance to ambiguity (Budner [1961]). Economists usually explain the ambiguity aversion with "psychological" traits without testing the validity of the explanation. The premium collected show that insurers are ambiguity averse and conflict averse since they set up higher premium for ambiguous and conflicting risks than for precise risks. Thus these results show that experts decision-makers are averse to ambiguity. Contrary to the comparative ignorance hypothesis, the ambiguity aversion is not exacerbated by the comparative context and the degree of familiarity of the insurers with the scenario has a minor impact on ambiguity aversion. Tolerance for ambiguity seems to be slightly correlated with ambiguity aversion in the earthquake scenario.

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(4.1) Managing Human Error at Hospital: clinical risk management to enhance patient safety, Tommaso Bellandi, Valentina Abrami, Riccardo Tartaglia, Carlo Tommasini, *Ergonomics Research Center (CRE) – Florence, Italy*

Since the publication of the rapport "To err is human" (2000), the problem of adverse event in the healthcare sector has been rising also in Italy. Public awareness of the problem and professionals commitment to pursue quality and safety for patients have pushed the national and regional health services to consider the organization of risk management programs. In this paper, the authors present the experience of adverse events analysis at the healthcare public company in Florence.

Ergonomics Research Center (CRE) is part of Florence public health service and has been working since 1999 on the design and the implementation of a clinical risk management program.

During the first two years CRE staff worked on the research of materials and methods adequate for the goal to reduce risks and enhance patient safety. According to international literature (Reason, 1990, 1997; Perrow, 1994; Vincent, 2001), the theoretical framework of systemic approach has been adopted for adverse event analysis. Researchers focus on the interaction among human factors, technology and organization embedded in a specific physical and social environment, so that critical issues may emerge from the analysis of activities and system failures.

The method developed for the analysis of adverse events is based on peer review (clinical audit).

With the support of CRE's professionals, clinicians monitor practice to identify adverse events and meet to discuss and find solutions for manageable breakdowns. The technique proposed for adverse event review is the task analysis tool FMEA (Failure Modes Effects analysis) developed in the field of machine reliability, but recently applied for the assessment of human reliability both in transportation and in health care sector. FMEA is a simple technique to reconstruct the sequence of events that led to system failure and to find out active and latent error associated with a breakdown on the sequence. When errors become clear and there is concordance between peers, organizational actions are suggested to improve training, procedures or instrumentation.

After method design, CRE staff have begun the implementation of risk management program in the hospitals of Florence. The first step concerns clinicians training through periodical review of those adverse events of public domain, related with patients death or bad injuries. At this stage, audits are carried out under the supervision of the ergonomist, who leads the analysis and the discussion of the case. Joining the audits, clinicians have the chance to put the hands on practice and understand methods and goals of peer review. Here we present the results of recent audits, discussing both the efficacy of this method and the quality of results. The second step is the proper organization of the patient safety program throughout the company. The direction set the goal for every unit to organize clinical audits at the occurrence of adverse events. To do this, specific personnel is identified to build a risk management team at every hospital and health local unit. These operators are MDs, nurses and technicians who cover the role of coordinator in their sectors. They undergo a specific training especially to acquire the communication skills later on needed to manage teams and clinical audits. A company team remains in chair for the coordination of activities and for the collection of reports to be organized in a database.

We finally discuss the reach of this process. On one hand, this risk management program is giving life to an important cultural change for healthcare professionals, who start to accept the occurrence of errors and systematically review their practices. On the other hand, it is often difficult to take the necessary actions either of improvement or reengineering as specified in audits' report for the prevention of further adverse events. This may be due to the lack of dedicated resources and continuous support for the practice of change.

(4.2) Risk, Decisions and Errors: A Field Approach, Therese Kobbeltvedt & Wibecke Brun, *University of Bergen, Norway.*

A traditional view in sleep-deprivation research is that complex decision making is relatively unaffected by sleep-deprivation, because it generates interest and compensatory effort. More recent research suggests that sleep-deprivation impairs innovative and flexible thinking. However, few sleep-deprivation studies involve realistic, complex decision making. This study explored decision making and risk perception among naval cadets during a nine day military ranger training. As part of the ranger training the cadets must plan a search and rescue operation, involving finding a missing soldier.

The planning of the rescue operation formed the experimental task in a series of experiments aimed at investigating the effects of sleep-deprivation, prior decision outcomes, time pressure in combination with sleep-deprivation, and the role of individual differences in need for cognition, on complex decision making and risk perception. Time spent on task completion, and the number of procedural errors yielded behavioural measures. External judges gave expert ratings of the quality of the plans, and the risk and probability for success associated with them. The cadets' self-ratings of the risk associated with the plans, the plan quality, and the probability of succeeding with it yielded subjective ratings.

The results support the traditional view in sleep-deprivation research, that complex decision making is relatively unaffected by sleep-deprivation. Extending that knowledge, this series of experiments suggest that individual differences in cognitive motivation, in terms of a tendency to enjoy complex cognitive tasks, may enhance compensatory efforts in sleep-deprived, and thereby improve decision making.

(4.3) **The Linate Disaster as an Organizing Failure**, Maurizio Catino, *University of Milan-Bicocca, Italy*

What generates accidents?. Is it always a human error?. Or, perhaps, is technology that fails?. Or, rather, accidents and disasters are intrinsically built up by the organizations?.

This paper examines and analyses in depth the Linate air crash which took place at the Milan airport (October 8th – 2001- Italy), causing the death of 118 people, and provoked by the dramatic collision between two airplanes during take-off. After the Tenerife disaster (1977), Linate is the second most serious accident ever to happen on ground. This paper argues that accidents, in very complex systems, have always organizational dynamics, and we must examine and challenge such interpretations in order to promote and encourage some useful changes that might prevent the occurrence of such dramatic disasters. The purpose of this article is to explore closely the intricate plot of the Linate accident, to describe in details how and why this accident ever took place, using the organizational theories to investigate the great complexity of the event. Through the analysis of the Linate accident, we would like to challenge some approaches regarding the theory of the human error and to raise significant questions about the reliability issues, arguing and challenging traditional theories regarding efficacy, efficiency and quality.

The Linate accident is the dramatic resultant of a series of mistakes: but if we can state that people in the organizations make mistakes, we can also truly suggest that these mistakes are socially organized and systematically produced. According to this perspective, we must talk of errors in organizing: Linate is a case of normal accident in a high reliability organization. Accidents, in very complex organizations, never occur for one cause only, but often find their origins in an unpredictable interactions of many events; none of which, alone, could possibly determine the occurrence of an accident.

Through the detailed description of the disaster, we want to focus on how the accident took place, and how it was favoured by the tight intersection of three different types of mistakes:

- human errors, made by the people who were in direct charge of the event as for example the controllers and the Cessna pilots;
- the organizational failures, regarding the weaknesses of the system defence, fallacious managerial decisions and/or ambiguous conditions that produce the error; or, even, the latent failures of the organizational system that belong to some other distant dimensions, incredibly unacquainted with the time and the space of the accident;
- interorganizational failures, regarding the processes of differentiation, coordination and integration of the different actors playing different roles, all of them involved in the correct functioning of the air traffic system.

Linate is, undoubtedly, an exceptional case, emblematic in many ways, and unrepeatable as a whole, but repeatable in its form. We consider the Linate accident exemplary as a case study because it has provided a luminous focus on some aspects of the organizational functioning, becoming evident thanks to its state of exception. This paper concludes suggesting some implications for the theory and the practice.

(4.4) **Travelers' Learning under Uncertainty: Evaluating the Effect of the Feedback Mechanism on Decision-Making**, Erel Avineri, Joseph N. Prashker, *Israel Institute of Technology, Haifa, Israel*

Travellers' learning in route choice situations may be considered as a *sequential decision problem*. At each stage, the traveller takes an action and observes a stochastic outcome (travel time). The traveller's stage utility depends on his/her action, the observed outcome and on previous outcomes. We may assume the traveller is Bayesian and is endowed with a subjective belief over the distribution of travel times. The traveller's initial belief is typically inaccurate. Therefore, his/her subjectively optimal strategy is initially suboptimal. As time passes, information about the true dynamics is accumulated and, depending on the compatibility of the belief with respect to the truth, the traveller may eventually learn to optimize.

