



**EADM – European Association for
Decision Making**

**LEEDS UNIVERSITY
BUSINESS SCHOOL**

**Centre for Decision
Research**

PROGRAMME BOOK FOR SPUDM – 16

**The 16th bi-annual conference on Subjective
Probability Utility and Decision Making**

LEEDS, AUGUST 18 - 21, 1997

Organised by:

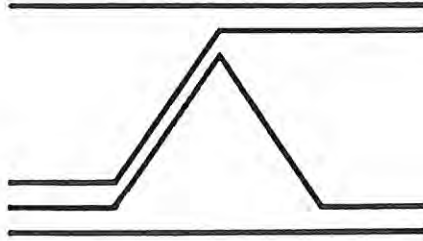
Eric Johnson (University of Pennsylvania, USA)

John Maule (University of Leeds, England)

Rob Ranyard (Bolton Institute, England)

Martin Weber (Universität Mannheim, Germany)





EADM - European Association for Decision Making

PROGRAMME BOOK FOR SPUDM-16

The 16th bi-annual conference on Subjective
Probability Utility and Decision Making.

LEEDS, AUGUST 18-21, 1997

Organised by:

Eric Johnson (University of Pennsylvania, USA)
John Maule (Leeds University Business School, England)
Rob Ranyard (Bolton Institute, England)
Martin Weber (Universitat Mannheim, Germany)

Table of Contents

Programme Schedule

Keynote Speakers

Programme for the Oral Sessions

Chairs for the Oral Sessions

Post Presentations

Programme and Schedules for the Workshops

Workshop Outlines

List of Presenters

Abstracts (for oral, poster and workshop presentations)

Abstracts for the Symposia

PROGRAMME SCHEDULE

Sunday 17th August

- 18.30 Reception at Devonshire Hall sponsored by the University of Leeds
 19.00 - Buffet and music at Devonshire Hall (Bar open all evening)

Monday 18th August

- 08.30 Bus from Devonshire Hall to the University Campus
 09.00 - 09.15 Welcoming address and conference information
 09.15 - 10.15 Keynote Speaker 1: Helmut Jungermann
 10.15 - 10.45 Coffee/Tea
 10.45 - 12.55 Paper Sessions
 10.45 - 11.15 4 parallel sessions
 11.15 - 11.45 4 parallel sessions
 11.55 - 12.25 4 parallel sessions
 12.25 - 12.55 4 parallel sessions
 12.55 - 14.00 Lunch
 14.00 - 15.00 Paper Sessions
 14.00 - 14.30 4 parallel sessions
 14.30 - 15.00 4 parallel sessions
 15.00 - 15.30 Coffee/ Tea
 15.30 - 17.00 Paper Sessions
 15.30 - 16.00 4 parallel sessions
 16.00 - 16.30 4 parallel sessions
 16.30 - 17.00 4 parallel sessions
 17.15 Transportation to Devonshire Hall
 From 17.45 Transportation to Brewery Wharf
 From 21.00 Bar open in Devonshire Hall

Tuesday 19th August

- 08.30 Bus from Devonshire Hall to the University Campus
 09.00 - 10.00 Keynote Speaker: Graham Loomes
 10.00 - 10.30 Coffee/ Tea
 10.30 - 12.30 Workshop Sessions
 12.30 - 13.30 Lunch
 13.30 - 15.00 Paper Sessions
 13.30 - 14.00 3 parallel sessions
 14.00 - 14.30 3 parallel sessions
 14.30 - 15.00 3 parallel sessions
 15.00 - 15.30 Coffee/ Tea
 15.30 - 17.00 Paper Sessions
 15.30 - 16.00 3 parallel sessions
 16.00 - 16.30 3 parallel sessions
 16.30 - 17.00 3 parallel sessions
 17.15 Bus to Devonshire Hall
 18.00 - 20.00 Poster Session, Devonshire Hall + bar
 20.00 - Dinner at Devonshire Hall
 Bar open all evening

Wednesday 20th August

08.30 Bus from Devonshire Hall to the University Campus
09.00 - 10.00 Keynote Speaker: Detlof von Winterfedt
10.00 - 10.30 Coffee/ Tea
10.30 - 12.30 Workshop Sessions
12.30 - 13.30 Lunch
13.30 - 14.30 Keynote Speaker: Dieter Frey
14.45 Excursions to Harewood House/Royal Armouries
18.30 Reception at Civic Centre
Bar open all evening

Thursday 21st August

08.30 Bus from Devonshire Hall to the University Campus
09.00 - 10.00 Keynote Speaker: Oswald Huber
10.00 - 10.30 Coffee/ Tea
10.30 - 12.30 Workshop Sessions
12.30 - 13.30 Lunch
13.30 - 15.00 Paper Sessions
13.30 - 14.00 4 parallel sessions
14.00 - 14.30 4 parallel sessions
14.30 - 15.00 de Finetti Prize Winner Presentation
15.00 - 15.30 Coffee/ Tea
15.30 - 16.30 Keynote Speaker: Robyn Dawes
16.30 - 17.30 Business Meeting
17.30 Bus to Devonshire Hall
18.30 Bus to Saltaire for Conference Dinner
Bar open from 23.00

KEYNOTE SPEAKERS.

Helmut Jungermann

Graham Loomes

Detlof von Winterfeldt

Dieter Frey

Oswald Huber

Robyn Dawes

Addresses of Keynote speakers.

Professor Graham Loomes
Centre for the Analysis of Safety
Policy and Attitudes to Risk,
Department of Economics
University of Newcastle
Newcastle upon Tyne
NE1 7RU

Professor Dr. Dieter Frey
Institute Fur Psychologie
Sozialpsychologie
Ludwig-Maxmillians-Universitat
Munchen Leopoldstr 13
80802 Munchen
Germany.

Professor Detlof von Winterfeldt
University of Southern California
Institute of Safety and Systems Management
Los Angeles
California 90089-002

Professor Dr. Oswald Huber
University of Fribourg
Department of Psychology
Rte de Faucigny 2, CH-1700
Fribourg
Switzerland

Professor Robyn Dawes
Department of Social & Decision Sciences
Carnegie Mellon University
Pittsburgh
Pennsylvania 15213
United States of America.

Professor Helmut Jungermann
Institute fur Psychologie
Technische Universitat Berlin
Dovestr 1-5, D-10587
Berlin.
Germany.

Advice Giving and Taking (AG&T)

**Helmut Jungermann
Institut für Psychologie
Technische Universität Berlin**

August 1997

In a number of areas people increasingly have to make difficult and important personal decisions, and they make these decisions following some kind of consultation. Some examples are medical treatment decisions, genetic testing decisions, and financial investment decisions. In each case, complex facts and values are to be considered. The only approach decision researchers have suggested to deal with such problems is the decision analytic approach. This approach supposedly guides optimally the "joint decision making" of consultant and client. In my lecture, I will argue that the decision analytic approach is not adequate for modelling and/or improving the decision making behavior in this class of situations, and that a different approach is required which takes into account the social context and the different expectations and expertise of consultant and client. I will then propose a descriptive model of the consultant-client-interaction which portrays, first, the consultant as matching options to clients and as advising one single option rather than exploring several options, and portrays secondly, the client as evaluating the quality of the advised option as well as the credibility of the consultant. This conception of an "advice-based choice" suggest a number of interesting theoretical and technical perspectives for descriptive as well as prescriptive decision research.

Graham Loomes
Centre for the Analysis of Safety Policy and Attitudes to Risk
Department of Economics
University of Newcastle.

Title: Private Values and Public Policies

Abstract:

If people do not have values and preferences of the kind usually assumed by decision theorists and welfare economists - namely, highly articulated values and well-behaved preferences which they can readily bring to bear upon decisions of every kind - what are the implications for the theory and practice of incorporating individual preferences into public policy? This question will be asked - but, sadly, will only be partially answered - with particular reference to issues of health and safety.

Detlof von Winterfeldt
School of Urban Planning and Development,
University of Southern California.

Major Public Policy Applications of Decision Analysis in the USA: An Overview and an Example.

This presentation will first give an overview of several applications of decision and risk analysis to major public policy problems in the USA. Subsequently, three recent applications will be described. The first application was to support a major U.S. utility in upgrading a regional transmission system. This study made use of decision trees to assess, among other things, the impacts of alternative routes and line configurations on health impacts from electromagnetic fields. The second application assisted the US. Department of Energy to determine the best technology for cleaning up high-level nuclear wastes, currently stored in tanks at the Hanford site in Washington State. This study used multiattribute utility analysis with an extensive involvement of stakeholders with conflicting values about the treatment of nuclear wastes. The third application helped the Secretary of Energy select a technology for producing tritium in support of the US nuclear weapons stockpile. This study consisted of a probabilistic assessment of the risks of production shortfalls, cost overruns, and environmental impacts.

Groupthink research and its implications for politics and economy.

**Dieter Frey,
University of Munich, Germany.**

Together with his co-workers, the present author made in the last year a series of research on groupthink-phenomena. In this research groups between three and seven subjects discussed complex economic problems and made - after discussion - a tentative group decision. After this the group could choose supporting or non-supporting information.

The following variables were introduced: Homogeneity vs. heterogeneity of groups - Number of minority members in groups - Hierarchical vs. egalitarian group structure - Competition between groups vs. no competition between groups - Groups which define themselves as "experts" vs. groups which define themselves as "laypeople".

In general, our research shows:

1. Homogenous groups are more selective than heterogenous groups.
2. Experts (= groups which define themselves as competent and highly secure) are more selective than laypeople (=groups which define themselves as less competent and secure).
3. The higher the rate of minority members, the lower is the selectivity.
4. Representative of groups are more selective than non-representatives.
5. Hierarchical groups are more selective than egalitarian groups.

This research has direct and indirect consequences on decision-making in politics and economics because a lot of these - important - decisions are group-based decisions. Under specific conditions the bias in information processing in these groups is very high and can lead to very negative outcomes.

The Lottery Paradigm - A Dead End for Psychological Decision Theory?

Oswald Huber

University of Fribourg, Switzerland

This paper questions the prevalence of the lottery paradigm in experimental research on risky decision making. Lotteries differ in several respects from at least some types of non-lottery risky tasks. For example, they ignore the topic of (perceived) control in decision making.

The paper first summarises the main results of some experiments which were designed to find out which kind of information is actively requested by the decision maker in a non-lottery task. In all out tasks (one of them was a real decision), information about the probability of the critical event was demanded only by a minority of subjects. Subjects asked about the possibilities to control the event or the occurrence of the negative consequences, about the availability of new alternatives, and about worst-case plans. Some hypotheses about the decision process, and the role of subjective probability and perceived control in the decision process are discussed.

Mere Predictability Doesn't Matter Like it Should (Without a Good Story Appended to It)*

Robyn M. Dawes¹
Carnegie Mellon University

Abstract

In a recent Pittsburgh address (3/3/97), Jay Gould defined humans as "the primates who tell stories." A more radical definition of humans is as "the primates whose cognitive capacities shut down in the absence of a story." This paper reviews evidence for the more radical definition in the area of understanding and employing probabilistic inference. Since inference is often appreciated if and only if it can be "wrapped up" inside a "causal story." The implication for the standard expected utility model of economic decision making is that people cannot conform ("descriptively") to it, given that probabilities often cannot be incorporated either implicitly or explicitly into predictions or evaluations not involving a good, clearly relevant story. Moreover, that inability severely limits the standard model as one that can be used for prescriptive decision making, in which people consciously attempt to incorporate normative probabilistic principles to make the best—or at least a good--decision.

Programme for the Oral Paper Session.

MONDAY 18 August

Room A

09.15-10.15	"Advice giving and taking "	Helmut Jungermann
-------------	-----------------------------	-------------------

Room A

10.45-11.15	"Reasoning, decision making and argument"	David Hardman and Peter Ayton
11.15-11.45	"How do psychiatrists and judges assess dangerousness of mentally ill persons?"	Fenna H. Poletiek
11.55-12.25	"Decision making by similarity- toward a theory of anomalies"	Jonathan W Leland
12.25-12.55	"Overconcreteness effect in categorizations. Role of value and error utility in categorization decisions"	Maria Lewicka
14.00-14.30	"Examining justice evaluations using Image Theory's compatability test: Effects on judgment and choice"	Stephen W Gilliland, Lehman Benson III and Donald H Schepers
14.30-15.00	"Do changes in decision weights account for effects of prior outcomes on risky decisions?"	Joakim Romanus and Tommy Gärling
15.30-16.00	"Measuring utility when expected utility is violated"	Peter Wakker and Daniel Deneffe
16.00-16.30	"A constructive theory of act-conditional subjective expected-utility"	Zhigang Xie and Simon French
16.30-17.00	"The same but different: An empirical investigation of the axiom of reducibility of compound lotteries"	Ilan Fischer and David V Budescu

Room B

10.45-11.15	"Individual and cultural differences in optimistic time predictions"	Dale Griffin and Roger Buehler
11.15-11.45	"Domain differences in the performance of expert decision makers"	James Shanteau
11.55-12.25	"Parental influences on adolescents' decision making"	Margot Taal
12.25-12.55	"The developmental antecedents of adult decision making biases"	Janis E Jacobs
14.00 -17.00	Symposium: <i>"Models of Satisficing Inference"</i>	
14.00-14.30	"When it pays to be a lazy thinker: A simulation approach"	Jean Czerlinski, Gerd Gigerenzer, Daniel G Goldstein and Laura Martignon.
14.30-15.00	"Death tolls, accident statistics and city populations: Simple mechanisms for quantitative estimation"	Ralph Hertwig, Ulrich Hoffrage and Laura Martignon.
	Symposium (Continued): <i>"Models of Satisficing Inference"</i>	
15.30-16.00	"Cognitive reconstruction in hindsight: Memory as inference"	Ulrich Hoffrage and Ralph Hertwig.
16.00-16.30	"Simplicity versus accuracy in the context of human inference"	Laura Martignon
16.30-17.00	Discussion	Nick Chater

Room C

10.45-11.15	"When the whole differs from the parts and the parts differ from the other parts: Evaluations of risks and benefits of biotechnology"	Anne Brüggermann
11.15-11.45	"Prenatal testing: describing decision making under risk"	Hilary Bekker and Jenny Hewison
11.55-12.25	"Decision-theoretical risk concepts applied to global environmental change"	Gisela Böhm and Hans-Rüdiger Pfister
12.25-12.55	"How projecting the future and using multi-attribute evaluation may affect your preference-ordering of differing long-term policies for metropolitan traffic"	Charles Vlek, Jolieke Mesten and Linda Steg
14.00-17.00	Symposium: "Decision making in action"	
14.00-14.30	"Perceptual anomalies and strategic surprises"	J. Lampel and Z Shapira
14.30-15.00	"Safety Barrier Function Analysis when new systems are implemented in a process industry"	O.Svenson
	Symposium (Continued): "Decision making in action"	
15.30-16.00	"Managing organizational and project risks: The relevance of human factors"	A. Oldfield and Z Shapira
16.00-16.30	"Can managers learn from experience"	D Zakay.
16.30-17.00	Discussion	

Room D

10.45-11.15	"Internal organisation of physicians' knowledge in diagnostic tasks"	Oleg Larichev
11.15-11.45	"What makes sample size tasks difficult?"	Peter Sedlmeier
11.55-12.25	"Seek and ye shall find: A confirmation bias in clinical judgement"	Gershon Ben-Shakhar, Maya Bar-Hillel, Yoram Bilu and Gaby Shefler
12.25-12.55	"We knew it all along-but why? Theoretical explanations of the Hindsight bias"	Dagmar Stahlberg
14.00-14.30	"Framing lens and managerial rims: The sense of making strategic decisions"	Thea Herz
14.30-15.00	"Realism of confidence in sensory discrimination: Theory and data"	Henrik Olsson and Peter Juslin
15.30-16.00	"Disentangling the influence of consequences and context on the omission bias"	Katrin Fischer
16.00-16.30	"Behavioural and procedural consequences of structural variation in value trees"	Mari Pöyhönen, Hans Vrolijk and Raimo P Hämmäläinen
16.30-17.00	"Preferences: Conscious, subconscious, Labile and unformed"	Paul Goodwin and George Wright

Tuesday 19 August

Room A

09.00-10.00	"Private values and public policies"	Graham Loomes
-------------	--------------------------------------	---------------

Room A

13.30-14.00	"Phased narrowing and information monitoring as complementary process tracing techniques"	Irwin P Levin, J D Jasper, Mary E Huneke and Wendy S Forbes
14.00-14.30	"Compensation as a person characteristic: The construction of a measure"	Pieter Willems and Pieter Koele
14.30-15.00	"Process-tracing methods for the study of naturalistic decisions: A study of credit purchase insurance"	Janis Williamson, Lisa Cuthbert and Rob Ranyard
15.30-16.00	"Accountability to representatives of different interest groups: Effects on information search and information evaluation in a multi-attribute decision context"	Stefanie Schmeer
16.00-16.30	"New process tracing technique for studying decision making"	Tadeusz Tyszka, Piotr Matyja and Aldona Glńska
16.30-17.00	"When prior knowledge overrules new evidence: Adaptive use of decision strategies and the role of behavioural routines"	Tilmann Betsch, Julia Brinkmann, Klaus Fielder and Katja Breining

Room B

13.30-14.00	"How to be incoherent and seductive: Bookmakers' odds and support theory"	Peter Ayton
14.00-14.30	"Probability and risk judgements: The role of frequentistic information"	Karl Halvor Teigen, Wibecke Brun and Rune Frydenlund
14.30-15.00	"Learning to be well calibrated in discrete subjective probability judgement: Procedural debiasing to improving judgement under uncertainty"	William R Ferrell, Udo Zira and Michele Walsh
15.30-16.00	"The hard-easy effect in probability judgements: Should we be surprised?"	Alastair McClelland, Ruth Collins and A R Jonckheere
16.00-16.30	Effect of culture and educational tradition on probability estimation	Nigel J W Harvey and Vincent Yeo Soo Bin
16.30-17.00	"Preference reversals between joint and separate evaluations of alternatives"	Christopher K Hsee

Room C

13.30-14.00	"Your money or your health: How the fungibility of health and money affects temporal discount rates"	Gretchen B Chapman
14.00-14.30	"The Linda fallacy: An explanation by the theory of hints"	H.W Brachinger, P.A Monney, A. Vakili
14.30-15.00	"Temporal bracketing: Simultaneous vs sequential Choice"	Daniel Read and George Loewenstein
15.30-16.00	"Reference dependence and frame compatibility in choices between hedonic and functional goods"	Ravi Dhar and Klaus Wertenbroch
16.00-16.30	"Valuing sequences of future gains"	Harry Susianto and Felice G Iskandar
16.30-17.00	"The influence of framing on risky decisions: A meta-analysis"	Anton Kuehberger

WEDNESDAY 20 August

Room A

09.00-10.00	"Major public policy applications of decision analysis in the USA: An overview and example"	Detlof von Winterfeldt
--------------------	--	-------------------------------

Room A

13.30-14.30	"Groupthink research and its implications for politics and economy"	Dieter Frey
--------------------	--	--------------------

Thursday 21 August

Room A

09.00-10.00	"The lottery paradigm - A dead end for psychological decision theory?"	Oswald Huber
-------------	--	--------------

Room A

13.30-14.00	"Information and control: Their effects on performance in a dynamic distributed decision making task"	Mary Omodei and Alexander Wearing
14.00-14.30	"Naturalistic decision making can involve both recognitional and analytical strategies: Rapid decision making on the fire ground revisited"	Jim McLennan

Room B

13.30-14.00	"Affect and risk taking in G.P's: The relationship between mood states, risk taking and workload in UK family doctors"	PJ Clough, GRJ Hockey and AJ Maule
14.00-14.30	"The impact of motivational state on the intensity of disappointment and other negative emotions. Getting what you don't want versus not getting what you want"	Wilco W van Dijk, Joop van der Pligt and Jane Beattie.

Room C

13.30-14.00	"The formation of judgements and the likelihood of settlement: The effect of damage caps on litigation"	Linda Babcock and Greg Pogarsky
14.00-14.30	"Information seeking and prediction: The preference for redundancy"	Jack B Soll

Room D

13.30-14.00	"Closet tightwads: Compulsive inability to spend and the pain of paying"	Ofer Zellermeier, Drazen Prelec and George Loewenstein
14.00-14.30	"Applying Janis and Mann's theory of decision making to the characterisation of people faced with genetic testing"	Bryan T Maquire, Bethan J Henderson, Jennie Potts and Rachel Wright.

Room A

14.30-15.00	de Finetti Prize Winner 1997.	Johanna Kordes-de Vaal
-------------	-------------------------------	------------------------

Room A

15.30-16.30	"Mere predictability doesn't matter like it should (without a good story appended to it)"	Robyn Dawes
-------------	---	-------------

Chairs for the Oral Paper Sessions.

MONDAY 18 August

Room A

09.15-10.15	John Maule
-------------	------------

Room A

10.45-11.15	Jose Kerstholt
11.15-11.45	
11.55-12.25	
12.25-12.55	

14.00-14.30	Peter Ayton
14.30-15.00	

15.30-16.00	Pieter Koele
16.00-16.30	
16.30-17.00	

Room B

10.45-11.15	Terry Connolly
11.15-11.45	
11.55-12.25	
12.25-12.55	

14.00-14.30	Symposium: <i>"Models of Satisficing Inference"</i>
14.30-15.00	

15.30-16.00	Symposium: <i>"Models of Satisficing Inference"</i>
16.00-16.30	
16.30-17.00	

Room C

10.45-11.15	Tadeusz Tyszka
11.15-11.45	
11.55-12.25	
12.25-12.55	

14.00-14.30	Symposium: <i>"Decision making in action"</i>
14.30-15.00	

15.30-16.00	Symposium: <i>"Decision making in action"</i>
16.00-16.30	
16.30-17.00	

Room D

10.45-11.15	Russ Ferrell
11.15-11.45	
11.55-12.25	
12.25-12.55	

14.00-14.30	Raanan Lipshitz
14.30-15.00	

15.30-16.00	Alex Wearing
16.00-16.30	
16.30-17.00	

Tuesday 19 August

Room A

09.00-10.00	Eric Johnson
-------------	--------------

Room A

13.30-14.00	David Schkade
14.00-14.30	
14.30-15.00	

15.30-16.00	Ola Svenson
16.00-16.30	
16.30-17.00	

Room B

13.30-14.00	Maria Lewicka
14.00-14.30	
14.30-15.00	

15.30-16.00	Peter Wakker
16.00-16.30	
16.30-17.00	

Room C

13.30-14.00	Dan Zakay
14.00-14.30	
14.30-15.00	

15.30-16.00	Ralph Hertwig
16.00-16.30	
16.30-17.00	

Wednesday 20 August

Room A

09.00-10.00	Martin Weber
-------------	--------------

Room A

13.30-14.30	Rob Ranyard
-------------	-------------

Thursday 21 August

Room A

09.00-10.00	Martin Weber
-------------	--------------

Room A

13.30-14.00 14.00-14.30	Nigel Harvey
----------------------------	--------------

Room B

13.30-14.00 14.00-14.30	Charles Vlek
----------------------------	--------------

Room C

13.30-14.00 14.00-14.30	Dagmar Stahlberg
----------------------------	------------------

Room D

13.30-14.00 14.00-14.30	Gretchen Chapman
----------------------------	------------------

Room A

14.30-15.00	John Maule
-------------	------------

Room A

15.30-16.30	Eric Johnson
-------------	--------------

POSTER PRESENTATIONS

	1st Author	Title:
Poster 1 :	M. J. Abdolmohammadi	'A framework for analysis of characteristics of audit experts'
Poster 2 :	Christopher J Armitage	'Behavioural decision making: a meta-analytic review of the theory of planned behaviour'
Poster 3 :	Ole Boe	'Integration of outcomes of concurrent decisions'
Poster 4 :	Fergus Bolger	'Two routes to food choice: A model and some data'
Poster 5 :	Marita Broadstock	'The process and outcomes of decision making about gene testing for hereditary breast and ovarian cancer - study in progress'
Poster 6 :	Susan Brodt	'Group memory, systems and their implications for negotiating teams and intergroup negotiation'
Poster 7 :	Wandi Bruine de Bruin	'50/50 = 50%?'
Poster 8 :	Eva Carling	'Timing in dynamic decision making'
Poster 9 :	Grechen Chapman	'Similarity and reluctance to trade'
Poster 10 :	Ruth Collins Presented by Alistair McClland.	'Judgement under uncertainty and aging: Unconfounding item selection and task difficulty'
Poster 11 :	Jonathan Crego	'Critical incident management: engendering experience through simulation'
Poster 12 :	Mandeep K Dhami	'A study of magistrates' bail decision making'
Poster 13 :	Claudia Downing	' Making reproductive decision in the social context of families facing a late onset genetic disorder, Huntington's Disease'
Poster 14 :	Frank A Drews	'Support for Support Theory'
Poster 15 :		
Poster 16 :	August Fenk	'Subjective probability and prognostic performance'
Poster 17 :	Robert Gillholm	'The effect of choice on intention-behavior consistency'
Poster 18 :	Armin Hartinger	'Generalisations of expected-value theory as psychological theories of individual risky choice behaviour'
Poster 19 :	Teci Hill	'Smoking cessation from a decision theoretical perspective'
Poster 20 :	Ulrich Hoffrage	'Improving diagnostic inferences in physicians: Natural frequencies'
Poster 21 :	Ulrich Hoffrage	'Does "judgement policy capturing" really capture policies?'

	1st Author	Title.
Poster 22 :	Anders Johansson	'Attributing attractiveness judgements to other members participating in a group decision: Comparing majority and minority members'
Poster 23 :	Jose Kerstholt	'Eyewitness identification accuracy: A comparison of three line-up presentation modes'
Poster 24 :	Susan S Kirschenbaum	'Pre-decisional information search: Individual differences among experts'
Poster 25 :		
Poster 26 :	Joseph J. Krantz	'Frame normalization technique to improve team decision making processes. A frame normalisation method to reduce technically dispositioned solution biasing on Integrated Product Team decision making in the requirements definition domain'
Poster 27 :	Freerk A. Lootsma	'Preferences in perspective'
Poster 28 :	Gunter Molz	'The "Confirmation Bias" - Does it result from mental accounting?'
Poster 29 :	Andreas Oehler	'Information transparency, investor behaviour and market efficiency'
Poster 30 :	Ayse Onculer	'Strategic rent-seeking: An experimental investigation'
Poster 31:	Jaeshin Park	'Beyond sensitivity analysis: Implementing decisions and the issue of legitimation'
Poster 32 :	P Pauwels	'Choosing and rejecting: an application in the domain of food choice'
Poster 33 :	Mojca V. Pavsic	'An experimental investigation of the comprehensibility of the four modes of decision knowledge representation'
Poster 34 :		
Poster 35 :	Victoria Phillips	'Social influences on individual and comparative judgements'
Poster 36 :		
Poster 37 :	Jorg Rieskamp	'What can we learn from the Mouse Lab?'
Poster 38 :	Georgios Rigas	'Learning by experience in a dynamic decision making environment and intelligence'
Poster 39 :	Renate Schubert	'Risk perception and the gender perspective'

	1st Author	Title.
Poster 40 :		
Poster 41 :	Sanny Shamoun	'The effects of induced attribute conflicts on decision making and on postdecision processes'
Poster 42 :	Robert D. Sorkin	'Specifying upper and lower bounds on group performance'
Poster 43 :	Paul Sparks	'Preference elicitation and food products: What's in a Method?'
Poster 44 :	P.F.M. Stalmeier	'Framing and the difference between risky and riskless values'
Poster 45 :	Linda Steg	'Group discussion changes risk perception and multi-attribute evaluation of transport policy scenarios in the Netherlands (but not necessarily in the positive)'
Poster 46 :	P Terlouw	'Requisite modelling and product development'
Poster 47 :	Michele Tonglet	'The decision to shoplift'
Poster 48 :	Wilco W. van Dijk	'The impact of probability of outcome on disappointment and elation'
Poster 49 :	Carol Varey	'Psychological factors affecting the disutility of pain'
Poster 50 :	Guido Weisßhahn	'Evaluation of decision support systems considering problem specificity and stages of the decision process'
Poster 51 :	Myriam Welkenhuysen	'Risk perception and acceptability of risk in a population tested for CF carriership'
Poster 52 :	Pia Wennerholm	'Simultaneous over-and under-confidence bias in judgement II: Format-dependence in calibration of subjective probability assessment'
Poster 53 :	Ander Winman	'The "Knew-it all-Along" phenomenon: An accuracy-assessment model'
Poster 54 :	Cilia Witteman	'Treatment decision for depressed patients'
Poster 55 :	Abigail Wroe	'A cognitive behavioural approach to decision making in genetic testing'
Poster 56 :	Kimihiko Yamagishi	'Intuitive probability judgment of membership and non-membership'
Poster 57 :	Tomasz Zaleskiwicz	Dimensions of risk perception in money investment.
Poster 58 :	Marcel Zeelenberg	'Anticipated regret and decision making under uncertainty: The role of expected feedback'

Workshop Timetable.

	Tues.19.	Wed.20.	Thurs.21.
<u>Decision Making in Social Contexts.</u>	X	X	
<u>Mental Accounting</u>		X	X
<u>Verbal Probabilities</u>	X		
<u>Cross-Cultural Approaches</u>	X	X	
<u>Naturalistic Decision Making</u>		X	X
<u>Problem Structuring for Decision Analysis</u>	X		X
<u>Risk, Uncertainty and Ambiguity</u>	X	X	
<u>Constructive Preferences</u>	X		X

WORKSHOP PROGRAMMES

"Cross cultural approaches to decision making"

Elke Weber (Ohio State University, USA) and Frank Yates (University of Michigan, USA).

"Verbal probabilities"

K. Teigen (University of Tromso, Norway) and W Brun (University of Bergen, Norway).

"Risk, uncertainty, and ambiguity in decision making"

G Wu (Harvard University, USA) and C Fox (Duke University, USA).

"The psychology and measurement of constructive preferences"

J Payne (Duke University, USA).

"Decision making in social contexts"

David Messick (Northwestern University, USA).

"Mental Accounting"

T Garling (University of Goteborg, Sweden) and R. Ranyard (Bolton Institute, UK).

Naturalistic decision making"

R Flynn (University of Aberdeen, UK) and H Montgomery (Stockholm University, Sweden).

"Problem Structuring for decision analysis"

S French (University of Manchester, UK).

"Individual differences in decision making"

J Shanteau (Kansas University, USA).

CROSS-CULTURAL APPROACHES TO DECISION MAKING

Conveners:

Elke U. Weber

Departments of Psychology and Management and Human Resources
The Ohio State University

J. Frank Yates

Department of Psychology
University of Michigan

Aims and Objectives:

The purpose of this workshop is to bring together researchers in the judgment and decision making community who are interested in cross-cultural approaches. We will discuss the substantive as well as methodological reasons that motivate cross-cultural comparative research, consider the unique challenges engendered by it, and compare notes on ways to creatively address those challenges.

Presentations:

Tuesday, August 19

Peter Smith

"Distinctive challenges facing cross-cultural research in decision making"

Elke Weber & Chris Hsee

"A multi-methods approach to distinguish between levels of explanation
for cross-cultural data"

Frank Yates, Ju-Whei Lee, & Hiromi Shinotsuka

"Summing up: What we have learned about and from cross-cultural variations in probability
judgments"

Chris Hsee & Elke Weber

"Are Americans or Chinese more willing to take risk?"

Wednesday, August 20

Pete Suttmeier

"Culture and high reliability organizations in China"

Donnel Briley

"Culture and compromise: The influence of collectivism on consumer choice"

Nancy Buchan, Eric Johnson, & Rachel Croson

"The cultural boundaries of trust and reciprocity in economic bargaining"

Contributors:

Donnel A. Briley
Graduate School of Business
Stanford University

Nancy R. Buchan
School of Business
University of Wisconsin

Rachel T. A. Croson
The Wharton School
University of Pennsylvania

Christopher K. Hsee
Center for Decision Research, Graduate School of Business
University of Chicago

Eric J. Johnson
The Wharton School
University of Pennsylvania

Ju-Whei Lee
Department of Psychology
Chung Yuan University, Taiwan

Hiromi Shinotsuka
Department of Psychology
Hokkaido University, Japan

Peter Smith
Department of Psychology
University of Sussex

Richard P. Suttmeier
Department of Political Science, University of Oregon

Elke U. Weber
Departments of Psychology and Management and Human Resources
The Ohio State University

J. Frank Yates
Department of Psychology, University of Michigan

Workshop:
Verbal probabilities

Conveners:

Karl H. Teigen, University of Tromsø, and Wibecke Brun, University of Bergen

In daily life, uncertainties, probabilities and frequencies are expressed with words, like "a good chance", "doubtful", and "almost certain". What do they mean? This question can be given several interpretations, some of the most interesting being:

(1) How well do they correspond to numbers? This is the 'traditional' question, giving rise to the traditional answer: not too well. Verbal probability phrases can typically correspond to a wide range of numerical values. Thus this question leads to two main issues: The translation issue and the variability issue.

(2) What else do they mean? If they do not always correspond to numbers they may convey a different message, they may for instance express vagueness, cautiousness, encouragement or discouragement. We may call this the semantic components or perhaps the conversational issue.

(3) How do they direct our thinking? Will reasoning and decision making based on verbal probabilities lead to different conclusions from reasoning based on numbers? Does the choice of verbal phrases make a difference? Does the language influence one's preference for probabilistic thinking? These questions make up the probabilistic reasoning issue.

The contributors to the present workshop will address all the three issues. There will be two sessions, with altogether five presentations:

1. Introduction: "Verbal probabilities: Issues and findings".

Karl H. Teigen, University of Tromsø, and Wibecke Brun, University of Bergen, Norway

2. "Base rate effects on the value of verbal frequency expressions with single and frequent probability events".

P. H. M. P. Roelofsma, Free University Amsterdam, The Netherlands

3. "Verbal interpretation of frequencies and emotional decision making".

Joseph Yassour, Ruppin Institute, Israel.

4. "Linguistic coding of probability and probabilistic thinking of Chinese and English speakers.

Lai-Yin Lau, Bolton Institute, UK

5. "When verbal probabilities reduce the conjunction effect".

Wibecke Brun, University of Bergen, and Karl H. Teigen, University of Tromsø, Norway

Risk, uncertainty, and ambiguity in decision making

Conveners:

G Wu (Harvard University, USA) & C Fox (Duke University, USA).

The workshop will consist of two 120 minute sessions (Tuesday and Wednesday). Each session will begin with 15 minutes of introductory comments and/or tutorial by one of the workshop organizers, followed by three 20 minute presentations by workshop participants (each followed by 5 minutes of Q&A). The sessions will end with 10 minutes of discussant comments and general discussion in any time that may be remaining.

Our schedule is as follows:

Tuesday, August 19--Judgment

Craig Fox (opening comments), Duke University

Rene Lion & R.M. Meertens, Maastricht University, Functional risk perception: the influence of goals of risk perception

Derek Koehler, University of Waterloo, to be announced

Lyle Brenner, University of California-Los Angeles, to be announced

discussant (TBA)

Wednesday (August 20)--Decision Making

George Wu (opening comments), Harvard Business School

Michael Kilka & Martin Weber, Universtat Mannheim, The Impact of Perceived Competence on Probability Estimations

Raanan Lipshitz & Marvin Cohen, University of Haifa, Coping with Uncertainty

Peter Wakker, Leiden University, to be announced

discussant (TBA)

The Psychology and Measurement of Constructive Preferences

Convenor: John Payne, Duke University, USA

The constructive processing perspective, shared by an increasing number of psychologists and other researchers, is that expressed preferences for, and beliefs about, objects of any complexity and novelty are often constructed - not merely revealed - in the generation of a response to a judgment or choice task. The constructiveness of preferences has been attributed to the limited information processing capacity of humans. A key implication of a constructive view of preferences is the severe context dependence of the elicited values. The purpose of this workshop is to present recent research on the constructive nature of preferences and beliefs and to explore the implications of a constructive preferences perspective for the measurement of values.

Contributors:

1) Keith Yardley and John Maule (Leeds University, UK)

“Constructive processes in two stage decision making: The importance of response mode and task complexity”

2) Irwin Levin, J.D. Jasper, Mary E. Huneke, and Wendy S. Forbes (University of Iowa and University of Pennsylvania, USA)

“Phased Narrowing and Information Monitoring as Complementary Process Tracing Techniques”

3) Marcus Selart (Goteborg University, Sweden)

“Aspects of Compatibility and the Construction of Preference”

4) Claire Harries and Nigel Harvey (University of Reading, UK)

“Priming Bias in Probability Judgments”

5) Thomas Langer, Rakesh Sarin, and Martin Weber (University of Mannheim,
Germany, UCLA, USA)

“Peak and End Effects in Evaluating Economic Experiences”

6) Gretchen Chapman and Eric Johnson (Rutgers and University of Pennsylvania, USA)

“Two Predictions from a Confirmatory Search Model of Anchoring”

7) Mary Frances Luce, John W. Payne, and James R. Bettman (University of
Pennsylvania and Duke University, USA)

“Trade-off Difficulty and Decision Strategy Selection”

8) David A. Schkade, John W. Payne, and James R. Bettman (University of Texas and
Duke University, USA)

“The Measurement of Constructed Preferences: Towards a Building Code”

**[note: it is expected that the first five presentations will be on Tuesday; the other
three presentations plus a general discussion time will be on Thursday].**

WORKSHOP ON DECISION MAKING IN SOCIAL CONTEXTS.

**Organiser: David Messick
Kellogg Graduate School of Management
Northwestern University
Evanston. IL 60208**

This workshop will include two relatively self contained sessions on two areas of social decision making of growing importance. The first deals with dynamic and emergent properties of decision processes in social contexts. Dynamic refers to properties that are time-dependent and emergent refers to features that arise from group contexts that cannot be described or accounted for at the individual level. The topics to be discussed include computer simulations as well as experimental studies.