In this work, route-choice simulations and laboratory experiments were conducted in order to evaluate the effect of feedback mechanism on decision-making under uncertainty, with and without provided information about travel times. We discuss the prediction of travellers' response to uncertainty in

two route-choice situations. In the first situation travellers are faced with a route-choice problem in which travel times are uncertain but some information (which may be static or dynamic) about travel times of each (or some) route is provided. The second situation takes place in a more uncertain environment in which information about routes is not provided, and the travellers' only source of information is their own experience.

Analysis of choice behaviour in iterative tasks with immediate feedback reveals robust deviations from utility maximization. One of the most obvious class of such failures is the *Payoff Variability Effect*: High payoff variability seems to move choice behaviour toward random choice (See Myers *et al.*, 1965; Busemeyer & Townsend, 1993; Erev *et al.*, 1999). Evidence of the *Payoff Variability Effect* in route-choice situations was found in recent studies. In this paper we show, that the higher the variance in travel times is, the lower is the travellers' sensitivity to travel time differences. Particularly, it was found out that in some cases, increasing travel time variability of a less attractive route can enlarge its perceived attractiveness. This affects the choice proportion of specific route, and produces results which completely differ from those predicted by models based on the utility maximization assumption. The *Payoff Variability Effect* is predicted by learning models. Specifically, three learning models were studied in this work: Fudenberg & Levine's learning model; Erev *et al.* Reinforcement Learning Model; and CPTL (cumulative prospect theory learning model), a dynamic generalization of the CPT static which is based on prospect theory assumptions together with a fictitious play approach.

The experimental results are also in conflict with the paradigm about traveller information systems: providing travellers with information will not necessarily lead them to make better decisions. There are situations when propensity to choose a more efficient route might be decreased (instead of increased) when travel time information about the routes is provided. As a consequence of information, the propensity of travellers to maximize utility is not always increased. It was found out that providing travellers with static information about expected travel times increases the non-homogeneity of travellers and reduces the maximization rate. These findings are described and explained. This better understanding of route-choice behaviour may improve traffic predictions based on route-choice modelling. The design of better cost-effective *ATIS* (*Advanced Transportation Information Systems*) may benefit from such an insight.

Poster Session

(1) Imagery and Affect in Risk Assessment¹

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Risk is assessed as higher when the risk information is presented in terms of relative frequency (e.g., “of every 10 patients like this person, 1 is expected to be violent”), than when the same information is presented in terms of probabilities (e.g., “this patient has a 10% chance of being violent”). Slovic, Monahan and MacGregor (2000) offered an imagery model to explain the difference: the image created by the frequency format (a violent person) is more frightening than the image created by the probability format (a person quite unlikely to cause harm). The former arouses a stronger emotional reaction, which leads to a higher risk assessment.

The current study examines the imagery model through the use of individual differences in imagery. If the model is true, we should see an interaction between the risk format and imagery ability: when frequency terms are used, people who easily produce vivid and fluent images should be more likely to create a frightening image, and hence give higher risk assessments than people who rarely produce such images. When probability terms are used, the image created should be less frightening, thus have a smaller emotional influence, and lead to a smaller difference between risk assessments in the two groups.

Subjects were 196 students from the Hebrew university of Jerusalem, who answered two questionnaires. The first was an individual differences questionnaire examining habitual imagery (Pavio and Harshman, 1983). The second was a questionnaire used by Slovic et al. (2000), which contained a case summary of a patient with a mental disorder, and questions about the expected risk he posed to others. Information about the patient's condition was presented in frequency terms in half of the questionnaires, and in probability terms in the other half.

The expected interaction effect was indeed found: “high imagers” (subjects in the top quarter of the individual differences questionnaire) gave higher risk assessments than “low imagers” (subjects in the bottom quarter of the individual differences questionnaire) when relative frequency terms were used, while both groups gave similar risk assessments when probability terms were used { $F(1,90) = 4.915, p < 0.05$ }.

Results of the current study support the imagery model suggested by Slovic et al. (2000), and give further evidence of the role of imagery and emotion in risk assessment.

(2) Deciphering Descartes' Error – Experimental Tests of the Somatic Marker Hypothesis

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Damasio's (1994) Somatic Marker hypothesis posits that emotion-generated mental markers influence our decisions and, in particular, tend to curb inherent tendencies to seek risk, to be impatient and to be callous in social situations. Ventromedial (VM) prefrontal cortex damage interferes with this marking process, resulting in risk seeking behavior, impatience and socially inappropriate behavior. In the present study, we present 27 normal controls and 17 patients with prefrontal cortex lesions with batteries of questions designed to probe their attitudes toward risk, intertemporal preferences and behavior in social contexts. The results demonstrate that VM patients are no more risk seeking, impatient, or prone to behavior in socially inappropriate manners than normal subjects. Indeed, we find no significant differences of any sort between the two groups of subjects on any the dimensions investigated. We discuss why VM cortex damage in humans appears to influence decisions in certain circumstances but not in others.

(3) Risk Management and the Precautionary Principle : A Matter of Degree

William Leiss, *University of Ottawa, Ottawa, Canada*

In a forthcoming paper (“Risk Management and Precaution: Insights on the Cautious Use of Evidence,” *Environmental Health Perspectives*, vol. 111, no. 13, October 2003, 1577-81), Hrudey and Leiss start from the remark: “Done well, risk management is inherently precautionary in the sense that it should make use of effective risk assessment to predict, anticipate, and prevent harm, rather than merely reacting when harm arises.” This acts as a presupposition for the discussion that follows there; the proposed conference paper will undertake a systematic, conceptual exploration along these lines to bring greater precision to the usages around the notions of risk management (RM) and the precautionary principle (PP).

In North America, when the PP first became the subject of debate, many within the RM community represented PP as the antithesis to RM, as an irrational and/or ideological attack on the risk assessment

¹ This research is part of an MA thesis conducted under the supervision of Prof. Maya Bar-Hillel.

methods which are seen to make up the heart and soul of RM. While that representation has died down of late, it is still common to find references suggesting that the PP is a kind of external appendage to RM, to be invoked only in unusual or extreme circumstances. In my opinion, both of those propositions are seriously in error. In considering where these positions go wrong, this paper will draw upon the recent reflections of Paul Slovic *et al.*, concerning the tension between “affect” and “analysis” in risk matters (“Risk as Analysis and Risk as Feelings,” 2003, *Risk Analysis*, in press). Some comparison between Europe and North America on conceptions of PP will also be made.

If instead we see PP as being the heart and soul of RM as such, the practical question becomes, not *whether* to be precautionary in the face of substantial risk, but rather, *how precautionary* one should be – a matter of degree, which will vary widely from case to case, and which has its own internal limits (the subject of the EHP paper cited above). This is itself a non-trivial matter: expenditures for risk reduction can be, and often are, very expensive. To set a reasoned limit to risk reduction in particular cases, and in relation to the need to address multiple sets of risks, is a critical task for public policy. *Unfortunately, this task itself goes largely unrecognized today, even in political units where RM is firmly established.*

Public policy decision-making in areas of risk still suffers greatly from lack of clarity on how to allocate public budgets, and how to impose regulatory costs on private actors, in a way that is “proactive” (using risk forecasting), fair, and proportional to the scope of the risk scenario within generic sets of activities – for example, animal health/food safety, infectious disease, and terrorism/security. This paper will use the example of the management of BSE risk in Canada as a case study to illustrate in detail the proposition that being insufficiently precautionary, as a matter of policy, can inflict enormous economic and social damage in a modern economy.

(4) Emotions and the Acceptability of Risk

Sabine Roeser, *Delft University of Technology, Delft, The Netherlands*

Technologies, particularly if they are new, often give rise to emotions based upon their perceived risks. Recent examples of such technological risks are cloning and GM-foods, while the use of nuclear energy continues to spark heated and emotional debates. Many people are afraid of the possible unwanted consequences of such new technologies. Should engineers, scientists and policy makers involved in developing risk regulation take the emotions of the public seriously or not?

Paul Slovic has conducted empirical psychological research from which he concludes that people do indeed rely on affect in assessing technological risks. However, this empirical research does not answer the normative question whether relying on affect is a good or reliable way to assess the moral acceptability of risks. This paper will provide for such a normative answer by arguing that we need emotions in order to make reliable judgments concerning the moral acceptability of technological risks.