The second topic focuses on some aspects of the nature of motivation in social contexts. Specifically, people have preferences for the outcomes of others, and their judgements can also be influenced by the experience of regret. The second day of the workshop will examine some of the issues involved in this domain of research.

The presenters for the two days are listed in the attached sheet.

Emergent and Dynamic Processes

Susan E. Brodt
Duke University
Fuqua School of Business
Durham NC 27708-0120

Prof. Dr. Wim B.G. Liebrand
RuG Expertise Centrum
Computer Ondersteund Onderwijs
Broerstraat 4
9712 CP Groningen
The Netherlands

Paul Van Geert
Department of Psychology
Faculty of Behavioral and Social Sciences
University of Groningen
9712 TS Groningen
The Netherlands

Dr. Andrzej Nowak
Faculty of Psychology, Inst. Soc. Science
University of Warsaw
UL. Stawki 5/7
PL-00-183 Warsaw
Poland

Social Motivation and Decision Making

Dr. Anders Biel
Goteborg University
Department of Psychology
Haraldsg. 1
S-41314 Goteborg
Sweden

Dr. Paul A.M. Van Lange
Department of Social Psychology
Free University
V.D. Boechorstr. 1
NL-1081 BT Amsterdam
The Netherlands

Dr. Janusz Grzelak
Faculty of Psychology, Inst. Soc. Science
University of Warsaw
Ul. Stawki 5-7
PL-00-183 Warsaw
Poland

Marcel Zeelenberg
Eindhoven University of Technology
Faculty of Technology Management
P.O. Box 513
5600 MB Eindhoven
The Netherlands

Mental Accounting

Conveners:

Tommy Gärling

Göteborg University, Sweden

Rob Ranyard

Bolton Institute, UK

Description

Aims and Objectives. Since its introduction by Thaler (1980, 1985, 1993), the idea of mental accounting has gained momentum in decision-making research. A primary aim of the workshop is to discuss recent progress as well as future prospects. One salient question is whether and how the different ways the concept of mental accounting are currently used will be possible to reconcile. Another salient issue concerns whether or not mental accounting needs to be limited to economic decisions. A recurrent, related issue is how mental accounting relates to information-processing concepts of cognitive psychology.

Summary of Discussion Topics. In the behavioral life-cycle theory proposed by Shefrin and Thaler (1988), an assumption was made with testable implications for the predictions of savings behavior which are at odds with traditional economic theory. The assumption is that people classify assets in three different mental accounts: current income, current assets, and future income. Both the existence of these mental accounts in adults and children, whether they generalize to other assets than money, and the underlying idea that mental accounts function as a self-control technique (Thaler & Shefrin, 1981) will be discussed by the contributors to the first session of the workshop. Building on Thaler's work, Tversky and Kahneman (1981) introduced the idea that mental accounting refers to a process of mentally relating decisions or outcomes of decisions. They proposed the concept as an explanation of paradoxical responses to the "jacket-and-calculator" and the "lost-theater-ticket" problems. On the basis of additional data on these problems presented by contributors in the second workshop session, the explanatory power of the concept of mental accounting will be examined. Other contributors will contrast it to concepts such as scripts borrowed from information-processing psychology.

Shefrin, H. M., & Thaler, R. H. (1988). The behavioral life-cycle hypothesis. *Economic Inquiry*, 26, 609-643.

Thaler, R. H. (1980). Toward a positive theory of consumer choice. *Journal of Economic Behavior and Organization*, 1, 39-60.

Thaler, R. H. (1985). Mental accounting and consumer choice. *Marketing Science*, 4, 199-214.

Thaler, R. H. (1993) *Mental accounting matters*. Paper presented at the 14th international research conference on subjective probability, utility, and decision making (SPUDM 14), Aix-en-Provence, France.

Thaler, R. H. & Shefrin, H. M. (1981). An economic theory of self-control. *Journal of Political Economy*, 89, 392-410.

Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, 211, 453-458.

Contributions

Session 1 (Chair: Rob Ranyard)

Gerrit Antonides and Carla M. Veldscholte, Erasmus University, Amsterdam, The Netherlands: Categorization and mental accounting in energy saving

Paul Webley and Zarrea Plaisier, University of Exeter, UK: Mental accounting in childhood

Niklas Karlsson, Marcus Selart, and Tommy Gärling, Göteborg University, Sweden: Revealing mental accounting as a self-control strategy

Session 2 (Chair: Tommy Gärling)

Phil Moon, Darren Duxbury, and Kevin Keasey, Leeds University Business School, UK: Mental accounting and decision making: The relationship between relative and absolute savings

Nicolao Bonini, University of Cacliari, Italy, and Rino Rumiati, University of Padova, Italy: Categorical links between planned purchases and the acceptance of a price discount

Rob Ranyard, Janis Williamson, and John Charlton, Bolton Institute, UK: Purchase price judgments: The role of mental accounting, transaction utility, and transaction scripts

SPUDM 16, 1997
European Association for Decision Making - Leeds 17/21st August

NATURALISTIC DECISION MAKING WORKSHOPS

Conveners: Rhona Flin & Henry Montgomery

Workshop 1. Wednesday 20th August 10.30 - 12.30 (Room to be confirmed)

Chair Henry Montgomery

10.30 *Introduction. Naturalistic Decision Making : The State of the Art*
Rhona Flin, University of Aberdeen

10.55 *Deciding and Implementing are Two Different Decisions*
Dan Zakay, Tel-Aviv University

11.20 *Perspective Shifts in Troubled Marital Relationships as a Means to Structure a Decision Situation*
Helena Willen, Goteberg University & Henry Montgomery, Stockholm University

11.45 *Dominance Search Theory and the Process of Psychodiagnostic Team Decision Making: Testing a Model in a Naturalistic Setting*
E. De Bruyn, University of Nijmegen, Henry Montgomery, Stockholm University, H. Pijnenburg, University of Nijmegen

12.10 *General Discussion*

Workshop 2. Thursday 21st August 10.30 - 12.30

Chair Rhona Flin

10.30 *Replacing the Experimenter's by the Observer's Stance: Tackling the Dilemma of Rigor vs. Relevance in the Study of Naturalistic Decision Making.*
Raanan Lipshitz, University of Haifa

10.55 *Decision Making Under Risk: When Feed- and Auxiliary Feedwater Fail in a Nuclear Power Plant*
Ola Svenson, Stockholm University and University of Leeds

11.20 *Pre-decisional Information Search: Individual Differences among Experts.*
Susan Kirschenbaum, Naval Undersea Warfare Center, USA,
Wayne Gray & Brian Ehert, George Mason University

11.45 *Decision Making in Simulated Emergencies*
Jan Skriver & Rhona Flin, University of Aberdeen

12.10 *General Discussion*

Professor Simon French, School of Informatics, Coupland 1, University of Manchester
Oxford Road, Manchester M13 9PL, UK

WORKSHOP ON PROBLEM FORMULATION IN MULT-CRITERIA DECISION ANALYSIS

The idea behind the workshop is to look at the problem formulation phase which occurs between the analyst meeting a person with a 'mess' and the time he/she begins to analyse a structured problem with several alternatives scored against several attributes/criteria. Three analysts who generally approach problems using, respectively, standard multi-attribute value theory, AHP and a hybrid method with aspects of both MAVT and AHP, will address the same problem. Since all three methods have at their heart an attribute hierarchy, presumably they have similar routes to get from the mess to the model. It is possible that, given the three schools have very different philosophies of analysis in the later phases, that there are some differences in this early phase of problem formulation. These differences are of interest for at least two reasons:

- (i) they may point to distinctions between the methodologies additional to those that are apparent in the analysis phases; and
- (ii) they offer the chance of learning from each other.

The format of the workshop is as follows. Three decision analysts have kindly agreed to take part and formulate a problem in front of an audience.
They are:

Valerie Belton, University of Strathclyde
Freerk Lootsma, Technical University of Delft
Mari Poyhonen, Helsinki University of Technology.

Each will be introduced to a subject. We will use three postgraduates from Leeds, who have no training or experience in decision analysis. The subjects will have been schooled in a problem 'mess', actually a real one from a couple of years back that we are sanitising and then muddying. We will brief the subjects in this 'mess' without even getting so far as to suggest alternatives or objectives: just the 'issues'. In the first session of the workshop there will be three parallel events in which each decision analyst meets their subject and discusses the issues in order to formulate a decision model. The analysts will be encouraged to push the analysis as far as they can. The three sessions will be observed both by delegates at SPUDM and by two designated observers. These observers will NOT interact at all during the session. They will just watch. At the second two-hour session of the workshop, we will all meet together. Each of analyst will present his or her formulation (about 15 mins each) and indicate how the analysis would progress, what judgements would need to be elicited, what further data would be needed, etc. The observers will each make a 5 min presentation on their thoughts on what they saw. The remaining time will be taken up with general discussion.

Workshop: Individual Differences in Decision Making

Convener: James Shanteau, Kansas State University, USA

This is an interesting topic for three reasons:

- (1) There are persistent and sizable individual differences in most of our studies. We seldom have much to say about them, but these differences suggest there is more going on in our studies ~~than~~ our models can account for. I believe we need to start thinking more about how do build these differences into our models and theories.
- (2) Individual differences have important consequences for the generality of our findings. What does it mean to draw conclusions on mean data when the variance between subjects is large? Have we been deluding ourselves by making statements about "average" subjects?
- (3) Some classes of individual differences are the source of important new areas of research in decision making. Some examples include expert- novice differences, gender differences, cross-cultural differences, and risk aversion vs. risk seeking behavior.

Day One

James Shanteau (Kansas State University, USA):

"Introduction and Background"

Oswald Huber (Universitat Fribourg, Switzerland):

"Who Makes Better Decisions in a Multistage Investment Task: Internals or Externals?"

Judith Orasanu (NASA Ames, USA):

"Alternative Perspectives on Risk: Individual Differences in Problem Structuring"

Robert Sorkin (University of Florida, USA)

"Discussant for Day One Papers"

General Discussion

Day Two

Alex Wearing and Mary Omodei (University of Melbourne, Australia)

"Individual Differences in Dynamic Decision Making Tasks"

Henk Aarts and Ap Dijksterhuis (Eindhoven University and University of Nijmegen, The Netherlands)

"Automaticity in Habitual Travel Mode Decisions"

Irwin Levin (University of Iowa, USA)

"Discussant for Day Two Papers"

James Shanteau (Kansas State University, USA)

"Directions and Future Trends for Research on Individual Differences in Decision Making"

General Discussion

(Note: Because of possible conflicts with other workshops, there may be some changes)

LIST OF PRESENTERS

- Aarts, Henk** (Eindhoven University of Technology) and **A P Dijksterhuis** (University of Nijmegen)
 'Goal directed automaticity in habitual travel mode decisions' **Workshop**
- Abdolmohammadi, M J** (Bentley College), **M A D Gerald Searfoss** (University of Utah) and
James Shanteau (Kansas State University).
 'A framework for analysis of characteristics of audit experts' **Poster**
- Antonides, Gerrit** (Erasmus University) and **Carla M Veldscholte** (Readers Digest, Amsterdam.)
 'Categorization and mental accounting in energy saving' **Workshop**
- Armitage, Christopher J** (University of Leeds) and **Mark Conner** (University of Leeds),
 'Behavioural decision making: a meta-analytic review of the theory of
 planned behaviour'. **Poster**
- Ayton, Peter** (City University, London)
 'How to be incoherent and seductive: Bookmakers' odds and support theory' **Oral**
- Babcock, Linda** (Carnegie Mellon University) and **Greg Pogarsky** (Carnegie Mellon University)
 'The formation of judgements and the likelihood of settlement: The effect of
 damage caps on litigation' **Oral**
- Bekker, Hilary** (University of Leeds) and **Jenny Hewison** (University of Leeds)
 'Pre-natal testing: Describing decision making under risk' **Oral**
- Ben Shakar, Gershon** (Hebrew University), **Maya Bar-Hillel** (Hebrew University), **Yoram Bilu**
 (Hebrew University) and **Gaby Shefler**, (Hebrew University)
 'Seek and ye shall find: A confirmation bias in clinical judgement'. **Oral**
- Betsch, Tilmann** (University of Heidleberg), **Julia Brinkmann** (University of Heidleberg),
Klaus Fiedler (University of Heidleberg) and **Katja Breining** (University of Heidleberg).
 'When prior knowledge overrules new evidence: Adaptive use of decision strategies
 and the role of behavioural routines'. **Oral**
- Boe, Ole** (Goteburg University) and **Tommy Garling** (Goteburg University).
 'Integration of outcomes of concurrent decisions'. **Poster**
- Bohm, Gisela** (Universitat Bremen) and **Hans-Rudiger Pfister** (Technical University of Berlin)
 'Decision-theoretical risk concepts applied to global environmental change'. **Oral**
- Bolger, Fergus** (City University), and **Peter Ayton**, (City University).
 'Two routes to food choice: A model and some data'. **Poster**
- Bonini, Nicolao** (Sa Duchessa, Italy) and **Rino Rumiati**, (Via Venezia, Italy).
 'Categorical links between planned purchases and the acceptance of a price discount'.
Workshop
- Brachinger H.W.** (University of Fribourg (CH))
 'The Linda fallacy: An explanation by the theory of hints'. **Oral**

- Broadstock Marita** (University of Cambridge),
 'The process and outcomes of decision making about gene testing for hereditary breast and ovarian cancer - study in progress'. **Poster**
- Brodtt, Susan** (Duke University)
 'Group memory systems and their implications for negotiating teams and inter group negotiation'. **Poster**
- Bruggemann, Anne** (Technische Universität, Berlin).
 'When the whole differs from the parts and the parts differ from the other parts: Evaluations of risks and benefits of biotechnology' **Oral**
- Bruine de Bruin, Wandt** (Carnegie Mellon University) and Baruch Fischhoff (Carnegie Mellon University)
 '50/50 = 50%?' **Poster**
- Buchan, Nancy R** (University of Wisconsin), Eric J Johnson (The Wharton School, University of Pennsylvania) and Rachel T A Croson, (The Wharton School, University of Pennsylvania)
 'The cultural boundaries of trust and reciprocity in economic bargaining'. **Workshop**
- Carling, Eva** (Uppsala University).
 'Timing in dynamic decision making'. **Poster**
- Chapman, Grechen** (Rutgers University).
 'Your money or your health: How the fungibility of health and money affects temporal discount rates'. **Oral**
- Chapman, Grechen** (Rutgers University).
 'Similarity and reluctance to trade'. **Poster**
- Chapman, Grechen** (Rutgers University) and Eric J Johnson (The Wharton School, University of Pennsylvania)
 'Two Predictions from a confirmatory search model of anchoring'. **Workshop**
- Clough, P J** (University of Hull), G R J Hockey, (University of Hull) and A J Maule, (Leeds University Business School).
 'Affect & risk taking in GPs: The relationship between mood states, risk taking and workload in UK family doctors'. **Oral**
- Collins Ruth** (University College, London) and **Alistair McClelland** (University College London).
 'Judgement under uncertainty and aging: Unconfounding item selection and task difficulty'. **Poster**
- Crego, Jonathan** (Metropolitan Police Service, London) and Tony Spinks (Metropolitan Police Service, London).
 'Critical incident management: Engendering experience through simulation'. **Poster**
- Czerlinski, Jean** (Max Planck Institute), Gerd Gigerenzer (Max Planck Institute), Dan Goldstein (Max Planck Institute) and Laura Martignon (Max Planck Institute)
 'When it pays to be a lazy thinker: A simulation approach' **Symposium**

- Dhami, Mandeep K** (City University, London).
'A study of magistrates' bail decision making' **Poster**
- Dhar, Ravi** (Yale University), and **Klaus Wertenbroch**, (Duke University).
'Reference dependence and frame compatibility in choices between hedonic and functional goods'. **Oral**
- Downing, Claudia** (Centre for Family Research, University of Cambridge),
'Making reproductive decisions in the social context of families facing a late onset genetic disorder, Huntington's Disease'. **Poster**
- Drews, Frank A** (Technische Universität, Berlin).
'Support for Support Theory'. **Poster**
- Fenk, August** (University of Klagenfurt)
'Subjective probability and prognostic performance' **Poster**
- Ferrell, William** (University of Arizona), **Udo Zirn** (University of Stuttgart), **Michele Walsh** (Veterans' Affairs Medical Centre Tucson)
'Learning to be well calibrated in discrete subjective probability judgement: Procedural debiasing to improving judgment under uncertainty'. **Oral**
- Fischer, Katrin** (Technische Universität Berlin),
'Disentangling the influence of consequences and context on the omission bias'. **Oral**
- Fischer, Ilan** (University College London) and **David V Budescu**, (University of Illinois)
'The same but different: An empirical investigation of the axiom of reducibility of compound lotteries'. **Oral**
- Gillholm, Robert** (Göteborg University) and **Tommy Garling** (Göteborg University).
'The effect of choice on intention-behaviour consistency'. **Poster**
- Gilliland, Stephen W** (University of Arizona), **Lehman Benson III** (University of Arizona) and **Donald H Schepers** (University of Arizona).
'Examining justice using Image Theory's compatibility test: Effects on judgement and choice'. **Oral**
- Goodwin, Paul** (University of West of England) and **George Wright**, (University of Leeds).
'Preferences: conscious, subconscious, labile and unformed.' **Oral**
- Griffin, Dale** (University of Sussex) and **Roger Buehler**, (Wilfred Laurier University)
'Individual and cultural differences in optimistic time predictions'. **Oral**
- Hardman, David K** (City University, London) and **Peter Ayton**, (City University, London).
'Reasoning, decision making, and argument'. **Oral**
- Hartinger, Armin** (University of Regensburg)
'Generalisations of expected-value theory as psychological theories of individual risky choice behaviour'. **Poster**

- Harvey, Nigel J W** (University College, London) and **Vincent Yeo Soo Bin**, (University College, London).
'Effect of culture and educational tradition on probability estimation'. **Oral**
- Hertwig, Ralph** (Max Planck Institute) **Ulrich Hoffrage** (Max Planck Institute) and **Laura Martignon** (Max Planck Institute)
'Models of satisficing inference' **Symposium**
- Hertwig, Ralph** (Max Planck Institute) **Ulrich Hoffrage** (Max Planck Institute) and **Laura Martignon** (Max Planck Institute)
'Death tolls, accident statistics and city populations: Simple mechanisms for quantitative estimation' **Symposium**
- Herz, Thea** (Universite Rene Descartes, Paris).
'Framing lens and managerial risks: The sense of making strategic decisions'. **Oral**
- Hill, Teci** (University of Stockholm) and **Ola Svenson**, (University of Stockholm)
'Smoking cessation from a decision theoretical perspective'. **Poster**
- Hoffrage, Ulrich** (Max Planck Institute), and **Gerd Gigerenzer** (Max Planck Institute)
'Improving diagnostic inferences in physicians: Natural frequencies'. **Poster**
- Hoffrage, Ulrich** (Max Planck Institute) and **Ralph Hertwig** (Max Planck Institute)
'Cognitive reconstruction in hindsight: Memory as inference' **Symposium**
- Hoffrage, Ulrich** (Max Planck Institute), **Laura Martignon** and **Ralph Hertwig** (Max Planck Institute)
'Does "judgement policy capturing" really capture policies?'. **Poster**
- Hsee, Christopher K** (University of Chicago)
'Preference reversals between joint and separate evaluations of alternatives' **Oral**
- Jacobs, Janis E.** (Pennsylvania State University, USA)
'The developmental antecedents of adult decision making biases' **Oral**
- Johansson, Anders** (Stockholm University) and **Ola Svenson** (Stockholm University)
'Attributing attractiveness judgements to other members participating in a group decision: Comparing majority and minority members' **Poster**
- Karlsson, Niklas** (Goteburg University), **Marcus Selart** (Goteburg University) and **Tommy Garling** (Goteburg University)
'Revealing mental accounting as a self-control strategy" **Workshop**
- Kerstholt, Jose** (TNO Human Factors Research Institute),
'Eyewitness identification accuracy: A comparison of three line-up presentation modes" **Poster**
- Kilka, Michael** (Universitat Mannheim) and **Martin Weber** (Universitat Mannheim)
'The impact of perceived competence on probability estimations **Workshop**
- Kirschenbaum, Susan S** (Naval Undersea Warfare Centre Division) and **Wayne D. Gray** (George Mason University) and **Brian D. Ehret**, (George Mason University).
'Pre-decisional information search: Individual differences among experts" **Poster**

- Kordes de Vaal, Johanna** (Vrije University)
 'When does the omission bias occur? An information processing explanation' **Oral**
- Krantz, Joseph J** (Analysis and Technology, Inc. USA) and **Denis M. Coffey**, (Analysis and Technology Inc., USA)
 'Frame normalization technique to improve team decision making processes. A frame normalisation method to reduce technically dispositioned solution biasing on Integrated Product Team decision making in the requirements definition domain' **Poster**
- Kuehberger, Anton** (University of Salzburg),
 'The influence of framing on risky decisions: A meta-analysis.' **Oral**
- Lampel, J** (University of St Andrews)
 'Perceptual anomalies and strategic surprises' **Symposium**
- Langer, Thomas** (Universitat Mannheim), **Rakesh Sarin** (Universitat Mannheim) and **Martin Weber** (Universitat Mannheim)
 'Peak and end effects in evaluating economic experiences' **Workshop**
- Larichev, Oleg** (Institute for Systems Analysis, Moscow.)
 "Internal organisation of physicians knowledge in diagnostic tasks." **Oral**
- Lau, Lai-Yin** (Bolton Institute),
 'Chinese and English speakers' modes of probabilistic thinking and levels of risk taking in gambling.' **Workshop**
- Lau, Lai-Yin** (Bolton Institute),
 'Linguistic coding of probability and probabilistic thinking of Chinese and English speakers.' **Workshop**
- Leland, Jonathan W** (National Science Foundation, Arlington, Virginia),
 "Decision making by similarity - Toward a theory of anomalies." **Oral**
- Levin, Irwin P.** (University of Iowa), **J.D. Jasper**, (University of Pennsylvania), **Mary Huneke** (University of Iowa) and **Wendy S Forbes** (University of Iowa)
 'Phased narrowing and information monitoring as complementary process tracing techniques.' **Oral**
- Lewicka, Maria** (University of Warsaw, Poland)
 "Overconcreteness effect in categorizations. Role of value and error utility in categorization decisions." **Oral**
- Lion, R.** (Maastricht University) and **R.M. Meertens**, (Maastricht University)
 'Functional risk perception: The influence of goals on risk perception.' **Workshop**
- Lipshitz, Raanan** (University of Haifa) and **Orna Strauss**, (University of Haifa)
 'Coping with uncertainty: A naturalistic decision-making analysis.' **Workshop**
- Lipshitz, Raanan** (University of Haifa)
 'Replacing the experimenter's by the observer's stance: Tackling the dilemma of rigor vs. relevance in the study of naturalistic decision making' **Workshop**

- Lootsma, Freerk A.** (Delft University of Technology)
 'Preferences in perspective'" **Poster**
- Luce, Mary Frances** (University of Pennsylvania), **John W. Payne** (Duke University)
 and **James R. Bettman**, (Duke University)
 'Trade-off difficulty and decision strategy selection.'" **Workshop**
- Maguire, Bryan T** (University of Wales), **Bethan J. Henderson** (University of Wales),
Jennie Potts (University of Wales) and **Rachel Wright** (University of Wales).
 'Applying Janis and Mann's theory of decision making to the characterisation
 of people faced with genetic testing" **Oral**
- Martignon, Laura** (Max Planck Institute)
 'Simplicity versus accuracy in the context of human inference' **Symposium**
- McClelland, Alastair** (University College, London) **Ruth Collins** (University College, London)
 and **A.R. Jonkheere** (University College, London)
 'The hard-easy effect in probability judgements: Should we be surprised?" **Oral**
- McLennan, Jim** (Swinburne University of Technology),
 'Naturalistic decision making can involve both recognitional and analytical strategies:
 "Rapid decision making on the fire ground" revisited' **Oral**
- Molz, Gunter** (Justus-Leibig-University, Giessen),
 'The "confirmation bias" - Does it result from mental accounting?' **Poster**
- Moon, Phil** (Leeds University Business School), **Darren Duxbury** (Leeds University
 Business School) and **Kevin Keasey** (Leeds University Business School)
 'Mental accounting and decision making: The relationship between relative
 and absolute savings" **Workshop**
- Oehler, Andreas** (Universitat Bamberg) and **Matthias Unser** (Universitat Bamberg).
 'Information transparency, investor behaviour and market efficiency' **Poster**
- Oldfield, Agi** (Kingston University)
 'Managing organizational and project risks: The relevance of human factors' **Symposium**
- Olsson, Henrik** (Uppsala University) and **Peter Juslin** (Uppsala University)
 'Realism of confidence in sensory discrimination: Theory and data' **Oral**
- Omodei, Mary** (La Trobe University) and **Alexander J. Wearing** (University of Melbourne),
 'Information and control: Their effects on performance in a dynamic distributed
 decision making task' **Oral**
- Onculer, Ayse** (University of Pennsylvania)
 'Strategic rent-seeking: An experimental investigation' **Poster**
- Park, Jaeshin** (University of Cambridge) and **David R. Probert** (University of Cambridge).
 'Beyond sensitivity analysis: Implementing decisions and the issue of legitimation" **Poster**

- Pauwels, P** (Institute for Food Research, Reading), Paul Sparks (Institute for Food Research, Reading) and E Fung (Institute for Food Research, Reading).
'Choosing and rejecting: An application in the domain of food choice' **Poster**
- Pavsic, Mojca V** (University of Ljubljana), Janek Musek (University of Ljubljana) and Vladislav Rajkovic, (University of Maribor).
'An experimental investigation of the comprehensibility of the four modes of decision knowledge representation' **Poster**
- Phillips, Victoria** (University of Iowa) and Irwin P Levin, (The University of Iowa).
'Social influences on individual and comparative judgements'. **Poster**
- Poletiek, Fenna H** (Netherlands Institute of Mental Health and Addiction)
'How do psychiatrists and judges assess dangerousness of mentally ill persons?'. **Oral**
- Poyhonen, Mari** (Helsinki University of Technology), Hans Vrolijk (Helsinki University of Technology) and Raimo P Hamalainen (Helsinki University of Technology)
'Behavioural and procedural consequences of structural variation in value trees'. **Oral**
- Read, Daniel** (University of Leeds) and George Loewenstein, (Carnegie Mellon University.)
'Temporal bracketing: Simultaneous vs sequential choice'. **Oral**
- Rieskamp, Jorg** (Technical University, Berlin) and Ulrich Hoffage. (Max Plank Institute)
'What can we learn from the Mouse Lab?'. **Poster**
- Rigas, Georgios** (Uppsala University.)
'Learning by experience in a dynamic decision making environment and intelligence'. **Poster**
- Roelofsma, P** (Free University Amsterdam)
'Base rate effects on the value of verbal frequency expressions with single and frequent probability events' **Workshop**
- Romanus, Joakim** (Goteburg University) and Tommy Garling, (Goteburg University).
Do changes in decision weights account for effects of prior outcomes on risky decisions? **Oral**
- Schkade, David** (University of Texas)
'On measuring constructed preferences'. **Workshop**
- Schmeer, Stefanie** (University of Hertfordshire)
'Accountability to representatives of different interest groups: Effects on information search and information evaluation in a multi-attribute decision context'. **Oral**
- Schubert, Renate** (Swiss Federal Institute of Technology) and Hans Brachinger (University of Fribourg)
'Risk perception and the gender perspective' **Poster**
- Sedlmeier, Peter** (University of Paderborn)
'What makes sample size tasks difficult?' **Oral**
- Selart, Marcus** (Goteborg University)
'Aspects of Compatibility and the Construction of Preference' **Workshop**

- Shamoun, Sanny** (Stockholm University) and **Ola Svenson** (University of Stockholm)
 'The effects of induced attribute conflicts on decision making and on postdecision processes' **Poster**
- Shanteau, James** (Kansas State University)
 'Domain differences in the performance of expert decision makers' **Oral**
- Soll, Jack B** (INSEAD)
 'Information seeking and prediction: The preference for redundancy' **Oral**
- Sorkin, Robert D** (University of Florida)
 'Specifying upper and lower bounds on group performance' **Poster**
- Sparks, Paul** (Institute of Food Research, Reading) and **R Shepherd** (Institute of Food Research, Reading)
 'Preference elicitation and food products: What's in a method?' **Poster**
- Stahlberg, Dagmar** (University of Mannheim)
 'We knew it all along - but why? Theoretical explanations of the hindsight bias' **Oral**
- Stalmeier, P F M** (University of Nijmegen) and **Th G G Bezembinder** (University of Nijmegen)
 'Framing and the difference between risky and riskless values' **Poster**
- Steg, Linda** (University of Groningen) and **Charles Vlek**, (University of Groningen)
 'Group discussion changes risk perception and multi-attribute evaluation of transport policy scenarios in the Netherlands (but not necessarily in the positive)' **Poster**
- Susianto, Harry** (Erasmus University) and **Felice G. Iskandar** (University of Indonesia)
 'Valuing sequences of future gains' **Oral**
- Svenson, Ola** (University of Stockholm)
 'Safety barrier function analysis when new systems are implemented in a process industry' **Symposium**
- Taal, Margot** (University of Amsterdam)
 'Parental influences on adolescents' decision making' **Oral**
- Teigen, Karl Halvor** (University of Tromso), **Wibecke Brun** (University of Bergen) and **Rune Frydenlund** (University of Tromso)
 'Probability and risk judgements: The role of frequentistic information' **Oral**
- Terlouw, P** (University of Groningen), **P.C. Muller** (University of Groningen) and **J.M.L. van Engelen**, (University of Groningen)
 'Requisite modelling and product development' **Poster**
- Tonglet, Michele** (Nene College of Higher Education)
 'The decision to shoplift' **Poster**
- Tyszka, Tadeusz** (Polish Academy of Science) and **Piotr Matyja**, (Polish Academy of Science) and **Aldona Glinska** (Copernicus University)
 'New process tracing technique for studying decision making' **Oral**

- van Dijk, Wilco W** (University of Amsterdam), **Joop van der Pligt**, (University of Amsterdam) and **Jane Beattie** (University of Sussex)
'The impact of motivational state on the intensity of disappointment and other negative emotions. Getting what you don't want versus getting what you want' **Oral**
- van Dijk, Wilco W** (University of Amsterdam) and **Joop van der Pligt** (University of Amsterdam)
'The impact of probability of outcome on disappointment and elation' **Poster**
- Varey, Carol** (University of Sussex)
'Psychological factors affecting the disutility of pain' **Poster**
- Vlek, Charles** (University of Groningen), **Jolieke Mesken** (University of Groningen) and **Linda Steg** (University of Groningen)
'How projecting the future and using multi-attribute evaluation may affect your preference-ordering of differing long-term policies for metropolitan traffic' **Oral**
- Wakker, Peter** (Leiden University) and **Daniel Deneffe** (A D Little International, Brussels)
'Measuring utility when expected utility is violated' **Oral**
- Webley, P** (University of Exeter)
'Mental accounting in childhood.' **Workshop**
- Weisßhahn, Guido** (Technische Universität Dresden), **Torsten Rönsch** (Technische Universität Dresden) and **Pierre Sachse** (Technische Universität Dresden),
'Evaluation of decision support systems considering problem specificity and stages of the decision process' **Poster**
- Welkenhuysen, Myriam** (University Hospital Leuven), **Lieve Danayer** (University Hospital Leuven) and **Gerry Evers-Kiebooms** (University Hospital Leuven)
'Risk perception and acceptability of risk in a population tested for CF carriership' **Poster**
- Wennerholm, Pia** (Uppsala University), **Peter Juslin** (Uppsala University) and **Henrik Olsson** (Uppsala University)
'Simultaneous over- and under-confidence bias in judgement II: Format-dependence in calibration of subjective probability assessment' **Poster**
- Willems, Pieter** (University of Amsterdam) and **Pieter Koele**, (University of Amsterdam)
'Compensation as a person characteristic: The construction of a measure' **Oral**
- Williamson, Janis** (Bolton Institute), **Lisa Cuthbert** (Bolton Institute) and **Rob Ranyard** (Bolton Institute)
'Process-tracing methods for the study of naturalistic decisions: A study of credit purchase decisions' **Oral**
- Winman, Anders** (Uppsala University), **Peter Juslin** (Uppsala University) and **Mats Bjorkman** (Uppsala University)
'The "knew-it-all-along" phenomenon: An accuracy-assessment model' **Poster**
- Witteman, Cilia** (Utrecht University), **Harald Kunst** (Utrecht University) and **Pieter Koele**, (University of Amsterdam)
'Treatment decisions for depressed patients' **Poster**

Wroe, Abigail (University of Oxford) and Paul Salkovskis (University of Oxford) 'A cognitive behavioural approach to decision making in genetic testing'	Poster
Xie, Zhigang (Shanghai University of Finance and Economics) and Simon French , (University of Manchester) 'A constructive theory of act-conditional subjective expected utility'	Oral
Yamagishi, Kimihiko (Shukutoku University) 'Intuitive probability judgements of membership and non-membership'	Poster
Zakay, Dan (Tel-Aviv University) 'Can managers learn from experience?'	Symposium
Zaleskeiwicz, Tomasz (Technical University of Wroclaw) 'Dimensions of risk perception in money investment'	Poster.
Zeelenberg, Marcel (Eindhoven University of Technology) and Jane Beattie (University of Sussex) 'On the role of regret in ultimatum game'	Workshop
Zeelenberg, Marcel (Eindhoven University of Technology) 'Anticipated regret and decision making under uncertainty: The role of expected feedback'	Poster
Zellermayer, Ofer (Carnegie Mellon University) Drazen Prelec (MIT) and George Loewenstein (Carnegie Mellon University) 'Closet tightwads: Compulsive inability to spend and the pain of paying'	Oral

Abstracts

In the following pages you can find all the abstracts of papers that will be presented in SPUDM-16, including abstracts for orally presented papers, symposia and posters. In addition, there are abstracts for those workshop presentations that were originally submitted to the organizing committee. There are, no abstracts for the majority of workshop presentations, since the programmes were arranged by workshop convenors. The abstracts are presented in alphabetical order, according to the last name of the first author. If you wish to find out how a given abstract will be presented, we refer you to the List of Presenters, which is also organised in alphabetical order, according to the last name of the first author. Usually, a paper will be presented by its first author.

If you wish to find out when and where an oral presentation will be given, we refer you to the timetable.

Title:
Goal-directed automaticity in habitual travel mode decisions

Henk Aarts
**(Department of Psychology and Language, Eindhoven University of
Technology, The Netherlands)**

Ap Dijksterhuis
**(Department of Social Psychology, University of Nijmegen, The
Netherlands)**

ABSTRACT

The present research investigated goal-directed automaticity in habitual behavior. Expanding on the idea that habits are mentally represented, it was proposed that, when behavior is frequently performed in similar situations and becomes a habit, instigation of the very goal to act automatically activates the behavioral response. Specifically, we tested that, when travel behavior is habitual, travel destinations become automatically associated with the habitually chosen travel mode option.

Participants were presented very briefly with travel destinations (e.g., university) and subsequently asked to indicate as quickly as possible whether a second presented transport mode (bicycle) would be an option to use for the presented travel location. Response latencies served as the main dependent variable. In total, the results suggest that 1) the automaticity in habits is conditional on the presence of an active goal (goal-dependent automaticity, Bargh, 1989), and 2) the formation of implementation intentions (that is, the creation of a strong mental link between situations and behavior) may simulate the goal-directed automaticity in habitual behaviors.

A Framework for Analysis of Characteristics of Audit Experts

Mohammad J. Abdolmohammadi, Bentley College, Waltham, MA, 02154-4705

D. Gerald Searfoss, University of Utah, Salt lake City, Utah 84112

James Shanteau, Kansas State University, Bluemont Hall, Manhattan, KS
66506-7095

Expertise enhances the efficiency and effectiveness of audit judgments and is highly valued in accounting firms whose primary objective is to render professional judgment. The initial objectives of this study were to: (a) identify the characteristics that describe an expert industry audit specialist, and (b) classify the identified characteristics by their membership in five broad categories of a proposed framework: "Knowledge Component," "Psychological Traits," "Cognitive Abilities," "Decision Strategies," and "Task Analysis."

One hundred and fourteen expert audit specialists from an accounting firm participated in the study and generated a list of 90 characteristics of effective experts. Based on the analysis of the data, a sixth characteristic category, "Interpersonal Skills," was identified and added to the five categories in (b) above. The participants also assessed the importance of 25 pre-defined characteristics and classified them by their membership in the five categories. The results indicate that in contrast with much of the findings in prior studies which focused on knowledge and experience as determinants of expertise, other attributes are also important to be an effective expert. In fact, many psychological, cognitive, interpersonal skills and decision strategic attributes were identified as characteristics of expert auditors. The implication is that although deep knowledge is a necessary component of expertise, it is not sufficient to assure effective communication and application of the expertise.

Categorization and Mental Accounting in Energy Saving

Gerrit Antonides
Erasmus University, Rotterdam, The Netherlands

Carla M. Veldscholte
Reader's Digest, Amsterdam, The Netherlands

Abstract

Mental accounting has been studied earlier in experimental research. Usually, behavioral events have been described and presented to subjects. Consequently, subjects may engage in hedonic editing of the descriptions, i.e. they may categorize the events such as to maximize the total value of the outcomes. However, in survey research, respondents usually report about their own behavior, the structure of which has already been determined. Here, the behavior probably has been categorized on the basis of cognitive associations, regardless of the outcomes. Thus, people may engage in hedonic behavior.

Here, mental accounting theory has been applied in a survey on energy saving behavior including 200 Dutch consumers. Both the categorization of energy behaviors and the mental accounting hypotheses were investigated. The categorization of behavior was studied by means of a sorting task involving 24 behaviors, 16 of which were related to energy consumption. The respondents were asked to place similar behaviors in the same category and dissimilar behaviors in different categories. A psychometric scaling program managed to represent the categorizations in the sample by a three-dimensional perceptual space.

Furthermore, for each of the 16 energy behaviors, it was asked to what extent it was deemed possible to save an extra 10 percent on the energy consumption associated with this behavior. Response categories were (1) impossible, (2) great difficulty, (3) moderate difficulty, (4) almost no difficulty, and (5) not difficult at all. For 12 of these behaviors, the perceived energy efficiency of behavior was assessed with response categories (1) not efficient at all, (2) little efficient, (3) rather efficient, (4) very efficient, and (5) maximally efficient. These variables were considered as behavioral cost variables.

The following mental accounting hypotheses were stated.

H1: The variation of behavioral costs within categories is smaller than its variation between categories.

H2: The ratio of within category variation to between category variation is smaller for small categorizers than for broad categorizers.

For each of the cost variables, the within-group variation was smaller than the between-group variation in about 2/3 of the cases. This result corroborated H1, indicating specialization of energy behavior, thus supporting mental accounting. The second hypothesis was rejected, although for the energy efficiency measure, the result was almost significant, statistically.

On the basis of the results, a two-step policy procedure might be proposed, in which the first step involves reduction of energy in relatively efficient categories. The first step should be relatively easy and may induce a greater overall awareness of one's energy behavior and concern with the energy problem. The second step could be the promotion of a specific energy efficient behavior in a different category. This may be more difficult but, if successful, step one could be repeated, and so on. The second step may be considered a foot-in-the-door technique of promoting energy saving.

Behavioural decision making: a meta-analytic review of the theory of planned behaviour

Christopher J. Armitage and Mark Conner,
Department of Psychology,
University of Leeds,
Leeds, LS2 9JT.

A number of psychological models of behavioural decision making have been developed and derived from subjective expected utility theory (SEU; Fishbein & Ajzen, 1975). Whereas decision theorists have tended to focus directly on probabilities and values associated with outcomes, social psychologists have tended to regard attitudes as summaries of the underlying SEU-based process.

The study of attitudes has a long history in social psychology (e.g., LaPiere, 1934) and a major focus of research interest has been the prediction of behaviour from attitudes (see Eagly & Chaiken, 1993). However, in the face of pessimistic reviews of the link between attitudes and behaviour (e.g., Wicker, 1969), more complex models were suggested, which incorporated additional determinants of behavioural decision making (e.g., perceptions of social pressure). From this literature, the theory of planned behaviour (TPB; Ajzen, 1988; 1991) has been developed and applied to a variety of behavioural decision making contexts (for a review, see Conner & Sparks, 1996).

Briefly, the TPB allows prediction of behaviour from intentions and perceptions of control (to the extent that they are accurate or increase self-efficacy). In turn, intentions are determined by attitudes (positive/negative evaluations, based on SEU), subjective norms (perceptions of social pressure), and perceived behavioural control (PBC). These direct antecedents of intention derive from underlying beliefs: behavioural, normative and control beliefs, respectively. Behavioural beliefs are derived directly from SEU: the likelihood of an outcome occurring, weighted by one's evaluation of that outcome. Normative beliefs underlie subjective norms and represent one's perceived social pressure from individual referents, multiplied by one's motivation to comply with those referents. Control beliefs are the frequency of occurrence of inhibiting and facilitating factors, multiplied by their perceived power to influence behaviour.

This presentation reviews and combines 85 studies in a meta-analysis of the TPB, a model which has been applied to areas as diverse as live kidney donation, traffic violations and food choice. The aim is to assess the efficacy of the TPB through moderator analyses and to gauge the impact of proposed additions to the theory.

Overall, the data indicate the success of the model as applied to diverse fields. On average, it accounts for 25% of the variance in behaviour, and 40% of the variance in intentions. A series of moderator analyses shed further light on the efficacy of the TPB, particularly in the domain of health behaviour, where the TPB has most often been applied.

The meta-analysis also highlights several areas worthy of future study. The weak predictive power of subjective norm and the possible addition of moral norms highlight the need for extension of the normative component. The role of PBC has received inadequate attention, particularly in relation to its multi-dimensional nature and its determinants. Additions to the TPB are also suggested, in particular: previous behaviour, self-identity and moral norms.

HOW TO BE INCOHERENT AND SEDUCTIVE: BOOKMAKERS' ODDS AND SUPPORT THEORY

Peter Ayton

Department of Psychology
The City University
LONDON, U.K.

Support theory (Tversky and Koehler, 1994) suggests that different descriptions of the same event can lead to different evoked subjective probabilities. According to the theory more explicit descriptions of events lead to stronger evidence being retrieved which will prompt a higher subjective likelihood. In this paper bookmakers' odds are examined in relation to this hypothesis. For football matches, British bookmakers quote odds so that one can bet, generally, on victory, draw or loss for each team; more specifically, one can also bet on different components of the general hypotheses such as the actual score of the game. Consistent with support theory I find that bookmakers' odds for general hypotheses are sub-additive; they have a smaller value than the sum of the odds given to the explicitly unpacked, but extensionally equivalent, disjunction. The extent of the sub-additivity increases for disjunctions unpacked into a larger number of components. However, although support theory implies that probabilities for explicitly presented disjunctions of events should be additive, I find that the sum of the odds given to race horses exceeds unity and increases with the number of horses in the race. The implications of these findings are considered in relation to other evidence for non-additivity.

The Formation of Judgments and the Likelihood of Settlement: The Effect of Damage Caps on Litigation

Linda Babcock and Greg Pogarsky
Heinz School
Carnegie Mellon University
Pittsburgh, PA 15213
USA
LB2K@andrew.cmu.edu

A major issue in the current debate over litigation reform is whether to limit the amount of damages plaintiffs can receive. In some jurisdictions in the United States, "damage caps" have been placed on payments for pain and suffering, punitive damages, and recovery of medical expenses. This paper presents experimental evidence on the impact of these caps on the judgments and negotiating behavior of subjects assigned to be litigants in a pre-trial negotiation.

We explore two psychologically based theories of information processing and judgment formation in an attempt to gain a deeper understanding of the impact of this important institutional change. This first stems from previous research (Babcock, Loewenstein, Issacharoff, and Camerer, 1993, 1995, 1996) on self-serving judgments. If subjects form self-serving judgments, the cap will be more binding on the plaintiffs' judgments than on defendants' judgments. As a result, the difference between plaintiffs' and defendants' judgments will be smaller under a damage cap regime. This increases the likelihood that an out-of-court agreement can be reached. We conduct a bargaining experiment with two conditions: one with no cap and one where trial awards are capped. We find that the difference between plaintiffs' and defendants' expectations is lower and the settlement rate is higher in the capped condition.

The second theory explores whether subjects view the damage cap in relative or absolute terms, building on the work of Messick and Sentis (1979). If subjects view the cap in absolute terms, when subjects assess damages to be greater than the cap amount, damages will be truncated at the cap value. We should therefore see a distribution of subjects' beliefs about the trial outcome that is "spiked" at the cap amount. However, if subjects view the cap in relative terms, assessed damages will be re-calibrated relative to the cap amount. In other words, if the cap represents the amount awarded to plaintiffs with the worst possible injuries or damages, then the judgment for this case should be "re-calibrated" relative to the value of other possible cases. We elicited subjects predictions of the trial outcome in our experiment. We find that the distribution of plaintiffs' predictions is spiked at the damage cap amount, but that the defendants' predictions are not, but are re-calibrated relative to the cap value. This is consistent with self-serving processing of information since it leads to lower predictions by defendants and higher predictions by plaintiffs.

Abstract for the SPUDM 16 conference - August 1997

Title: Prenatal testing: describing decision making under risk

Authors: Hilary Bekker and Jenny Hewison

Presentation: *oral/ workshop/ symposium*

Introduction:

The risk of miscarriage following a diagnostic test in pregnancy (amniocentesis and chorionic villus sampling) is between 0.5% and 2%; a screen positive risk for Down's syndrome is between 0.4% and 20%. Upon receipt of a screen positive, women are encouraged to make informed decisions about whether or not to have a diagnostic test. An informed choice includes an awareness of all the alternatives available, the pros and cons and consequences of each alternative, and the utility associated with the consequences *i.e.* based on a rational model of decision making. The aim of this paper is to describe the processes and strategies women employ when faced with this decision.

Procedure:

All women screening positive for Down's syndrome at a teaching-hospital in Leeds are invited to attend an information giving consultation with a midwife. Over a six month period, 44 women (94%) agreed to have this consultation audio-tape recorded. The recordings were transcribed and coded using quantitative content analysis.

Results:

Following the consultation, 9 women decided to have no further testing and 34 decided to have a diagnostic test. The main themes generated following content analysis were: affect; conflict in decision making; reference to and perception of risk; reasoning about the test/ no test alternatives; and, reference to Down's. On comparing the pattern of responses between those choosing to have/ not have a diagnostic test differences were found in the expression of affect, decisional conflict, and perception of risk. Additionally, the processing of reasons employed by the 'no testers' were more systematic than the 'testers'. However, on evaluating the attributes of the two diagnostic tests, the 'testers' employed more systematic reasoning than the 'no testers'.

Discussion:

Few women systematically evaluated all attributes of the alternatives available suggesting: either women should be encouraged to adopt a more rational approach to their decision making or another model of decision making (e.g. reason-based choice, conflict theory, etc.) be used to interpret the data in order to inform subsequent consultations and facilitate informed decision making.

Seek and ye shall find: A confirmation bias in clinical judgment

Gershon Ben-Shakhar, Maya Bar-Hillel, Yoram Bilu & Gaby Shefler *

Dept. of Psychology, The Hebrew University, Jerusalem 91905

e-mail: msmaya @ pluto.mscc.huji.ac.il, fax: 972-2-6513681

Expert clinicians were given batteries of psychodiagnostic test results (Rorshach, TAT, Draw-A-Person, Bender-Gestalt, Wechsler) to analyze. For half, a battery came along with a suggestion that the person suffers from Borderline Personality disorder, and for half -- that battery was accompanied by a suggestion that he suffers from Paranoid Personality disorder. In Study 1, the suggestion was made indirectly, through a background story that accompanied the test results. In Study 2, the suggestion was made directly, by the instructions given. The experts saw in the tests what they hypothesized to be there. In particular, the target diagnoses were rated higher when they were hypothesized than when they were not.

**On the Effect of Payoff Magnitude in Repeated Decision Tasks
with Immediate Feedback**

Yoella Bereby-Meyer *and* Ido Erev

Faculty for Industrial Engineering and Management
Technion - IIT, Haifa 32000, Israel

Much of the criticism of behavioral decision research is based on the argument that decisions among hypothetical alternatives and among gambles with small payoffs might be qualitatively different from "real life" decisions. Following Siegel and Goldstein's (1959) classical research, many believe that at least when the payoffs are high and when immediate feedback is available, decision makers quickly converge to the predictions of Expected Utility Theory.

The present research re-evaluates Siegel's results and the old probability learning literature and demonstrates that the effect of payoff magnitude is not trivial even when immediate feedback is available. On the basis of an analysis of 10 old data sets and three new experiments we conclude that choice behavior is much more sensitive to a framing change than to a change in payoff magnitude. The main effect observed by Siegel can be explained without reference to a payoff magnitude effect. The implications of these results to the renewed interest in learning are addressed by comparing five alternative models. Erev and Roth's (1996) reinforcement learning model with an adjustable reference point clearly outperforms the alternative models.

Siegel, S., & Goldstein, D. A. (1959). Decision-Making Behavior in a Two-Choice Uncertain Outcome Situation. *Journal of Experimental Psychology*, 57, 37-42.

Erev, I., & Roth, A. E. (1996). On the Need for Low Rationality, Cognitive Game Theory: Reinforcement Learning in Experimental Games with Unique, Mixed Strategy equilibria. (Submitted for Publication)

**When Prior Knowledge Overrides New Evidence:
Adaptive Use of Decision Strategies and the Role of Behavioral Routines**

Tilmann Betsch, Julia Brinkmann, Klaus Fiedler, and Katja Breining
University of Heidelberg, Germany

Psychological Institute
University of Heidelberg
Hauptstrasse 47-51
D-69117 Heidelberg
Germany

E-mail: zdz1@psi-sv1.psi.uni-heidelberg.de

Abstract

This paper focuses on behavioral routines in adaptive decision making - an issue which has almost been neglected to date. In two successive experiments, participants worked on recurrent, multiattribute choice problems. In the first experiment, routine acquisition was achieved by making use of the human ability to adapt to situational changes by changing decision strategies. To induce strategy change, time pressure was varied as a within factor. Payoffs were manipulated so that an adaptive change in strategy led participants to maximize choice frequency for one out of three options (routine acquisition). One group was instructed to use a limited set of strategies (expected utility, elimination by aspects, lexicographic rule), the other group received no instructions. Participants of both groups adapted successfully to time constraints, resulting in preference for the intended routine option in about 65% of the choices. After one week delay, participants worked on similar problems, containing the routine. In this second experiment payoffs favoured deviation from the routine. Results showed that choices were almost perfectly calibrated to payoffs under low time pressure. However, if time pressure increased, participants were more likely to prefer the routine - although strategies were still used adaptively and evidence discouraged routine selection.

Integration of Outcomes of Concurrent Decisions

Ole Boe and Tommy Gärling
Department of Psychology
Göteborg University
Haraldsgatan 1
S-41314 Göteborg, Sweden

Abstract

In some decision tasks such as the jacket-and-calculator problem entailing several concurrent decisions, subjects frequently fail to integrate the outcomes of the different decisions. A reason may be that subjects do not perceive that the outcomes are related. In order to test this explanation, in Experiment 1 subjects were requested in one condition to make choices between consumer products which were presented in pairs. In another condition subjects chose between pairs of the same consumer products. Some pairs in which one item was a means and the other an end (e.g., telephone and answering machine) were found to be chosen more frequently than predicted from the choices of the single products. Experiment 2 was conducted in which four different groups of subjects participated. Each subject was run in two conditions: either he or she made an isolated choice between two consumer products or two such choices concurrently. In the latter condition, in one of the choices one product always dominated the other whereas in the other choice a product which was related to the dominating one in the first choice was dominated by an unrelated product. In the different between-subjects conditions the related, dominating product was either a means or an end. Half of the subjects were asked to imagine that they choose to buy one of the products at specified prices, whereas the other half of the subjects were asked to imagine to choose between buying lottery tickets which gave them a chance to win the same consumer products. Consistent with the results of Experiment 1, the outcomes of the concurrent choices were integrated if the consumer products were related but not if they were unrelated. Furthermore, the integration was stronger when the outcomes were certain (purchasing condition) rather than uncertain (lottery condition). The results are discussed in relation to processes of editing decision outcomes, in particular categorization and encoding in memory.

DECISION-THEORETICAL RISK CONCEPTS APPLIED TO GLOBAL ENVIRONMENTAL CHANGE

Gisela Böhm

University of Bremen, Germany

Hans-Rüdiger Pfister

Technical University of Berlin, Germany

The present paper will be concerned with risk perception in the area of global environmental change phenomena, such as climate change and ozone depletion. Most research in risk perception has been concerned with risks to human health and safety that can be conceptualized as decision options, such as certain actions, technologies, or drugs. Two studies are presented that investigate whether decision-theoretical risk concepts can be applied to ecological risks or global change phenomena such as global warming. It is argued that risk judgments, such as those commonly used in the so-called psychometric paradigm, imply causal judgments and that risk evaluation is based on subjective causal scenarios, i.e., on the causes and consequences ascribed to risks. These causal scenarios are modelled following a decision-theoretical risk concept that consists of three basic elements: potential losses, loss significance, and uncertainty. It is assumed that even though this risk concept was formulated for risks that constitute decision options, it can be applied to global environmental risks, such as depletion of the ozon layer. Their consequences, e.g., skin cancer, represent potential losses that are uncertain and subjectively significant and can thus be characterized by these three elements in the same way as decision outcomes.

The first study investigates whether the three risk elements loss, significance, and uncertainty adequately describe lay conceptions of risk in the realm of global environmental change. One thousand subjects answered two open-ended questions. First, they were asked which environmental changes they would call a global environmental risk. Second, they were asked to tell for each risk given in the first question, why they call this a global environmental risk. The latter explanations for risks were classified according to the three risk elements. The concept that best describes lay conceptions of risk is potential loss. The other two elements, uncertainty and significance, are rarely explicitly mentioned in lay explanations for riskiness.

The second study served to analyze the role of lay causal scenarios about global change phenomena as judgmental basis of risk judgments. Twenty-five environmental risks were presented to 150 subjects. Subjects performed two types of judgmental task. One task consisted of an evaluation of each risk on 13 psychometric scales. The other task consisted of causal judgments, subjects were asked to indicate the most important cause of each risk and its most important consequence. Multivariate analyses reveal that the causal structure of the environmental risks as derived from the causal ascription task is systematically related to differences in their risk evaluation on psychometric scales. The implications of these findings for the risk appraisal process are discussed.

Two routes to food choice: A model and some data

Fergus Bolger and Peter Ayton (City University)

Centre for HCI Design

School of Informatics

City University

Northampton Square

LONDON EC1V 0HB

UK

Recently there has been a rapid increase in interest in what have been termed "dual-process" models. In each of these models a dichotomy is formed on the basis of a distinction between psychological processes which depend upon some immediate cue present in the stimulus situation (perceptual, emotional, physiological etc.) and those which comprise an analysis of the situation in terms of some existing values (beliefs, attitudes, preferences etc.) and imagined or desired consequences (goals, expectations, causal models etc.). In the first half of this paper we give a brief introduction to dual-process models and propose our own dual-process model specialised for food-risk decision making.

In the second half of the paper we report an experiment designed to test our model with respect to information search on a computer-based supermarket food-shopping simulation. In this study we first provided participants with scenarios about unfamiliar risks (fictional risks which are analogues of real risks) and then asked the participants to choose between a number of food products of which half were implicated with one of the risks given in the scenarios. The scenarios varied in terms of the degree to which the risk constituted a threat to subjects ('high-' or 'low-threat' conditions) and the degree to which inference had to be used in order to determine indicators of risk in products ('high-' or 'low-inference' conditions). It was hypothesised that 'fast-route' strategies (i.e. cue-based, such as buying on the basis of attractive packaging, familiar brand, or taste) would be most often observed in the 'low-threat'/'high-inference' condition whereas 'slow-route' strategies (i.e. analysis-based, for instance, looking for arguments/evidence for and against a particular product) would be most evident in the 'high-threat'/'low-inference' condition. The implications of our results are discussed for dual-process models of risk-related decision making in general, and for purchasing food in the presence of a potential health risk specifically.

Categorical links between planned purchases and the acceptance of a price discount

Nicolao Bonini

Department of Psychology, Sa Duchessa, 09100 Cagliari (ITALY)

Rino Rumiati

Department of Psychology, Via Venezia 8, 35100 Padova (ITALY)

The effect of the manipulation of the categorical link between planned purchases on the acceptance of an offered price reduction is controlled. The experimental paradigm used in these experiments relates to the "calculator problem" (Tversky and Kahneman, 1981). This problem is made of two versions (between parenthesis is reported the second one):

"Imagine that you are about to purchase a jacket for \$125 (\$15), and a calculator for \$15 (\$125). The calculator salesman informs you that the calculator you wish to buy is on sale for \$10 (\$120) at the other branch of the store, located 20 minutes drive away. Would you make the trip to the other store?"

Results show that 68% of subjects accept the price discount in the first version of the problem whereas 29% of subjects do that in the second version. Tversky and Kahneman explain this effect by arguing that people tend to use a topical mental account of the decision problem rather than a comprehensive one. We argue that a comprehensive mental account is more easily activated if the link between the two planned purchases is enhanced.

In the reported experiment, the type of the "product category" link between the two purchases is manipulated. In the control condition, the two purchases relate to two different product categories ("downhill skis" and "compact disk reader"). In three different experimental conditions, the target purchase "downhill skis" is coupled with three purchases that are differently related to the target purchase category. They are respectively, "ski suit", "cross country skis" and "tennis racket".

Results show that the effect reported by Tversky and Kahneman is found when the target purchase is coupled with "compact disk reader" and "tennis racket". However, it disappears when the target purchase is coupled with "ski suit" and "cross country skis". These findings are discussed by the notion of mental accounting and bottom up factors that control the activation of a mental account.

The Linda Fallacy: An Explanation by the Theory of Hints
H.W. Brachinger, P.-A. Monney, A. Vakili
Seminar of Statistics, University of Fribourg(CH)
Department of Economic and Social Sciences
University of Fribourg
Avenue de Beauregard 13
CH-1700 FRIBOURG

One of the most fundamental principles of probability is the "monotonicity property". This property implies the so-called "conjunction rule" " $P(A+B)$ smaller than or equal to $P(A)$ ", since $(A+B)$ is a subset of A . It is well-known that people violate this rule in situations where the conjunction is more representative or more available than one of its components. An extensive series of studies (Tversky and Kahneman, 1983) demonstrated such violations.

One of the best known examples of such a violation is "Linda's problem": Subjects are provided with a description of a young woman, named Linda, which fits to a feminist but not to a bank teller. Then they are asked to rank 8 statements by their probabilities, among these they find (B) Linda is a bank teller and (B+F) Linda is a bank teller active in the feminist movement. Tversky and Kahneman (1982,1983) and others reported that subjects assign to (B+F) a higher probability than to its component B. They suggested that this fallacy is due to the so-called "representativeness heuristic".

By some authors, e.g. Gigerenzer (1996), this explanation is not accepted because the representativeness heuristic, as the other heuristics in the heuristics-and-biases program of Tversky and Kahneman, is too vague to count as explanation. In this paper it is shown that the Linda fallacy can be explained in a clear and precise manner by the so-called theory of hints(Kohlas, Monney 1995).

After a short introduction, a brief outline of the theory of hints is given. The notion of a hint is defined and two important functions associated with it, called "degree of support" and "degree of plausibility", are introduced. Then, three concepts are discussed which are important for understanding the common reasoning in Linda's problem. These are the concepts of combination, extension and restriction of hints. The basic operation in combining hints is well-known as "Dempster's rule of combination".

In the second part of the paper, Linda's problem is regarded from the view-point of the theory of hints. It is demonstrated how the information given to the subjects can be interpreted as an "evidential hint". Then, this hint is combined with a "relational hint" specifying the decision maker's prior belief. Finally, the Linda fallacy can be explained by comparing the evidential hint pointing to Linda being a bank teller with the combined hint to the query of Linda being a feminist bank teller.

The process and outcomes of decision making about gene testing for hereditary breast and ovarian cancer - study in progress.

Marita Broadstock, Susan Michie and Theresa Marteau

Aims

This study aims to investigate decision making about mutation searching and direct gene testing in women at risk of hereditary breast and ovarian cancer (HBOC). Women at risk of HBOC make one or both of two decisions about genetic testing. First is the decision about whether to initiate a mutation search (MS) for an HBOC mutation on the DNA of a member of the family living with cancer. The second decision, if the existence of the mutation is confirmed, is whether relatives have a direct gene test (DGT) to determine whether they carry the same mutation as their affected relative.

The objectives of this study are to investigate:

1. when women form an intention to have genetic testing;
2. how women decide about genetic testing in terms of mode/s of cognitive processing employed;
3. what predicts best psychological outcome (in the short and medium term).

Method

Sample: Women will be recruited in consecutive series from those referred to the Cancer Genetics Clinics at Addenbrooke's Hospital, Cambridge and at the Institute of Medical Genetics, Cardiff. One hundred women aged 18 or over without cancer at time of referral will be recruited to achieve a sample of 80 (allowing for refusal and drop-out); forty in each study group

Design: There are two study groups: (1) those at risk of HBOC offered mutation searching in the family as the first step to direct gene testing (MS group); (2) those at risk of HBOC offered direct gene testing after a mutation has been identified in the family (DGT Group).

1. At baseline 4 weeks prior to the clinic appointment, a baseline questionnaire will measure cognitions about genetic testing (reasons for coming to clinic, awareness of testing, whether decision made about testing, reasons for and against testing); emotional state, cognitions about breast cancer risk and management; and cancer screening and early detection behaviours. In addition, the Systematic Decision Making Questionnaire (SDMQ) will assess women's reported decision-making processes.
2. One week prior to the clinic appointment at which the decision is reported, a telephone interview will assess clinic expectations, understanding of process of genetic testing, and whether and what decision has been made about genetic testing.

In addition, we are considering employing a "card sort" task and "think aloud" process tracing methods. We would be interested to hear of other researchers' experiences of these methods.

3. At follow-up, questionnaires will include repeated measures of emotional state, cognitions, and behavioural outcomes. In addition, the questionnaire will include whether the woman was told anything she did not expect at clinic, expectations of waiting for result of search/test, and the Decision Making Outcome Questionnaire (DMOQ) measuring women's reported outcome of their decision. Follow up will take place at two points,
 - 1 week post appointment (for MS group) and 1 week post test result (for DGT group)
 - 6 month post appointment (for MS group) and 6 months post test result (for DGT group, or equivalent period for those deciding not to be tested).

Details of the newly developed SDMQ and the DMOQ will be presented.

Timeline: May 1997 - February 1999

Group Memory, Systems and Their. Implications for Negotiating Teams and Intergroup Negotiation

Susan E. Brodt, Duke University, Fuqua School of Business

Durham, NC 27708-0120 USA, voice/fax-1 919-660-7831/1081-6244 email: brodt@mail.duke.edu

Researchers who study group decision making often conceptualise the process as a co-operative enterprise in which individuals share their knowledge with each other in an attempt to arrive at a consensual decision (Witte & Davis, 1996, vol 1). Moreover, deviations from this relatively free exchange of information (e.g., evidence that group members tend to discuss shared knowledge more than unshared knowledge, Stasser, Taylor and Hanna, 1989) are assumed to be due to social or cognitive tendencies rather than the mixed-motive nature of the task. Recent research in negotiation, however, highlights the potentially competitive as well as co-operative aspects of group decision making in many organisational contexts (e.g., Mannix, 1993). Group members may have dual loyalties, for example, which would align interests for some group members and divide them for others. Adding even more complexity, groups often negotiate with other groups to resolve conflicts, allocate resources, or, create new working relationship (e.g., alliances).

The present paper combines research on group decision making and intergroup negotiation: it integrates work on group memory systems (Wegner, Erber & Raymond, 1991), group decision making among close friends (Gruenfeld, Mannix, Williams & Neale, 1996), and intergroup negotiation (Thompson, Peterson, & Brodt, 1996). In an empirical study of negotiating terms and intergroup negotiation, student teams whose members had worked together for an average of five weeks (i.e. intact teams) were compared with teams newly constituted for the experiment (i.e., impromptu teams). The complete experimental design fully crossed teams type (intact or impromptu) in a two-party negotiation. Because there were no role differences, the four combinations were reduced to three: intact-intact, impromptu-impromptu, and mixed. The eight-issue negotiation task was mixed-motive, including issues that were compatible, competitive, and pairs of issues that could be combined (or logrolled) to create additional value for the parties.

Predictions focus on (1) evidence of memory systems in the intact versus impromptu groups and (2) implications of such systems for negotiating team behaviour and intergroup negotiation. Specifically, compared to impromptu groups, I expect members of intact groups to report higher cohesiveness and knowledge about each other, and to identify more accurately (and completely) each others areas of expertise. According to Wegner's (1995) computer network analogy, members of intact groups should show evidence of differentiated knowledge (i.e., knowledge of member expertise) that is both accurate and accessible to the group's memory system.

Contrary to Wegner's analysis, I do not expect intact team systems to benefit them in the intergroup negotiation context, having information available in a group memory system does not mean that the information will be accessed, thoroughly processed and combined in ways that facilitate creative problem solving. For example, in the case of group decision making, the bias for groups to focus on shared rather than unshared information (Stasser, et al., 1989) may dominate even in the case of a group memory system. Recent evidence, suggests, however, that this may not be the case. In a study comparing groups of close friends and non-friends, Gruenfeld, et al, (1996) showed that close friends were actually more likely to discuss unshared information. At the level of the negotiating team, therefore, I might predict that group memory systems enhance co-operative group decision making.

The present study, however, embeds group decision processes in an intergroup competitive context, which expected to undermine the friendly, co-operative atmosphere in which Gruenfeld et al.'s close friends shared information and confronted conflicts. In fact, the intergroup context makes salient the distinction between parties and creates a public atmosphere in which a group conducts its, intragroup negotiations (Brodt, Peterson and Thompson, 1995). In the intergroup context, I argue that the group's status becomes highly salient and stifles the (beneficial) intragroup conflict and probing necessary for the memory system to work most effectively. While the system may still access information, the conflict and processing needed to integrate the diverse elements of the system and discover beneficial trade-offs will be absent. Hence, I predict that intact groups will not outperform their impromptu peers due in part to their, unwillingness to confront fellow group members and instead defer to them on the basis of their expertise. The desire to maintain the integrity of the group (rather than appear fractured and divided) will lead them to avoid internal conflict.

Results strongly supported these predictions. Intact groups showed evidence of group memory systems whereas impromptu groups did not. Compared to their impromptu peer groups, members of intact groups reported knowing each other better, and accurately reported each others' areas of expertise. Regarding outcomes, as predicted, intact groups underperformed relative to their peers; the total value of the negotiated agreements were 5970 and 6380 for intact and impromptu groups, respectively ($P < .01$). When analyzed in terms of the two-party combinations, similar results emerge: intact, impromptu and mixed pairings resulted in deals valued at 5700, 6402, and 6307 points respectively ($P < .04$). Analyses of process measures (e.g., information sharing, team members' relative contribution) showed that even though intact groups had more dispersed participation than impromptu groups, members were highly deferential to individuals and spent a larger proportion of time supporting their experts' opinions rather than challenging them or speculating about possible creative solutions. As a result, relative to impromptu groups, intact groups logrolled less successfully and were less likely to identify compatible issues (these results were particularly strong for negotiations between two intact groups).

**When the whole differs from the parts and the parts differ from the other parts:
evaluations of risks and benefits of biotechnology**

Anne Brüggemann

**Institut für Psychologie, Technische Universität Berlin
Dovestr. 1-5, D-10587 Berlin, Germany**

Biotechnology is a new technology with many different applications in various, often unrelated domains (e.g., agriculture, pharmaceuticals). Many lay people (as well as experts) have great difficulties to evaluate the risks and benefits of this complex threatening as well as promising technology and its products. Studies reveal seemingly inconsistent attitudes towards biotechnology (Brüggemann & Jungermann 1996, Frewer, Howard & Shepherd 1997): People express *negative* attitudes when asked without specifications about "*biotechnology*", but they express *positive* attitudes when asked about specific "*applications of biotechnology*", like the production of substances for medical drugs. This "discrepancy" between judgments of the whole and judgments of the parts is surprising because one might argue that the specific applications *constitute* biotechnology. And it is *significant* because it raises doubts about the meaning of responses to questions about biotechnology in survey studies: When we ask for evaluations of applications, can we infer from the responses the overall opinion about biotechnology? And when we ask for overall judgments, what do the responses tell us about the acceptance or rejection of specific biotechnological products?

We assume that evaluations of risks and benefits are influenced by the presentation of biotechnology on different levels of concreteness. In an empirical study, we distinguished three levels: biotechnology a) "as such", i.e. as a technology, b) as domains of application, e.g. agriculture, and c) as products or effects, e.g. genetically manipulated tomatoes. *Benefits* were represented by pro-arguments, supposedly more important for the formation of a judgment on the level of concrete products compared to their importance on an abstract level, i.e. biotechnology "as such". *Risks* were represented by contra-arguments, their importance supposedly decreasing: cons are more important on an abstract level of presentation than on a concrete level, i.e. products or effects.

99 student subjects were given short statements about biotechnology resp. biotechnological applications together with pro-arguments and contra-arguments. Ss evaluated the items on a number of scales with respect to weight and personal importance of pros and cons (e.g. "To what extent is the pro-argument in favour of genetically manipulated tomatoes?"). The scale ranged 1 ("favours not at all") to 5 ("favours very much").

The data clearly reveal a systematic relation between the level of concreteness and the importance of risks and benefits, but this relation is domain specific: in the pharmaceutical domain, benefits are more important on the most concrete level of presentation, e.g. production of insulin, and risks are more important on the most abstract level, i.e. biotechnology "as such". Notably, we find the contrary in the agricultural domain: the importance of risks is increasing on the most concrete level, e.g. genetically altered rape, and benefits are more important on the most abstract level. People not only distinguish between *biotechnology* on the one hand and its *applications* on the other hand, they also make clear distinctions between different domains of application. In any case, the whole of biotechnology is something different than the simple average of its parts.

References:

- Brüggemann & Jungermann (1996) The whole and the parts of genetic engineering: The importance of structuring the assessment of opinions about biotechnology with respect to its specificity. To be published by the Wissenschaftszentrum Berlin für Sozialforschung
- Frewer, Howard & Shepherd (1997). Public concerns about general and specific applications of genetic engineering: risk, benefit and ethics, *Technology and human Values*, 22, 1, 98-124.

50/50 = 50%?

Baruch Fischhoff & Wändi Bruine de Bruin
Carnegie Mellon University

Studies using quantitative response modes have often found troubling misunderstandings of risks. For example, one large, national study reported that women significantly overestimated the risk of breast cancer (Black, Nease & Tosteson, 1995). However, examination of their response distribution shows a seemingly strange blip at 50. In recent open-ended interviews about AIDS risks, we have found that teens would often answer "50/50" to probability questions when they felt that they had no idea as to the answer, rather than to mean a 50% chance of occurrence.

All of these studies used open-ended response modes, respondents were asked to, in effect, fill in a blank, generating their own probability response from the 0-100 range. This study examined the extent to which the 50 "blip" is an artifact of this response mode. Three alternative response modes were used, varying the availability of response options, under the assumption that respondents are more likely to say 50-50 when other response options are not explicitly provided. One offered a blank, akin to the previous studies. A second presented participants with a 0-100 scale, with 101 tick marks and every 10 labeled. The third expanded the 0-1% range of this scale, providing additional low-probability responses in a log format.

Respondents were asked to give their assessment of low probability events, such as their developing cancer by age 40 and an average woman being diagnosed with breast cancer in a life time. Many more 50 responses were provided when respondents filled in a blank than when they were presented with one of the two scales. Deleting the 50 responses from the blank condition brought their estimates more into line with the two scale conditions and with actual risks.

The Cultural Boundaries of Trust and Reciprocity in Economic Bargaining

Nancy R. Buchan*, Eric J. Johnson, & Rachel T.A. Croson

The Wharton School
University of Pennsylvania
Philadelphia, PA 19104-6371

*As of July 1, 1997
School of Business
University of Wisconsin
Madison, WI 53706

Whom do we trust, and how much do we trust them? We propose that cultural norms influence the degree to which we trust others, and the distinctions between whom to trust and whom not to trust. We investigate the influence of cultural norms on trust and reciprocation within four different countries: Japan, Korea, China, and the United States. In each country we run the Investment Game (Berg, Dickhaut, and McCabe 1995) between members of the same and different social groups of university students and compare amounts sent and returned by participants. Drawing on theories from political science regarding the formation of trust and social capital, we test the following propositions. The first proposition, suggested by Fukuyama (1995), is that certain cultures are inherently more trusting than others. The second, also from Fukuyama, is that there exists a "radius of trust" within each culture, but the size of the radius varies by culture. The third proposition, forwarded by Putnam (1993) is that within cultures, horizontal networks of communication promote more trusting behavior among members than do vertical networks of communication. We demonstrate that although trust is a robust phenomenon across cultures, it is differentially prevalent and influential within cultures depending on the relationship between the bargaining partners and the type of communication which occurred between them

Berg, Joyce, John Dickhaut and Kevin McCabe (1995) "Trust, Reciprocity, and Social History," *Games and Economic Behavior*, 10, 122-142.

Fukuyama, Francis (1995) *Trust: The Social Virtues and the Creation of Prosperity*, New York: The Free Press.

Putnam, Robert D. (1993) *Making Democracy Work: Civic Traditions in Modern Italy*, Princeton, NJ: Princeton University Press.

Timing in Dynamic Decision Making

Eva Carling

Department of Psychology
Uppsala University, Sweden,
ecg@hgs.se

Making decisions in dynamic environments is a matter of timing. Describing dynamic decision making would be saying: It is made up of a series of decisions (i), which are interdependent (ii), causing changes that are a result both of the decision maker's interventions and of the system's internal dynamics (iii), and which have to be made in real time (iv). Within this framework one of the issues is how feedback delays of different kind and length affect performance. By the means of a simulated fire fighting task (NEWFIRE) we have studied how subjects cope with feedback delays in a complex environment. We varied the feedback delay by different speed of the fire brigades and by the age of the fire when detected. An attempt to measure the strategy used by the subjects in NEWFIRE to extinguish the fire shows high correlation with the amount of lost area. The measure was based on a task analysis of logged performance data, and contained thirteen different components, e.g. allocation of fire brigades before the fire, allocation considering the wind, number of fire brigades used, the use of direct attack and encircling the fire in different ways. An introductory analysis of the verbal protocols gives us few signs of the subjects considering the timing of the fire fighting. The first results indicate that the subjects could handle the complexity fairly well, but seemed to fail in considering efficient timing of the distribution of the fire brigades. This is different from what have been hypothesised for example in recent design of interfaces, where the complexity is the main issue to 'design away' while the problems caused by lack of timing have not been addressed.