There are two major traditions in moral thought about the role of emotions, going back to the philosophers Immanuel Kant and David Hume. Hume thinks that ethics is based on emotions, but since he takes emotions to be subjective, there cannot be objective moral facts. However, as many moral philosophers have argued, Hume's view would make morality subjective and contingent. This would undermine the critical authority which we take morality to have. Kant instead believes that ethics is objective, and hence emotions have to be banned from moral thought. Most moral philosophers fall into either of these two camps. However, based on recent theories of emotions, we can reject this dichotomy between objectivity and emotions as a false dilemma.

According to recent developments in neurobiology, psychology and the philosophy of emotions, emotions and cognitions are not mutually exclusive, but rather, emotions are a form of cognition, or they are a precondition for knowledge (cf. for example the research by Antonio Damasio and Martha Nussbaum). Based on such a 'cognitive theory of emotions', one can say that in order to have moral knowledge, we need to have certain emotions.

A cognitive theory of emotions can provide for new insights concerning emotions about morally acceptable risks. On the traditional picture, one would have to choose between the two horns of the Hume-Kant-dilemma: either take emotions seriously but forfeit claims to objectivity, or reject emotions as being a threat to objectivity. In both cases, engineers, scientists and policy-makers could reject the emotions of the public: on the Hume-interpretation, the emotions of the public could be discarded since emotions would be merely subjective responses that are not grounded in reality; on the Kant-interpretation the emotions of the public could be rejected since they would even be misleading. Instead, on a cognitive theory of emotions we can conclude that we have to take emotions seriously in order to achieve an objective picture of the moral acceptability of technological risks. For example, our fear can indicate that a certain risk is really unacceptable.

This paper will argue that a cognitive theory of emotion can answer the normative question whether emotions can serve as a guide in judging the moral acceptability of risks in the affirmative. Emotions are not infallible, but in order to have reliable knowledge concerning the moral acceptability of risks, we need to have appropriate emotions.

(5) Preliminary Decision Leads to Risk Averseness

Odilo Huber, *University of Fribourg, Fribourg, Switzerland*

The objective of the study was to demonstrate that the process of decision-making itself may result in risk-averseness. To that purpose, a quasi-naturalistic risky decision experiment was designed to investigate the effect of preliminary decisions - based on incomplete information - on a final decision based on complete information in the same task. It was expected that preliminary decisions would lead to a more intense processing of the negative outcomes and thus would make these more salient. In effect, a safe alternative with a moderate negative outcome would become more attractive compared to a risky alternative with two possible outcomes: A more negative outcome than that of the safe alternative and a neutral one.

One-hundred subjects performed the task: A basic description depicted a decision situation with two alternatives, structured as described above. Subsequently, subjects were given 10 additional pieces of information. In the preliminary decision condition subjects decided preliminary after each new piece of information, while in the control condition subjects only had to decide finally after having inspected all information. The results confirmed the hypothesis. 64% of the subjects chose the risky alternative in the control group, but only 44% chose it in the preliminary decision condition.

(6) Data Format and the Perception of Variability

Massimo Warglien & Yaakov Kareev, *Ca' Foscari Univ. of Venezia and Cognitive Science Lab & The Hebrew University of Jerusalem*

The risk involved in choosing a course of action, whether in finance, medicine or environmental policy, is related to the variability of a set of outcomes. Hence, correctly perceiving the variability of a distribution is fundamental to decision making and inference. We show that the format in which data are presented, whether graphical or numerical, affects the perception of variance, with both formats biasing it, but in opposite directions.

Former studies found the subjective perception of variance and its objective value to be highly correlated but - due to elicitation methods employed - biases in perceived variability could go undetected. To find out if a bias exist, we assessed perceived variability by the use of direct measures. We conducted an experiment in which participants were presented with a set of datapoints and immediately asked to reproduce them from memory. The variance in the reproduction was taken as a measure of perceived variance. Data presentation format was either graphical or numerical, in accordance with common data-presentation modes: The items were either bars colored black to differing heights or numbers (corresponding in value to the length of the black part of the bars). The items of each data-set were presented for 10 secs. Unrelated decision-making tasks intervened between the two presentations. For greater generality, for some subjects (N=61) the data sets consisted of 7 items whereas for others (N=65) they consisted of 9 items. Objective variance with 9 items was larger than with 7.

An analysis of the reproduced items indicated that whereas memory for means was quite accurate, memory for variances was strongly biased. Perceived variance for the graphical format was attenuated, whereas that for the numerical format was amplified. The differences in perceived variance (expressed as the ratio between the variance of the reproduction and the true variance) between the two modes was highly significant ($F(1,124)=31.06$, $p<.001$). Furthermore, for both modes of presentation perceived variance deviated significantly from the true value: $t(125)=-4.00$, $p<.001$, and $t(125)=4.25$, $p<.001$, for the graphical and numerical format, respectively.

When faced with a stream of data people must make do with samples of it - due to time constraints or structural limitations of the cognitive system. Unlike the sample mean, which is an unbiased estimator, the sample variance is not. It is a statistical fact that the variance of a random sample is attenuated, the attenuation being larger the smaller the sample. The pattern of reconstructions observed with the graphical format is consistent with a process of random sampling without correction for sample size⁸. The situation is different for numbers, where sampling was non-random, with subjects more likely to remember extreme values.

Being faced with large amounts of data is often the case. Our findings indicate that, unlike the perception of the mean, the perception of variability is systematically biased. As a result, people's assessment of risk and confidence in their predictions will be attenuated or amplified depending on the presentation format used. The profound implications of these effects should be taken into consideration in data communication, to help people come up with unbiased estimates of variability and risk.

(7) The effects of the experienced regret on decision-making

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The concept of the influence of regret has been present in decision research for many years (Savage, 1951). Thirty years later, the anticipatory aspects of regret were explicitly incorporated in Bell's (1982) and Loomes and Sudgen's (1982) regret theory of decision making.

More recently, Mellers, Schwartz, Ho and Ritov (1997) assessed to what extent the affective state following a decision depends on actual outcome, and to what extent it depends on outcomes which could have happened. However, little research has been carried out to explore the effects of experienced regret on choice behaviour (Zeelenberg & Beattie, 1997), and currently available data could also be explained in an alternative way. The aim of the present research is to investigate the influence of the experienced regret on subsequent decisions. In the first experiment a scenario-based methodology was employed. Participants are requested to imagine having played as the Proposer in the ultimatum game and they have just discovered that their offer has been refused. Their task is therefore to play again. To single out the effect of experienced regret on the second offer two variables were manipulated: the first offer (generous vs greedy) and the difference between the first offer and the minimal acceptable offer for the Respondent (5 vs 55%). Results showed an interaction between the two manipulated factors: low differences produced higher scores on the regret scale, but the effect of regret on the second offer was different depending on the level of the first offer.

These results were replicated in a second experiment involving real playing of the ultimatum game in laboratory settings. Theoretical and methodological implications for the study of the way in which regret influences decisions will be discussed.

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(8) The Effect of Pursuing Useless Information on Decision Making across Cultures

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BACKGROUND: People often think that to make decisions, it is better to gather more information; but most of the time, they do not know which information is useful for the task. Recent research indicates that when making decisions, people tend to pursue useless information if provided (Bastardi, Shafir, 1998, Redelmeier, Shafir, Aujla, 2000). This effect is derived from the fact that people often do not have well-defined values and preferences and make them in the process of the act of making a decision (Slovic, 1995).

AIM: To investigate the effects of useless information on decision making across three individualist and collectivist cultures (i.e., American, Iranian, and Japanese) using the paradigm introduced by Bastardi and Shafir (1998).

METHOD: An experiment was conducted in which 143 American, Iranian, and Japanese participants (Nurses in Problem 1 and university undergraduate volunteers in Problem 2) responded to two surveys adapted from Bastardi & Shafir (1998, Problem 1) and Redelmeier, Shafir, & Aujla (2000, Problem 2). Half of the participants received the Simple version and the other half, the Uncertain version. In the Simple version, no "useless" information was provided, but in the Uncertain version participants received information that was noninstrumental for the task of decision making. No incentives were given to the participants.

RESULTS: The results revealed that participants in all three cultures are susceptible to pursuing useless information under uncertainty conditions. Specifically, there was a significant difference between the participants' responses in the Simple and Uncertain conditions. It was also found that participants from the individualist (American) culture show a higher rate of pursuing the useless information than the other two groups.