**Your money or your health:
How the fungibility of health and money affects temporal discount rates**

Gretchen B. Chapman
Rutgers, The State University of New Jersey

According to normative economic theory, the same temporal discount rate should be applied to all outcomes. If for example, a higher discount rate is applied to money than to health, decision paradoxes result (Keeler & Cretin, 1983). In contrast to this normative prescription, psychological studies have found that decision makers use different discount rates for health and money decisions (Chapman, 1996; Chapman & Elstein, 1995). The normative theory assumes, however, that health and money are fungible. If health cannot be traded for money (as is sometimes the case in real life), then it is normatively acceptable to use different discount rates in the two domains.

The present experiment examined the effect of fungibility on the agreement between discount rates for health and money. 45 undergraduate students were given two intertemporal trade-off questions, one concerning money and another concerning health. For half the subjects, the questionnaire described a situation where health and money were fungible. They were asked to imagine that they suffered from migraine headaches and could buy medication to prevent them at a cost of \$1,000 for a yearly supply. In the health question, the subject's health insurance company was giving a cash rebate of either \$1,000 now or more money in three years. Subjects had to specify the amount of delayed money that would be just as attractive as the immediate amount. In the money question, the subject's health insurance company was offering some medication free of charge--either a one year supply right away, or a larger amount in three years. Because medication could be bought, free medication saved the subject money, and a cash rebate could be used to buy medication (that is, money and medication were fungible). For the remaining subjects, the questionnaire described a situation where health and money were not fungible. In this scenario the medication was not for sale. Instead free medication was available on a one-time basis--either a one year supply now or a larger supply in 3 years. Thus, free medication did not save the subject any money, and a cash rebate could not be used to buy medication (that is, money and medication were not fungible).

For subjects in the non-fungible condition, the mean annual discount rate for money was 39% (corresponding to indifference between \$1,000 now and \$2,686 in 3 years); for health it was -2%. That is, subjects discounted money but not health. For those in the fungible condition, the rates for money and health were 24% and 30%, respectively. Thus, discount rates for health and money were more similar in the fungible condition than in the non-fungible condition, as indicated by a significant interaction between domain (health vs. money) and condition, $F(1,42)=11.64, p<.005$. Interestingly, the fungible scenario raised health rates rather than lowering money rates. This result suggests that fungibility makes health more like money (e.g., a tradeable commodity) rather than making money more like health.

Similarity and Reluctance to Trade

Gretchen B. Chapman

Rutgers, The State University of New Jersey

Previous research has shown that after decision makers are endowed with an object, they are reluctant to trade it for an alternative item. For example, Kahneman, Knetsch, and Thaler (1990) gave some subjects coffee mugs and others chocolate bars. When given the opportunity to exchange the item with which they had been endowed for the other type of item, very few preferred to do so. This endowment effect can be explained by loss aversion, the tendency to weight losses more heavily than gains. Consequently, there is no reluctance to trade when no true loss is involved. Kahneman, et al. (1990) found that subjects were perfectly willing to trade tokens for cash, and Bar-Hillel and Neter (1996) found that subjects were quite willing to trade a pen for another identical pen.

These results suggest that reluctance to trade declines when the trade involves less of a loss--specifically, when one item is traded for another very similar item. Four studies investigated this possibility. In the first three studies subjects were endowed with an item (e.g., a pack of colored pencils) and given the chance to trade for another similar item (e.g., a pack of colored crayons) or a dissimilar item (e.g., a bag of potato chips.) These experiments did not reveal a relation between willingness to trade and the similarity between the two items being traded. Subjects were equally reluctant to trade in both the similar and dissimilar trade conditions.

A fourth experiment was modeled more directly on the studies by Bar-Hillel and Neter (1996). 96 subjects were each endowed with one of four items (peanut butter cup, Kit-Kat bar, cinnamon gum, and spearmint gum). They were asked three questions about whether they would trade their endowment for (1) an identical item (e.g., a pack of cinnamon gum for an identical pack of cinnamon gum), (2) a similar item (e.g., cinnamon gum for spearmint gum), or (3) a dissimilar item (e.g., cinnamon gum for peanut butter cup.) Following Bar-Hillel and Neter (1996) subjects were given a small cash incentive (5 cents) for trading. A die was rolled to determine which one of the 3 trade questions would be carried out for each subject. 79% of subjects were willing to make the identical trade, 54% were willing to make the similar trade, and 42% the dissimilar trade. When subjects who refused the identical trade (and therefore violated dominance) were removed, 59% of the remaining subjects accepted the similar trade compared to only 41% accepting the dissimilar, $\chi^2(1, N=76) = 5.76, p < 0.02$. Thus, willingness to trade increased as the similarity between the endowment and the alternative increased. This result suggests that loss aversion is a function not only of the item being lost but also of the trade itself--that is, of the relation between the two items being traded.

Two Predictions From a Confirmatory Search Model of Anchoring

Gretchen B. Chapman & Eric J. Johnson

Rutgers, The State University of New Jersey

The Wharton School, University of Pennsylvania

Anchoring is a pervasive judgment bias in which decision makers are systematically influenced by random and uninformative starting points. While the anchoring bias has been demonstrated in numerous studies, little is known about the underlying causes of anchoring. We propose a Confirmatory Search model of anchoring which postulates that anchors affect judgments by increasing the availability and construction of features that the anchor and target hold in common and reducing the availability of features of the target that differ from the anchor. We test two predictions of this model in two experiments.

In the first experiment (conducted in Spring, 1996), each subject estimated the probability that a Republican would win the 1996 US presidential election after first considering an anchor constructed from the subject's own social security number. Prompting subjects to consider reasons why the target was different from the anchor reduced anchoring. In contrast, prompts to consider the similarity between the target and anchor had no effect, relative to a control condition, suggesting that subjects were already focusing on the similarity between target and anchor. This pattern of results replicated our previous studies, but in this study the anchors were obviously irrelevant (since one's social security number could not plausibly be related to the election outcome.) Thus, the Confirmatory Search process is not an artifact of subjects' assumptions that the presentation of the anchor indicates its relevance.

In the second experiment, we tested the prediction that the anchor will be more successful in facilitating consideration of target features similar to the anchor if there is a larger pool of features available for priming. We manipulated the size of the set of target features by asking subjects to elaborate on the target. Half the subjects elaborated on the topic of health by listing actions they undertook that improved or threatened their health. The remaining subjects elaborated on an unrelated topic (property crime). All subjects then estimated the answer to a health-related question (the number of Americans who would die of heart disease or cancer in the next 10 years) after considering a high or low anchor. Subjects who had elaborated about health showed a stronger anchoring effect on this question.

These studies demonstrate that Confirmatory Search is an important process involved in the anchoring bias. This analysis suggests a method for debiasing anchoring and also points to important similarities in cognitive processes between anchoring and other judgment phenomena.

Affect and Risk taking in GPs: The relationship between mood states, risk taking and workload in UK family doctors.

P.J. Clough¹, G.R.J. Hockey² & A.J. Maule³

¹Department of Behavioural Sciences, University of Huddersfield

²Department of Psychology, University of Hull

³Leeds University Business School

Research on decision making and risk has typically assumed a 'steady state' decision making apparatus, with little regard for the fact that cognitive processes underlying decision making may be modified by changes in bodily and emotional states. As part of a larger ESRC sponsored programme investigating the impact of mood states on decision making, a study was carried out to examine the relationships between workload, affect and risk taking in family doctors.

An important methodological feature underpinning this research is the recognition of the need to calibrate within-person reports of moods, in order to take account of differences between individuals in their baseline level and variability of reported affect. Single individual reports of the measures are generally unreliable (e.g. Depue & Monroe, 1986) and therefore daily mood measures are taken over an extended time period using short bespoke diaries.

A sample of 43 family doctors (GPs) were asked to complete diaries for each surgery they ran over a 4 week period, reporting their affective state (before and after the surgery), the workload experienced (how busy they were, how much hassle they had) and a self evaluation of their actions during the surgery, including riskiness of clinical decisions. In total, data was obtained from 642 surgeries.

Day to day differences in Negative affect (NA) were correlated with self judged riskiness of clinical decision making, such that GPs reporting higher levels of tension before the surgery began reported taking more risky decisions within that surgery. An analysis of the moderating effects of the surgery workload revealed that risk was higher on high load days, and the effects of mood states on risk were also much stronger during high workload surgeries.

Feedback was give to each of the GPs describing their individual mood, workload and risk taking relationships. Nearly all the GPs felt that this was an accurate representation of their behaviour and over 40% of the sample stated they would monitor their behaviour more carefully and act to reduce the impact of their moods on their decision making.

Depue, RA & Monroe, SM (1986) Conceptualisation and measurement of human disorders in life stress research: the problem of chronic disturbance. *Psychological Bulletin*, 99, 35-51

Judgment under Uncertainty and Aging: Unconfounding
Item Selection and Task Difficulty

Ruth Collins and Alastair McClelland

Department of Psychology
University College London

The tendency for individuals to display overconfidence when making judgments under uncertainty, and for the degree of overconfidence to vary systematically with task difficulty, is well documented. Typically, these effects have been investigated by examining calibration performance on sub-sets of items, selected *post hoc* on the basis of item difficulty. Proponents of the Ecological School (e.g., Gigerenzer, Hoffrage & Kleinbölting, 1991; Juslin, 1994) have argued that it is this non-random (and thus unrepresentative) selection of items which leads to the hard-easy effect, and have demonstrated that reasonable calibration is observed when the items are randomly selected from a natural environment. However, it has proven difficult to unconfound item selection and task-difficulty, as tasks made up of randomly selected items are invariably easier than those employing non-randomly selected items. In the present study, item selection is held constant, and task difficulty is manipulated by varying the age of the subjects. The calibration performance of younger and older adults was examined using both semantic and episodic memory tests. These were always two-alternative forced-choice, and a confidence rating was elicited for each memory judgment. The calibration performance of both groups of subjects was found to vary systematically with task-difficulty, but critically, the old demonstrated poorer performance and greater overconfidence than the young on a recognition memory task, thus demonstrating a classic hard-easy effect with stimulus sampling held constant. This result appears to be inconsistent with the ecological approach, and the findings are discussed with reference to other current models of probability assessment.

References

- Gigerenzer, G., Hoffrage, U., & Kleinbölting, H. (1991). Probabilistic mental models: A Brunswikian theory of confidence. *Psychological Review*, 98, 506-528.
- Juslin, P. (1994). The overconfidence phenomenon as a consequence of informal experimenter-guided selection of almana items. *Organizational Behavior and Human Decision Processes*, 57, 226-246.

Critical Incident Management:

Engendering Experience Through Simulation

Jonathan Crego Ph.D

Tony Spinks BA (Hons)

Metropolitan Police Service New Scotland Yard UK

Abstract

Minerva is a guided team-based simulation system that supports real-time naturalistic decision making by senior officers tasked with managing a critical incident. Because the management of such incidents typically requires a co-ordinated team-based response, the system provides for group learning, allowing members of a management team to tackle an incident individually whilst at the same time co-operating, communicating and co-ordinating their efforts with other members of their team. The learning provided is experiential in that the learners are actively and directly engaged in resolving a shared series which accurately mirror those arising from a real critical incident.

Uniquely for a computer based training system problems arising within a Minerva exercise tend to be multi-faceted and potentially complex mirroring the real-world of critical incident management in which unresolved issues often impact on the way the unfolding situation might develop.

A core skill within critical incident management is the ability to make effective decisions within narrowing time frames, this is a central and recurring theme within the Minerva simulator which requires players to think and act as quickly as they would have to at a real event.

Running across a computer network, the simulator makes use of video footage and audio material that shows each player the scene of the problem from their own individual location and perspective.

This paper describes the system the educational technology and the theoretical decision making model upon which it is based.

A Study of Magistrates' Bail Decision Making

Mandeep K Dhami
Department of Psychology
City University
Northampton Square
London
EC1V OHB
UK

The question of bail may arise at the magistrates' court when a defendant is awaiting trial, sentence, appeal or is committed to crown court. The magistrates' bail decision has great implications for decisions made at further stages in the criminal justice system. Magistrates may decide either to bail, bail with conditions or remand a defendant in custody. The bail decision is often made with great speed, and the information upon which the decision is made may be incomplete and of poor quality. The law on bail specifies the principles upon which a decision may be made. Critics argue that magistrates are biased, inconsistent and too "harsh".

The present study aimed to examine the relative importance of different information upon magistrates' bail decisions and their self insight into the policies they use in making these decisions. A policy capturing approach was used. Magistrates made bail decisions upon hypothetical cases, and then rated the cues according to their relative importance in making their decisions. This approach has been applied to a wide variety of domains. It has consistently been found that linear models can quite accurately represent the human judge; that judges utilise a small number of cues in their decision making policies; that there are wide inter individual differences in policies; and that judges lack insight into their policies. The results of the present study are discussed in relation to these findings.

REFERENCE DEPENDENCE AND FRAME COMPATIBILITY IN CHOICES BETWEEN HEDONIC AND FUNCTIONAL GOODS

Ravi Dhar, Yale University, and
Klaus Wertenbroch, Duke University

work in progress

Surprisingly little is known about the differences in psychological processes underlying consumers' valuations of functional and hedonic goods such as luxury products. Introducing the notion of frame compatibility, we propose that loss aversion is greater for hedonic than for functional goods. We test this hypothesis of hedonic loss aversion in two studies. In the first study, subjects made actual decisions between a hedonic product (a coupon for a CD of their choice) and a functional product (a coupon for a 10-pack of brand name diskettes). They were either asked to choose between the two alternatives (gain condition) or to give up one of the same two alternatives (loss condition). Consistent with our hypothesis of greater loss aversion for hedonic goods, subjects in the loss condition were more likely to retain the CD coupon than subjects in the gain condition.

A second study uses a similar design to examine differences in consumers' valuations at the attribute level. Subjects are asked to choose between two alternatives (e.g., rental apartments), each of which is superior on a functional feature (e.g., distance to work) or on a hedonic feature (e.g., view). Subjects' reference points are manipulated such that in one case the choice appears as a tradeoff between improvements in view and improvements in travel distance (low reference state). In the high reference state, the choice is seen as a tradeoff between decrements in view and travel time. Consistent with differential loss aversion for functional and hedonic features, we show that subjects are more likely to choose the alternative that is better on the hedonic attribute (i.e., apartment with the superior view) from the high reference state than from the low reference state.

A field study tests the implications of our experimental findings for used car markets. Hedonic loss aversion suggests differences in owners' evaluations between functional and luxury and sports cars. Economic and accounting theory suggest that buyers and sellers depreciate both types of goods at an equal rate, provided the goods are of equal perceived quality and exhibit the same usage and maintenance rates. We assume that Bluebook prices are market clearing prices, and show that the excess of owners' selling reservation prices to Bluebook prices is greater for hedonic than for functional cars, controlling for car age and several other variables. We discuss the theoretical implications of this research for luxury and other hedonic goods markets and explore consequences for managerial decisions for hedonic and functional products.

MAKING REPRODUCTIVE DECISIONS IN THE SOCIAL CONTEXT OF FAMILIES FACING A LATE ONSET GENETIC DISORDER, HUNTINGTON'S DISEASE.

Claudia Downing
Centre for Family Research
University of Cambridge
Free School Lane
Cambridge CB2 3RF
E-MAIL cd10008@cus.cam.uk

Some risks, such as genetic risk, are primarily experienced and negotiated in the social context of the family. However, little is known about how information, including the recent choices provided by genetic testing for refining or avoiding risks, is communicated and acted on within families. This is partly a function of limited research designs as few studies have sought to include a number of family members. It is also a function of restricted conceptual frameworks. Models being developed to account for how people make risky decisions in real life settings have tended to focus on the individual. One exception, Image theory, has recently extended to account for shared decision making in organisational contexts (Beach, 1993, 1996). This model suggests that individuals perform a preliminary two step process, screening options at a pre-choice stage for compatibility with values followed by a further stage of screening of remaining options for their potential to achieve desired goals. Social decision making is postulated as a later stage of compatibility screening between individual's surviving strategies and goals.

The feasibility of applying Beach's extended model to the social context of the family will be discussed by drawing on data collected and being analyzed for a study of reproductive decision making in 17 families facing the risk for a late onset genetic disorder, Huntington's disease. Snowball sampling resulted in accounts being obtained from a number of family members including those at risk, their siblings, partners, and in some cases, their cousins, who were currently making or considering reproductive decisions. Where possible the previous generation were also included to explore the extent and nature of their involvement. In depth individual interviews encouraged the 76 participants to talk freely about sensitive areas, including what was and what was not shared with other family members, as well as comment frankly on perceived differences in approach. Comparison of multiple accounts made it possible to build up a picture of how individuals negotiate decisions in a social context. Case studies will be used to illustrate how this varied for couples and siblings within particular families. Mention will also be made of the ethical and analytical challenges presented by multiple accounts.

It is suggested that although Beach's model provides a framework for understanding family decision making, much is gained by incorporating recent work from other relevant areas, such as family therapy. One approach which draws on narratives to gain insider perspectives of how families cope with change and form beliefs will be discussed (Dallos, in press).

Beach, Lee Roy (1993) Making the right decision: Organisational culture, vision and planning. Prentice Hall: Englewood Cliffs, New Jersey.

Beach, Lee Roy (Ed) (1996) Decision making in the workplace: A unified perspective. Lawrence Erlbaum Associates: Mahwah, New Jersey. (L.R.)

Dallos, R. (in press) Interacting stories: Narratives, family beliefs and therapy. Karnac Press.

Support for Support Theory?

Frank A. Drews

Institut für Psychologie, Technische Universität Berlin
Dovestr. 1, D-10587 Berlin, Germany

Tversky & Koehler (1994) presented a nonextensional theory of subjective probability, which they called *support theory*. The theory provides an interpretation of subjective probability in terms of *relative support*. One prediction derived from the theory is *subadditivity* of probability judgments when an *implicit hypothesis* gets less support than the unpacked, *disjunctive elements of this hypothesis*. The implicit hypothesis receives less (cognitive) support when people do not 'unpack' this hypothesis (cognitively) sufficiently into its elements and base their judgment only on the subset of available elements. There is empirical evidence in favor of this assumption. For example, the subjective probability that a person dies from cancer (implicit hypothesis) is often less than the sum of the probabilities of the unpacked elements of this hypothesis (lung cancer, digestive cancer, other cancer). In case of a complete unpacking of an implicit hypothesis, the probabilities of this hypothesis and the sum of its exclusive elements should be equal.

But what if people face hypotheses which are *new* to them? In this case the actual inclusive relation of an hypothesis is unknown to them, i.e., the elements of the hypothesis are unknown. Since they know only the hypothesis itself, they can not possibly unpack elements more or less sufficiently. Consequently, there is *no basis for subadditivity*, and we should observe no subadditivity.

In an experimental study, subjects read short stories about an unknown disease and its possible causes. The causes were different types of viruses each having various subtypes. The set of subtypes of a virus represents an unpacked hypothesis, a type of a virus (without its subtypes) represents an implicit hypothesis. The stories of one group of subjects contained only implicit hypotheses, whereas the stories of another group contained the explicit hypotheses. The support for hypotheses was manipulated by hints about the properties of the viruses. Subjects were presented these hints in a stepwise manner, and after each hint they judged the probability that a specific virus caused the disease on a scale from 0 to 100.

The analysis *shows subadditivity* of the subjective probabilities. This observation of subadditivity is not compatible with *support theory*: The theory explains subadditivity by insufficient unpacking, but in our study there was nothing to unpack. One interpretation of this finding is that the unpacking-assumption of the theory is an unnecessary or insufficient explanation of subadditivity. Another interpretation is that subadditivity can result from different causes. In some conditions, it might result indeed from insufficient unpacking, in other conditions (like in our study) it might have a different source. We propose as an alternative or at least as another source that the *number of hypotheses* has an effect on subjective probabilities and the occurrence of subadditivity in the probability judgments.

Ref.: A. Tversky & D. Koehler (1994). Support Theory: A Nonextensional Representation of Subjective Probability. *Psychological Review*, 101, 547-567.

SUBJECTIVE PROBABILITY AND PROGNOSTIC PERFORMANCE

August Fenk

University of Klagenfurt, Austria

The representation of subjective probabilities plays an essential role in decisions under uncertainty [1, 2]. But, obviously, there is a principal difference between the two dimensions relevant in (the analytical description of) decision making: While *subjective utility* - as well as its coordination with the subjective probability - can only be evaluated in terms of "internal consistency", *subjective probability* itself can be evaluated (e.g. in calibration studies) in terms of "external validity". Appropriateness of decisions depends on the prognostic performance of the deciding subject within the relevant domain. But how to measure prognostic performance?

An attempt was made [3] to develop Shannon's guessing game technique into a more sensitive and widely applicable instrument for measuring prognostic performance. Shannon's guessing game technique as well as all related techniques are blind to the guesser's "metacognitive" knowledge of the (limited) chances of correctness of his prognoses. The suggestion is made that these subjective probabilities should also be collected. As in Shannon's guessing game, the feedback is either "right" or "false", and in the case of a wrong prognosis the subject has to continue guessing until getting a positive feedback. In order to calculate the prognostic error per element to be guessed, we sum up the subjective probabilities of the prognoses which turned out to be wrong and add the error which might even be associated with a correct prediction: In the case of a correct prediction the forecaster's "failure" is the probability he implicitly ascribes to all non-Ds when predicting "D" with a subjective probability of, let us say, 80 percent; according to the probabilistic "complementarity of negation" [4] the probability of all non-Ds - and the false estimation of the subject, if all non-Ds are wrong - is 20 percent in this guess. If all elements or events are predicted correctly offhand and with a subjective probability of 100 percent, then the prognostic error is zero and the prognostic performance is maximal.

In other words: The prognostic error is the product of the number of guesses needed per event and the mean false estimation (see above!) corrected by each single feedback following these guesses. Higher probability values increase the weight of incorrect prognoses (as errors) and the weight of correct prognoses (as "hits"). The smaller the prognostic error to be eliminated in the guessing procedure, the higher the level of prognostic performance.

In particular, taking into account the requirements of a psychology of "information processing" a further algorithm is introduced, which makes it possible to quantify the prognostic error, i.e. the uncertainty reduced by the "binary" feedback in the guessing procedure, in bits. Again, a lower value meaning higher performance is achieved when wrong predictions are rare and associated with low subjective probabilities and when the correct predictions are associated with high subjective probabilities.

In a first probe a text had to be guessed letter by letter. It was possible to demonstrate the enhanced sensitivity of the diagnostic instrument. In addition, data reveal a quite successful strategy: With almost any new letter to be guessed the subject started with high-probability predictions fitting into her hypotheses on relatively big supersigns (words or even clauses) and dropped down to low-probability levels when her far-reaching hypotheses failed and she was thrown back to her less context-specific "knowledge" about syllable-structures and transitional probabilities between letters.

- [1] Tversky, A., & Koehler, D.J. (1994). Support Theory: A Nonextensional Representation of Subjective Probability. *Psychological Review*, Vol. 101, No. 4, 547 - 567
- [2] Fenk, A. (1992). Ratiomorphe Entscheidungen in der Evolutionären Erkenntnistheorie. *FIF-Forum für interdisziplinäre Forschung*, Vol. 5, No. 1, 33 - 40
- [3] Fenk, A. & Vanoucek, J. (1992). Zur Messung prognostischer Leistung. *Zeitschrift für Experimentelle und Angewandte Psychologie*, Vol. 39, 1, 18 - 55
- [4] Smithson, M. (1989). *Ignorance and Uncertainty*. New York: Springer

**Learning to be well calibrated in discrete subjective probability judgment:
Procedural debiasing to improving judgment under uncertainty**

William R. Ferrell

Systems & Industrial Engineering, University of Arizona, Tucson, Arizona

Udo Zirn, University of Stuttgart, Germany.

Michele Walsh, Veterans' Affairs Medical Center, Tucson Arizona

It has been widely found that subjective probability judgements are not very well calibrated. The degree of over/under confidence depends on the difficulty of the task, and there may also be a systematic base-rate effect. Several studies have attempted to train people to be well calibrated by giving them performance feedback. Two approaches have been tried. The first helps the subject learn to make better discriminations, as in Lichtenstein & Fischhoff (1977) in which very overconfident subjects became fairly well calibrated. Training made the task much easier, so calibration became less overconfident.

The second approach gives feedback about calibration, directly or by a rule that rewards better calibration with a better score (Murphy & Winkler, 1970). Weather forecasters are usually well calibrated and they get scoring rule results as well as calibration curves. However, training studies in areas other than weather forecasting have resulted in no, or only very modest, improvement in calibration (Benson & Onkal, 1992, Fischer, 1982; Sharp, Cutler & Penrod 1988). The one exception, Lichtenstein & Fischhoff (1980) involved intensive prior training and, following a 200 item test of calibration, a thorough analysis of performance with calibration curves, scores, and discussion. On a subsequent test, calibration improved for those not well calibrated.

A New approach "procedural debiasing" was introduced by Lopes (1987) The idea is that subjects can more easily make accurate judgements of the training consists not just of feedback of performance, but of instruction in the judgements *process*. This requires a *descriptive* model of how the task is performed and a *prescriptive* model of how it should be performed. Training consists of showing the subject how to change the process used so that it conforms more closely to the prescriptive model.

The decision variable partition (DVP) model of calibration (Ferrell, 1994a; Ferrell, 1994b; Ferrell, 1995; Ferrell & McGoey, 1980) provides both descriptive and prescriptive models of numerical response, and thus may be suitable as a basis for procedural debiasing. The model suggests that individuals do not adjust their response criteria sufficiently to maintain good calibration when task difficulty changes.

A procedural debiasing approach for calibration is tested. The subject responds to a sufficient number of items to produce a calibration curve. The DVP model is fitted to the data to assess the criteria used. The optimal criteria are calculated from the proportion correct. Subsequently, after every judgement, the assessed and optimal criteria are shown together to the subject, who is instructed how to modify the judgement, if necessary, to better conform to the optimal criteria. A new calibration curve and a new partition are computed after every n items to track the change in the subjects' performance.

The efficacy of this approach has been tested by implementing the instructional process with a dynamic, graphical computer display, and by measuring the changes in subjects' performance. The degree to which the training generalizes to other degrees of difficulty and to other tasks is also investigated. The results, thus far, are encouraging as a practical means of improving calibration and they also support the DVP model's representation of the response process as the partition of an internal response variable.

Disentangling the influence of consequences and context on the omission bias

Katrin Fischer

Institut für Psychologie, Technische Universität Berlin
Dovestr. 1, D-10587 Berlin, Germany

A number of studies have demonstrated a tendency to judge action worse than non-action, and to choose not to act rather than to act, when both options lead to the same negative consequences. This behavior has been interpreted as an "omission bias" (Ritov & Baron, 1990). The bias has been attributed by different researchers to different causes, in particular to loss aversion, aversion of responsibility, and minimization of anticipated regret. The common denominator of all these explanations is the assumption that negative consequences resulting from action are judged worse than the same negative consequences resulting from non-action.

But there is evidence that the occurrence of the bias is not simply an effect of the different evaluations of the consequences of action and non-action, but that it also depends on specific contextual conditions. For instance, people seem to be less willing to act in a medical context (e.g., vaccination) than in a business context (e.g., buying stocks), perhaps due to different social expectations. However, in these studies the decision was not only placed in different contexts but lead also to different kinds of consequences (e.g., in medical context *lives*, in business context *money*). It is thus open whether the source of the observed tendency is the *kind of consequences* which the decision can produce or the *kind of context* in which the decision takes place. In two studies we tried to disentangle the influence of the two factors.

In study I, we presented decision problems in two different contexts: In a medical context, the consequences of action and non-action were lives lost. Under this condition the usual *omission* tendency was observed. In a business context, the consequences were monetary losses. Under this condition, a strong tendency to prefer action rather than non-action was observed, i.e., a *commission* tendency.

In study II, the consequences of the options in the medical context were monetary losses, and the consequences of the options in the business context were lives lost. With this change of the type of consequences, the decision tendencies reversed: an *omission* tendency was observed in the business context and a *commission* tendency was observed in the medical context.

In summary, the studies indicate that *it is not the context* which induces an "omission (or commission)-prone" behavior. Rather, it is the *kind of consequences* which determines whether people prefer to omit or to commit an action.

The same but different: An empirical investigation of the axiom of reducibility of compound lotteries

Ilan Fischer
University College London
London, UK

David V. Budescu
University of Illinois
Champaign, IL USA

According to classical utility theory the valuation of any lottery should depend only on its outcomes and their respective probabilities, and should not be affected by the nature, complexity and structure of the chance mechanism. Thus, a DM should be indifferent when confronted with choices between simple (one stage) and compound (multi stage) lotteries with identical outcomes, "reduced" probabilities and expected values (e.g., Luce, 1990).

Previous research has documented systematic violations of this axiom. For example subjects tend to prefer lotteries in which the payoffs are contingent on the joint occurrence of multiple events (e.g., Bar-Hillel, 1973; Slovic, 1969), and lotteries in which the earlier stages offer higher probabilities (e.g., Ronen, 1973).

In the present study 40 subjects were presented with 30 pairs of binary gambles. In any given pair the lotteries had identical outcomes and equal "reduced" probabilities (and, of course, equal expected values). However, the chance mechanisms varied along a variety of factors such as the sample space, the number of stages, temporal ordering, order of probabilities, their transparency and time constraints. Half the subjects saw lotteries involving gains and the other half considered only losses. After choosing one lottery in each pair, the subjects were asked to explain and justify their choices.

We uncovered several systematic violations of the reducibility axiom. For example, when presented with three stage gambles with different time intervals between successive stages, most subjects displayed a strong preference for quicker resolutions in the earlier stages. Interestingly, some of the factors had opposite effects in the domains of gains and losses. For example, in three stage gambles involving gains subjects preferred to have the highest probability on the first stage (and the lowest probability on the third stage), but displayed the opposite preferences for losses. A content analysis of the subjects' stated reasons for their choices identified eight major categories. The most frequently invoked were Hope, Fun, Simplicity and Time.

References

Bar-Hillel, M. (1973). On the subjective probability of compound events. *Organizational Behavior and Human Performance*, 9, 396-406.

Luce, D. (1990). Rational versus plausible accounting equivalencies in preference judgments. *Psychological Science*, 1, 225-234.

Ronen, J. (1973). Effects of some probability displays on choices. *Organizational Behavior and Human Performance*, 9, 1-15.

Slovic, P. (1969) Manipulating the attractiveness of a gamble without changing its expected value. *Journal of Experimental Psychology*, 79, 139-145.

Groupthink research and its implications for politics and economy.

**Dieter Frey,
University of Munich, Germany.**

Together with his co-workers, the present author made in the last year a series of research on groupthink-phenomena. In this research groups between three and seven subjects discussed complex economic problems and made - after discussion - a tentative group decision. After this the group could choose supporting or non-supporting information.

The following variables were introduced: Homogeneity vs. heterogeneity of groups - Number of minority members in groups - Hierarchical vs. egalitarian group structure - Competition between groups vs. no competition between groups - Groups which define themselves as "experts" vs. groups which define themselves as "laypeople".

In general, our research shows:

1. Homogenous groups are more selective than heterogenous groups.
2. Experts (= groups which define themselves as competent and highly secure) are more selective than laypeople (=groups which define themselves as less competent and secure).
3. The higher the rate of minority members, the lower is the selectivity.
4. Representative of groups are more selective than non-representatives.
5. Hierarchical groups are more selective than egalitarian groups.

This research has direct and indirect consequences on decision-making in politics and economics because a lot of these - important - decisions are group-based decisions. Under specific conditions the bias in information processing in these groups is very high and can lead to very negative outcomes.

Abstract submitted to the 16th research conference on subjective probability, utility, and decision making (SPUDM16), University of Leeds, UK, August 18-21 1997

The Effect of Choice on Intention-Behavior Consistency

Robert Gillholm and Tommy Gärling

Department of Psychology, Göteborg University, Sweden

In a meta-analysis of 28 studies, it was shown that the relationship between intention and behavior increases when a choice is made among several behavioral alternatives as compared to when no such choice is made. We replicated this effect in a single controlled study. Undergraduates were asked to write a short essay during the following days. Reliably more subjects who chose a topic among three alternatives wrote the essay than subjects who were assigned one of the topics. Initial differences in interest in the topics could not account for the effect of choice on intention-behavior consistency. However, subjects who chose topic expressed a stronger intention to write the essay. The results of two subsequent studies suggested that the stronger intention results from self-generation. In none of these studies an effect of choice was observed when the control group also chose a topic although only one of the alternative topics was interesting. The results refuted an alternative hypothesis that choice lead to more planning. Although more essays were written by subjects who either indicated when and where they would write the essay or made an outline (planning conditions), this effect was independent of the effect of choice.

Abstract

The purpose of the current research is to compare predictions generated through image theory with those suggested by existing justice theories. Justice theory suggests that fairness evaluations emerge from compensatory weighting of violations and satisfaction of justice rules (e.g., Gilliland, 1993). Image theory, however, suggests that individuals use a compatibility test, involving the use of an individual "rejection" threshold beyond which situations will be judged to be unfair. Determination of whether or not the rejection threshold is exceeded is based on solely on the number of violations of some decision standard selected by the decision maker (thus, non - compensatory) Beach, (1990). We conducted three studies that compared the impact of both image violations and non-violations on judgment and choice outcomes. The results suggested that when making judgments about fairness, the predictions generated through justice theories are supported. However, when one has to select a course of action after making a judgment concerning fairness (i.e., choose whether or not the company is rewarded or punished), predictions generated through image theory are supported. These results have important implications in the judgment and decision making research. It appears that the distinction between judgment and choice is more important than previously believed. Implications and future research are discussed.

Examining Justice Evaluations Using Image Theory's Compatibility Test: Effects on Judgment and Choice

Stephen W. Gilliland

Lehman Benson, III

Donald H. Schepers

University of Arizona

Correspondence concerning this article should be addressed to Stephen W. Gilliland, Department of Management and Policy, 405 McClelland Hall, University of Arizona, Tucson, AZ 85721-0108, (520) 621-9324, FAX (520) 621-4171, SGILLILAND@BPA.ARIZONA.EDU.

□

by Paul Goodwin, University of the West of England and George Wright, University of Leeds.

Abstract

Multiattribute decision analysis models exist to facilitate the articulation of preference between alternative courses of action. The approach is based on the elicitation of values which are obtained either by direct questioning or inferred from the decision maker's responses to questions involving choices. This approach presumes a pre-existing set of preferences relating to the attributes of the decision problem and assumes that the barrier to the articulation of preferences for the courses of action is the unaided decision maker's inability to combine these pre-existing preferences.

In reality, the decision maker's preferences relating to the attributes may be subconscious, labile or unformed. Where they are subconscious, deep 'excavation' may be required to identify them. In this case, conventional value-elicitation techniques, even those based on several methods and involving consistency checks, may only obtain superficial responses. Where 'true' preferences are labile, either because they are fundamentally changeable or evolving to a steady state, the elicited model may not be appropriate when the decision has to be implemented, or its consequences experienced. When preferences are unformed, there is a danger that they will be artificially constructed by the elicitation process.

Some of these issues have recently been emphasised by Keeney who has proposed 'value focused thinking' whereby values, and hence preferences, are identified or discovered before the consideration and creation of options. But where preferences are subconscious or unformed how can they be identified? Other authors (e.g. March) have argued that values can only be discovered through action. This suggests the following conflict:

Keeney's argument is that the creation and choice of options should follow the establishment of values:

Values → Creation and choice of options

while March argues that we establish our values by choosing and experiencing options:

Creation and choice of options → Values

The paper argues that the use of conventional 'question and answer' elicitation techniques on their own is unlikely to lead to a valid model if any of the three 'preference conditions' outlined above apply. We identify the prevalence of post-decisional processes such as dominance restructuring, and differentiation and consolidation as indicative of, often undocumented, difficulties in elicitation of values. We conclude that techniques to aid mental experimentation with the range of outcomes of choice are required and that these should precede elicitation. Various techniques such as role-playing, psychodrama and scenario planning are described and evaluated in terms of their ability to develop or create knowledge of one's own values. A new methodology for mental experimentation based on scenario planning is developed, documented and applied. Provisional experimentation indicates the efficiency of this technique as an aid to value development and discovery.

Individual and Cultural Differences in Optimistic Time Predictions

Dale Griffin and Roger Buehler

University of Sussex and Wilfrid Laurier University

In our studies of biases in time prediction, we have primarily sampled students and community members from western cultures (Canada and the UK, in particular). In such samples we find robust optimistic biases, such that most people believe that their tasks will be completed earlier than they actually are. Consistent with the theoretical analysis of the "Planning Fallacy" offered by Kahneman and Tversky, we find that such biases are associated with specific mediating cognitive processes, such as a reliance on forward planning without consideration for possible obstacles, a neglect of relevant past experience, and the use of attributional mechanisms to make past failures irrelevant to the current plan. In the present research, we examine whether the magnitude of the optimistic bias-- and the presence of the mediating mechanisms--varies systematically with certain key individual difference variables. Over a series of studies, we find that both predictions and outcomes are unrelated to dispositional optimism and self-esteem, but that both are related to dispositional procrastination. We discuss these findings in light of J. F. Yates's analysis of the (limited) role of self-esteem in overconfidence, and conclude by presenting some data on the cultural specificity of optimistic time predictions.

Reasoning, decision making, and argument

David Hardman and Peter Ayton

City University

Department of Psychology

Northampton Square

London EC1V 0HB

Psychologists and computer scientists have recently begun to take more interest in argumentation. For psychologists in particular, argumentation appears to offer a way to understand how people think in everyday situations, where the kinds of problems are unlike those normally presented in the laboratory. In this paper we review psychological work related to argumentation. We consider the cognitive processes involved and discuss argumentation in relation to normative models of reasoning and decision making. Finally, we give an example of how argumentation has been implemented computationally, in order to help experts make decisions under uncertainty.