CONCLUSIONS: The findings of the present experiment demonstrate that people from the American, Iranian, and Japanese cultures tend to use noninstrumental and irrelevant information when making decisions. Also, participants with an individualist background may show a higher proneness to the effect. Bem's Self-perception theory may explain this observed difference.

(9) The counter-intuitive nature of the self-weighted average

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The **self-weighted mean**, denoted *SW*, is a weighted mean in which the weights are the values themselves:

$$\bar{x} = \frac{x_1^2 + x_2^2 + \dots + x_n^2}{x_1 + x_2 + \dots + x_n}$$

SW is called for whenever the probability of sampling a given value is proportional to its size, that is, under self-weighted sampling (SWS), also called "size- or length-biased sampling". SWS is encountered in diverse areas: demography, medicine, management science, and many others. For example, consider the case in which each child in a community is asked how many children are there in his/her family. In this case, the arithmetic mean of the obtained answers equals the self-weighted mean of the numbers of children in all the families.

SW is different from the arithmetic mean, but is it obvious when to correctly use each of them?

We studied people's intuitive judgments in some SWS situations. We hypothesized that some people might fall back on the easiest heuristic of assigning equal weights to all the averaged values. Consider the following question:

"Many cars drive on the same direction on a highway, the same number of cars in each kilometre: Half of them drive at 100kph, and the other half at 60kph. A radar device is located somewhere at the side of the highway, measuring and recording the speeds of all the cars that pass it, within one hour.

What would you expect the mean of these speed recordings to be?"

The participants were asked to circle a number from the list: 60, 65, ..., 95, 100. We got the following results from a sample of 104 statistically-naïve students in the Hebrew University of Jerusalem:

Percents of students according to the average speed they chose (N=104)

Average Speed	60	65	70	75	80	85	90	95	100	Total
Percent	0	0	0	0	65.4	16.3	15.4	1.9	1.0	100

Our hypothesis was confirmed. 65.4% of the students gave equal weights to both speeds (i.e. computed the arithmetic mean), whereas only 16.3% gave the correct *SW* average (the rest used improper weights, but in the right direction).

The figure below demonstrates the fact that the radar device samples speeds in proportion to their own size. (Insert the figure from the second file about here)

The implicit assignment of equal weights to all the values is compatible with Tversky and Kahneman's well-known description of heuristic principles that people rely on when assessing the value of an uncertain quantity. In particular, tacitly assuming uniformity is in harmony with people's predilection for symmetry and equality (Zabell, 1988).

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(10) Would you vote for Saddam? Recognition, Valence, and Choice in Low-Information Decision Settings

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Within the "simple heuristics" research program the recognition heuristic (RH) is the simplest, ecologically most rational, fastest and most frugal heuristic, which uses recognition to make inferences about unknown subjects. It is limited to search for recognition information and requires a beneficial lack of knowledge about a topic to work [3; 4; 5]. Lots of examples for areas in which the RH can lead to adequate decision making have been published including natural food choice of Norway rats [2], two-alternative-choice tasks [4] or investment related decision making [1; 6].

The RH works the following way: If one of two alternatives is (merely) recognized and the other is not, then the recognized alternative is chosen. If someone wins a weekend-trip in a TV game show and a choice is given between a weekend in lovely Salzburg, the city of Mozart, and a weekend in not so well-known Halle/Salle, city of Samuel Scheidt, then Salzburg should according to the RH be the preferred choice as it is (and Mozart is) typically recognized, while Halle and Scheidt are not. In this case the RH simply works on the basis of name recognition.

According to Goldstein and Gigerenzer [4] valence does not necessarily have an effect on the learning process of name recognition as they report an example in which name recognition has been taught through negative or at least shocking information: Toscani, the photographer behind the well-known scandalous series of Benetton advertisements, placed the brand among the top five best-known fashion labels of the world getting even higher recognition than *Chanel* ever did. His advertisement photographs include no information about the brand itself but show “eye catchers” like a dying AIDS-patient or a nun kissing a priest.

Similarly, politicians operate on the principle that if they are recognized, people will favor and therefore vote for them and not for less-known politicians. Just imagine Pim Fortuyn, the former Dutch right-wing extremist and head of his own party, who mainly attracted attention by negative international media coverage until he was murdered in 2002.

According to the principle of the RH [4] participants who have the right degree of ignorance with respect to Dutch politics would vote for Pim Fortuyn, provided that they have not heard of any other Dutch politician, if they have heard his name before but do not remember any further information such as that he has been murdered or that he used to be a right-wing extremist. That would mean that recognition can exist without valence which we think is unlikely.

Design 1: We presented participants (N = 185 students at the University of Klagenfurt) with a questionnaire asking who the Dutch prime minister was. We offered four alternative names to choose from including Pim Fortuyn, J. P. Balkenende (the actual prime minister) and two other Dutch politicians. Design 2: We confronted participants with an imaginary election. They were asked to vote for one of the four politicians as the Dutch prime minister. If recognition is valence-free and if participants apply the RH we would expect those who recognize Pim Fortuyn but no other politician to choose Pim Fortuyn in both designs.

Of 64 participants being able to apply the RH (recognized Pim Fortuyn only) just 20% did so when they were asked who the Dutch prime minister was. However, 74% of those who recognized J. P. Balkenende, the actual prime minister, who is not famous for negative media presence, chose Balkenende. When participants were asked to vote for the Dutch prime minister only 17% of those being able to apply the RH voted for Pim Fortuyn whereas 60% who recognized J. P. Balkenende voted for Balkenende. This study on the basis of the best known European populists did not give evidence for a “valence-free recognition” hypothesis. We assume that recognition is not (or at least not completely) free of valence as only few participants who only recognized Pim Fortuyn applied the RH. Recognition in his case might even have led to *not* giving him one’s vote. Additional data from a second study conducted in other European countries will be presented at the conference.

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(11) Stochastic Dominance and Cumulative Prospect Theory: Theory and Experiments

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Based on recent theoretical and empirical results about the significance of Cumulative Prospect Theory (CPT), we define RWc-SD, an extended notion of stochastic dominance that captures both the reflection effect (R) and an empirically relevant class of probability weighting functions. A second definition of stochastic dominance (R*Wd-SD) for preferences with reverse reflection effect (R*) (Markowitz (1952)) is presented. Using these definitions, we empirically discriminate between two competing explanations of

behavior under risk, namely, CPT and Markowitz. Our experiments reject the reverse reflection effect recently advocated by Levy and Levy (2002a) and offer insight into the relevance of the weighting function in empirical research on choice under risk. We present and test two additional definitions of stochastic dominance that embody loss aversion, an important feature of CPT.

(12) Decision Making and Trade-Union Negotiation

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The paper is about an action research carried out on 97 workers of an E.N.E.L. company. The company stipulated an agreement with the trade-union, which modified the old system of compensation. The new system is more advantageous for workers than the old one, but workers think the new agreement is worse. They justify their judgements with sentences that reveal their negative attitudes toward both the agreement and the company. The research aims both at studying the reasons why of this situation, and at changing the negative attitudes of the workers toward the advantageous agreement by teaching them decision-making processes and techniques, in order to let them assess things and the agreement in a more unbiased and objective way.

STAGE 1: 97 workers were administered an *ad hoc* questionnaire, composed by one multiple-choice item and five open questions, aiming at finding out the percentages of “*pro*” and “*against*” people and at understanding the reasons why of their attitudes (see TABLE 1).

STAGE 2: From this group of 97 workers, two samples of 12 subjects each were drawn: the 12 people showing the most “*against*” attitude would make the experimental group; the 12 people showing the most “*pro*” attitude would make the control group.

STAGE 3: The 12 experimental subjects were supplied with a training course of 10 sessions and 20 hours altogether. The 12 control subjects were not. The course was about the themes of human judgement and decision-making processes and techniques. It was also about the agreement and the exploration of its contents.

STAGE 4: After the training, the 24 subjects were administered the same *ad hoc* questionnaire again, in order to see if something was changed and if the training was really effective in influencing the attitudes of the participants (see TABLE 2). The results can be seen through the comparison of the following two tables, the first showing the results of the administration *before* the training (97 subjects), the second showing the results of the administration *after* the training (24 subjects).

Six of the 12 experimental subjects saying the new agreement was unsatisfactory have changed their mind and now they say it is better than the old one. The other 6 keep the same opinion. The 6 experimental subjects changing their mind pass from the position “the new agreement is unsatisfactory” to the next position “the new agreement is better than the old one”. None passes to the higher position “the new agreement is satisfactory”. Finally, subjects show a change in their attitudes only for very specific aspects of the agreement. No change at all in their negative attitudes towards company. We can call this state of things “resistance to change”, and say that even though the training about decision-making processes and techniques was effective, it was not completely, maybe because of the resistance of subjects to change their mind.

As for the control group, 11 of the 12 subjects keep the same opinion after the training, while only 1 of them now says the new agreement is better than the old one.

TABLE 1: First administration of the *ad hoc* questionnaire to the subjects, BEFORE the training

Subjects who were administered the <i>ad hoc</i> questionnaire	97	100%
Subjects who say the new agreement is satisfactory	12	12,4%
Subjects who say the new agreement is better than the old one	25	25,8%
Subjects who say the new agreement is unsatisfactory	60	61,8%

TABLE 2: Second administration of the *ad hoc* questionnaire to the subjects, AFTER the training

Subjects who were administered the <i>ad hoc</i> questionnaire	24	100%
Subjects who say the new agreement is satisfactory	11	45,8%
Subjects who say the new agreement is better than the old one	7	29,2%
Subjects who say the new agreement is unsatisfactory	6	25,0%

(13) Expert’s proneness to the confirmation bias and their ability to use debiasing interventions

Talya Miron-Shatz, Gershon Ben-Shakhar, *The Hebrew University, Israel*

This study examined whether expert performance of a personnel selection task would be confirmatory, despite task requirements. We examined the proneness of experts (N=160 human resource managers and professionals) to the confirmation bias as well as the immediate and prolonged efficacy of 3

interventions planned to reduce the effects of prior information on judgment and process variables. Various debiasing methods were applied: a novel intervention of having the participants build a decision model, structured recall and a combination of both. Lay performance of the same tasks was biased in all conditions, and particularly in the debiasing groups (Miron-Shatz & Ben-Shakhar, 2003). Results of the control group showed that expert judgments were even more biased than those of laypeople, indicating that experts rely heavily on heuristic processing. A discrepancy emerged between process and product: Participants were unaffected by the preliminary information when applying the debiasing methods, yet their final judgments were biased. Dual processes are discussed as an explanation for this discrepancy, suggesting that judgment was based on an immediate, affective level, rendering the comprehensive decision-making processes induced by the debiasing interventions irrelevant.

Experts made better use of the debiasing interventions than laypeople, arriving at judgments that were less plagued by the confirmation bias, both immediately and in a second measurement, 2 weeks after the first one. This finding is discussed with relation to the vast literature regarding experts' improved judgment and decision making processes, such as information retrieval and analysis and the usage of complex reasoning rules.

(14) Retro-active and pro-active prevention of error for safety

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In the causative route to the health damage in work-places, human error has a crucial role in emerging of risk conditions, causing the accident and determining damage. For this reason we cannot face safety issues without locate, remove or counteract the conditions on which errors are based.

Two approaches are given:

- In the retro-active approach prevention is based on the analysis of accomplished errors, that implies the need of implementing notification systems of accidents and going back to their far roots. The logic that underpins this approach goes from the analysis of error to prevention. The epidemiology of error and the study of his activation mechanisms lead to the protecting action (1) (4).
- In the pro-active approach prevention is based on the analysis of work process, performed by the workers who act in the process itself. This analysis gives the appropriate knowledge to identify and assess the hazardous conditions (organizational constraints). The logic that underpins this approach goes from the analysis of work process to prevention (2)(3).

Substantial differences are evident in the two approaches, both in concept and in practical prospects.

While the first approach aims to protection interventions through the analysis of verified damages or of evident and tangible risks, the second offers an intervention strategy according to which analysis and planning of work process are strictly correlated to primary prevention. This includes all the actions that could be activated in order to modify the organizational choices that cause hazard conditions (organizational constraints), so that the emerging of actual risks is avoided.

Epidemiological knowledge is useful but not sufficient, as it goes up from damages to risks, while what is needed is to be able to go down from organizational choices to the occasions of risk. Error is considered as the wrong outcome of one of the several alternative choices in the organizational process, which causes constraints at different level of decision and action.

In our experience of safety and health management in hospitals and other work places, both the approaches were used in a logic of integrated strategy. The realization of the document of evaluation of risks, foreseen by the EU directives on safety and well-being in the workplaces, through the analysis operated by the workers themselves, gave us the opportunity to apply the criteria described above. The integrated strategy is based on the reconstruction of the occurrence of accident from the records provided for by law and on participatory analysis of the work process using the Method of Organizational Congruencies (2) in order to plan systems that can tolerate or control error.

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(15) Do travellers Make Rational Route-Choice Decisions? Modelling Route-Choice Stated Preferences with Cumulative Prospect Theory

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Common travel choice models are based on the maximum utility assumption. The traveler is assumed to behave as he/she correctly assigned probabilities to relevant random travel times and choose a route that maximizes the expected value of his/her resulting utility (for example, minimizing the expected travel time).

However, using expected utility theory in descriptive models of individual choice was criticized by behavioural scientists, and recently also by transportation researchers. The aim of this work is to examine whether violations of expected utility theory may be found in travelers stated-preferences behaviour.

One may wonder if there is a reason to assume that the violations of expected utility theory will occur also in situations of individual traveler choice behavior. One may argue that such an assumption is not to be trivial because of two main reasons.

First, there is a lot difference between route-choice decision-making that is based on the expected travel time, and the gambling problems based on monetary values that were studied by Kahneman & Tversky. One of their findings was that people are often much more sensitive about the difference between an outcome and the reference level than about the absolute value of the measured outcome. Since travel time cannot be stored or pooled, as may be done with monetary outcomes, the authors believe that route choice decision problems may better suit the above finding about sensitivity to a reference point, than problems dealing with selection of risky monetary assets.

Another characterization of the route choice problem, which makes it different from most of the monetary-based problems, is that there is no consensus about the reference point. When dealing with monetary gains and losses, €0 may be the common reference point. Dealing with traveler's experienced travel time, the framing of the resulted travel time as a gain or a loss is based on an individual reference point, which may be based on the traveler's past experience and expectations. Such a reference point may differ from one traveler to another, without having a consensus about a single particular reference point.

In this work, route-choice stated-preferences experiment was conducted. A questionnaire, inspired by Kahneman's & Tversky's experiments, presented simple route-choice problems. Evidence was found of two violations of expected utility theory: the *Allais Paradox (Certainty Effect)* and *Inflating of Small Probabilities*. The experimental results may be explained by *Cumulative Prospect Theory*, an alternative model of decision-making under risk.

(16) The “Ostrich Effect” and the Relationship between the Liquidity and the Yields of Financial Assets

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This paper documents a puzzle where a liquid asset (government T-bill) provides a higher return than an illiquid asset (bank deposits). This cannot be attributed to taxes, risk or transaction costs. Given that, it is inconsistent with rational expectations. We present a potential behavioral explanation for this apparent enigma which we have named: “The Ostrich Effect”. This effect is defined as the treatment of apparently risky situations by pretending they do not exist. As predicted by the Ostrich Effect, we find that the difference between the return on the liquid asset relative to the illiquid asset is higher in periods of greater uncertainty.

(17) Escaping the Tyranny of Too Much Choice

Barbara Fasolo, Gary H. McClelland & Peter M. Todd, *Max-Planck Institute for Human Development, Berlin, Germany & University of Colorado at Boulder*

Common choices we make every day, even those as trivial as which jam to buy for breakfast, hide a tyrannical side: the more options they provide, the less satisfactory the choice process and outcome seem to become and the lower the actual rate of choosing (Iyengar and Lepper, 2000; Beattie, Baron, Hershey, and Spranca 1984; Schwartz, 2000). This paradox of “less is more” in the choice domain has been increasingly related to the *number of options* decision makers have available. However, options are only one source of tyranny. In fact, the *number of attributes* might be an even harsher source of oppression.