Generalizations of expected-value theory as psychological theories of individual risky choice behavior

Armin Hartinger

University Regensburg, Germany

This study examines several generalized expected-value models which have been proposed in the literature to describe individuals' choice behavior. The models investigated here include, as a central feature, subjective weighting of outcomes or probabilities. For instance, one theory, expected-utility theory, only assumes subjective weighting of outcomes, another theory, cumulative prospect theory, additionally allows subjective weighting of probabilities. The latter theory also differentiates between probabilities of gains and losses. Of central interest in this study is the question to what extent individually determined weighting functions (utility functions and subjective weighting functions for probabilities) of generalized expected-value models can capture individual traits of human decision makers. If these functions captured individual traits, they should be consistent over time and be generalizable to similar choice situations.

To answer this question, pairs of risky alternatives are repeatedly presented to subjects. Using probabilistic versions of the deterministic models consistency and generalizability of individually determined weighting functions are tested. The results show a considerable inconsistency.

The generalizability of qualitative features of subjectively determined weighting functions is investigated using a questionnaire. The results show that the models do not capture individual features of the decision maker. This holds true even though only decisions of the most consistent subjects are taken into account.

A comparison of the goodness-of-fit of the different models shows that more general models, like cumulative prospect theory, yield only minor improvements over more restricted models, like expected-utility theory. Expected-value theory, however, is clearly rejected by the data.

Effects of culture and educational tradition on probability estimation

Nigel Harvey and Vincent Yeo Soo Bin

University College London

A large number of studies have shown that people from most Asian countries tend to be more overconfident in their judgments than people from Western countries. Phillips and Wright (1977) attributed this to a difference in culture. They argued that people in Asian countries tend to hold a somewhat fatalistic world view. This is more antithetical to the continuous assessment of levels of uncertainty than the probabilistic world view that is more common in the West. However, Yates *et al.* (1989) found Japanese people's overconfidence to be comparable to that of American rather than to that of Chinese people. Japan possesses a culture closer to China than America but an education system more similar to that of America than China. Thus Yates *et al.* (1989) argued that differences in educational tradition have been responsible for the differences in overconfidence that have been reported in the literature. Specifically, overconfidence is greater in countries where the dominant educational strategy is 'direct instruction' than in those where it is cultivation of 'critical thinking'. This is because the latter does more to recruit arguments against as well as for any given view.

203 undergraduates at the National University of Singapore and at University College London participated in our experiment. There were 89 Europeans and Americans but nine of these had been educated in Asian countries under the 'direct instruction' tradition. Of the remaining 114 people from 'fatalistic' cultures, 19 had been educated in Western countries where critical thinking is the dominant educational tradition. All these students made 40 probabilistic forecasts for events that could occur in the following month. These events concerned global politics, global disaster, local politics and local weather. We also asked people to estimate their abilities and performance relative to their peers.

Questions that varied in difficulty across subject groups were excluded from the analyses. The covariance decomposition of the probability score was used to extract indices that define quality of probability judgments (Bias, Slope, Scatter). In addition, an index of Extremeness of probability judgments was extracted. It was simply the sum of frequencies of judgments of 0%, 50% and 100%. These four indices together with six measures of how people

perceived themselves relative to their peers were subjected to factor analysis. The best model contained four factors. Two loaded on self-perception measures, one loaded on Extremeness and Scatter and one loaded on Bias, Slope and Scatter.

The four factor levels for each person were extracted and used as dependent variables in a MANOVA. The biodata (sex, type of educational history, cultural background) comprised the independent variables. Results showed no significant interaction effects between these biodata variables. However, all three independent variables had a main effect on at least one of the dependent ones. Sex influenced the two factors that loaded on self-perception. Educational tradition influenced the third factor that loaded on Extremeness and Scatter. Cultural background influenced the fourth factor that loaded on Bias, Slope and Scatter. Thus culture and educational tradition affected different aspects of probability estimation.

Phillips, L.D. and Wright, G.N. (1977). Cultural differences in viewing uncertainty and assessing probabilities. In H. Jungermann and G. DeZeeuw (Eds), *Decision Making and Change in Human Affairs*. D. Reidel Press, Dordrecht.

Yates, J.F. *et al.* (1989). Probability Judgment Accuracy: China, Japan and the United States. *Organizational Behavior and Human Decision Processes*, 43, 145-171.

Framing Lens and Managerial Rims: the Sense of Making Strategic Decisions

Théa Herz

Université René Descartes - Paris V

Laboratoire de Psychologie sociale

28, rue Serpente 75270 PARIS Cedex 06, FRANCE

ABSTRACT

Since Kahneman and Tversky (1984) suggest that real-world decisions could be influenced “merely by the framing of outcomes and contingencies”, the series of experiments presented here uses (a) a differentially framed organisational choice task, and (b) an extended experimental design. Further, responses of students are related to those of experienced managers.

A problem concerning choice between 2 personnel selection techniques differing in their expected outcomes (openings either filled or left vacant) was administered to a sample of students (N=91). Findings show framing effect and preference reversals, indicating respondents did not construct a canonical representation.

The previous personnel selection problem was embedded in a scenario form questionnaire. Dynamism was introduced into the design by creating a sequential, variable and interactive task (i.e., inserting a peer's choice). Questionnaires were addressed to a sample (N=74) of managers. They were also administered to a sample (N=103) of students. Framing effect reproduced in both samples, and was modulated by the manipulated congruency of peer choice vis-à-vis frame. Yet preference reversals are found only in the student sample. Further exploring the role of the frame-of-reference underlying preference construction and choice, responses from a second managerial sample (N=62) and a third student sample (N=68) to a revised form of the questionnaire, reproducing framing effect, were obtained.

Respondents' differential information-use and processing patterns, their representations of the alternatives in the different congruency conditions, their levels of certainty and confidence in the appropriateness of his/her choice, converging or diverging with peer's choice, indicate how both framing and feedback from social interaction can be expected to operate when making real-world decisions. Making organisational decisions is thus seen as a set of interwoven cognitive processes occurring in time, providing active decision makers immersed in a social context with opportunities to shape, adapt, and share a frame-of-reference that guides them while they clarify the ambiguous present and deal with an uncertain future.

SMOKING CESSATION FROM A DECISION THEORETICAL PERSPECTIVE

Teci Hill & Ola Svenson

Abstract

Earlier research on smoking cessation, has mainly concerned the process leading up to a decision to stop smoking. Within the framework of Differentiation and Consolidation theory (Diff Con) (Svenson, 1992; 1996), the aim of the present study was to study both pre- and postdecision processes in smoking cessation. Participants in smoking cessation programs will be followed from before the implementation of the decision to stop smoking, until a year after the implementation of the decision. The subjects will first generate three attributes that speaking in favor of continuing to smoke, and then three attributes speaking in favor of ending smoking. The subjects will first indicate how attractive each of these six attributes was for the alternative to stop smoking, and then how attractive each attribute was for the alternative to continue smoking. The subjects will also describe two situations in which the temptation to smoke would be strongest, and their certainty of resisting the temptation in each of the situations. First, it was predicted that the subjects who succeeded to stop smoking, would indicate stronger differentiation and/or consolidation by attractiveness restructuring, than the subjects who relapsed. Second, it was predicted that the stronger a subject experienced a conflict in the decision to stop smoking, the stronger the differentiation and/or consolidation. Third, it was predicted that subjects who succeeded to stop smoking would indicate a higher degree of perceived control in their decisions. From this follows that a positive correlation between perceived control and degree of differentiation and consolidation can be expected. Apart from the more applied aspects of the study, a complementary purpose was to, in contrast to earlier studies from a Diff Con perspective, to more fully examine both pre- and postdecision processes in an integrated analysis. The data are collected at the present moment, and will be analyzed for presentation at the SPUDM conference in Leeds in August 1997.

Improving Diagnostic Inferences in Physicians: Natural Frequencies

Ulrich Hoffrage and Gerd Gigerenzer

Max Planck Institute for Psychological Research Leopoldstrasse 24, 80802 Munich, Germany
{hoffrage,gigerenzer}@mpipf-muenchen.mpg.de

Previous research on Bayesian inference, reporting poor performance by students and experts alike, has often led to the conclusion that the mind lacks the appropriate cognitive algorithm. We argue that this conclusion is unjustified because it does not take into account the information format in which this cognitive algorithm is designed to operate. We demonstrate that a Bayesian algorithm is computationally simpler when the information is represented in a frequency rather than a probability format that has been used in previous research. A frequency format corresponds to the way information is acquired in natural sampling-sequentially and without constraints on which observations will be included in the sample. Based on the assumption that performance will reflect computational complexity, we predict that a frequency format yields more Bayesian solutions than a probability format. We tested this prediction in a study conducted with 48 physicians. Using outcome and process analysis, we categorised their individual solutions as Bayesian or non-Bayesian. When information was presented in natural frequencies, 46% of their inferences were obtained by a Bayesian algorithm, as compared to only 10% when the problems were presented in the probability format.

Does "Judgement Policy Capturing" Really capture Policies?

Ulrich Hoffrage, Laura Martignon and Ralph Hertwig

**Max Planck Institute for Psychological Research, Leopoldstrasse 24, 80802 Munich,
Germany.**

{hoffrage,hertwig,martignon}@mpipf-muenchen.mpg.de

One important and influential line of research in judgement and decision making is the neo-Brunswikian judgement analysis. As a statistical model to describe how subjects integrate several proximal cues to arrive at a judgement on a distal variable, neo-Brunswikians almost exclusively use multiple regression: In a technique called judgement policy capturing this model is used to describe how subjects utilise available cues to arrive at their judgements. Decades of research in this field have proven the usefulness of this approach: in general, multiple regression achieve good fits when describing actual judgements.

However, there may exist other algorithms that result in the same judgement given the same cue values, although they process the information in a different way. The existence of such algorithms would invalidate the argument that a good fit of multiple regression necessarily describes how the mind works. Although neo-Brunswikians are aware of the fact that multiple regression is only a paramorphic mathematical representation, little has been done in elaborating on different algorithms. In this paper we propose several satisficing algorithms that do not process all of the available information. They are not only psychologically plausible but also match multiple regression in performance, that is, in accurately predicting real-world states (Gigerenzer & Goldstein, 1996, *Psychological Review*). We discuss the (in)efficiency of policy capturing based on multiple regression in distinguishing between choices derived by weighted linear models and those derived by satisficing algorithms.

Preference Reversals Between Joint and Separate Evaluations of Alternatives

Christopher K. Hsee

Graduate School of Business, the University of Chicago

There are two basic modes in which we make evaluations -- joint and separate. In the joint mode, we evaluate multiple options side by side and comparatively. In the separate mode, we evaluate one item at a time. For example, sometimes an art appraiser evaluates multiple paintings at the same time (joint evaluation); sometimes, the appraiser evaluates one painting at a time (separate evaluation). This research examines whether a set of options (e.g., two paintings) will receive different valuations when evaluated jointly than when evaluated separately.

Through a series of studies, systematic reversals of preference were observed between the two evaluation modes. In one study, for example, two hypothetical job candidates for a computer programming position were evaluated -- one with a higher college GPA and the other with more programming experience. When they were evaluated jointly, the more experienced candidate was judged more favorably, but when they were evaluated separately, the candidate with the higher GPA was judged more favorably.

In another study, two hypothetical sets of dinnerware were evaluated. One contained 40 pieces and the other only 24 pieces. The 40-piece set included a few broken pieces, although it still dominated the other set. When they were evaluated jointly, the 40-piece set was deemed more valuable. When they were evaluated separately, the intact 24-piece set was valued more.

These findings are explained in terms of the *evaluability hypothesis*. According to this hypothesis, if the choice set includes an attribute that is easy to evaluate independently (e.g., GPA) and an attribute that is hard to evaluate independently (e.g., programming experience), then the easy-to-evaluate attribute looms larger in the separate mode and the hard-to-evaluate attribute looms larger in the joint mode. This hypothesis can account for not only the findings presented here but also many other joint-separate evaluation preference reversal findings documented in recent literature.

The Developmental Antecedents of Adult Decision Making Biases

Janis E. Jacobs, Ph.D.

Pennsylvania State University

Much of the research on adult judgement and decision making has focused on deviations from normative models, demonstrating judgement biases and reliance on heuristic shortcuts (for reviews see Dawes, 1988; Plous, 1993). The characterisation of mature decision makers as illogical and irrational does not fit traditional developmental theories that describe cognitive development as increasingly logical (e.g., Piaget) and efficient (e.g., information-processing). Some have suggested that decision biases are just overgeneralisations of rules that are usually beneficial (e.g., Baron, 1990. Gigerenzer, 1991). If this is true, research on the antecedents of adult biases should result in a model that accounts for the development of inferential limitations and judgement biases, as well as the improvements in reasoning that we typically associate with development.

Although Ross (1981) suggested more than a decade ago that research should be directed toward determining the origins of adult inferential shortcomings, only a few studies have been conducted with this aim (Agnoli, 1991; Baron, Granato, Spranca, & Teubal, 1993; Davidson, 1995; Jacobs & Potenza, 1991; Jacobs, Greenwald, & Osgood, 1995). From these studies we know that even very young children exhibit many of the same biases in judgement that have been found in adults. Our research group has conducted several studies to document developmental trends in the use of statistical reasoning and heuristics to make social judgements. The studies on intuitive statistical reasoning indicate that children's use of the "law of large numbers" to make judgements about people and events increases during middle childhood; and that children's estimates of the base rates of everyday events become more accurate across the same age span. At the same time as these seemingly normative rules are developing, children's use of judgement heuristics is increasing. In an earlier study that tested the use of base rates and the representativeness heuristic, we found that children could use base rates appropriately as early as first grade, but that they used the representativeness heuristic when individuating information was available.

The presentation will review the previous research and present our most recent study on the use of the representativeness heuristic. In this study, the goals were to include younger children, to have children "collect their own data" rather than provide the numbers for them, and to manipulate the base rate ratios to determine the conditions under which children would use quantitative versus heuristic information. To do this, we had children make judgements about pictures of social situations in which we had manipulated the base rate ratio (by depicting similar numbers of each group or very different numbers of each group) and the instructional condition (by drawing attention to base rates or to individuating information). In a sample of approximately 200 subjects of ages 4, 6, and 8, we found that children's judgements were more accurate with increasing age, but that accuracy depended on both the base-rate ratio and the instructional condition. Judgements of the youngest children were not significantly affected by changes in ratio or instruction, but judgements of the oldest children were significantly affected by both, so that they gave the most accurate judgements when they looked at disparate ratios and heard the base rate instructions.

These findings suggest that, during middle childhood, the intuitive use of base rates and the representative heuristic are developing at about the same time, but that the use of base rate

information appears to precede and supersede the use of representativeness (in cases in which differential base rates are clear and in cases in which the social knowledge doesn't exist). The use of judgement heuristics appears to develop in tandem with other intuitive knowledge about the statistical properties of social distributions so that children are using both sources of information rather than pitting one against the other. The information from this study and others with children and adolescents is important for those interested in training people to overcome biased judgement strategies (e.g., Baron & Brown, 1991; Larrick, Morgan, & Nisbett, 1990; Nisbett, Fong, Lehman and Cheng, 1987), because it provides insight into the conditions under which such strategies develop.

Attributing attractiveness judgments to other members participating in a group decision:
Comparing majority and minority members

Anders E. L. Johansson

Ola Svenson

Department of Psychology, Stockholm University

S-106 91 Stockholm, Sweden

It was predicted that estimates of other groupmembers' attractiveness judgments of decision alternatives could serve a function of protecting a member's own personal view of a decision alternative after a groupdecision. Forty-two students individually judged the attributewise and overall attractiveness of two holiday trips of the approximate worth of USD 450, and then indicated which of the two alternatives they preferred. Based on this preference indication, the subjects were distributed into three-member groups in which two members (majority members) preferred one alternative, while the third member (minority member) preferred the other alternative. The groups' task was to make joint judgments of, and a decision between the two alternatives. In all cases analyzed in the present study, the groupdecision was the same as the majority members' preferred alternative. After the group session, the subjects were asked to reproduce their initial attributewise and overall attractiveness judgments of the alternatives. The subjects were then asked to rate how each of the two other members in the group had made his or her attractiveness judgments of the alternatives. These ratings were then compared to each other member's real ratings of the decision alternatives. The preliminary results showed that minority members exaggerated the majority members' attractiveness judgments of the alternatives as being more in favor of the chosen alternative compared to the majority members' real judgments. Exaggerating the strength of the majority members' preferences for the chosen alternative may indicate a self-protecting process for minority members, who in the group gave up his or her own individual preference. The corresponding exaggeration of the attractiveness advantage for the chosen alternative was found for majority members' ratings of the other majority member in the group, something that could be interpreted as a way of reducing ones own responsibility for the group decision. Further, majority members were rather accurate about minority members' attractiveness judgments on the two most important attributes. However, quite interestingly, the majority members exaggerated the minority member's attractiveness judgments as being more in favor of the nonchosen alternative on the overall measure. This might indicate that majority members allocate the conflict in the groupdecision to overall response. Further, implications of groupmembers' attributions of attractiveness judgments to other groupmembers on their own individual postdecision processes are discussed briefly.

Revealing Mental Accounting as a Self-Control Strategy

Niklas Karlsson, Marcus Selart, and Tommy Gärling

Department of Psychology

Göteborg University

Haraldsgatan 1

S-413 14 Göteborg

Sweden

How people cognitively describe decision outcomes is the focus of much research. Mental accounting refers to a process of categorizing outcomes (Henderson & Peterson, 1992; Tversky & Kahneman, 1981). In this vein, the behavioral life-cycle theory of Shefrin and Thaler (1988) assumes that people classify assets in three mental accounts: current income, current assets, and future income. The decomposition of wealth into mental accounts may serve the purpose of a self-control strategy, since it substantiate a way of attaining also more farsighted preferences. In the present study we wanted to test the hypothesis that future consumption is considered to a lesser extent when money is available as current income compared to when current assets have to be used. This hypothesis constitutes a specification of how the use of mental accounts may serve as a self-control strategy, in that concerns for future consumption is tied to the use of current assets, while only short-term preferences are considered when using a current income. An experiment was performed in which undergraduates made fictitious choices between buying or not buying a durable good after having experienced a temporary income change. In different conditions subjects were told that their income was less, the same, or higher than usual. At the same time they were informed to have an amount saved which made their total assets equal in all conditions. Furthermore, in some of the situations, subjects were told that they had an expenditure above the usual, that they had to pay in 2 weeks, 1 month, 3 months, or 6 months. In line with the hypothesis, it was found that the propensity to buy the durable good was less affected by the future expenditure when money was available as current income compared to when current assets had to be used. Moreover, how distant the future expenditure was had less importance when using current income than current assets for consumption.

References

- Henderson, P. W., & Peterson, R. A. (1992). Mental accounting and categorization. *Organizational Behavior and Human Decision Processes*, 51, 92-117.
- Shefrin, H. M., & Thaler, R. H. (1992). Mental accounting, saving, and self-control. In G. Loewenstein, & J. Elster (Eds.), *Choice over time* (pp. 287-330). New York: Russel Sage Foundation.
- Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, 211, 453-458.

EYEWITNESS IDENTIFICATION ACCURACY: A COMPARISON OF THREE LINEUP PRESENTATION MODES

Jos, Kerstholt
TNO Human Factors Research Institute

Statements of eyewitnesses are in many criminal cases part of the evidence provided by the prosecution. In decisions to convict a defendant, a strong weight is generally placed on positive identifications, and for that reason it is of crucial importance that lineup procedures are followed that yield reliable judgements. The main purpose of the present experiment was to investigate whether the mode of lineup presentation (live, video or photographs) would affect the witness's judgement. Several predictions can be made: A live lineup confrontation may result in more accurate judgements than a lineup confrontation via video, and video may be better than photographs, due to the higher number of retrieval cues; Context reinstatement may facilitate the recognition process (Cutler, Penrod & Martens, 1987); And a sequential lineup presentation may result in more correct judgements than a simultaneous presentation, because an absolute criterion is used rather than a relative one (Sporer, 1993). Subjects (N=335) were recruited from various clubs and represented a wide range across age and education. Subjects thought they were participating in a memory experiment. Before they carried out the memory task, however, they witnessed a staged event. After they had carried out the memory task, they were reminded of the incident and asked to identify the person involved. This person was either present in the lineup or not. The results indicated that there were less false alarms with a live lineup confrontation than with a lineup confrontation via video or photographs. For each presentation mode the same number of correct identifications were acquired. Context reinstatement and additional cues from movements and facial expressions enhanced recognition: dynamic video presentations resulted in more correct judgments than the static ones. In contrast with previous findings, it did not make any difference whether photographs were presented simultaneously or sequentially. An explanation for this difference is the duration of the presentation, which was rather long in the present experiment. Under some circumstances, longer exposure times at the recognition phase may result in worse performance (Kerstholt, Raaijmakers & Valeton, 1992). An additional goal of the experiment was to identify the variables that could best predict the accuracy of a judgement. In this regard, most attention has been given to the eyewitness accuracy-confidence relation (for example, Read, Vokey and Hammersley, 1990), and more recently to decision times (Sporer, 1993). In addition to subjects' confidence and decision times we also used the research assistant's assessment of the reliability of the witnesses' judgements. For each presentation mode the assistant's assessment appeared to be the best predictor for the accuracy of the subjects' judgments.

The Impact of Perceived Competence on Probability Estimations

Michael Kilka and Martin Weber

**Lehrstuhl für Bankbetriebslehre
Universität Mannheim**

In many experiments, people were found to be overconfident in their ability to predict the outcomes of events. For quantity estimations it has been shown that confidence intervals are typically too narrow which could be interpreted as a form of overconfidence. Additionally, Heath and Tversky (1991) present evidence that self rated competence has an important impact on peoples decisions.

Combining these findings we expect the degree of confidence expressed by self rated competence to be reflected in the estimation of probabilities. Particularly, we expect perceived competence to have an impact on different characteristics of the subjective probability distribution such as the dispersion and the location of the distribution. Especially we expect the dispersion to decrease with higher preceived competence.

To test our hypotheses we conducted a cross cultural experiment among graduate business students in Germany and the U.S. in a stock market setting. Both groups were asked to rate their perceived competence and to indicate their subjective probability distributions concerning future stock prices of an identical set of German and U.S. stocks and stock market indices.

The analysis for each test group shows that higher perceived competence is associated with a tighter subjective distribution. Since people feel more competent concerning domestic stocks the dispersion is found to be lower for domestic stocks than for foreign stocks. Perceived competence also affects the location of the probability distribution. High competence stocks are judged more optimistically than low competence stocks. Additionally, the identical experimental design allows us to compare the results of the U.S. test group to the results of the German test group. To further interpret the findings these subjective distributions are compared to real stock market data.

Pre-decisional information search: Individual differences among experts

Susan S. Kirschenbaum¹, Naval Undersea Warfare Center Division, Newport, RI, U.S.A.

Wayne D. Gray, and Brian D. Ehret George Mason University, Fairfax, VA, U.S.A.

In naturalistic situations, information search strategies can be a key component of expert decision making. The submarine decision maker (DM), attempting to locate a target, is aided by sophisticated technological support systems. However, because of the nature of sound transmission underwater and the possible actions of the target, he² must make decisions in a dynamic environment without full information. Moreover, in order to gather information, he must take interim diagnostic actions that change the nature of the problem and that can not be undone. Given these conditions, experts are highly adaptive in their information gathering behavior.

We report on the information gathering behavior of five expert submarine DMs in a simulated problem. Ten hours of verbal and video protocols have been analyzed to extract the information gathering and decision behavior in the form of goals and operators. Among the most striking finding are the variability of behavior among these experts. Subjects varied both in their typical sequence of actions and in their interim decisions. For example, a moderate correlation, $r = 0.77$, was obtained for number of operators employed to accomplish different subgoals. Detailed analysis of these different "styles" of performance will be discussed. No systematic, experimenter-controlled factors account for this variation, however, there were performance consequences for differences in information gathering style.

When Does the Omission Bias Occur?
An Information-Processing Explanation
Johanna H. Kordes - de Vaal
Vrije Universiteit, Amsterdam

Abstract

Two forms of omission bias were investigated; an omission bias in one's own behavior and in the evaluation of someone else's behavior. For both forms, the results show an omission bias for negative outcomes and a commission bias for positive outcomes. In addition, a framing effect was found on both forms of the omission bias. In Experiment 5, a positive frame caused subjects to show a commission bias, while a negative frame caused subjects to show an omission bias. In Experiment 6, decisions with positively framed outcomes were evaluated as better when they were commissions instead of omissions, and decisions with negatively framed outcomes were evaluated as better when they were omissions instead of commissions. However, when the outcome of the other option was known, this was taken as a reference point instead of the reference point suggested by frame. A combination of "focussing" and "reason-based choice" is proposed to underlie these results.

Frame normalization technique to improve team decision making processes. A frame normalization method to reduce technically dispositioned solution biasing on Integrated Product Team (IPT) decision making in the requirements definition domain.

Joseph J. Kranz & Denis M. Coffey

**Analysis & Technology, Inc., Corporate Program Managers Requirements,
Engineering Analysis & Technology, Inc. One , Corporate Place Middletown, RI 02842-6277**

Engineering requirements definition teams, even cross-functional ones such as Integrated Product Teams (IPT), are heavily biased by the concentration of specific expertise and technical solutions familiar to the members of the team. This has classically resulted in product design decisions which do not meet the needs and desires of the product consumer. Many techniques for product definition have evolved to address this weakness. A substantial number of these techniques arise from Japanese methods which tend to have engineering team cultural specific success. Specifically, Japanese methods emphasize a long-term consensus building period of requirements analysis prior to engineering development. North American (and European) engineering teams tend to become impatient with these techniques and want to fulfill the focus of their technical/scientific education with engineering solutions early in a requirements definition process. Further, they are typically pressed by engineering managers to "get on with it" and design something early to meet an arbitrary corporate goal. Effective requirements definition decision making requires the creation of a product-use immersion environment whereby the engineering team emotionally identifies with the end user and utilizes this perspective in the decision making process leading to the definition and design of products. The authors present a technique which creates an end-user normalized frame for the requirements definition team. By evoking the end use frame, the IPT inherently overcomes engineering heuristic biases in anchoring and adjustment; the team autonomically realizes that they can not develop a solution because they become intrinsically aware that they do not understand the problem. This creates a motivational stimulus to "swim in the user's fish bowl." Further, team level overconfidence, availability, representativeness, simulation and hard-easy effect biases are mitigated. Also, remarkably, group polarization effects are refocused because the group frame is not on solution but on use; the risk of taking an extreme position is more accurately assessed and evaluated based upon potential reward to the user, and not based on the elegance or innovation (and resulting group/individual technical notoriety) of the solution. The team takes uncharacteristic risks to confront management in the interests of the user or customer.

Schein, E. H. (1996); *Three Cultures of Management: The Key to Organizational Learning in the 21st Century*. Boston: MIT Sloan School of Management.

Damasiano, A.; *Descartes Error*.

Witteman, C. & Kunst, H. (1996); *A Technology for Debiasing Psychotherapists' Decision Processes*. DECI research project. The Netherlands: Utrecht University.

Rathus, S.A. (1996); *Psychology in the New Millennium*. Fort Worth: Harcourt Brace College Publishers.

Burchill, G. (1995); *Concept Engineering*. Cambridge, MA: Center for Quality of Management.

Kahneman, D., Slovic, P. & Tversky, A.; *Judgement under Uncertainty, Heuristics and Biases*.

Cohen, L. (1995); *Quality Function Deployment*. Reading, MA: Addison-Wesley Publishing Company. Frame normalization to improve team engineering processes.

The Influence of Framing on Risky Decisions: A Meta-analysis

Anton Küchberger

University of Salzburg, Austria

The framing effect is the finding that, in risky decision making, highlighting the positive aspects of formally identical problems leads to risk aversion and that highlighting their equivalent negative aspects leads to risk seeking. This effect was first demonstrated in 1981 by Tversky & Kahneman and since has attracted a lot of empirical and theoretical work. The size of this effect is evaluated in a meta-analysis. By using both the ancestry as well as the descendency approach, around 130 empirical papers, with approx. 30,000 participants were retrieved, which investigate gain/loss framing in risky contexts. The data base is analyzed with respect to different research paradigms, and methodical as well as substantive characteristics. Results show that the overall framing effect between conditions is of a moderate size ($d=.33$), but is very heterogeneous. Marked differences in mean effect sizes exist between the different research paradigms. Important methodical features are: the quality of the framing manipulation (i.e., whether or not a reference point is manipulated; whether or not the gain/loss distinction is made explicit), the nature of the risk involved (i.e., whether alternatives differ qualitatively or quantitatively in riskiness; whether or not there is a single risky event) response format (choice vs. judgment) and study design (between vs. within). Effect sizes did also vary between problem domains. Other features were shown not to be important (e.g., expertise of participants, individuals vs. groups as experimental units). The important features are discussed and the findings are evaluated with respect to current theory. It is concluded that many important features of framing have been overlooked and that the most significant feature (framing by reference point manipulation vs. framing by outcome saliency) has been neglected altogether. Furthermore, the findings help understand why some framing paradigms are effective while others are not.

Peak and End Effects in Evaluating Economic Experiences

Thomas Langer, Rakesh Sarin, Martin Weber

When choosing between alternatives that will influence their future utility individuals often consider the utility they experienced in similar situations in the past. Therefore the ability of making "good" retrospective evaluations of experiences will determine the quality of present choices.

It was shown however in many experiments (e.g. Redelmeier/Kahneman, 1996, Fredrickson/Kahneman, 1993) that individuals are systematically biased in retrospective evaluations of temporally extended experiences of pain and pleasure. These biases are basically described by two principles' (Kahneman, Sarin, Wakker): *The Peak-and-End-Effect* and *Duration Neglect*. The Peak-and-End-Effect states that in retrospective evaluation individuals give excessive weight to the best (worst) and the last moment of an experience. Duration Neglect describes the fact that the retrospective evaluation mostly neglects the total length of the experience. As a consequence of these principles individuals might even prefer strictly dominated alternatives, which they experienced before.

All experiments run so far dealt with the subjective experiences pain and pleasure. We believe however that Peak-and-End-Effect and Duration Neglect are more general phenomena that are not restricted to continuous streams of hedonic values. If the biases appear in a similar way in retrospective evaluation of discrete sequences of rather objective experiences they will play an important role in economic settings. This paper reports some first results from computerised experiments simulating economic situations. Subjects were shown nothing but sequences of numbers relating to some previously mentioned economic context. As in the pain/pleasure experiments they were asked to rate attractiveness and to make choices.

Internal Organization of Physicians Knowledge in Diagnostic Tasks

Oleg I. Larichev

Institute for Systems Analysis, Moscow, Russia.

The problem under investigation in the paper is: how physicians working for a long time in the field organise their knowledge?

In the diagnostic tasks physicians make decisions on the base of information describing a patient. The typical behaviour of a good expert is known: "forward" reasoning, fast and correct decisions (Atkinson et al.,1993). There is the evaluation that good experts possess the big knowledge: tens of thousands of possible clinical situations (Simon, 1983).

The paper presents results of experiments aimed to uncover the internal organization experts knowledge. The experiments with several experienced physicians demonstrated that experts have in the memory several (no more than 7) decision rules of special kind. The rules describe clinical situations "located on the border" between decision classes (classes of diagnoses). In general case the rules could be described by trees of attributes values. The decision rules are unconscious: experts could not verbalise them but they behave in the accordance with the rules.

System CLASS (Larichev et al.,1990) have been used in the experiments for the presentation of different clinical situations to physicians. The fixation of time of an expert's reasoning have been used to check some hypotheses concerning the internal organization of physicians knowledge.

Atkinson R.L., Atkinson K.C., Smith E.E., Bem D.J. "Introduction to Psychology", Eleventh Edition, Harcourt Brace Jovanovich College Publ., New York, 1993.

Larichev O., Moshkovich H., Furems E., Mechitov A., Morgoev V. "Knowledge Acquisition for the construction of full and contradiction free Knowledge Bases", Progamma, Groningen, the Netherlands, 1991.

Simon H.A. "Reason in Human Affairs", Stanford University Press, Stanford,1983.

Chinese and English Speaker's Modes of Probabilistic Thinking and Levels of Risk Taking in Gambling

Lai-Yin Lau

Bolton Institute, Division of Psychology and Biology

The results of Phillips and Wright's study (1977) suggested that compared with English speakers, Chinese made more "100%1 numerical probability judgements and more 'yes/no' responses to the 'Probability Assessment Questionnaire' (PAQ) and to the 'View of Uncertainty Questionnaire' (VUQ) respectively. The Chinese tended to be overconfident in their probability judgements. These findings led them to conclude that Chinese and English speakers had different modes of probabilistic thinking. Chinese were inclined to adopt non-probabilistic thought under uncertainty, while English tended to take a probabilistic view. In turn, Kogan and Wallach (1964) observed that there seemed to be a relationship between extreme probability judgement under high confidence and risk taking in gambling. From the findings of these two studies, the current investigation conjectured that the Chinese who made extreme probability judgements demonstrating non-probabilistic thinking in Phillips and Wright's study might have a preference for risky strategies in gambling. In order to test this hypothesis, two studies were conducted. In the first study, four subject groups were established: Chinese gamblers, Chinese non-gamblers, English gamblers and English non-gamblers. All four groups were tested in the UK.. Modes of probabilistic thinking expressed numerically was measured by using the PAQ. A hypothetical horse-racing gambling game was designed to measure levels of risk-taking behaviour. In the game, subjects were asked to imagine that they had £100 to bet on four races. Results indicated that there was correlation between the measure of "100%1 responses in the PAQ and the 'total stake' measure in the horse-racing game. The two Chinese groups and the English gamblers made more 100% assessments (non-probabilistic thinking) and bet more money on the game than the English non-gamblers. In the second study, modes of probabilistic thinking expressed verbally was measured by the VUQ. The hypothetical horse-racing game was used again to measure degrees of risk-taking behaviour. In the game, subjects did not just bet on the four races, they had to give a probability judgement to indicate how sure they were that the horse they bet on would win the race. Four groups of subjects were tested: Chinese gamblers, Chinese non-gamblers, English gamblers and English non-gamblers. All the Chinese subjects were tested in Hong Kong, while the English subjects were tested in the UK.. Results of the second study were consistent with those found in the first one. The two Chinese groups and the English gamblers who demonstrated their nonprobabilistic thinking in the VUQ, also tended to be overconfident in their probability judgement in the horse-racing game which resulted in their betting more money in the game. on the contrary, the English non-gamblers tended to adopt probabilistic thinking in the VUQ and they were more cautious in their bets in the horse racing game. Therefore, it was concluded that non-probabilistic thinking seemed to be related to risk taking in gambling. These findings are discussed in terms of a model of decision making for gamblers and Chinese non-gamblers in-gambling behaviour.

Linguistic Coding of Probability and Probabilistic Thinking of Chinese and English Speakers

Lai-yin Lau
Bolton Institute
Division of Psychology and Biology

It was previously found that compared to English speakers, the Chinese were less inclined to think probabilistically when facing uncertainties (Phillips and Wright 1977). This resulted in the production of fewer English probability responses and less variety of English probability terms from the 'View of Uncertainty Questionnaire' - VUQ, when the Chinese speakers responded to the questionnaire in English. In order to verify this finding, in the present study the Chinese were given a version of VUQ to which they responded in their native language i.e. Chinese. It was hypothesized that the Chinese would produce fewer Chinese probability responses and less variety of the Chinese probability expressions than English speakers would produce. According to the weak form of the Sapir-Whorf hypothesis, language influences the way individuals conceptualize the world. If so, could it be that the reason the Chinese are less likely to take a probability view to uncertainties is because they have fewer probability expressions in their language? The present study investigated the differences between the Chinese and the English probability linguistic codes and explored the role of language in probabilistic and nonprobabilistic thinking. Two experimental instruments were used VUQ and PST (Probability Scale Task). The former which was similar to the one used by Phillips and Wright, was employed to measure the variety of the Chinese and the English probability language and the habitual use of probability expressions by Chinese and English adults. The latter was used to measure the numerical probability indication of the Chinese and English probability language. There was a scale of probability percentages in the PST from 0% to 100%, with 5% intervals i.e. 0%, 5%, 10% ... 100%. Subjects were required to convert each percentage level into a probability term in their own native language. Results showed that: i) in terms of quantitative measures, the English had a greater variety of probability terms; and ii) with respect to the quality of the expressions, the English terms appeared to have a more precise numerical probability meaning. These findings seemed to suggest that different forms of probability languages were related to different modes of probabilistic thinking. The Chinese speakers' non-probabilistic thought could be influenced by the less variety and less precision of the Chinese probability language. On the contrary, the English speakers' probabilistic thinking could be stimulated and shaped by the richness of the English probability linguistic coding. The weak form of the Sapir-Whorf hypothesis thus appeared to be supported by the present work. Language may not determine how we think but it appears to have some degree of influence on thought.

Decision Making by Similarity - Toward a Theory of Anomalies

Jonathan W. Leland
National Science Foundation

Abstract

The assumption that individuals choose according to a coherent set of preferences lies at the heart of decision theory. A compelling justification for this assumption is that we do not observe the types of pathological behavior that would follow if preferences were intransitive or non-monotonic -- people appear rational in the large. On the other hand, it has become increasingly clear that there is a corridor in the choice space involving decisions between alternatives, at least proportionally close in value, where behavior systematically departs from the requirements of rationality-- people appear irrational in the small.

Elsewhere (Leland 1994, 1997) I have interpreted such rationality in the large but irrationality in the small as indicating that people possess coherent preferences but are unable to discriminate between alternatives close in value. When the latter situation occurs, choices are based on simple decision rules involving comparisons of prizes and their corresponding probabilities of occurrence across alternatives, first with respect to their equality or inequality and, if these comparisons prove uninformative, with respect to their similarity or dissimilarity. As such, anomalies are not preference but rather process revealing.