Can the tyranny of too much choice be escaped by providing fewer rather than more attributes for the options available? By means of simulations and analysis of real-world choice problems we show that one attribute is enough to select a reasonable option within 90% of the highest value possible so long as the choice environment permits, namely so long as interattribute correlations are positive and attributes are subjectively unequally important. Tyranny persists just in cases where attributes are equally important and negatively related (hence trade-offs are needed).

(18) TSD & Risk Perception in Adolescence

Emilia Salvadori, Riccardo Luccio & Caterina Primi, *University of Florence, Italy*

The study of decision making and risk perception has often been interested in young people, which could assume risky and potentially dangerous behaviours. It has been assumed that the adolescent, in the moment in which he must decide if to adopt or less one potentially dangerous lead, has to disposition a series of informations that are just probabilities, not certainties; so we can consider this type of reasoning re-enters in the field of decision taken under uncertainty conditions.

The present research has the objective to contribute to the study of risk perception in adolescence, supplying a new index of measurement derived from the Theory of Signal Detection (TSD): the criterion of the operator.

This criterion is defined as the b optimal index (bott) and represents the fact that the subject makes an evaluation of costs and benefits related to every possible option of answer and takes under consideration the consequences that will derive from his choice. The criterion of the observer allow us to obtain an esteem of the risk amount that the subject assumes at the moment of the choice. The TSD assumes that the threshold value for the bott corresponds to 1, and this permits us to discriminate if the subject assumes a gambler attitude ($bott < 1$) or a conservative attitude ($bott > 1$).

The aim of the present research is to introduce the bott index in the study of decision making in adolescence. In this case the decision making concerns the choice of the participant with respect to the possibility to ask for help because of possible negative consequences. In the same way, the cost-benefits evaluation and the consequent risk assumption regard the opportunity of the help request considering the consequences that this exposition could cause.

Questionnaire. Two types of potentially harmful behaviours, diffuse in the young people, were selected and inquired: synthetic drug use and abuse and alcoholic substances use and abuse. Two parallels versions of the same questionnaire were constructed.

Participants. Participants were 405 adolescents of mean age 17.67 ± 0.69 years, 229 males (56.5%) and 176 females (43.5%), attending the High School in Florence and Pisa.

Results. In the analysis (ANOVA for repeated measures) made on the total sample, for the high and low gravity consequences, the bott assumes values greater than 1, denoting a conservative attitude of the subject regarding the help request. On the other hand, for the medium gravity consequences, the bott assumes values lower than 1, that indicates a gambler attitude. The same result emerges in the successive analysis made on the two samples (drug and alcohol behaviours).

In the two groups of behaviours (drug and alcohol) the values of both for the high gravity consequences are meaningfully different.

Conclusions. It seems that there is a various attitude regarding the help request, and this difference seems to be based on the gravity attributed to the consequence.

One of the possible explanations, for the high gravity consequences, is that the adolescents could fear one strict external punishment if they would be discovered. On the other hand, for the low gravity consequences they could think of being able to manage the situation without the involvement of others. So in those cases it seems that there is not availability to ask for external help. On the contrary, when the adolescent is in doubt to incur consequences of medium gravity, there could be a greater indecision and consequently a greater disposition to the help request.

The difference of the values of bott for the high gravity consequences in the two groups of behaviours (drug and alcohol) allows us to assume that the two behaviours subtend in the subjects two different decisional processes, which take under consideration different types of variable and are based on different cost-benefit evaluations.

Concluding, this research has shown a good reliability of the bott index in the measurement of risk perception in adolescence, and it's a good starting point for further studies in this field.

(19) How Information Format Affects Financial Decision Making: Preliminary results

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The influence of numeric information format on decision making processes has been demonstrated in different domains. There is evidence showing that probabilistic reasoning is different depending on the information format used (Gigerenzer, 1995 and 1999). For example, individuals tend to be sensible to the absolute magnitude of a number more than its statistical meaning (Helpern, Blackman, and Salzman, 1989). Stone, Yates, and Parker (1994) showed that risk perception and consumer decision are influenced by the information format. In the absolute information condition participants choose between two types of tires; they were presented with the probability to have a tire blowouts and with the tires price. In the relative information condition participants made the same choice but the risk of tire blowouts was described comparing the average risk and the risk associated with the two tires brands. Their results suggest that displaying information in a relative format leads to less risky behaviour.

To our knowledge there are no studies aimed at investigating the influence of information format on financial decisions. In one experiment, we studied how information format can influence people's

investment strategies. We designed a financial scenario that allowed to check for the status quo bias (Samuelson e Zuckhauser, 1988; Kahneman, Knetsch, and Thaler, 1991) and for the disposition effect (Shefrin e Statman, 1985; Odean, 1998; Shapira e Venezia, 2000). The status quo bias describe people's inclination to not change their original investment strategy; people prefer to keep the original strategy to avoid the risk of making a mistake when decide to change. The disposition effect describe people's attitude to sell gaining investments too early and to hold loosing investments too long. The scenario describes the returns of two stock funds owned by the individual and asks them to choose how to proceed with their investment strategy (basically, to change or stay with the funds). Funds' returns were presented in one of four different formats: percentage (25%), mean prices of stocks (1.22€), fractions (1/4), and difference between mean prices of stocks now and at the start of the investment (0.25). Of the two funds described in the scenario, one was a losing fund and the other a gaining fund.

Fourhundred and eighty students enrolled at the University of Modena and Reggio Emilia were asked to make a choice among four different alternatives: sell the losing fund and keep the gaining fund, sell the gaining fund and keep the loosing fund, keep both funds, and sell both funds. Our main hypothesis was that the numeric information format would affect choices both increasing and reducing the status quo bias and the disposition effect. Specifically, we predicted an increase in the number of participants who choose to sell the losing fund when returns are presented as percentages because this is the format presenting numbers higher in magnitude. We also hypothesized that the fraction format should increase the preferences for the status quo alternative (to keep both funds) because of the relative format of the information.

A 4 (information format) x 4 (choices) log-linear analysis displayed an interaction between information format and type of choice ($\chi^2(9,480) = 19.874$; $p = .019$). When funds' returns are expressed as percentages there is a significant increase in the number of participants who choose to sell the losing fund in comparison with the other formats ($\chi^2(3,65) = 7.923$; $p = .048$). In the percentage condition the alternatives "to sell the losing fund" and "to sell the gaining fund" are equally chosen ($\chi^2(1,65) = 2.600$; $p = .107$) while in the other three conditions the alternative "to sell the losing fund" is significantly less chosen. Chi-square analyses are significant for both the mean price condition ($\chi^2(1,62) = 23.299$; $p = .001$), for the difference condition ($\chi^2(1,60) = 17.067$; $p = .001$) and for the ratios condition ($\chi^2(1,48) = 10.083$; $p = .001$).

Results in the percentage condition contradict the disposition effect. When returns are expressed as ratios the alternative "to keep both funds" (status quo bias) is more attractive than the alternative "to sell the gaining fund" ($\chi^2(1,100) = 9.000$; $p = .003$) while in the other three conditions there are no differences. Chi-square analyses are not significant for the percentage condition ($\chi^2(1,80) = 0.5$; $p = \text{n.s.}$), for the mean price condition ($\chi^2(1,97) = 0.93$; $p = \text{n.s.}$) and for the difference condition ($\chi^2(1,97) = 0.258$; $p = \text{n.s.}$). Thus, the ratio condition appears to increase the status quo bias; however in this condition the number of participants choosing the status quo alternative was not significantly higher in comparison with the other conditions ($\chi^2(3,204) = 6.118$; $p = .106$).

In conclusion, the results in the percentage condition can be explained by the absolute magnitude of the numbers presented to the participants in this condition (Helpert, Blackman, and Salzman, 1989) while, the results in the fractions condition can be explained by the relative format of the information (Stone, Yates, and Parker, 1994). This study shows how simple format variations of the same information can sensibly affect individuals' preferences on how to manage their financial investments.

(20) Improving Risk Assessment with Stretched Rating Scales: Conversational Processes Account for Increased Accuracy

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Past research has examined whether stretched rating scales (i.e. scales with decomposed numeric values in certain parts of the scale) lead to more accurate risk assessments, with mixed results. We introduce an improved stretched rating scale, and show that it results in more accurate (Study 1) and valid (Study 2) risk judgments for both rare and frequent events. Study 3 shows that conversational processes account for the increased measurement qualities in that the stretched scale better communicates the range of plausible probability values for the event at hand. The results suggest that the numeric values of probability rating scales should be chosen such that they are sensitive to the base rate frequency of the event that is assessed.

(21) Vividness Effect: Implications for Judgment and Choice

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Previous studies demonstrated that vivid messages can have an impact on judgments and choices. More vivid or specific is a message and more persuasive and attractive it is perceived (Taylor and Wood, 1983; Sheller and Manis, 1986; Mc-Gill and Anand, 1989). In particular when individuals are presented with a choice the vivid/specific message is more attractive than a general message; instead when individuals are asked to judge two different messages the vivid-specific message is more persuasive than the general one.

In this experiment participants were presented with two products. The products were identical except for their price, in fact one of the products had a price 5% higher than the other. This difference between prices was due to the reason that the expensive product assign 5% of its price to some charitable goal. The explanations of the price increase provided to participants were either general or vivid/specific. The second product was described only by its price. Participants were randomly assigned to two different task conditions: choice and judgment.

We expect that in both task conditions the more expensive product is preferred more frequently when it is associated with a vivid explanation of the increased price than when it is associated with a general explanation.

Indeed we expect to find a difference between tasks (choice and judgment). In the choice condition the product associated with the vivid explanation is expected to be preferred more frequently than in the judgment condition.

(22) How Adolescents Make Decisions? Naive Ideas of Decision Making

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The aim of this research is to study: (1) how a group of Spanish adolescents make decisions and (2) how they think they should made them in order to develop a formal decision making course.

Participants were three groups of students in their early (12-14), middle (14-16) and in their late adolescent years.

During an academic course (2002-03) and along two sessions for each group, we analyzed their "naïve" ideas about how make decisions and how they should do it, comparing with a "normative approach. Structured and unstructured materials were used to measure different dependent variables. Data were analyzed following quantitative and qualitative methods.

The main results were:

- All groups consider that for making a good decision it is important to think hard and also with enough time.
- Related to decision making "naïve ideas" we found that although participants, above all the oldest ones, considered the main elements of a "normative approach" there are ample space for teaching how to make good decisions.
- Students did not receive any formal teaching on decision making in their school but they pointed out that when they had to make an important decision they look for the advice of parents and friends (we found some differences between groups)
- As adolescents are active decision makers and the results of our data, we conclude that adolescents can take advance of a formal decision making course (see Baron and Brown, 1991). We discuss the features that such a program should have.

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(23) What are the Decisions that Adolescents Make? A Spanish Study

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The aim of this research is to study what are the main decisions that a spanish adolescent group used to made in order to develop a formal decision making course.

Participants were three groups of students in their early (12-14), middle (14-16) and in their late adolescent years.

During an academic course (2002-03) and along three sessions each group, we analyzed: (1) which are adolescents important and hard decisions and (2) the reasons they give of such difficulty.

Structured and unstructured materials were used to measure different dependent variables (difficulty and importance of decisions). Data were analyzed following quantitative and qualitative methods.

The main results were:

- The most important decisions for the three groups are those related to family, studies and friendship (This results are according with Fischhoff, 1996 and Friedman, 2000)
- For the oldest group the most difficult decisions are those related to studies, for 14-16 years group the family decisions, and in early adolescents those related to friendship.
- Decisions considered by adults as “risky decisions” (being pregnant, taking drugs...) were described by adolescents as important decisions but not as hard ones (socially desirable response?)

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(24) Harold Shipman: latent errors, violations and the regulatory crisis for health care

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The case of Harold Shipman sent shock waves of revulsion and disbelief through UK society and through the NHS. The notion that a doctor could repeatedly, systematically and callously murder patients in his care shattered the assumptions that many held about health care professionals. As terrible as Shipman's actions were, they raised quite fundamental questions about how a doctor could kill patients over such a long period without being detected and stopped. As such, Shipman served to surface a much wider sense of malaise within the health service. To see the actions of Shipman as generating a crisis for health care might be somewhat misleading, although there is little doubt that it was a crisis for the community of Hyde. What the Shipman murders do illustrate, along with a number of other events concerning problem doctors, are the difficulties facing a health service that, until the turn of the millennium, had failed to adequately address the problems of rogue doctors. Shipman proved to be one of a number of trigger events that illustrated the fragility of the regulatory system that was in place to deal with medicine and, more importantly, it illustrated the importance of societal assumptions in the generation and incubation of that 'crisis'. This paper seeks to examine some of these issues as part of a wider debate concerning the nature of crisis within government and the manner in which learning after the event can serve to prevent the incubation of further crises.

(25) Is hazard similar to climbing?: The perception of similarities and differences between various kinds of risk, Tomasz Zaleskiewicz, *Warsaw School of Social Psychology, Warsaw, Poland*

Cognitive psychologists (e.g., Gardner and Pettigrew) showed many years ago that people differ in how precisely they categorize reality. It has been demonstrated that some people tend to perceive similarities rather than differences between objects and to divide these objects into a small number of wide categories. Other people tend to perceive differences rather than similarities between objects and to divide these objects into a large number of narrow categories. Pettigrew showed in his research that this difference can be regarded as a relatively stable individual characteristic referred to as the breadth of categorization.

The problem of how different people categorize reality is very important for the process of risk perception and decision making. Because risk is a multidimensional variable (e.g., financial risk, social risk, ethical risk), the consequences of choices would depend on how the decision maker perceives and categorizes risky situations. When somebody tends to perceive more similarities than differences between various kinds of risk, she would apply similar, if not the same, rules of behavior in different risky situations. On the other hand, perceiving differences rather than similarities between various kinds of risk would cause an individual to be inclined to change the rule of behavior with changing risky situations.

This paper presents results of a study that demonstrated that people differ in how precisely they categorize risky objects and risky activities. It also has been showed that those differences can be attributed to people's risk preferences. In particular, the preferences of two kinds of risk were taken into account: the preference for an instrumental risk (i.e., the willingness to take risk to reach a future goal) and the preference for a stimulating risk (i.e., risk taking as a form of sensation seeking). It has been demonstrated that those individuals who were instrumental risk takers tended to be more sensitive to differences between various risky objects and to divide these objects into many narrow categories. On the other hand, stimulating risk takers tended to perceive more similarities between risky objects and to divide these objects into a small number of broad groups. The paper also shows interesting gender differences in the perception of similarities and differences between various kinds of risk.

(26) How do lay people perceive the results of risk analyses and what information do they use? A qualitative study, V. Visschers, R. Meertens, and W. Passchier, *Universiteit Maastricht, Department of Health Education and Promotion, the Netherlands*

On the basis of risk communication practice and research, several scholars have developed insights in how information about a certain risk should be communicated to the public (see Covello, von Winterfeldt, & Slovic, 1987; Fischhoff, 1995; Keeney & von Winterfeldt, 1986; NRC, 1989; Sandman, 1994; Slovic, 2000; Weinstein & Sandman, 1993). The first impression of risk information determines further information seeking (Lion, 2001). In this study, we were therefore interested in exploring how lay people perceive the results of risk analyses in press releases. The results of this qualitative study are used for further research. During in-depth interviews and focus group interviews respondents were presented with several press releases about new risks after which they were interviewed. In addition to the qualitative issues as seriousness, familiarity, and consequences of the risk, respondents also paid a lot of attention to prior knowledge by means of making comparisons to known risks and events. Prior knowledge can be useful in the development of a new risk communication. Prior knowledge about a certain risk can be presented in a concept map (Bostrom, Fischhoff, & Morgan, 1992). After a pre-test of the risk information and prior knowledge linked to this, concept maps can be drafted to serve as indicators where to focus the risk communication on. The effect of prior knowledge on risk perception and its implication for risk communication will be studied in a subsequent experiment.