While exceedingly simply, these comparative rules and, in particular, the one involving similarity judgments, prove remarkably powerful for explaining observed violations of expected utility occurring in single-shot choices between risky alternatives. For certain representations of alternatives, similarity judgments produce behaviors implied by Prospect Theory. For representations of alternatives as actions, the model predicts the types of behaviors implied by Regret Theory. In addition, the model implies observed violations of stochastic dominance, transitivity, and invariance not accounted for by available alternatives to expected utility.

This paper extends the model of similarity judgments and examines its implications for choices under uncertainty involving repeat play (behaviors differing from those observed in single shot decisions), choices between intertemporal prospects, observed disparities between willingness to pay and compensation demanded measures of value, and preference reversals manifest in choice versus pricing tasks.

Perceptual Anomalies and Strategic Surprises

Joseph Lampel

Department of Management, St. Andrews University, Scotland

Abstract

Strategic surprises are a feature that is common to war, politics, and business. Case studies of strategic surprises have concluded that strategic surprises are usually the result of a misinterpretation of ambiguous information. Such misinterpretation, it is often argued, could have been rectified by collecting additional information, or by the proper use of historical data. By contrast, we argue that the ambiguity of strategic surprises is due primarily to the use of heuristics in situations where decision makers must analyze rare or unique situations. These heuristics are employed quickly under time constraints, and are not amenable to change when more information is collected. In effect, our thesis is that the ambiguity is not inherent in the situation, since all strategic situations are inherently ambiguous, but that ambiguity is the product of the interaction of decision heuristics with situations that are complex and fraught with important consequences to the actors. We examine how different decision heuristics produce different types of ambiguity, and illustrate our typology drawing on case material.

Phased Narrowing and Information Monitoring as Complementary Process Tracing Techniques

Irwin P. Levin, University of Iowa
J. D. Jasper, University of Pennsylvania
Mary E. Huneke, University of Iowa
Wendy S. Forbes, University of Iowa

The authors have developed a process tracing technique, called phased narrowing, to complement existing techniques by providing new data on the manner in which decision makers process information across successive stages in arriving at a final choice. In phased narrowing decision makers are given a relatively large set of multiattribute choice options (e.g., selecting a college to attend) and are asked to narrow them down in successive stages, corresponding to the formation of a consideration set, then a choice set, then a final choice. What's new about phased narrowing is that, by computing the average value of each attribute for the options selected at each stage, quantitative measures can be derived of how the relative impact of each attribute changes over successive stages and how these changes relate to individual difference factors.

The studies to date using this method have yielded the following results 1. The attribute with the greatest impact at the consideration set formation stage will continue to have the greatest impact on later stages, as long, as the remaining options include variation on this key attribute. 2. The magnitude of individual differences (e.g., the effect of consumer nationalism on selection of multi-national products) increases across stages. 3. The size of the consideration set is smaller when decision makers are asked to include options for later scrutiny than when they are asked to exclude options they would no longer consider. Notably, differences in consideration set size did not lead to differences in final choice, 4. Options with missing information tended to be discarded faster than options with complete information. 5, The method of phased narrowing seems to be user friendly". That is, decision makers rated it as easy to use and "natural", and were confident in the choices they made. 6. The process of narrowing down choices on successive stages does not seem to distort the final choice. The distribution of final choices did not differ between subjects using phased narrowing and control subjects making only a final choice. The method thus appears to be valid and easy to use, and has the advantage of providing researchers with choice-based measures of information usage.

Despite the desirable features of phased narrowing in tracking changes in information usage across successive stages, much more can be learned about the processes occurring at each stage by combining phased narrowing with traditional process tracing methods such as information monitoring and verbal protocols, This is the subject of current work. For example, by using computer-generated stimulus displays and Payne et al.'s "moiaselab" procedures, a number of information processing measures (e.g., % of tie-in spent on attribute-based vs. alternative-based searches) can be taken and compared across successive decision stages. Evidence thus provided on, for example, the relative use of compensatory and noncompensatory strategies at each stage can be used to develop the most comprehensive model to date of multi-phased decision making.

OVERCONCRETENESS EFFECT IN CATEGORIZATIONS. ROLE OF VALUE AND ERROR UTILITY IN CATEGORIZATION DECISIONS.

MARIA LEWICKA
Faculty of Psychology
University of Warsaw

The typical behavior of people in rule discovery (category learning) tasks consists in focusing on positive examples of a category instead of its counterexamples. This behavior leads to overly concrete final categories which consist of sufficient but not necessary categorization criteria. This overconcreteness effect has been reported in a great variety of tasks and contents like, concept learning (Bruner, Rosch), hypothesis testing (Friedrich, Klayman & Ha, Lewicka, Wason), stereotypical categorizations (Allport, Leyens & Yzerbyt), and became known under different names, for instance as confirmation bias or the ingroup overexclusion effect.

The most convincing explanation of the overconcreteness effect presents it as a product of higher negative utility of false positives over false negatives in categorizations decisions. In other words, overly concrete categories prevent us from dangerous commissions, although they make us more vulnerable to the error of omissions (Friedrich, Lewicka). The reason for this asymmetry is that in the majority of situations, commissions appear to have more dangerous pragmatic consequences than omissions. Hence the ensuing risk aversion in categorizations decisions.

Lewicka (1988, 1993) suggested that the above asymmetry and the ensuing overconcreteness in categorizations should be correlated with the affective value of the category. Desirable or neutral categories should instigate elimination of commissions to a significantly higher degree than undesirable categories which in fact should make salient the dangers of omissions. Hence, the overconcreteness effect should be significantly more pronounced in the former than in the latter.

Five studies were run to test this hypothesis. In a computer game participants tried to maximize financial gain/minimize loss by either deciding to contact or to avoid the financially profitable or unprofitable category instances. Throughout the game they "learned" which categorization rule would ensure the maximum/minimum payoff. Manipulated was the pragmatic value of category instances (desirable versus undesirable categories, that is categories which instances signified either financial gain or loss) and a number of other factors predicted to influence performance (utilities attached to categorization decisions, logical structure of categories, concreteness of the categorization rule, etc.).

In all five experiments the final desirable categories turned out significantly narrower than the final undesirable categories. As predicted, the final categorization rules acquired in the "gain" (desirable instances) conditions consisted of more sufficient than necessary categorization criteria and the reverse was true for the "loss" (undesirable instances) conditions. Independent manipulation of the (negative) utility of categorization errors (only commissions versus only omissions versus both commissions and omissions) revealed that error utility plays a more important role in the final shape of the categorization rule than the affective value of the category instances.

There will be discussed significance of the results for reduction of the overconcreteness effect.

Lion, R., & Meertens, R.M.

Department of Health Education and Promotion, Maastricht University, P.O. Box 616, 6200 MD Maastricht, The Netherlands.
Tel.: +31.(0)43- 388 24 13 /Fax: +31.(0)43-367 10 32. E-mail: R.Lion@gvo.unimaas.nl

Functional risk perception: the influence of goals on risk perception

Research in risk perception and risk taking has typically been done from two points of view (see Lopes, 1987). One has focused on characteristics of the risk situation (e.g. voluntariness, controllability, frequency information) and how they affect risk perception and decision making (e.g. Vlek & Stallen, 1981; Kahneman & Tversky, 1979; Slovic, Fischhoff & Lichtenstein, 1982; Hendrickx & Vlek, 1991). The other has focused on personality factors that determine one's risk taking tendency (e.g. risk seekers/risk avoiders, Wilde, 1982; need for achievement, Atkinson, 1964; Atkinson & Birch, 1970; uncertainty orientation, Sorrentino & Hewitt, 1984; Sorrentino, Hewitt & Raso-Knott, 1992).

Relatively neglected in these research traditions, are the specific social or personal functions risk perception and risk taking may serve, depending on the current situation. Risk perception or risk taking may for instance serve defensive (e.g. trivialize an uncontrollable, huge risk) or self presentational goals (e.g. taking a risk in order to create a bold impression). Risk perception and risk taking might also be affected by interpersonal aspects such as accountability or outcome dependence (cf. Fiske & Neuberg, 1992; Tetlock, 1992).

Research on this functional perspective on risk taking has hardly been carried out (exceptions that might be fitted into such a framework are Weigold and Schlenker [1991], Lenderink, Meertens and Vlek [1994] and Tetlock [1992]). However, this perspective fits in with recent research in social cognition research stressing the impact of goals on social information processing (see Bargh, 1990; Bargh & Gollwitzer, 1994; Gollwitzer & Moscovitz, 1996; Kruglanski, 1996). It can also be argued that the risk perceiver has been treated as a passive information processor. Subjects in an experiment were typically offered information that was deemed relevant (by the experimenter) to the situation, and subjects could consequently use only that information. In real life, people can usually determine the relevance of information themselves. People are active information seekers, whose information search strategy depends on his or her goals in a specific situation.

In the current research project we will try to combine the aspects mentioned above in an attempt to answer the following questions. In what way can goals influence the way risky situations are perceived, and how does this affect a risky judgement? How is the information search affected by a current goal? What can the way an information search is conducted reveal about the structure of a goal itself (i.e. how does a goal work)? In the presentation, an overview of the theoretical ideas behind the research project is provided. Second, the results of a first (pilot) project will be presented. In this experiment, subjects will be confronted with a risk of which they have relatively little prior knowledge. Information regarding the risk will be presented by means of an information display board (Jacoby, Jaccard, Kuss, Troutman & Mazursky, 1986; Payne, 1976), after which the preferred level of risk, the acceptability of the risk etc. will be measured.

Coping with Uncertainty: A Naturalistic Decision-Making Analysis

Raanan Lipshitz and Orna Strauss, University of Haifa

Abstract

This paper is concerned with three questions: How do decision makers conceptualize uncertainty? How do decision makers cope with uncertainty? Are there systematic relationships between different conceptualizations of uncertainty and different methods of coping? To answer these questions we analyzed 102 self reports of decision-making under uncertainty with an inclusive method of classifying conceptualizations of uncertainty and coping mechanisms that we developed from the decision making literature. The results show that decision makers distinguish among three types of uncertainty: inadequate understanding, incomplete information and undifferentiated alternatives. To these they apply five strategies of coping: reducing uncertainty, assumption-based reasoning, weighing pros & cons of competing alternatives, suppressing uncertainty, and forestalling. Inadequate understanding is primarily managed by reduction; incomplete information is primarily managed by with assumption-based reasoning; and conflict among alternatives is primarily managed by weighing pros & cons. Based on these results and findings from previous studies of naturalistic decision-making we hypothesize a *R.A.W.F.S.* (Reduction, Assumption based reasoning, Weighing pros & cons, Suppression and Hedging) heuristic which describes the strategies that decision makers apply to different types of uncertainty in naturalistic settings.

Replacing the experimenter's by the observer's stance: Tackling the dilemma of rigor vs. relevance in the study of naturalistic decision making.

Raanan Lipshitz , University of Haifa

Abstract

Thorngate (1978) argued that the study of decision making can benefit more from naturalistic observation than from tightly controlled laboratory experimentation. Observing decision making in naturalistic settings, however, is problematic because decision makers are not easily accessible to researchers, and because the cognitive processes that drive decision making cannot be observed and, hence, require externalization. Unfortunately, trustworthy methods of externalization (e.g., think-aloud protocols and the CDM interview) are time consuming and generally difficult to use in most naturalistic settings, limiting studies to small samples which preclude statistical analyses and to low level, basically technical, decision making. Thus, researchers of naturalistic decision making confront a dilemma of rigor vs. relevance: On the one hand, the more reliable methods of externalization (and standard cannons of validity) require "Spartan" research strategy. On the other hand, this strategy produces findings that lack credibility. This paper argues that microworlds methodology (computer-driven behavioral simulations) can be used to tackle the dilemma of rigor vs. relevance, because they allow rigorous observation of decision processes that approximate naturalistic decision making as characterized by Orasanu and Connolly (1993). The paper demonstrates this argument by preliminary results from a microworld study of concomitant changes in decision makers' mental models and decision making strategies that underlie the acquisition of expertise in complex dynamic decision making.

Graham Loomes
Department of Economics.
University of Newcastle.

Title: Private Values and Public Policies

Abstract:

If people do not have values and preferences of the kind usually assumed by decision theorists and welfare economists - namely, highly articulated values and well-behaved preferences which they can readily bring to bear upon decisions of every kind - what are the implications for the theory and practice of incorporating individual preferences into public policy? This question will be asked - but, sadly, will only be partially answered - with particular reference to issues of health and safety.

PREFERENCES IN PERSPECTIVE

Freerk A. Lootsma
Delft University of Technology
Faculty of Mathematics and Informatics
Mekelweg 4, 2628 CD Delft, The Netherlands

Tel. +31.15.278.5093,
Fax +31.15.278.7255,
E-mail: F.A.Lootsma@twi.tudelft.nl

The question of what preference actually is has rarely been discussed in the literature on Multi-Criteria Decision Analysis (MCDA) although it is of prime importance. Methods for MCDA are designed to reveal the preferences of the decision makers via more or less sophisticated elicitation procedures. Since the true nature of preference is not a point of discussion there are several schools in MCDA. Some of them advocate ordinal methods with the argument that the decision makers cannot accurately measure their preference intensities. Others, however, develop cardinal methods because they are convinced that subjective measurement of preferential feelings is feasible and sufficiently reliable indeed. Thus, the unresolved issue of what preference actually is and how it can be modelled strongly affects the development of MCDA methods. For an extensive discussion of the issue we refer the reader to the Chapters 7 and 10 of Von Winterfeldt and Edwards (1986).

In order to model the preferences of the decision maker we assume that decisions are invariably made within a particular context. Under each criterion we model the context as the range of acceptable performance data on the corresponding dimension. The lower and the upper bound are to be estimated by the decision maker. Next, starting from a particular viewpoint we partition each of these ranges into a number of subintervals which are subjectively equal. On the basis of psycho-physical arguments the gridpoints demarcating the subintervals constitute a geometric sequence. The behaviour of the gridpoints is in fact surprisingly uniform. The progression of historical periods and planning horizons, the categorization of nations on the basis of the population size, and the categorization of light and sound intensities, they all have a progression factor which is roughly equal to 2. This enables us to categorize the ranges and to quantify verbal expressions like weak, strict, and strong preference (the so-called gradations of relative preference) in the pairwise-comparison methods for MCDA.

The subdivision of a range with a geometric sequence of gridpoints and a progression factor 2 can be achieved via extremely simple steps: bisections and duplications. One does not need a particular unit of measurement to carry out these operations. Bisections and duplications, the progression factor 2, they will certainly remind the reader of the partitioning of time in musical compositions: tone durations as bisections or duplications of the rhythm's fundamental beat and repetitions of phrases, possibly transposed, in the melody. Bisections and duplications seem to be so deeply embedded in human behaviour that they may have a physiological basis in the neural system.

Thus, the leading idea of our approach is that the decision maker, standing at the so-called desired target, views the range of acceptable performance data in perspective. In essence, the subjective measurement of preference intensities is associated with the perception of space and time or, more adequately, with the motor skills of human beings. We perceive in order to move, but we also move in order to perceive. The motor skills make sure that the hands, the feet, and other parts of the human body will be at the right place at the right time. The neuro-physiological basis is still under investigation. It seems to be unclear how the motor skills are acquired, stored, retrieved, and applied (as motor programs on a parallel computer?).

Trade-Off Difficulty and Decision Strategy Selection

Mary Frances Luce

(1400 SH-DH, Wharton, University of Pennsylvania, Philadelphia, PA 19104-6371)

John W. Payne

James R. Bettman

(Fuqua School of Business, Duke University, Durham, NC 27708)

Behavioral decision research clearly demonstrates that decision makers possess a wide repertoire of decision strategies from which they appear to choose or construct a particular strategy based on task demands. It is well documented that decision makers appear to be sensitive to both the accuracy offered by and the effort required by particular decision processing operations when constructing a decision strategy (e.g., Payne, Bettman & Johnson 1993). This research addresses an additional goal that may guide choice: *minimizing negative emotion*. As the resolution of difficult tradeoffs is a key component of value construction, we address the goal of minimizing negative emotion in the context of decision makers' willingness to confront between-attribute tradeoffs.

We will discuss three studies demonstrating that subjects' decision strategies are altered with increases in the potential for negative emotion in the trade-offs presented by simple, two-attribute choices. Subjects in all three experiments are confronted with choices involving a currency attribute (e.g., price) and a non-currency attribute (e.g., quality). Attribute values for these choices are individually tailored to each subject based on a matching task where the subject equates a higher- and a lower-quality alternative in terms of price. Consistent with prior research, subjects' choices are responsive to the relative expense of the higher-quality alternative and to the relative importance of the quality attribute versus the price attribute. The experiments also demonstrate that decision makers respond to the trade-off difficulty of the quality attribute. Decision makers increasingly maximize the quality attribute in choice as that attribute is rated as more emotion-laden, involves lower relative attribute values, or involves losses rather than gains. This tendency to maximize quality in high trade-off difficulty conditions leads to choice-matching preference reversals favoring the high-quality alternative in choice. The influence of attribute trade-off difficulty on choice and choice-matching preference reversals is generally independent of and in addition to the well-documented prominence effect (e.g., Tversky, Sattath & Slovic 1988). Therefore, it appears that the potential negative emotion associated with particular trade-offs is one of the factors on which subjects rely when constructing their choice strategies.

Payne, J. W., Bettman, J.R. & Johnson, E.J. (1993). The Adaptive Decision Maker. Cambridge, England: Cambridge University Press.

Tversky, A., Sattath, S. & Slovic, P. (1988). Contingent weighting in judgment and choice. Psychological Review, 95, 371-384

Applying Janis and Mann's theory of decision-making to the characterisation of people faced with genetic testing

Bryan T Maguire, Bethan J Henderson, Jennie Potts, Rachel Wright
School of Psychology, University of Wales, Bangor

There are individual differences in the way in which people approach emotionally charged decisions such as those related to genetic testing for adult-onset diseases. One of the challenges facing genetic counsellors and other information providers is to match the information provided or offered to the informational needs of the individual at a given time. The information may be stressful to the patient but not all stress is dysfunctional. One theory which considers explicitly the relationship between stress and decision making is that advanced by Janis and Mann (1977). This study operationalises Janis and Mann's coping patterns using a combination of qualitative and quantitative data.

Twenty young adults were presented with a scenario in which a relative had died of a hypothetical genetic cancer which manifests in older adults. They could obtain further information about the disease and a test for the relevant gene by means of a set of thirteen short (34-244 secs) video clips presented on a computer. Each clip dealt with a different aspect of the disease. These clips were accessed in the sequence chosen by the participant, not predetermined by the experimenter. The clips had labels such as "Cause of the Disease", "Test Result" and "Reliability of the Test". The participants did not necessarily access all the clips. The task for the respondents was to decide whether they wanted to find out more about the test by discussing it with their GP.

As respondents searched through the information on offer they were asked to "think aloud". The transcripts were analysed for evidence of the coping patterns outlined by the theory. The number of video clips accessed and the proportion of the video clips viewed were used as evidence of the thoroughness of the search for information.

The five coping strategies are unconflicted adherence (inertia), unconflicted change, defensive avoidance, hypervigilance, and vigilance. The features contributing to these coping strategies are the survey of alternatives, canvassing of objectives, evaluation of current and proposed actions, thoroughness of the search for new information, the extent to which new information is assimilated in an unbiased manner, the re-evaluation of consequences and planning for the future. A matrix of these features was mapped from the verbal protocols of each respondent.

Respondents showing defensive avoidance and unconflicted change both looked at relatively few clips but the former accompanied her search with statements such as "I feel I don't need to go into any more detail, I know what the basis of it is" and "I feel satisfied with that" whereas the latter said "It's good to know that even if you've got a positive result that something could be done about it" and "It's good to know that if the parents have got the disease then you have risk of getting it". Neither of these respondents gave evidence of taking the other steps which contribute to a vigilant coping style as evidenced by statements like "right, we've got to think we've got the disease so you'd want to know the consequences of the disease".

These characterisations, should they prove reliable in other samples, may be useful in looking at the differential impact of information provision in experimental and clinical settings.

The Hard-Easy Effect in Probability Judgments: Should we be Surprised?

Alastair McClelland, Ruth Collins & A.R. Jonckheere

Department of Psychology
University College London

The hard-easy effect refers to the systematic relationship between over/underconfidence and task difficulty evident both within and across experiments on the calibration of subjective probabilities. When tasks are difficult, expressed confidence exceeds accuracy (overconfidence); for tasks of moderate difficulty overconfidence disappears, and with easy tasks accuracy exceeds confidence (underconfidence). In a recent critical review, Brenner, Koehler, Liberman and Tversky (1996) stated that: "...the hard-easy effect... is hardly surprising. Because overconfidence is *defined* as the difference between mean confidence and overall accuracy, we expect a negative correlation between overconfidence and accuracy on purely statistical grounds" (p. 212). In this paper, Brenner et al.'s claim is examined in some detail, through an exploration of the statistical relationship between confidence and accuracy, and over/underconfidence and accuracy. We demonstrate that a regression line relating over/underconfidence to accuracy with a negative slope will *only* be observed when the regression line relating confidence to accuracy has a positive slope less than unity, and argue that this result strongly supports the existence of a genuine hard-easy effect. We present data which suggests that in addition to task difficulty, chronological age is also a significant and independent predictor of over/underconfidence - with elderly subjects being more *overconfident* than young subjects at any given level of performance. The implications of these results are discussed in relation to current theories of judgment under uncertainty.

Reference

Brenner, L.A., Koehler, D.J., Liberman, V., & Tversky, A. (1996). Overconfidence in probability and frequency judgments: A critical examination. *Organizational Behavior and Human Decision Processes*, 65, 212-219.

Naturalistic Decision Making Can Involve Both Recognitional and Analytical Strategies: "Rapid Decision Making on the Fire Ground" Revisited

Jim McLennan

*School of Social and Behavioural Sciences, Swinburne University of Technology
William Street, Hawthorn, Victoria, 3122, AUSTRALIA.*

telephone: (+) 61 3 9214 8105; fax: (+) 61 3 9819 0574; email: jmcclennan@swin.edu.au

Several decision making researchers have proposed that there are two influential paradigms for conceptualising human decision making processes. The first, historically prior, is exemplified as behavioural decision theory. While there are several variants, these have in common an assumption that the decision maker scans simultaneously the elements of an array of alternative courses of action and chooses one on the basis of some form of subjective utility maximisation. Most research studies following this paradigm have been carried out within laboratory settings using well-structured choice tasks undertaken by naive subjects. The second paradigm is most often referred to as naturalistic decision making. The major defining characteristic of this paradigm is an emphasis on studying decision making by experienced personnel directly, in the field. The most influential conceptual account of decision making in real-world settings is G. Klein's Recognition-primed Decision (RPD) model. A seminal study in the development of the RPD model, and of naturalistic decision making research generally, was reported by G. Klein et al. (1986). These researchers interviewed 26 experienced fire officers, asking each to describe in detail his actions while in command at non-routine emergency incidents. The researchers concluded that under time pressure, fire ground commanders typically used recognitional strategies, involving prototype matching, rather than using analytical strategies involving choice among options.

The present study aimed to extend that of Klein et al. Fifty three experienced fire officers (members of the Melbourne Metropolitan Fire Brigade) were interviewed, using a critical incident protocol. The procedure followed differed from that of the 1986 study in two important ways. 1. Officers were asked to describe in detail two incidents: the first "routine" and the second "non-routine" in that it challenged their incident control skills. 2. The critical incident protocol used by Klein et al. was extended to cover additional aspects of decision making in real-world settings: (a) pre-priming factors, (b) the possible distribution of fire ground decision making across subordinate controllers, (c) the role of self-monitoring and affect regulation, (d) the dynamic nature of an emergency incident as the demands on the decision maker alter over time. The incidents described included house and apartment fires, factory and commercial fires, rescues of trapped individuals, and hazardous chemical discharges. Recognitional decision making strategies were used in (mostly "routine") situations which were: transparent, familiar, and where the resources immediately available were sufficient. Most of the "non-routine" incidents were opaque, or unfamiliar, or had insufficient resources immediately available, and analytical problem solving strategies involving choice were employed frequently. The findings suggest that naturalistic decision making should be conceptualised rather generally as adaptive action on a particular environment. In some naturalistic decision environments the nature of the adaptive action will involve recognitional strategies, in other naturalistic decision making environments more complex analytical strategies may be required.

Reference: Klein, G., Calderwood, R., Clinton-Cirocco, A. (1986). Rapid decision making on the fire ground. *Proceedings of the Human Factors Society 30th Annual Meeting*, 1, 576-580.

The "Confirmation Bias" - does it Result from Mental Accounting?

Günter Molz

Justus-Liebig-University Giessen, Department of Psychology,

Otto-Behaghel-Str. 10, 35394 Giessen, Germany

phone: +49 (0) 641 / 99 - 2 61 22 (2 61 20)

e-mail: Guenter.Molz@psychol.uni-giessen.de

This paper focuses on the confirmation bias, i. e. the tendency to test a hypothesis by checking examples confirming it. Wason (1966) investigated this problem by means of the card-turning problem. Subjects had to test a conditional statement: If a card has a vowel (p) on one side, then it has an even number (q) on the other side. Subjects were given four cards with a vowel (p), a consonant (non-p), an even number (q) and an odd number (non-q). Subjects then had to decide which cards should be turned to test the statement. About half of the subjects determined to flip over cards (p) and (q). Rationally, however, cards (p) and (non-q) should be turned. Only these cards can violate the above if-then statement.

Firstly the turning-card problem is discussed theoretically. It is argued that for the analysis of the confirmation bias it is not very helpful to refer to the subjects' behaviour as either confirming or disconfirming. Two other distinctions are preferred. (1) *Test strategy*: Positive testing means to check instances that are in line with own preconceptions, negative testing is synonymous with the attempt to falsify suppositions. (2) *Relevance*: In the Wason selection task, cards (p) and (non-q) are relevant because only they can potentially violate the given statement.

An experiment was conducted with the aim of investigating whether the confirmation bias can be interpreted in terms of prospect theory: People assess useful but disconfirming information more negatively (psychological loss) than information that confirm their assumptions (psychological gain). Consequently it is predicted that people value the utility of relevant information less than the satisfaction about irrelevant information which is compatible with their preconceptions. 40 subjects were given the Wason turning-card problem. Each subject passed 4 trials. After selecting the cards to be flipped over, they were told whether the card's other side was compatible with the given statement. Next they had to assess (1) their *satisfaction* about this information and (2) its *utility*. Results show that the satisfaction ratings after flipping over the irrelevant card (q) are higher than the utility ratings for statement confirming results after turning the relevant cards (p) and (non-q).

A posteriori analysis was performed on the utility ratings. The utility scores for information falsifying the statement are higher than for confirming results. Utility ratings for relevant cards supporting the statement are valued more than confirming information after turning irrelevant cards. Despite these rational utility assessments, almost all subjects failed to select the relevant cards. Possible explanations for these inconsistent findings are discussed.

SPUDM 1996, University of Leeds, August 18th-21st

Submission of Abstract for a Mental Accounting Workshop Session

Mental Accounting and Decision-Making: The Relationship between Relative and Absolute Savings

. The formation by individuals of 'mental accounts' was hypothesised by Tversky & Kahneman (1981), and Kahneman & Tversky (1984) to explain their observation of an apparent departure from rational decision-making in two experimental scenarios. Thus, in one of these, the 'jacket and calculator' scenario, the potential monetary saving on an item is viewed, topically, in relation to the original expected cost of that item, rather than in relation to the original, expected cost of all items purchased on the same shopping trip. Their results have been replicated by several researchers (Mowen & Mowen, 1986; Frisch, 1993; Ranyard & Abdel-Nabi, 1993). Specifically, the proportion of subjects prepared to travel a given time for a given saving on a given item increases as the relative saving on the item increases.

The current paper describes a new experiment that seeks to discover whether this 'mental accounting' characteristic applies more widely. While our results confirm the existence of the mental accounting effect at low levels of absolute savings, we find that the effect disappears as the level of absolute saving to be gained increases. This suggests that topical accounts only apply in restricted contexts.

Phil Moon, Darren Duxbury and Kevin Keasey

Leeds University Business School

Information Transparency, Investor Behaviour, and Market Efficiency

Andreas Oehler / Matthias Unser

Universität Bamberg, Lehrstuhl für Betriebswirtschaftslehre, insbesondere Finanzwirtschaft

The majority of models in finance theory implicitly assume that investors are rational decision makers (in the sense of subjective expected utility theory (SEUT)) able to process information in an unbiased way. Empirical (mainly psychological) studies demonstrate that people do not behave according to the rules of SEUT, even in very simple decision contexts. The issue at hand is if investors are able to process information available from the market and the media in the manner finance theory assumes.

The growing interest in experimental economics has swept over into finance theory as well and there is a growing number of experimental studies on market microstructure effects and investor behaviour. In order to gain control over the experimental situation and to have a normative reference point for the evaluation of the experimental results, experimental financial studies often use a more or less simple information structure, only one tradeable asset and independent trading periods. To derive more realistic conclusions on the effects of market structure, our approach differs from these in that the experimental situation is characterized by three main aspects:

- Information available consists of forecasts on four financial ratios that have been proved to be suitable for insolvency analysis (fundamental information) and market prices. Both financial ratios and the first market price are not manipulated but belong to companies that are traded at German stock exchanges.
- The market comprises of 6 stocks that are traded over 12 periods. Each market consists of 8 to 10 traders.
- There is no normative price for a stock but an unambiguous direction in which a stock price should move according to the change in financial ratios.

Our design allows to make inferences on two levels, the level of individual investors and the market microstructure level. Regarding the **individual level** the main questions/results are:

- Are subjects able to process fundamental information in a way according to finance theory?
- To what extent are they sensitive to changes in market transparency (open order book)?
- Do subjects place more weight on fundamental information or on market information (prices)?
- Are there trading patterns depending on the use of fundamental and/or market information?
- Can personality differences explain investment behaviour?

Important questions/results on the **market level** are

- Are market prices efficient in the sense that they move in the direction indicated by the changes of financial ratios?
- Does market transparency improve efficiency?
- What effects do insiders have on market prices?

The study was conducted so far with about 300 student subjects from 2 German universities. Further experiments are currently under way and can be presented in addition to the conference.

Managing Organizational and Project Risks: The Relevance of Human Factors

Agi Oldfield
Kingston Business School, Kingston University, UK

Abstract

Managers are increasingly coming under pressure to manage project and organizational risks more effectively. Although sophisticated Quantitative Risk Analysis (QRA) techniques are useful in Project Risk Management (PRM) they fail to take into consideration human factors, which make the greatest contribution to project failure. Evidence of project failure such as Chunnel Tunnel fire, British library, Bearings Bank, demonstrate that the utilization of even more sophisticated QRA techniques does not provide the manager with a solution for managing risk effectively. Most project failures can be traced back to human factors, an area which is rarely included in the QRA.

Human factors within project and organizational management are classified as People Management issues and thus excluded from the risk analysis process. This paper considers the relevance of human factors for PRM and identifies key elements which need to be explored in order to aid the risk management process. The importance of understanding stakeholder perceptions and perspectives and management issues is emphasized.

Realism of Confidence in Sensory Discrimination: Theory and Data

Henrik Olsson and Peter Juslin

Department of Psychology, Uppsala University, Box 1225, S-751 42, Uppsala, Sweden

We contribute to the recent debate on *underconfidence* in sensory discrimination (Baranski & Petrusic, 1994; Juslin & Olsson, in press; Olsson & Winman, 1996) by presenting a meta-analysis of data collected in our laboratory that demonstrate that when we control for task difficulty, there is a clear difference between 44 cognitive and 21 sensory tasks, with overconfidence or good calibration in cognitive tasks and a disposition towards underconfidence in sensory discrimination. It is suggested that the reason for the different conclusions about confidence in sensory discrimination stem from different notions about what constitutes a sensory task. We argue that an analysis of cognitive and sensory tasks need to start with a careful examination of different origins of uncertainty in judgment. We have recently formulated a computational theory, the *sensory sampling model* (Juslin & Olsson, in press) that predicts decisions, confidence and the complex patterns of response times in sensory discrimination. We present some recent applications of the model where it used to (a) account for data from individual participants, including response time distributions, (b) explain different effects of feedback on calibration in single stimuli and pair comparison tasks, and (c) an application of the model to distinguish between sensory and cognitive processing (Runeson, Juslin & Olsson, 1997).

References

- Baranski, J. V., & Petrusic, W. M. (1994). The calibration and resolution of confidence in perceptual judgments. *Perception and Psychophysics*, 55, 412-428.
- Juslin, P., & Olsson, H. (in press). Thurstonian- and Brunswikian origins of uncertainty in judgment: A sensory sampling model of confidence in sensory discrimination, *Psychological Review*.
- Olsson, H., & Winman, A. (1996). Underconfidence in sensory discrimination: The interaction between experimental setting and response strategies. *Perception and Psychophysics*, 58, 374-382.
- Runeson, S., Juslin, P., & Olsson, H. (1997). *Direct visual perception of dynamic properties*. Manuscript in preparation.

Information and Control: Their effects on Performance in a Dynamic Distributed Decision Making Task

Mary Omodei & Alexander J. Wearing

La Trobe University & the University of Melbourne

Modern information and communication technologies have revolutionised C3I in both military and non-military settings. They allow those who exercise overall control, be they a Fire Brigade Commander, a military Commander-in-Chief, or the manager of a corporation or a business unit (a) to have direct access to detailed real-time information on a developing incident, and (b) to issue commands directly to all operational staff, regardless of rank. Such opportunities widen the range of possible information processing and decision structures, and raise the question of whether or not, and what conditions, one structure might be better than another. At the same time, the contribution that laboratory based decision-making research has been able to make to both theoretical developments and operational practices relating to the management of such large scale operations has been limited by the shortages of methodologies that are both ecologically valid, and able to bring the relevant factors under adequate experimental control.

This paper has two objectives. The first goal is describe the development of a fully networked implementation of our Fire Chief incident simulation program in which a number of linked command centres can be created. This implementation, which involves a significant extension of the single controller version of Fire Chief, allows the simulation of a decision environment exemplified by the cases listed above, and enables us to bring under experimental control those variables which relate to the coordination of decision making in the relatively open task environments which have been reported to characterise decision making in natural settings.

Second, we report the results of experimental investigations of the extent to which different information and control structures affect performance in simulated command and control tasks. For example, one study involved adopting a fully crossed experimental design to investigate the extent to which (a) direct access to detailed information (high information vs low information) and (b) opportunity to issue direct

operational commands (high control vs low control) impacted on decision making effectiveness.

Using the networked Fire Chief incident simulation program to simulate large scale forest fires, 32 subjects were recruited to assume the role of overall Incident Controller in radio contact with two Sector Controllers (East & West). Operational control of the simulated fires was by way of commands to simulated fire fighting appliance crews which were able to patrol for and extinguish fires in assigned areas. Each Incident Controller subject was asked to control the spread of the simulated fires as best he/she could. In addition to various measures of performance, a number of pencil and paper measures, developed in previous research, were obtained. These included items assessing affect and mood, as well as a number of measures of the subjects' perception of various aspects of the tasks.

A number of findings relating the independent variables to performance and questionnaire measures will be reported, but among the principal findings are that access to detailed information and the opportunity for direct control were both associated with poorer performance (you can have too much of a good thing!), with no interaction occurring between the two independent conditions. Furthermore, within those subjects who were provided with the opportunity to exercise direct control, the more direct commands a subject issued to the sector controllers, the poorer his/her performance ($r = -.78$).

Some implications of our experimental findings for the design and command and control systems in military, para-military and commercial settings are discussed, and linkages with broader human factors issues considered. Finally, the place of these investigations in the dynamic decision making literature is analysed, and the question of the progress of this research is pondered.

Strategic Rent-Seeking: An Experimental Investigation

Ayşe Onculer

Department of Operations & Information Management
The Wharton School of the University of Pennsylvania¹

Abstract

The analysis of interest groups and public policy has been critically affected by rent-dissipation and efficiency concerns. The fundamental question has been whether the final rent from a given public policy is totally dissipated by socially unproductive rent-seeking expenditures. This paper develops an experimental rent-seeking model, based on Tullock's (1980) standard rent-seeking game, in order to examine the impact of three factors on such socially unproductive activities: the number of lobbyists, the initial endowments of these players and the cross-cultural differences.

In the first part of the study, we extend Tullock's model to a two-stage rent-seeking game for a risky prize. The players face an allocation problem: they can either invest in lobbying activities or in increasing the expected value of the prize. By using a lottery framework, we test whether experimental behavior is consistent with the theoretical predictions. A comparative analysis between different treatments suggest that the strategic interaction between the lobbyists is a key factor in determining the inefficiency of rent-seeking. In the second part, we provide a cross-cultural analysis of rent-seeking activities based on the experimental results obtained in Turkey and in the United States.

Based on this experimental framework, we identify some major conditions that affect rent-seeking and give an insight to the extent of social costs associated with unproductive rent-seeking activities. Finally, by focusing on such activities taken by potential recipients of an economic rent, we explore different policy instruments that may alleviate the social waste generated by rent-seeking expenditures.

¹ e-mail: onc69@opim.wharton.upenn.edu

Beyond Sensitivity Analysis: Implementing Decisions and the Issue of Legitimation

Jaeshin Park and David R. Probert

University of Cambridge, Department of Engineering, Mill Lane, Cambridge CB2 1RX, UK

The concept of legitimation in multiple-criteria decision support (MCDS) is developed in this paper. The primary aim of the paper is to show the necessity of incorporating legitimation issues explicitly into the decision support process. First the concept of legitimation in the context of MCDS is defined. By distinguishing decision from choice, legitimation might be viewed as a process to link choice to decision resulting in implementation of the choice. The paper argues that choice making can be described as 'a search for dominance structure' (Montgomery, 1983) between alternatives, while decision making can be described as the process by which the decision maker's cognition about the dominance structure reaches a certain inspiration level which legitimises the choice result. This inspiration level is a state of mind at which the decision maker becomes willing to accept the responsibility resulting from implementation of the choice result into action. Real life examples are discussed to illustrate that when the legitimation issues are not adequately dealt with, the implementation of the choice result may be left to chance. The paper also attempts to identify the variables relevant to the legitimation process, such as understandability, optimality, defendability, etc., suggested by Kleindorfer et al. (1993). Finally, some methodological considerations to enhance the legitimacy by addressing those variables during the decision support process are presented to invite further research.