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(27) Comparative analysis of risk perception related to human health issues

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The purpose of this paper is to explore and compare different levels of acceptance and reluctance to risk associated with human health, with respect to the specific cultural contexts of France and the UK. The paper is also developing a preliminary analysis of the perception of controversial vaccines, namely the MMR vaccine and the hepatitis B vaccines. The degree societal of acceptance for health related risks is low compared to other risks. This is especially true of those risks affecting children's health. The number of recent scandals related to health and sanitary issues (BSE, Blood transfusion, Foot and Mouth disease) are calling for detailed attention at those factors that may influence acceptance or rejection of risk. Although the level of tolerance of risks associated with pharmaceutical products seems higher than the acceptance of other health related hazards, vaccines represent an area of growing concern. A selection of newspaper articles covering the MMR and hepatitis B controversies tends to confirm that declining patterns of tolerability for vaccines are a trend and that they are amplified by poor policy responses. Risk mismanagement and crisis avoidance have a critical negative impact on trust and this influences risk acceptance. The case study calls for a dramatic effort towards a renewal of risk communication in the area of risks associated with pharmaceutical products. The rich body of risk communication analysis could help achieve this important shift (in particular the work of Baruch Fischhoff and Ann Bostrom).

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(28) Rethinking sunk cost influenced behaviours

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Classic rational choice theory states that decision makers, when deciding, should choose among a set of alternatives considering the future possible consequences of each alternative. Decision makers should judge and rank the future consequences of the alternatives according to their preferences [5, 8]. The "rational" decision maker is the one that selects the alternative that displays the best consequence and the lower cost. In this decision process the subject should not consider past investments because they cannot affect future consequences.

A series of experimental decision scenarios confirms the fact that decision makers are heavily influenced by past investments in particular when they receive negative feedback [2]. In fact, instead of considering future consequences, decision makers select courses of action that tend to reuse past investment. In literature these decision makers are considered as influenced by the so called "sunk cost effect" that is, they tend to consider past investments in the selection of the alternative [6]. From the perspective of the classic decision theory, the behaviours of such decision makers are irrational because they make choices considering past expenditures and not only future consequences. Scholars of such an irrational behaviour use psychological arguments to explain why decision makers have difficulties to get out from losing situations. For instance, the most used arguments are the "don't waste" rule [1], the irrational escalation effect [9], the self-justification attitude [4].

Another growing school of thought in this area, that falls under the notion of "decision dilemma theory", judge not necessarily irrational the consideration of sunk costs in decisions making [3]. The statement of this theory is that those experiments that were made in order to evaluate such irrationality were characterized by a strong degree of equivocality [7]. This means that the questions used for the experiments provide a decision context that lacks the necessary elements to make a unique rational choice [10]. In fact, the equivocality in experiment situations makes ill-defined the negative feedback that should show the losing situation. In other words, it means that the scenarios allow several plausible interpretations that do not imply a clearly foreseeable rational action.

The aim of this research is to analyze the relationship between sunk cost effect and equivocality. Our hypothesis is that equivocality influences the willingness to commit further resources in a decision context.

Starting from the considerations proposed above our work is focused on the notion of equivocality and its influence on decision situations. The idea we want to analyze is that equivocality allow further commitment of resources because decision makers have the opportunity to enact, through action, an environment favourable to them [11]. For this purpose we propose a series of experimental questions that show different equivocal scenarios. The results illustrate a different willingness to continue the investment in each scenario. These wide differences are not explainable with classical “sunk cost” hypotheses and carry us to assert that in equivocal situations it is not correct to consider necessarily irrational behaviours influenced by sunk costs.

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(29) How Food Safety Information affects Consumers' Decision Making

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The European Union has repeatedly experienced severe food safety crises in recent years. These incidents have received widespread publicity and an extensive media coverage which has evidently been mainly negative. A multitude of (empiric) studies has revealed the corresponding effects. Scant attention, however, has - in this context - been turned to the asymmetry in the impact of positive and negative media coverage. The objective of this article is to illustrate how information, both positive and negative, affects the consumer's decision making and finally, his purchasing behaviour.

Consumers do not dispose of all relevant information when purchasing food. Thus, they cannot avoid a certain risk which they, presumed they behave rationally, attempt to reduce. This provokes an increased demand for media coverage in addition to the media's economic self-interest to supply information.

Starting point for the analysis is information about a food safety incident. The impact of negative media coverage on demand is assumed to be twofold. Firstly, negative media coverage of a food safety issue might lead to an immediate but transitory decline in demand. Once the media's interest has ceased, a slow and often incomplete recovery towards previous consumption levels can be observed. Consumers' reactions, i.e. the decline in demand, can mostly be ascribed to the risk perceived, respectively the uncertainty faced. The hypodermic as well as the transactional model shall be reviewed in terms of their explanatory contribution within this investigation. Secondly, negative media coverage might provoke a sustained shift in consumption patterns. This, in turn, would cause a permanent reduction in consumption. Positive media coverage, in contrast, was shown to influence consumption only insignificantly and has a remarkably weaker impact on aggregate demand.

Against above background, the diffusion of information within social networks will be outlined. The majority of information is assumed to be disseminated through mass media, i.e. newspapers, television or radio broadcasting. In a next step, general behavioural patterns of consumers who are confronted with information on food safety issues will be accurately portrayed. Special emphasis will be put on explaining how both positive and negative information affects the consumer's process of decision making. This matter

will be illustrated by a Bayesian Revision Process. A detailed examination, ranging from the information's origin to the actual purchasing decision will be the basis for further analyses. Since an exclusive focus on information would improperly simplify a manifold and complex context, the approach needs to be completed through additional parameters like the consumer's generally diminishing trust or increasing saturation.

The discrepant impact of negative and positive information on consumer decision making might partly be explained through latter's decreasing trust in certain information. In an attempt to reduce their uncertainty, consumers assign reliability judgements to different types of suppliers. Trust in suppliers can therefore be regarded as a necessary means to reduce uncertainty to acceptable levels and to simplify decisions. The reason for the comparably low impact of positive media coverage is to be seen in the discrepancy between destroying and creating trust. Whilst destroying trust only takes seconds, rebuilding might take years. Above aspects will be complemented through interim findings which result from the European Commission's programme on 'Food Risk Communication and Consumer's Trust in the Food Supply Chain'.

(30) A Model of Primary and Secondary Waves in Investment Cycles

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Schumpeter maintained that oscillations of macroeconomic variables are only the "secondary wave" of business cycles, a reflex of more fundamental "primary waves" at the microeconomic level caused by the innovative activity of entrepreneurs. Uniting Schumpeter's concern for innovation with Keynes' concern for uncertainty and expectations formation, this article focuses on the behaviour of entrepreneurs confronting uncertainty caused by innovation. Entrepreneurs' behaviour is reconstructed by modelling the functioning of their cognitive processes when innovations appear. Recognition of the possibilities opened up by a successful innovation generates a state of optimism in the minds of single entrepreneurs, which eventually propagates to the whole economy triggering an investments upswing. Likewise, unsuccessful innovations can trigger a downswing.

(31) Improving vs. worsening options after decision making: what more often leads us to change our mind?

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Living in constantly altering world we are faced every day with situations when decision made the day before or two hours before should be verified because it turns out that among considered options something has changed. Will people be attached to their choices or after receiving some additional information will they make another decision?

It's shown that there are two main phases in decision making process. At the beginning it's screening phase to reject everything unnecessary and useless. After that a choice is made (Beach, 1993, Levin, Jasper & Forbes, 1998, Montgomery, 1983). It points out an important and dissimilar role of rejections and direct choices in decision making, demonstrated earlier and later in numerous studies (e.g. Levin, Prosansky, Heller & Brunick, 2001, Lewicka, 1997, Yaniv & Schul, 1997). Not only choices vs. rejections can lead to a different decisions. The phenomenon of asymmetry between positive and negative, its different impact especially on judgements and decisions, has been known for a long time, sometimes called as positive-negative asymmetry (Peeters, Czapiński, 1990, Lewicka, Czapiński, Peeters, 1992).

The objective of the study was to show what circumstances most often make people change their decisions after receiving some new information. There were provided two studies, the aim of the first was to find a good restaurant for a group having a workshop (choosing an object), the second one - to seek for a roommate (choosing a person). Participants were instructed to choose vs. reject some options (1 vs. 3 vs. 5). After making a decision and judging all possibilities subjects were told that it turned out that either the best rejected/not chosen option was better than expected or the worst chosen/not rejected option was a little bit worse. And they were asked to make a new decision including taking recently received information into account and once again evaluate each possibility. In other words the question was how easy is to manipulate choices changing the values of alternatives 'on the border' between positive and negative. It was shown that making such a manipulation make people more often change their decisions if the options are comparable (there is no objective order among them), if negative information is received and when decision makers are women who choose among 'comparable' options.

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