Keywords: Multi-Criteria Decision Support, Legitimation, Decision, Choice, Implementation

ABSTRACT FOR SYMPOSIUM - SPUDM 16

Choosing and Rejecting: an application in the domain of food choice

Decision theory has traditionally assumed that each individual has a well-defined preference order. Recent research, however, shows that preference order is not invariant and is sensitive to the specific elicitation task (e.g. Tversky & Kahneman, 1986). Shafir (1993) argued that these findings are in line with the principle of compatibility and that therefore the following can be expected: (1) when the people are asked to choose an alternative, they will choose the alternative with the most positive attributes; (2) when people are asked to reject an alternative, they will reject the one with the most negative attributes. Depending on the type of question, a reversal in preference can be expected when one alternative possesses both the most negative and the most positive attributes. People may then, depending on the nature of the preference elicitation task, both choose and reject the same alternative.

Shafir (1993) asked his subjects to make a choice between two alternatives. One alternative was 'enriched'. The other alternative was 'impoverished'. The former had more positive and negative attributes, while the latter had fewer positive and negative attributes. The number of positive and negative attributes depended on the specific task. The subjects were then asked either to choose or reject an alternative. In both situations, subjects tended to choose or reject the enriched alternative. Shafir tested and confirmed this elicitation effect in a series of experiments, covering topics such as choosing a holiday, a lottery, a university course, or an ice-cream.

People's selection strategies, however, are not only dependent on task characteristics. Previous research has shown that the occurrence of framing effects might be dependent on the cognitive style of the individual. Smith and Levin (1996) found that subjects with a high Need For Cognition (NFC) were less susceptible to framing effects than those with a low Need For Cognition. The NFC refers to an individual's tendency to engage in and enjoy effortful cognitive endeavours (Cacioppo, Petty, & Kao, 1984).

The decision problems used by Shafir were rather simple and straightforward. This presentation describes a study designed to replicate Shafir's findings and extend them to more complex decision problems in the domain of food choice. In this study we used members of the general public instead of college students. In the described study we further tested whether the occurrence of elicitation effects, as described by Shafir, are also influenced by the subject's level of NFC. The results and the implications for elicitation effects are discussed.

An Experimental Investigation of the Comprehensibility of the Four Modes of Decision Knowledge Representation

Mojca Pavšič ¹, Janek Musek ², Vladislav Rajkovič ^{1,3}

¹*Jozef Stefan Institute, University of Ljubljana, Jamova 39, SI-1000 Ljubljana, Slovenia*

²*Department of Psychology, University of Ljubljana, Aškerčeva 2, SI-1000 Ljubljana, Slovenia*

³*School of Organizational Sciences, University of Maribor, Prešernova 11, SI-4000 Kranj, Slovenia*

Abstract - The stage of knowledge acquisition introduces a major problem in the process of building an expert system (Michie & Bratko, 1986; Neale, 1988; Rajkovič & Bohanec, 1991; Puppe, 1993; Giarratano & Riley, 1994). In this stage, designers attempt to encapsulate domain knowledge within the computer system. This complex process involves problem identification, resource identification, conceptualization, formalization and implementation. It is carried out in an iterative fashion, where, at each step, facts, rules, and concepts are presented to the system and tested for validity, completeness, and consistency. Through this process the system grows incrementally in both breadth and depth.

The knowledge engineer is highly dependent on expert knowledge sources, in particular, on the participation and collaboration of the human expert. The interaction between representatives of two different disciplines, with communication at a very deep and comprehensive level, introduces major difficulties into the process. These problems require a special consideration of the methods used to extract knowledge from the human expert and to validate this knowledge. Without proper verification, the expert's sanction of the knowledge encapsulation process means failure of the expert system. In order to verify, the expert must be able to understand the representation of the encapsulated knowledge. It has been recognized that well-designed modes of presentation can enhance the effectiveness of information transfer by capturing the interest of the viewer, by providing clear economical messages, and by stimulating analytical thought; however, little is known about the actual utility and effectiveness of different modes of presentation (Lehner & Zirk, 1987; Montazemi, 1991; Wickens, 1992; Wickens, Merwin, & Lin, 1994).

The present study reports on the results of the experiment to test the comprehensibility of four modes of knowledge representation that are used in DEX, an expert system shell for multi-attribute decision making (Rajkovič & Bohanec, 1991; Bohanec, Urh & Rajkovič, 1992;

Rajkovič et al. 1995). In this system, the knowledge is internally encoded with rules which represent points of multidimensional (aggregate) utility functions. For the purpose of knowledge explanation, the rules can be translated into aggregate rules, decision trees, three-dimensional graphs, and regression weights. The present study attempts to gain a fuller understanding of factors associated with the comprehensibility of the four modes of knowledge representation. It proposes a model and summarizes empirical findings that demonstrate some of the weaknesses and some of the strengths of these representations as communication tools. Our investigation revealed that decision trees significantly outperformed other three modes of knowledge representation, and that aggregate rules significantly outperformed three-dimensional graphs and regression weights. Besides, the research examined the effects of some relevant factors of the individual difference dimension on the comprehension of these knowledge representations.

Keywords: decision support, expert systems, knowledge representation, comprehension, cognitive strategy, multi-attribute decision making

Social Influences on Individual and Comparative Judgements

Victoria L. Phillips & Irwin P.
The University of Iowa

Social influence on attitude formation and change in individuals has been well documented. However, there has been relatively little research on how social information influences the decisions made by individuals. In a series of experiments we investigated how participants' judgements about course material were influenced by the comments of other students even after participants had already formed opinions of the material. Passages of course material, constructed to be either interesting or uninteresting, were judged accordingly by student participants. At a later point, comments said to be provided by other students were presented. Participants then re-evaluated the original passages. Judgements of individual passages were unaffected by others' comments. However, comparative ratings of interestingness and choices between pairs of passages differing in interestingness were affected by others' comments. This was especially true for participants independently classified as high self-monitors, i.e., those who are generally more receptive or responsive to others' opinions.

We interpret the differential influence of social factors on absolute versus comparative judgements as follows. Personal experience alone provided sufficient information for individual passage judgements. By contrast, comparisons and choices focused attention on the trade-off between potentially conflicting factors such as when the inherently more interesting passage was paired with unfavourable comments. Consequently, these latter responses were influenced by the judgements of others.

The results underscore the potential impact of social information on decision behaviour. We are in the process of testing the generality of these findings in a variety of contexts. Additional studies planned along these lines will include comparisons of social influences on personal decisions made for oneself (i.e., personal preference) with those judgements made for others (i.e., recommendations). Need for cognition previously demonstrated to moderate information framing effects (Smith & Levin 1996) will also be included as an individual difference factor. Also of interest are the circumstances in which people seek out and solicit social information.

HOW DO PSYCHIATRISTS AND JUDGES ASSESS DANGEROUSNESS OF MENTALLY ILL PERSONS?

Fenna H. Poletiek

Netherlands Institute of Mental Health and Addiction, Utrecht

Assessing and predicting dangerousness is a difficult task for psychiatric experts and judges to perform. This is especially true when the persons being judged are psychiatric patients and when 'dangerousness' can be interpreted in a large number of ways. I.e., not only as violent behaviour directed at other people (Slovic and Monahan, 1995) but also causing harm to him or herself may be seen as dangerous behaviour. The decision about dangerousness must generally be made in the context of an involuntary hospitalisation. The Dutch law, as well as most other legal systems, demand that the dangerousness standard be met for involuntary hospitalisation. However the range of possible interpretations of dangerousness may vary between legal systems. In the Netherlands and in other countries (Appelbaum, 1994) there is an ongoing debate about the interpretation of dangerousness in this context. Is someone who exhausts his family 'dangerous'?, someone who vandalises public goods? And someone who neglects his own health?

The purpose of our study is to investigate the interpretation of the dangerousness standard by legal and medical experts. Especially, possible differences between both interpretation of dangerousness are studied. Both kind of experts are involved in the decision about coercive hospitalisation. In the Netherlands, the law regulating coercive hospitalisation of psychiatric patients determines that patients can be forced to hospitalisation during a short period, on indication of a psychiatrist. Within this period, a judge decides about lengthening the hospitalisation or not. Both the psychiatrist (in the expert report) and the judge (in the legal verdict) must base their decision on (among others) their assessment of the dangerousness of the patient.

We observed 32 cases in which psychiatrists decided about a temporary coercive hospitalisation, and 36 cases in which a judge decided about lengthening the hospitalisation. The justifications of the decisions were studied. Some conclusions about the validity of the dangerousness assessment in the context of involuntary hospitalisation are presented, as well as the implications for practice.

References

- Appelbaum, P. S. (1994). Almost a revolution. Mental health law and the limits of change. New York: Oxford University Press.
- Slovic, P. & Monahan, J. (1995). Probability, Danger and Coercion. Law and Human Behaviour, Vol 19, 1, 49-65.

Behavioral and Procedural Consequences of Structural Variation in Value Trees

Mari Pöyhönen, Hans Vrolijk and Raimo P. Hämäläinen

Systems Analysis Laboratory
Helsinki University of Technology
Otakaari 1 M, 02150 Espoo, Finland
mari.poyhonen@hut.fi

Abstract

In this paper we suggest that different attribute weighting biases resulting from the structural variation of value trees and the number-of-attribute-levels effect in conjoint analysis are related to each other. All the phenomena seem to originate from response scale effects and from the normalization of weights. We present results from a new experiment studying the effects of structural variation in value trees. New results are that the division of attributes either increases or decreases the weight of an attribute and changes the rank of groups of attributes for individual decision maker. One origin for these changes in attribute weights is that decision makers choose their responses from a fixed set of numbers and they do not adjust the numbers enough to avoid the bias when the attributes are divided. This is the same phenomenon we found in our earlier experiment where different weighting methods were compared. The decision makers are basically giving information on the rank of attributes only. However, the methods assume that the numbers given by a decision maker describe the strength of his preferences. The weighting procedures should be developed so that the decision makers understand what their answers mean and what they are required to reveal. Yet, the methods should be easy-to-use. It is a challenge for researchers to design experiments and demonstrate applications where the decision makers are able to avoid the weighting biases.

Temporal Bracketing: Simultaneous vs Sequential Choice

Daniel Read, University of Leeds

George Loewenstein, Carnegie Mellon University

Many, if not most, of the decisions we face in life are repeated over time. These include where to buy gasoline and whether to "fill it up," whether to bring in lunch or buy it at work, what video to rent on Friday nights, and whether to risk a ticket by speeding on our daily commute. Temporal bracketing refers to the manner in which such sets of choices are partitioned for the purpose of decision making. It turns out that when choices are made sequentially (one at a time) the decision maker often ends up with a different set of alternatives than when choices are made simultaneously (all at once). In our paper, we present a theoretical account of temporal bracketing, and describe some of our new data.

There are at least three ways that temporal bracketing can change what we choose. First, choosing simultaneously can make us more aware of *preference interactions* within choice sets. We argue that these interactions underly the well-known tendency for risk seeking to increase when many risky prospects are combined, and for people to procrastinate. Second, different choice modes can induce different *temporal perspectives* on the alternatives between which we choose. When choosing simultaneously, we take the 'long view,' and thus choose more sensibly (perhaps deciding to give up smoking), while sequential choice often leads to repeated impulsive actions. Finally, simultaneous choice can enable us to integrate the information needed to make *resource tradeoffs* across choices. These tradeoffs occur when alternatives offer at least two dimensions of benefit or cost, and the decision maker calculates that it is better to capitalize on one dimension now and another dimension later rather than capitalizing on both dimensions at once.

We will describe new studies demonstrating the influence of some of these causes of temporal bracketing. In the studies, subjects make multiple *real* choices (for lottery tickets, videotapes, or snacks) either simultaneously or sequentially. In brief, we find that when choosing sequentially, people want more diversity, are less impulsive, and promise to work harder.

What can we learn from the MouseLab?

Jörg Rieskamp and Ulrich Hoffrage

Institute of Psychology, TU Berlin, Dovestr. 1, 10587 Berlin riesmaih@cetus.zrz.TU-Berlin.DE; and
Max Planck Institute for Psychological Research, Leopoldstrasse 24, 80802 Munich, Germany.
hoffrage@mpipf-muenchen.mpg.de

There are two different research approaches in the field of judgement and decision making. Structural approaches, such as social judgement theory, focus on modelling subjects' responses in a judgmental task. This branch of research is dominated by the use of linear models, such as multiple regression, that--in general--offer a good fit when predicting those judgements. However, this good fit is not sufficient evidence that linear models also accurately describe the processes underlying these judgements (and researchers using this approach are well aware of this fact). Process approaches, on the other hand, try to capture the processes underlying judgements by taking not only the outcomes into account, but, for instance, also information search or time measures (see Payne, Bettman & Johnson, 1988, *JEP:LMC*). Besides linear models, noncompensatory strategies that do not use all of the available information are explored, as well, and indeed there is evidence that under certain conditions such noncompensatory strategies are employed by subjects.

While previous process approaches focused predominantly on preference judgements, the present work applies such an approach to the study of inferences. In our experiment subjects had to select from four anonymous stock companies (Company 1, 2, 3, 4) the one with the highest profit. To make their choice they could acquire information on six different cues (e.g., investments) that had been displayed in the form of a 4*6 matrix using a computerised information board (the MouseLab System 6.0 by Johnson et al., 1996). We classified the inferential strategies by using both subjects' choices and several process-related variables such as order of information acquisition or looking times. The purpose of the study was to explore how the inferential strategy that has been applied depends-- among other things--on time pressure and whether or not subjects have to account for their choices. Results are not available at the time of submitting this abstract.

Learning by Experience in a Dynamic Decision Making Environment and Intelligence

Georgios Rigas
Department of Psychology
Uppsala University, Sweden
georgios.rigas@psyk.uu.se

Efforts to predict performance in dynamic decision making tasks in psychological laboratories with test-intelligence have not been successful. These findings are in sharp contrast with common sense. One explanation is that these two different types of tasks, that is, decision making in a microworld and completion of an intelligence test, place different demands upon the participants. Intelligence tests demand skills relevant in academic environments. Decision making in microworlds demands more general abilities that are relevant in real life problems. A second explanation is that performance scores in microworlds are unreliable. A third explanation is that traditional intelligence tests are limited because they measure only actual performance and not the learning potential of the individuals. Finally, another possible explanation, that has not been discussed in the context of dynamic decision making, is the task novelty hypothesis proposed by Raaheim. According to this hypothesis psychometric intelligence is most effective in tasks of medium novelty. In order to assess the extent of learning by experience and to test the task novelty hypothesis an experiment was conducted using the MORO computer simulation. The participants had to interact with this microworld for 3 periods of 30 years. In a fourth session Ravens Advanced Progressive Matrices (APM) were administered. The results do not support the task novelty hypothesis. Some weak correlations with a few performance variables were obtained only in the first session. The participants became more effective in controlling some of the central variables, e.g., the capital, but performance considering the state of the system as a whole was not improved. These results are congruent with Serman's misperception of feedback (MOF) hypothesis.

Base rate effects on the value of verbal frequency expressions with single and frequent probability events

dr P.H.M.P. Roelofsma, Free University Amsterdam, Department of Cognitive Psychology

The aim of this paper is to study to what extent the variability in valuation of verbal frequency expressions (e.g. rarely, sometimes, regularly, often, mostly) can be attributed to differences in subjective base rate of the frequency of the event or to the subjective seriousness of the consequences of the event. In addition, it was examined to what extent the potential differences between probability and frequency estimations would be diminished by presenting a reference population for the probability estimates. The data were analyzed using a multilevel analysis with a pseudo-binomial distribution. The results indicate that a large proportion of the between subject variability in verbal frequency expressions can be attributed to differences in subjective base rate. Subjective seriousness of the consequences appears not to have an important effect. Subjects gave lower valuations in frequency as compared to probability estimations. Implications for modelling of verbal frequency expressions are discussed.

Do Changes in Decision Weights Account for Effects of Prior Outcomes on Risky Decisions?

Joakim Romanus and Tommy Gärling
Department of Psychology
Göteborg University
Haraldsgatan 1
S-413 14 Göteborg
Sweden

Abstract

When prior outcomes in a sequence of decisions are experienced, they may be either integrated or segregated in the evaluation of the current decision. In earlier studies we found evidence for a integration principle (loss-sensitivity), stating that a prior outcome is only added to expected losses. Other possibilities are that prior outcomes may also influence the perceived probability of a subsequent outcome like in the gambler's fallacy or that the decision weights change. Thus, after a gain people may be more risk seeking and the reverse after a loss. The aim of two experiments was to investigate whether optimism and pessimism induced by a prior outcome accounts for the observed effect on risky decisions either alone or in addition to the effect of integration according to the loss-sensitivity principle. As predicted, the results showed that subjects changed the decision weights placed on the gain or loss depending on induced optimism or pessimism. Such effects would add to those of integration of the prior outcome.

Key words: Risky decisions, integration of prior outcomes, decision weights, subjective probability

On Measuring Constructed Preferences

David Schkade
Department of Management
University of Texas, Austin

The idea that preferences are often situation-specific constructions rather than stable primitives is no longer radical, and is steadily progressing toward widespread acceptance. If we accept the premise of at least partial construction, how does this affect the way that preferences are defined and used in decision research and decision analysis? What problems does this cause for predictive and prescriptive uses of preferences? How can constructive preferences be measured and incorporated into models? This talk will outline some major measurement problems arising from constructed preferences and suggest possible directions for addressing them.

Accountability to representatives of different interest groups: effects on information search and information evaluation in a multi-attribute decision context

Stefanie Schmeer

Department of Psychology, University of Hertfordshire,
College Lane, Hatfield, AL10 9AB, U.K.
E-mail: S.Schmeer@herts.ac.uk

Accountability can be defined as the need to provide explanations of one's behaviour either to oneself or to an external audience. These explanations are premised on, and will be evaluated with respect to, certain standards or norms. The decision-maker adapts to the views of the persons he or she is accountable to if those views are known or can be inferred and if no conflicting prior commitment exists (Tetlock, 1992). An extended model is presented here which predicts differential effects of accountability on the search and evaluation of information underlying the decision process. It proposes that accountability makes salient (1) accuracy goals which the decision-maker tries to meet by conducting a more extensive information search; (2) directional goals, namely, the motive to arrive at a conclusion presumed to be favoured by the person one is accountable to, which the decision-maker achieves by information evaluation that favours the alternative which appears to be most justifiable.

In an experiment conducted to test these assumptions students of computer science were presented with a scenario that required them to adopt the role of head of a company's software-development division and choose one of four software tools. Two between-subjects factors were varied: type of accountability (to users of the tool vs. to the management of the company) and time when accountability was introduced (before a first decision vs. before a second and final decision); another group of subjects received no accountability instructions and served as a control. Information search was assessed by presenting subjects with an information board (Payne, 1976) on which information about the available alternatives was arrayed. Subjects had to search information twice, before both the first and final decisions. Information evaluation was assessed by eliciting evaluation of outcomes and attribute weights before subjects made their first, after they made their first, and after they made their final decision.

The results were in accordance with previous findings and largely consistent with the proposed model. Subjects adjusted their attribute weights and choices to the views of the person they were accountable to if they were made accountable before a first decision, but not after a first decision. Accountability before the first decision, compared to no accountability, resulted in a more extensive information search only for subjects with both a pro-management attitude and accountability to the management. Before making the final decision, accountable subjects searched more information than subjects who were not made accountable. Information search before a final decision was generally strongly biased in support of the chosen alternative. There was no significant difference, however, between subjects who were and were not made accountable. No support was found for the assumption that accountable subjects increase the evaluative difference between their chosen and non-chosen alternatives more strongly than subjects who are not accountable. Implications for organisational decision-making are discussed.

RISK PERCEPTION AND THE GENDER PERSPECTIVE

Hans Wolfgang Brachinger, University of Fribourg (CH)

Renate Schubert, Swiss Federal Institute of Technology (ETH), Zürich (CH)

Risk perception has been investigated under many different aspects. However, until now, *gender* aspects have been rarely integrated. This paper shows in which way such integration can be undertaken. Furthermore, first results concerning women's risk perception as compared to men's are presented,

Insights into the risk perception of women and men are important for an explanation of observable gender differences in *risk behavior*. In many contexts, women seem to choose alternatives which are characterized by a lower risk than those chosen by men. As a rule, alternatives with lower risk show lower average results. This means that gender differences in the riskiness of choices would give rise to differences in economic results. Therefore, in order to influence economic results, one should take into consideration men's and women's behavior with respect to risky choices. Being able to influence this behavior requires knowledge on the determinants of risk attitudes as well as of risk perceptions. In this paper, the main focus is on the *perception* aspect.

The key issue of an analysis of gender differences in risk perception consists in the construction and estimation of risk functions. In such risk functions, risk values which individuals attach to different alternatives are explained by a well defined vector of variables. Differences in *risk perception* could, then, be represented by differences in the variables' values. Differences in *risk attitudes* would correspond to differences in the variables' coefficients. Yet, there are mainly two approaches how to define the variables and how to construct risk functions.

According to the first approach, the so-called *proscriptive or experimental approach*, essentially two explaining variables are considered: one loss variable and one probability-of-loss-variable. Based on lottery experiments which include these two variables, theoretical risk functions are constructed. In a next step, their relevance has to be evaluated by means of empirical fitting tests.

In the second approach, the so-called *descriptive or psychometric approach*, a multitude of variables which possibly determine the risk perception are transformed by means of a factor analysis into uncorrelated factors. Using a simple regression analysis model, risk functions are estimated from risk-value vectors on the one side and from vectors of the factors just mentioned on the other side.

In this paper, groups of *female and male students* as well as *female and male managers* are compared. For these groups, relevant risk dimensions are identified by means of each of the aforementioned approaches. Furthermore, the explicative power of both approaches will be analyzed. Finally, the relevance of a hybrid model built up from the two approaches will be tested. The resulting insights are important from a methodological point of view as well as from a practical one.

It turns out that dread and knowledge play an important role for risk perception. In order to study gender differences in depth, the dread-knowledge trade-off is explored in a series of *experiments* on how to mitigate risks.

References:

- Brachinger, H.W., Weber, M. (1996): Risk as a Primitive. OR-Spektrum, to appear.
- Hoitgrave, D.R., Weber, E.U. (1993): Dimensions of Risk Perception for Financial and Health Risks. Risk Analysis 13, 553 - 558.
- Slovic, P. (1987): Perception of Risk. Science 236, 280 - 285.

What Makes Sample Size Tasks Difficult?

Peter Sedlmeier
University of Paderborn
FB 2- Psychology
33095 Paderborn
Germany

Recently, Sedlmeier and Gigerenzer (in press) suggested that an intuition corresponding to the "empirical law of large numbers" aids people in solving sample size tasks involving frequency but not sampling distributions. This claim rested on a review of studies that (with one exception) did not directly address the above distinction but included data relevant to it. In the present research, well-known sample size tasks (Kahneman & Tversky, 1972) were used to analyze explicitly whether frequency distribution versions yield higher solution rates than sampling distribution versions.

In Study 1, a substantial difference between solution rates was found. Study 2 replicated this difference and ruled out the explanation that performance on sampling distribution tasks is worse because the essential task information is harder to extract.

The distinction between the two types of task is discussed in light of evolutionary and associationist accounts of how people judge probabilities. It is shown that the same distinction can be successfully employed in training people to solve particularly difficult sample size tasks.

Kahneman, D., & Tversky, A. (1972). Subjective probability: A judgment of representativeness. *Cognitive Psychology*, 3, 430-454.

Sedlmeier, P., & Gigerenzer, G. (in press). Intuitions about sample size: The empirical law of large numbers. *Journal of Behavioral Decision Making*.

Aspects of Compatibility and the Construction of Preference

Marcus Selart

Göteborg University

Dept of Psychology, Haraldsgatan 1, S-413 14 Göteborg, Sweden

In this paper a new cognitive model of compatibility is presented. The model assumes a process which includes several phases. Initially, a compatibility test between the input and the output is believed to take place in which it is tested if the information structure in input is compatible with the information structure of the required output. This test is supposed to have implications for the next phase, which is the selection of decision strategy. The use of decision strategy may in turn affect both the evaluation of the decision outcomes and the implementation of the judgement or decision. Two classes of variables are also assumed to influence the degree of compatibility ' that is, the task and context variables (Payne, 1982). The model is illustrated by the presentation of two empirical examples.

The effects of induced attribute conflicts on decision making and postdecision processes.

Sanny Shamoun and Ola Svenson

Risk Analysis and Decision Research Unit

Department of Psychology

Stockholm University

S-106 91 Stockholm Sweden

Abstract

The present study was conducted to investigate the effects of conflicting goals in decision making on postdecision processes. In particular, the purpose of the present study was to investigate possible differences between students experiencing a conflict and those not experiencing a conflict between attributes in a decision making process. It can be asserted in general, that students who experience a decision conflict will show greater differentiation and consolidation effects than students who do not experience such a conflict. The main hypotheses tested were: (1) Students with a conflict will consolidate their decision further than students not experiencing a conflict, (2) students experiencing a conflict on the first important attribute will consolidate their decision more than students experiencing a conflict on the second important attribute.

Altogether 64 students participated on two different occasions. All of the students attended the program of "Care and Nursing" in a high school program. The students were given a situation in which they were told to imagine them selves to be in. The situation that was described to the students was: You are just about to leave school and you are trying really hard to get a job in the area of your education. You are called to attend two job-interviews at the same time in different cities, and you must decide which one you prefer. One difference between the two job-interviews is the chance of employment (2 out of 20 interviewed persons for one alternative and 16 out of 20 for the other alternative). The decision situation was described with two different conditions of chance to get an employment and with fixed aspects on the four attributes. The decision situation was then arranged so that the alternative that was described as easier to get was also worse on the first or second most important attribute. Those students who choose this alternative were defined as the conflict group (29 students out of 64). The other students were defined as belonging to the non-conflict group (35 students).

On each of the two later occasions (after 15 min brake and after one month) the students were asked to perform a memory recall.

Finally the students were asked to do the decision again from their own present situation. Here the students had the opportunity to make a different decision, rankorder the attributes differently, and rate attractiveness differently. The results showed that the conflict group consolidate their decision significantly higher than the non-conflict group.

"Domain Differences in the Performance of Expert Decision Makers"

James Shanteau,
Director of the Institute for Social and
Behavioral Research,
Ahearn 202,
Kansas State University,
Manhattan, KS 66506 USA
(PH: 913/ 532-5912) (Fax: 913/532-3203)

Ten years ago, I introduced a table summarizing differences between domains where experts were reported to be superior on the one hand (eg, weather forecasters) and inferior on the other (eg, clinical psychologists). My original interpretation of the differences focused on the type of stimuli being judged, ie, physical vs behavioral. Thus, I argued that expert performance depended on specifiable characteristics of the domain.

In the years since, I have received many suggestions about other possible interpretations of the differences summarized in the table. In addition, there has been new research about domains of other expertise (eg, nurses) that appear to have performance characteristics that fit on both sides of the table.

These new insights led me to revise and update the table in a variety of ways. For instance, it now appears that there are at least four levels of expert performance: chance (eg, astrologers), restricted (eg, clinicians), competent (eg, agricultural judgment), and computer aided (eg, weather forecasting). Moreover it has become possible to describe how and when domains shift from one category to another.

For my presentation, I will review past and present thinking about domain differences in expert performance. I will then consider the implications for what these differences mean for studies of expertise specifically and for research on judgment and decision making generally.

Title: Information Seeking and Prediction: The Preference for Redundancy

Author: Jack B. Soll, Assistant Professor of Decision Sciences, INSEAD

People often collect information deliberately with the special purpose of informing a particular judgment, such as when a doctor orders several diagnostic tests. This paper is about the deliberate collection of costly information for the purpose of quantity prediction, such as a patient's life expectancy or a company's sales. Information costs time, money, and energy; a person cannot collect without limit, but must instead choose some subset of the total information available. In doing so one must assess what combination of information is likely to be most valuable.

One important feature of information is redundancy, or the degree to which it duplicates information that one already possesses. For example, two knowledgeable and experienced managers who work together will likely have observed the same past events, and therefore their predictions of future sales will tend to be correlated. Having consulted with one, the other is redundant, and one might do better to talk to a manager who has observed an independent set of events. Similarly, given two equally valid machines that measure blood pressure, prescriptively one should take one measurement from each machine rather than two from the same machine.

Do people have the right intuitions about redundancy? To what extent do people's information seeking strategies coincide with the normative model? In this paper, I show that people often prefer redundant information, even when they care only about judgmental accuracy. I attribute this result to the intuitive theories of error reduction that guide information search. In a series of studies, subjects were exposed to information sources such as medical tests, mountainous vantage points, and scales for weighing objects. Preliminary results suggested that, when considering a potential information source, people naturally partition error into two components, nonsystematic error and bias. Nonsystematic error is completely random and uncorrelated with everything. Bias is systematic --- a given source will have a general tendency to always guess too high or too low. One's intuitive model can be described by one's beliefs about what happens to nonsystematic error and bias when estimates are aggregated from the same source or from different sources. Most people correctly believe that averaging multiple estimates from the same source reduces nonsystematic error and averaging from different sources reduces bias. However, inconsistent with the normative model, many people believe that nonsystematic error cannot be reduced by averaging estimates from different sources. I call this pattern of beliefs the Error Tradeoff Model (ETM), because it implies that a person will *trade off* between reducing one kind of error and reducing another kind. To demonstrate ETM, subjects responded to word problems in which perceived nonsystematic error and bias were manipulated between subjects. The results show that at least some people subscribe to ETM. When nonsystematic error appears relatively large subjects tend to prefer redundant sources, and when bias appears relatively large they prefer nonredundant ones. A final study describes in detail the intuitive models that guide information search. ETM is common, but so is the normative model and several others.

In summary, this paper expands what we know about information search. People often prefer redundant information sources, even when they care only about accuracy. To explain this phenomenon, I show that people's intuitive models of error reduction, while sophisticated, fail to match statistical theory. In particular, people see a tradeoff between using a redundant source to reduce nonsystematic error and using a nonredundant source to reduce bias. In fact, nonredundant sources reduce both nonsystematic error and bias. My focus on intuitive models is unusual in decision making research, which typically explains judgmental strategies in terms of heuristics. Nevertheless, as the results show, intuitive theories are similar to heuristics in that they can lead to both good and bad decisions, depending on the characteristics of the problem at hand.

Specifying Upper and Lower Bounds on Group Performance

Robert D. Sorkin
Department of Psychology
University of Florida
PO Box 112250
Gainesville, FL 32611 USA

This paper reviews recent results in extending signal detection theory to the group decision problem. The signal detection approach allows one to specify upper and lower bounds on group performance and to make quantitative predictions about the effects of the group decision rule and type of member interaction. The nominal task is as follows: Each member of the group observes a noisy input, which may be either signal A or signal B. The responses of the members are then combined in some way to reach the group decision about whether A or B occurred. The upper bound on group performance is obtained by applying the model of the statistically optimal (Ideal) group. The lower bound on performance is obtained by applying the detection theory algorithm to a non-interacting or Condorcet version of the group. The performance of the non-interacting group is always inferior to the Ideal group, and its performance is a function of the group decision rule. The highest performance accuracy is produced by a simple majority rule, and performance decreases as the majority rule approaches unanimity. The implications of these results for the performance of real groups is discussed. [This research was partially supported by the U.S. Air Force Office of Scientific Research.]

Preference Elicitation and Food Products: What's in a Method?

Sparks, P. and Shepherd, R.

Institute of Food Research, Earley Gate, Reading, RG6 6BZ

Elicitation processes are recognized as playing a significant role in people's expressed preferences. This raises problems for the procedure invariance principle, which suggests that 'normatively equivalent procedures for assessing preferences should give rise to the same preference order' (Tversky, Sattath & Slovic, 1988, p.371); it also raises problems, of course, for conceptualizations of preference itself. Developing earlier research by Slovic (1975), Tversky et al. (1988) provide examples of where different elicitation methods (choosing tasks vs. matching tasks) result in a different pattern of apparent preferences. Their *prominence hypothesis* suggests that in a choice task, 'the more prominent attribute will weigh more heavily in choice than in matching' (p.372). Choice tasks may predispose a more qualitative decision process, whereas matching tasks require the person to carry out a more quantitative assessment of the choice options.

We investigated the effects of choosing and matching tasks in a study of people's food choices, in which we made the (informed) presumption that national food brands would be perceived to be of better quality than supermarket 'own-label' food brands, and that quality would generally be seen as a more important attribute than price.

Questionnaires were completed by 232 members of the consumer panel of a private research company. Each questionnaire began with a list of 26 food products and 8 vegetables: respondents were asked to indicate how often they consumed each of these. Respondents were then asked to imagine that they were shopping in a large supermarket. They were then presented with some choices involving national brands of food products and supermarket 'own label' brands; additional choices involved organically produced vegetables vs. conventionally produced vegetables. Approximately half the sample took part in a 'choosing task' in which they were presented with a list of pairs of food options along with respective prices: respondents then had to indicate which of the two items in each pair they would buy. The other half of the sample took part in a 'matching task': here respondents were presented with one of each pair of options, along with its price, and asked to indicate what price the other option would have to be for them to be just as likely to buy the one option as the other. At the end of the questionnaire, respondents were asked to indicate how important each of the following considerations were (in general) when they chose foods: health, nutrition, other peoples' views, price, quality, taste and weight control.

The results showed that the importance of different general choice considerations did not differ between the 'choosing task' respondents and the 'matching task' respondents. Overall, quality was more often considered to be more important than price. Crucially, the results revealed a number of significant differences between the outcomes of the choosing and matching tasks. In most cases, the pattern of findings was congruent with our prediction that national brands (with their higher quality as the most dominant attribute) would appear to be preferred in choosing judgments more often than they would in the matching task. However, there were exceptions: these are discussed in relation to characteristics of the choice options.

We knew it all along - but why?
Theoretical explanations of the hindsight bias
Dagmar Stahlberg, University of Mannheim

This paper is supposed to provide background information for the workshop on the phenomenon hindsight bias. The hindsight bias can be defined as the tendency for people to falsely believe that they would have predicted the outcome of an event correctly, once the outcome is known. Although there is a rich literature on hindsight distortions, the underlying mechanisms are not yet fully understood. The present paper addresses the question whether hindsight distortions represent the results of motivational processes of self-esteem protection or enhancement, memory impairment processes or biased reconstruction processes. Whereas researchers of the last decade ruled out the motivational explanation as a major determinant of the hindsight bias there is still an ongoing controversy between the memory impairment view and the biased reconstruction view. The memory impairment position states that memory for the original prediction is altered by subsequent outcome information. When learning about the actual or alleged outcome, the person reinterprets the original evidence in the light of the outcome knowledge, thereby inadvertently modifying what had been previously stored in memory. In contrast, the biased reconstruction position states that no recurrence on memory impairment processes is necessary to explain hindsight distortions. It assumes that people either do or do not remember their original predictions. Those that do remember their original estimates are likely to reproduce them correctly. Those that have forgotten them are forced to reconstruct them and, in the presence of outcome information, are likely to utilize this information as an anchor. Since people are generally overly optimistic about their capacities they will locate their presumed prior estimates closer to the real outcome than it had actually been, resulting in the hindsight bias. Several crucial experiments will be reported which confront both theoretical positions. The majority of these studies support the biased reconstruction view.

FRAMING AND THE DIFFERENCE BETWEEN RISKY AND RISKLESS VALUES

PFM Stalmeier, ThGG Bezembinder

**Radiotherapy / The Nijmegen Institute for Cognition and Information (NICI),
University of Nijmegen, the Netherlands.**

**Department of Medical Psychology
Academic Medical Centre, University of Amsterdam**

Differences between risky and riskless values, such as obtained by gamble and rating methods, respectively, have traditionally been explained through invoking risk attitude. We tested whether risk attitude as modelled in Prospect Theory (PT) can explain differences between risky and riskless values. Risky and riskless values for a continuous health state, namely living x days/week with migraine, were measured with gambles and difference measurement, respectively. Certainty equivalents were measured for thirty gambles, constructed from 5 probability levels (0.1, 0.3, 0.6, 0.85, 0.95) and 6 outcome pairs chosen from the set (3,2,1,0.5,0) days/week migraine. Subjects were offered a choice between a risky medicine or x days/week migraine for sure.

In the first experiment with healthy students ($N = 8$), convex functions were found for riskless methods, indicating that riskless health states are interpreted as losses. Surprisingly, gambles always yielded neutral or concave value functions, indicating that with gambles, some health states are viewed as gains. The difference between the PT values, which are riskless values derived from gambles, and the riskless values derived from difference measurement, was significant ($F=132$, $df=7$, $p=.000$). Thus, risk attitude as modelled in PT is not capable of explaining the differences between risky and riskless values.

In a second experiment ($N = 7$), all health states in the gambles were presented as losses with respect to the status quo 'healthy'. As a result, convex value functions were also found for the gamble method: now, risky and riskless value functions coincided. We conclude that the effects of losses/gains framing may partly explain that risky values are larger than riskless values. In riskless methods, health states are viewed as losses. With gambles, if the risky option is presented as a medical treatment, the best outcome is interpreted as a gain, which, according to PT, leads to higher values.

**Group discussion changes risk perception and multi-attribute evaluation
of transport policy scenarios in The Netherlands (but not necessarily in the positive)**

Linda Steg and Charles Vlek

Department of Psychology, University of Groningen, The Netherlands

It is rather difficult to evaluate strategic policy options aimed at reducing current environmental problems, because their effects tend to be uncertain, long-term and multi-attribute in character. One vivid example is the massive use of motor-cars. Individual judgements on these kinds of issues might be better founded as people think about them more thoroughly. Our hypothesis was that systematic discussion and opinion formation in a small-group setting would lead to an enhanced awareness of the aggregate problems of massive car-use. We also expected a more favourable evaluation of possible policy solutions, in comparison to individual judgement without group discussion.

To test these hypotheses, we organised 53 small-group discussions with a total of 336 regular Dutch car users. Respondents convened for one full day, during which they discussed, among other things, the societal problems from car use and policy measures to reduce these problems. The group discussion and decision-making procedure followed the Nominal Group Technique, in order to avoid the influence of negative interpersonal interactions. In each task, respondents first gave their individual judgements anonymously. Next, all individual judgements were presented, clarified, and discussed. After the group discussion participants gave their individual (anonymous) judgement once more. Three different policy scenarios, varying in the leniency of policy towards the individual car-user, were evaluated by means of weighted multi-attribute utility analysis, following the procedure of the Nominal Group Technique.

It appeared that the more thoroughly people deliberate and think about the problems resulting from car use and possible solutions for it (i.e. after group discussion), the *lower* becomes their problem awareness and the *less* favourably they evaluated policy measures. Apparently, people in such situations are confronted with a discrepancy. They perceive car use as a societal problem. But they are regularly using a car themselves, and they are not motivated to give up on its great advantages. Most people seem to reduce this cognitive dissonance by evaluating the problems as less serious, and by evaluating packages of effective policy measures less favourably. Thus, when the individual advantages of non-cooperative behaviour are large, 'decision support' may additionally motivate people to reject collective solution strategies and to justify their current behaviour.

Valuing Sequences of Future Gains

Harry Susianto and Felice G. Iskandar

Erasmus University, Rotterdam, The Netherlands, and

University of Indonesia, Jakarta, Indonesia

This paper reports three studies comparing three models on how individuals value sequences of future gains. According to discounted utility models (DU; e.g. Koopmans, 1970; Fishburn & Rubinstein, 1982; Meyer, 1993), individuals show a positive time preference when evaluating sequences of future outcomes. These economic models further assume that individuals discount future outcomes constantly over time. The time and outcome valuation model (TOV; Mowen & Mowen, 1991; Mowen, 1992), also predicts a positive time preference, but does not assume a constant discounting over time. The third model, the Loewenstein and Prelec's (1993) model, is the one that consider the distribution of the component outcomes in the sequence. It describes such valuation as the joint effect of a negative time preference and the willingness to spread gains evenly. In these three studies respectively using Dutch students, Indonesian students and housewives, the utility of each outcome which constituting the sequence was estimated empirically using the magnitude estimation method (Stevens, 1975; Galanter, 1990; Kemp, 1991). This estimation will extend Loewenstein and Prelec model which assumes the utility of the component outcome in the sequence. Moreover, three types of outcomes were used: money, a countable nonmonetary item that may not follow a single peak utility function (x-unit of photocopy card, telephone card, or voucher), and a countable nonmonetary item that follows a single peak utility function (x rambutans fruit). This extension is important because the literature commonly reports either money or nonmonetary items which follow the single peak utility function. The implications of the findings will be discussed in terms of the method used in measuring utility, the type of outcomes, and the possible cultural influences.

Keywords: intertemporal choice, sequence valuation, magnitude estimation

Address for correspondence:

Harry Susianto, Department of Marketing, Faculty of Economics, Erasmus University, P.O. Box 1738, 3000 DR Rotterdam, The Netherlands. E-mail: Susianto@few.eur.nl

SAFETY BARRIER FUNCTION ANALYSIS WHEN NEW SYSTEMS ARE IMPLEMENTED IN A PROCESS INDUSTRY: VERY APPLIED PROBLEM, BUT HOW TO USE DECISION THEORY IN THIS CONTEXT?

Ola Svenson

Department of Psychology, Stockholm University
S-106 91 Stockholm Sweden

This contribution describes an attempt to analyze the risks of a subprocess in a nuclear power plant in which both human factors, computer and technical systems interact. The method starts with an analysis of the phases in the subprocess (task analysis) and identifies threats (potential errors) to the process at different stages. The rated degree of belief that each of the different threats will develop into an error are collected. The rated possibilities of arresting the further development of an error if it should occur are also rated by experts in the field. An earlier version of the method has been applied to the refuelling process of a boiling water reactor and the method is now developed so that it becomes more fine grained and can be applied in different contexts. Problems and findings from work with this type of safety analysis and its implications (e.g., organizational) for the development of new systems will be presented and discussed.

Parental Influences on Adolescents' Decision-Making

Margot Taal, PhD

address: Department of Developmental Psychology, University of Amsterdam;
Roetersstraat 15; 1018 WB Amsterdam; The Netherlands;
tel. (+31)20-525.6777/525.6830; fax. (+31)20-639.0279;
E-mail: op_Taal@macmail.psy.uva.nl

The way people structure their decision-making is supposed not to be solely genetically inherited, but to be at least partially learnt from the social environment. The present study concerns the particular ways parents structure their 'life' decision-making in the eyes of their children and according to their own views. Structuring one's decision in this study applies to varying modes of orientation or exploration of alternative solutions, and to the quality as well as the quantity of criteria used in weighting each alternative's value. We hypothesised that parents would influence their adolescent children's decision-making by modeling and feedback processes. But also we hypothesized that parental examples and comments on their children were only influential as far as these were perceived by their children. In our study 298 adolescent with ages varying from 12 to 19 years ($M = 15.04$; $SD = 0.66$) participated as well as the parents of 128 of the adolescents. We compared scores of the adolescents on a questionnaire containing 140 items with those of their parents on the 100 questions of a structured interview. The adolescents' questionnaire concerned the way the adolescents themselves made their decisions and the perceptions of their parents' decision-structuring. While the parental interview concerned the ways the parents commented on their children's decisions and the examples they set them. Results of the study showed large correlations between children's perceptions of their parents' stimulation and the ways they made their own decisions. But no correlations were found between children's life-decision-making and parental stimulation according to the parents themselves. Also correlations between parental stimulation of decision-making as reported by the children and as reported by the parents themselves were very low or absent. Results of multiple regression analyses consistently showed that the ways parents oriented according to their adolescent children, and the perceived quantity and quality of their decision criteria were more influential on their children's decisions than the feedback the adolescents thought to receive. The discussion of the results bears on the relation between objective and subjective education of decision-making.

Probability and risk judgments: The role of frequentistic information

Karl Halvor Teigen
University of Tromsø

Wibecke Brun
University of Bergen

Rune Frydenlund
University of Tromsø

Recently there has been a renewed interest in frequentistic thinking as the basis for subjective probability reasoning. For instance it has been shown that several biases in probabilistic judgment can be reduced when tasks are phrased in terms of frequencies rather than probabilities. This has been interpreted by Gigerenzer and others to imply that humans are basically "frequentists". However, this interpretation does not explain why people fail to reason frequentistically when frequencies are not explicitly mentioned. We argue that frequencies do in fact play a less central role for lay judgments of probabilities and risks than they do for the statistically trained expert. The paper reports the results of four studies in which lay participants (students) were asked to give evidence in support of various probability and risk statements, or to evaluate the appropriateness of frequentistic and non-frequentistic evidence.

In Study 1, participants (N=64) were required to give reasons for probability statements by a sentence completion method, e.g. "It is a 90% chance that the school bus is on time, because ...". In this case, only a minority of subjects referred to past frequencies or regularities. When another group (N=82) was given the choice between statistical and non-statistical evidence, more subjects chose to rely on frequencies, but the majority still preferred non-statistical evidence as reasons for specific probability statements.

In Study 2, participants (N=80) were presented with a successful soccer team, and invited to draw causal arrows between the team's success frequency ("it wins often"), its probability of winning, and its quality ("the team is a good one"). Here, quality was seen as the main cause of probability, whereas probability was more often reported as a cause of frequency than vice versa.

In Study 3, participants (N=101) were asked to give counterarguments against statements about various hazards. For instance one group were asked to provide arguments against the statement "Car driving is very risky (dangerous)", whereas another should think of evidence refuting the statement "Car driving is not risky (dangerous)". Again, only a minority referred to accident frequencies, the most common response being a description of how an accident could occur (or be avoided), and how serious it could be.

In Study 4, participants (N=102) were asked to construct causal models similar to those in Study 2, by drawing arrows between riskiness (of a substance or an activity), accident or injury frequencies, and accident/injury probabilities. Here accident frequencies were viewed slightly more often as effects than as causes of accident probabilities and riskiness.

We conclude that even if people see the relevance of outcome frequencies for estimating probabilities and risk, they do not think of these concepts as exclusively or even primarily frequency-based.

Requisite modelling and product development

P. Terlouw, P.C. Muller, J.M.L. van Engelen

In the literature on product development several process models are given. Almost all of them are described as sequential models (which differs from practice where one usually jumps forward and backward). This sequentiality illustrates the large amount of time needed from 'the initial ideas' to 'the final marketed product'. One of the main questions in the product development process is whether or not it is possible to reduce that amount of time without loosing the 'goodness of fit of the final choice'. In the research to be reported in several cases parts of the sequential process are set partially in parallel to gain in the amount of time needed for the total process.

French (1985) states a process model consisting of four phases: *analysis of the problem, conceptual design, embodiment of schemes, and detailing*. Each of these phases usually consists of several steps frequently resulting in so called schemes. These schemes can be seen as requisite models as described by Philips (1984): *A model is requisite if its form and content are sufficient to solve the problem.*

In the research to be reported the two themes 'requisite modelling' (using the process of generating them as described by Philips) and 'reduction of time needed in the product development process' (using the first two phases of French) are integrated in the C3 method (Computer augmented Cooperative Concept development). The procedure of the C3 method consists of a number of sessions that are either supported by a group support system or by a project evaluation tool. Procedure and themes will be illustrated with a completed case study which is based in the development of a new, Internet based, service called '3D Object Mediator'TM (3DOME) (Muller et al., 1996).

French, M.J. (1985) *Conceptual Design for Engineers*, Design Council, London.

Muller, P.C., J.M.L. van Engelen and P. Terlouw (1996) *Computer Augmented Cooperative Concept Development: a New Product Development Perspective in Information System Development*, SOM (Graduate School/ Research Institute Systems, Organisations and Management) Research Report 96B20, Groningen.

Philips, L.D. (1984) *Requisite Decision Models*. In: Borcharding, K., B. Brehmer, C. Vlek and W.A. Wagenaar, *Research Perspectives in Decision Making under Uncertainty*, North-Holland, Amsterdam.

THE DECISION TO SHOPLIFT

Michele Tonglet

Nene College of Higher Education, Northampton

Although shoplifting has been researched from criminological, sociological and psychological perspectives, very little attention has been paid to the marketing aspects of shoplifting. Shoplifters have been variously described as "the ultimate frugal customer" (Klemke, 1992) and "aberrant consumers" (Kallis and Vanier, 1985), suggesting that consumer behaviour theories may have utility for shoplifting research. One such theory is the Theory of Reasoned Action (Ajzen and Fishbein, 1980) and its extension, the Theory of Planned Behaviour (Ajzen, 1991). These theories hypothesise that consumers make rational decisions, and are thus consistent with mainstream rational choice theories of crime. Cornish and Clarke (1986), suggest that criminals behave rationally, weighing up the costs and benefits of criminal behaviour, selecting the alternative with the highest utility. This view of criminal behaviour suggests that in the right circumstances anyone, not just those of a stereotypical criminal disposition, may decide to commit a crime (Johnson and Payne, 1986), a supposition supported by previous shoplifting research, which suggests that shoplifters come from all age groups and sections of society, and frequently do not have a criminal background. However, it is likely that criminals behave with limited rationality considering only a few aspects of the alternatives available to them, and it is these factors which are of interest to those concerned with understanding and preventing shoplifting behaviour.

I will be examining the underlying reasons for the behaviour of shoplifters and nonshoplifters using the Theories of Reasoned Action and Planned Behaviour. These theories suggest that underlying behaviour are sets of beliefs about the behaviour, and that these beliefs influence the individual's attitude toward the behaviour, their subjective and moral norm, the amount of control they perceive they have over performing the behaviour, and, in turn, their intention to perform or not to perform the behaviour. These beliefs are elicited from a sample of the survey population and are used to construct belief-based questions which are evaluated using expectancy-value theory.

The results of a small student survey will be summarised. This separated respondents into shoplifters and nonshoplifters by using a self-report question on past shoplifting behaviour. The

implications for decision making in shops will be analysed. The theories explained 82.7% of the variance in intentions of shoplifters, and 85.7% of the variance in nonshoplifters. The significant variables were attitude for shoplifters, and the moral norm for nonshoplifters. Analysis of the follow-up survey (asking the respondents if they had shoplifted since they completed the first questionnaire) indicated that the theories explained 92.3% of the variance in behaviour. Intention and behaviour were highly correlated (correlation coefficient .9692, $p = .000$), thus supporting the validity of the methodology.

However, the belief-based measures of the theory, based on expectancy-value, produced disappointing results, showing little correlation between belief-based measures and the global measures of attitude, subjective norm and perceived behavioural control, although there were significant differences between shoplifters and nonshoplifters for some of the beliefs. A further survey is being conducted, and the elicitation of salient beliefs includes questions on the costs and benefits of shoplifting, and the factors which encourage or discourage shoplifting. It is hoped that this elicitation will result in belief-based questions which produce more significant findings.

New Process Tracing Technique for Studying Decision Making

Tadeusz Tyszka

Piotr Matyja

Institute of Psychology, Polish Academy of Sciences, Warsaw, Poland

Aldona Glinńska

Faculty of Economic Sciences and Management

Copernicus University, Toruń, Poland

Abstract

The technique is aided by a computer program that guides the subjects through the experiment, giving him/her detailed instructions about what to do next. The choice alternatives are presented sequentially either as descriptions on the screen or as actual objects available to be inspected (like pencils, newspapers, etc.)

In the first stage, the subject is asked to evaluate the investigated alternatives. While investigating an alternative, the subject is asked to express his/her opinion about it by pressing either the 'plus' or the 'minus' key, depending on whether he/she likes or dislikes a given feature of the alternative. The subject is encouraged to press the keys whenever he/she "finds" a positive or a negative feature in an alternative presented. Unlike in the thinking aloud technique, the subject is not required to verbalise or to give reasons for his/her evaluations.

After completing the first part of the task, the subject is told that he/she will be choosing one of the previously investigated alternatives. However, before doing so, the alternatives will be presented once again and the subject is asked to evaluate them again by pressing pluses and minuses and, finally, to make the choice.

The computer program records the number of positive (pluses) and negative (minuses) evaluations for each alternative in both the judgement and the choice situation. Using these measurements, the following indices are calculated:

(i) The total evaluation of each alternative in both the judgement and the choice situation, defined as the sum of all pluses and minuses ascribed to this alternative.

(ii) Positivity of the evaluation of each alternative in both situations, defined as the ratio of pluses to the sum of pluses and minuses ascribed to the alternative.

A comparison of evaluations of the chosen and non-chosen alternatives, obtained with this new technique and with the thinking aloud technique will be presented.

The Impact of Motivational State on the Intensity of Disappointment and other Negative Emotions.

Getting what you don't want versus not getting what you want.

Wilco W. van Dijk
Joop van der Pligt
(University of Amsterdam)
&
Jane Beattie
(University of Sussex)

Although the role of disappointment in decision making is acknowledged, little research is known about which features of a situation determine the intensity of this emotion. In this paper we investigate the role of motivational state on the intensity of disappointment and other negative emotions. Several emotion theorists have contended that the appraisal of a motivational state may influence which emotion is experienced. A motivational state refers to whether the dominant operative motive for an individual in a given situation is represented as appetitive or aversive, a reward that s/he seeks to attain or a punishment that s/he seeks to avoid (Roseman, 1991). In the first study respondents wrote down a story in which they felt either disappointment, sadness, anger, frustration or regret. Subsequently they answered questions about their appraisal of the situation. It was shown that disappointment is more intense when the situation is appraised as something positive, which did not occur than when it is appraised as something negative, which did occur. In the second study we manipulated motivational state. Respondents were presented with a scenario in which they either received 150 English Pounds less than expected or in which they had to pay 150 English Pounds more than expected. Results show that disappointment is more intense in the first situation, while other negative emotions are more intense or equally intense in the second situation. Results indicate that disappointment is a negative emotion, which differs from other negative emotions concerning the motivational state involved. Implications of these results for decision making (e.g. disappointment theory) are discussed.

Wilco W. van Dijk
Dept. of Social Psychology, University of Amsterdam
Roetersstraat 15, 1018 WB Amsterdam, The Netherlands
E-mail: sp_dijk@macmail.psy.uva.nl

The Impact of Probability of Outcome on Disappointment and Elation

Wilco W. van Dijk & Joop van der Pligt

University of Amsterdam

Amsterdam, The Netherlands

There is a growing interest in the role of (anticipated) emotions on decision making.

Disappointment is one of the emotions which received some attention in this field. Both the decision making and emotion literature suggest that the probability of outcomes has an effect on the intensity of disappointment and elation. In five studies we found consistent support for the hypothesis that the probability of an outcome has an impact on the intensity of disappointment. Disappointment after not obtaining an outcome is more intense when the probability of obtaining that outcome is higher. We found support for this hypothesis both in a within-subjects and between-subjects design, with hypothetical and real lotteries, with small and large pay-offs and with objective and subjective probabilities. Furthermore, our results show that the magnitude of the obtained outcome has a large impact on the intensity of elation. People are more elated when they obtain a larger outcome. However, our results show no consistent findings concerning the impact of probability on elation. Moreover, our results also show no consistent effect of the magnitude of the unobtained outcome on the intensity of disappointment. In sum, our results suggest that when elated, people base their elation primarily on the magnitude of the outcome, whereas when disappointed people base their disappointment primarily on the probability with which they arrived at the outcome.

Wilco W. van Dijk

Dept. of Social Psychology, University of Amsterdam

Roetersstraat 15, 1018 WB Amsterdam, The Netherlands

E-mail: sp_dijk@macmail.psy.uva.nl

**Abstract submitted for POSTER presentation
at SPUDM 16 in Leeds, August 1997**

Psychological factors affecting the disutility of pain

**Carol Varey
University of Sussex, England**

The effects of mood and social/counterfactual comparison on the experience of cold pressor pain were investigated in three experiments. All subjects experienced 90 secs of hand immersion in water at 14°C. Pain ratings were obtained during the experience, a global evaluation of the overall experience was obtained after the experience, and subjects named the minimum reward required to repeat the same experience the following week.

A covert manipulation of mood by music was found to have significant effects on pain ratings during the experience and on retrospective evaluations of total pain, but had no effect on minimum prices required to repeat the experience.

Subjects who were led to believe that they could have undergone a 90 sec experience at 17°C instead of 14°C reported higher pain ratings, both on-line and retrospectively, than control subjects. However, there appeared to be little, if any, benefit in being allocated to a supposedly better temperature (14°C in the context of 11°C). Contrary to expectations, comparisons with conditions of shorter or longer duration appeared to have no effect on experienced pain. The disparity in social comparison effects for intensity as compared to duration is, however, consistent with the apparent underweighting of duration in evaluations of overall experiences (Varey & Kahneman, 1992). Subjects experiencing a 'shorter' duration were willing to repeat the experience for a lower reward. As in the mood manipulation, pain ratings and minimum prices appear to be dissociated.

Address correspondence to:

Dr. Carol A. Varey
School of Cognitive & Computing Sciences
University of Sussex
Brighton BN 1 9QH, UK

phone: 01273 678845
fax: 01273 671320

e-mail: carolv@cogs.susx.ac.uk

How projecting the future and using multi-attribute evaluation may affect your preference-ordering of differing long-term policies for metropolitan traffic

Charles Vlek, Jolieke Mesken and Linda Steg

Department of Psychology, University of Groningen

The practical usefulness of decision analysis often boils down to the significance of differences in the way complex choice alternatives are evaluated. Two such differences concern the explicitness of accounting for the future situation which may develop from given policies, and the method by which choice alternatives are evaluated. In the present study, 160 'representative' respondents were asked to evaluate and rank-order four different long-term policies for traffic and transportation for the Groningen metropolitan area. The policies themselves were developed as comprehensive packages of specific policy measures, in a large-scale citizen-participation project carried out in 1995-1996. The four policies were labelled: (1) "*Trend*: free room for the car", (2) "*Selective car use*: the car only when necessary", (3) "*Collective transport and bicycle*: priority for bus and bike", and (4) "*The real alternative*: green light for rapid trams and other innovations".

We have concisely presented the four policy directions to 160 respondents who came in small groups to meet with the experimenter and an assistant. Following a two-by-two design, half of the subjects did or did not sketch the expected future situation concerning traffic and traffic-related city-quality dimensions, while each half of these two subgroups preference-ordered the four policies either holistically or following a MAU-analysis. In the holistic judgment condition people listed the main reasons for their policy preferences afterwards. Multidimensional 'problem awareness' was assessed *a priori*, as well as some personal variables, amongst which respondents' degree of 'car-dependency'.

Raw data for this study are currently being analysed; a complete report will be available in June 1997. Hypotheses are: that different kinds of respondents associate rather different expected futures to the same package of policy measures, and that this largely explains personal differences in policy evaluation; that sketching expected futures affects the rank-ordering of the four policy alternatives; that an explicit multi-attribute evaluation provides respondents with a more satisfactory (and possibly different) preference order of the four policy alternatives; and that variations in 'problem awareness' and in 'car-dependency' will significantly correlate with variations in preferences among *Trend*, *Selective car use*, *Collective transport and bicycle*, and *The real alternative*.

The main results and conclusions of the study will be discussed. Effects on preferences of the cognitive elaboration of policy options will be especially considered.

Measuring Utility when Expected Utility is Violated

Peter Wakker, Medical Decision Making Unit, Leiden University, The Netherlands

(joint with *Daniel Deneffe*, Arthur D. Little International, Inc., Brussels, Belgium)

Purpose: Testing utility measurement under the widely confirmed violations of expected utility.

Method: The "Gamble Tradeoff method" (TO), introduced by Wakker & Deneffe (1996, Management Science), and existing methods (standard gamble, certainty equivalent), are used to measure utility, for life duration (N=50) and for money (N=46).

Results: Because the TO method corrects for some major deviations from expected utility (probability transformation and contingent weighting), we could see the impact of such deviations on the other methods. For money, certainty equivalents were distorted but not systematically; standard gambles were systematically distorted upwards. For life duration, certainty equivalents were distorted upwards, and standard gambles were distorted upwards to an extreme degree.

Conclusions:

- (1) TO is a simple technique for utility measurement that preserves validity under prospect theory.
- (2) The extreme risk aversion in standard gambles is due to probability distortion and other deviations from expected utility, rather than to high utilities.
- (3) For life duration, deviations from expected utility and, thereby, distortions of certainty equivalents and standard gambles, are more pronounced than for monetary outcomes.
- (4) Expected utility violations seem to be more pronounced in the health domain than in economics.

Abstract

**Evaluation of Decision Support Systems
Considering Problem Specificity and Stages of the Decision Process**

Based on a theoretical model of the decision process, two procedures of decision support are being introduced. Due to the characteristics of their content, both can be effectively applied for decision problems of differing topics and at different stages throughout the decision process.

Initially, the focus is a computer supported decision aid, which as a computer program is particularly used for judgmental selection decisions between several alternatives. Based on Multiattribute Utility-Technology (MAUT), weights and assessments of the user are additively calculated and a ranking list of the alternatives is determined, according to personal preferences.

The second procedure, Formal Concept Analysis, based on mathematical lattice theory, serves the purpose of a decision aid by structuring and graphically illustrating the data used for the decision. It is especially effective for decisions which are guided by specific rules by emphasising implications between the features of different alternatives.

The results of several studies employing both procedures are presented. It is suggested that the computer based decision aid improves the quality of the decision, increases the subjective certainty and simplifies the decision process. Furthermore, the decision assistance character of Formal Concept Analysis, especially in the early stages of the decision process, is stressed. A comparison of both procedures reflects their problem specificity and indicates possibilities of combined use.

Authors: Dipl.-Psych. Guido Weißhahn
Dipl.-Math. Torsten Rönsch
Dr. Pierre Sachse

Address: Technische Universität Dresden
Institut für Allgemeine Psychologie und Methoden
01062 Dresden
Germany

RISK PERCEPTION AND ACCEPTABILITY OF RISK IN A POPULATION TESTED FOR CF CARRIERSHIP.

Myriam Welkenhuysen, Lieve Denayer, Gerry Evers-Kiebooms.

Center for Human Genetics, University Hospital, Leuven, Belgium.

In Western populations, cystic fibrosis (CF) is the most common lethal autosomal recessive disorder, with a carrier prevalence of 1 in 25 and a disease prevalence of 1 in 2500 live births. The identification of the CF gene in 1989 made carrier detection possible. However, due to the limited test sensitivity, a negative test result is not conclusive: a negatively tested person still has a small chance to carry a rare mutation of the CF gene. Therefore, even if both partners have a negative test result, their risk of having a CF child still is higher than zero. In the Center for Human Genetics in Leuven, carrier testing has been requested most frequently by relatives of a CF patient. The present paper focusses on their perception of the post test risk of having a CF child themselves. The effect of knowing one's own risk status on hypothetical reproductive decision making is also evaluated.

Our sample consists of 126 tested adults who returned a mailed questionnaire and participated in a follow-up interview (1 month later). Males and females are equally presented in the sample; the median age is 29 years. About two thirds of the subjects have a CF patient in their own family and 27% have a CF patient in their partner's family. Almost one third of the sample are CF carriers; 67% has a negative test result. Most respondents (95%) correctly remember their test result.

For the analysis of the perception of the post test risk of having a CF child, the subjects are classified according to their objective risk, taking into consideration the partner's test result. When both partners tested negatively, 58% of the subjects are not aware of the restrictions of the DNA test and they are convinced that the residual risk of having a CF child is zero. In the case of one positive and one negative test result, 66% are aware of the existence of a residual risk. Nearly half of them (46%) indicate the correct risk interval; 57% evaluate this risk as very low. For carriers who are single or whose partner is not tested (with a post test risk of 1 in 100 versus the population risk of 1 in 2500) understanding of the risk is difficult: their risk estimations are very divergent, with the highest proportion of "I don't know answers". In total, only one fourth of the sample situates the post test risk in the correct answer category, with an overall tendency

for the other subjects to underestimate the risk. As expected, the subjective perception of the post test risk is influenced by the objective post test risk: the lower this objective risk, the lower the subjective quantitative and qualitative risk evaluation. The objective post test risk also has an impact on decisions in a hypothetical situation of a 1 in 4 risk of having a CF child: the lower risk groups (when at least one partner has a negative test result) consider more easily to remain childless in this hypothetical situation, while the carriers who are single or whose partner is not tested - and for whom this situation still is a possible one - opt more often for having own children. When asked which risk level would make them hesitate about a pregnancy, a significant trend is observed to accept higher risk levels as the own objective risk is higher. This suggests that the own risk level serves as a point of reference for judging the acceptability of hypothetical risks.

Simultaneous Over and Underconfidence Bias in Judgement II: Format Dependence in Calibration of Subjective Probability Assessment

Pia Wennerholm, Peter Juslin and Henrik Olsson

Department of Psychology, Uppsala University, Sweden

In this paper, *calibration* for three different methods for elicitation of subjective probability distributions were compared in order to trace the origin of overconfidence. The full-range format, the half-range format and a simplified version of the fractile format were applied to the same item content. It was hypothesized that if people are victims of a general information-processing bias, as suggested by the *heuristics-and-biases* approach (e.g., Kahneman, Slovic & Tversky, 1982), overconfidence should be observed with all three methods. If people are well-adapted to their natural environments, as postulated by the *ecological models* with their original assumptions (Gigerenzer, Hoffrage & Kleinbölting, 1991; Juslin, 1994), good calibration should result with all three methods, provided that items are representatively selected. The *combined error model* (Juslin, Olsson & Björkman, in press) extends the ecological model by adding two sources of random error in probability judgement, sampling error in the process that form internal degrees of belief and response error in overt probability assessment. The combined error model predicts an interaction between assessment format and over/under confidence. In support of the combined error model, with *exactly* the same item content there was close to zero over-/under confidence in full-range, under confidence in half-range and profound overconfidence with the simplified fractile condition. This result, not predicted by other theories of calibration, was quantitatively accounted for by fitting a four-parameter version of the combined error model to data.

References

- Gigerenzer, G., Hoffrage, U., & Kleinbölting, H. (1991). Probabilistic mental models: A Brunswikian theory of confidence. *Psychological Review*, 98, 506-528.
- Juslin, P. (1994). The overconfidence phenomenon as a consequence of informal experimenter -guided selection of almanac items. *Organizational Behavior and Human Decision Processes*, 57, 226-246.
- Juslin, P., Olsson, H., & Björkman, M. (in press). Brunswikian- and Thurstonian origins of bias in probability assessment: On the interpretation of stochastic components of judgement *Journal of Behavioral Decision Making*.
- Kahneman, D., Slovic, P., & Tversky, A. (1982). *Judgement under uncertainty: Heuristics and biases*. New York: Cambridge University Press.

Compensation As A Person Characteristic: The Construction Of A Measure

Pieter Willems & Pieter Koele
Faculty of Psychology
University of Amsterdam
Roetersstraat 15
1018 WB Amsterdam
The Netherlands

Multi-attribute decision processes usually concern the selection of an alternative out of a set of alternatives as the best or most attractive one on the basis of attribute information about these alternatives. Decision processes are called compensatory when they involve a trade off between attribute values: a low value on one attribute can be compensated for by a high value on another attribute. Koele and Westenberg (1995) introduced a measure for the degree of compensation of decision processes in multi-attribute decision situations that use the Information Board technique. This compensation index has a continuous scale running from 0 (fully noncompensatory) to 1 (fully compensatory).

In this presentation we address the issue of compensation as a person characteristic, assuming that people differ in the degree to which they are capable or willing to trade off attribute information when selecting an alternative. We constructed an interactive computerised instrument that presents the subject a series of multi-attribute decision problems in information board format. The mean compensation index over this series of information boards is taken to be the compensation score of an individual.

We present the results of a reliability analysis of this instrument, as well as the results of a first attempt to establish its construct validity by correlating compensation scores with person characteristics such as need for cognition, impulsiveness and depression.

Reference

Koele, P. & Westenberg, M.R.M. (1995): A compensation index for multiattribute decision strategies. *Psychonomic Bulletin & Review*, 2, 398-402.

PROCESS-TRACING METHODS FOR THE STUDY OF NATURALISTIC DECISIONS: A STUDY OF CREDIT PURCHASE INSURANCE

Janis Williamson, Lisa Cuthbert and Rob Ranyard

Bolton Institute, UK

In previous research, two standard procedures have been introduced to explore the way people process information as they make decisions: the information board and the think-aloud techniques. Both of these process-tracing methods were developed for the study of decision making under controlled conditions. Although they have been successfully adapted for use in applied settings, it can be argued that the study of naturalistic decisions requires more naturalistic methods. As an alternative to the information board procedure, Huber et al (1997) have devised a very productive 'Active Information Search' (AIS) technique to investigate patterns of predecision information seeking. The AIS method uses a very well-briefed researcher who provides the information requested in a more informal, face-to-face setting. In a similar vein, we are developing an alternative to the think aloud technique based on a more natural, semi-structured interview which we call the 'Cognitive Process Interview' (CPI). This paper discusses these two process-tracing methods for the study of everyday decisions, and presents a study in progress which is designed to evaluate them.

The evaluation study is based on the following everyday consumer decision problem. When people take out a loan for home improvements, a new car or hi-fi system, they run at least two kinds of risk: the risk that their future income may not be sufficient to meet their monthly repayments and the risk that the product may fail. Most personal loan arrangements offer the option of insurance against repayment problems due to unexpected loss of income through unemployment, ill-health or similar events, and most purchase agreements offer a warranty against product failure. This study investigates the processes underlying decisions concerning both types of risk, i.e. decisions to insure, or not to insure, personal loans of different amounts for different purposes and decisions to take out, or not to take out, an extended warranty. Preliminary results on the strengths and weaknesses of different process-tracing methods, and on the information processes underlying insurance decisions are presented and discussed.

The “Knew-It-All-Along” Phenomenon: An Accuracy-Assessment Model

Anders Winman, Peter Juslin, and Mats Björkman
Department of Psychology, Uppsala University, Sweden

Abstract

We present a model for the “knew-it-all-along-effect” in 2AFC tasks which accounts for phenomena where earlier theories fail. The Accuracy-Assessment (AA) model is based on the assumption that participants in hindsight studies use the strategy of trying to reproduce the distribution of correct and wrong responses that seem appropriate in view of their assessment of the task difficulty. The model provides precise, quantitative predictions about the extent and direction of hindsight bias. In particular, the model predicts good calibration in hindsight and a systematic relation between over/underconfidence in foresight and hindsight bias, referred to as the confidence-hindsight mirror effect. In tasks for which subjects are overconfident in a control (foresight) condition they are predicted to exhibit a “knew-it-all-along” effect of a similar magnitude. A novel and unique prediction by the model is a reversal of the “knew-it-all-along-effect” in judgment domains characterized by underconfidence in foresight. This reverse hindsight phenomenon and other predictions by the model are tested and confirmed in four experiments.

Treatment decisions for depressed patients

Cilia Witteman¹, Harald Kunst¹ & Pieter Koele²

¹Department of Psychonomics, Utrecht University

²Faculty of Psychology, University of Amsterdam
The Netherlands

Abstract

In this presentation we discuss the results of an investigation into the treatment decisions for depressed patients of over fifty practising psychotherapists. This study connects with the research on psychotherapist decision making as reported by Witteman (1995). We were interested in three questions.

First, we wanted to know whether treatment decisions depended primarily on the therapists' theoretical background or on patient characteristics. Second, we investigated how therapists' arguments for their treatment decisions were associated with their theoretical background as well as their decisions. And finally, we tried to find out whether the degree of structuring of information presentation and response mode would influence the treatment decision.

The participating therapists received two questionnaires about the treatment they would decide on for each of four paper patients. The first questionnaire contained open questions about their treatment decision and about their considerations leading to it. The second questionnaire, which the therapists received four weeks after they had returned the first one, contained a list of 80 aspects of depressive complaints or factors influencing such complaints. The therapists were asked to tick those aspects they considered to apply to the described patients. Next they had to decide on a treatment from a list of possible treatments. Finally they were asked for some biographical data, such as sex, age, number of years in practice, theoretical orientation and work setting.

The results indicate that there is not a satisfactory systematic explication of the way in which therapists arrive at a treatment decision. Theoretical background appears to be the most influential factor, but not to a substantial degree.

Reference

Witteman, C.: *Psychotherapist decision making*. Paper presented at the 15th Research Conference on Subjective Probability, Utility and Decision Making (SPUDM-15), Jerusalem, August 1995.

A COGNITIVE BEHAVIOURAL APPROACH TO

DECISION MAKING IN GENETIC TESTING

Abigail Wroe and Paul Salkovskis

Testing for diseases with genetic components, such as breast cancer and colon cancer may be widely available soon. Little is known about the decision making process involved when people opt for or against such testing. Several models have been proposed in an attempt to answer the question as to how people make decisions related to issues such as these. Much of this research has investigated how human decision making process deviates from the expected utility theory.

However, much of the research so far is limited in its explanation of the involvement of emotion in the decision making process. What seems to be required are theoretical and experimental approaches which integrate decision making theories and theories of emotion, such as the cognitive behavioural approach. It is proposed here, that people make decisions in the manner suggested by the utility theory, but that the decision outcome varies between individuals due to differing premises used to make the decision. These premises are likely to depend on several factors including cognitive appraisals of a situation, emotional factors such as anxiety and relative focusing of several issues.

A series of studies have been carried out in order to test this idea. A questionnaire study was carried out asking people to imagine that they are offered several genetic tests, to state how likely they would be to opt for the test, and to write down all the reasons that were relevant to their decision. The results supported the idea that the decision making process involves weighing up of the reasons for and reasons against testing, where the reasons include only those which are considered relevant at the time of the decision, and include emotion-related reasons. In order to test this hypothesis experimentally, studies were also carried out in which the ideas on which people focused were manipulated. Results of these studies also support the hypothesis.

A Constructive Theory of Act-Conditional Subjective Expected-Utility

Zhigang Xie

The School of Finance, Shanghai University of
Finance and Economics, Shanghai, China, P.R.
(email: zhigxie@fudan.edu.cn)

Simon French

The School of Informatics, University of Manchester,
Manchester, UK (email: simon.french@man.ac.uk)

Abstract

This paper takes the perspective that the normative and the descriptive approaches to subjective expected-utility theories together form the basis of *prescriptive analysis*, which supports decision makers by guiding the evolution of their perceptions and understanding. We propose a constructive axiomatisation of linear and non-linear subjective expected-utility theories that may better serve as a logical basis of prescriptive analysis. The structure of the axiom system is designed to be consistent with our understanding of the decision makers' cognitive processes. Furthermore, the system is an open in that it allows both linear and non-linear subjective expected-utility theories to be developed in compatible ways that allow one to distinguish the points at which they depart from each other.

The axiomatisation is separated into three stages, i.e., structuring, elicitation and consistency stages. Each stage is flexibly constructed so that it is open to further investigations in accordance with decision problems and the decision maker's cognitive capabilities.

In the structuring stage, we set the real decision alternative as decision primitive. As a result, our model is act-conditional and the traditional subjective utility theories are treated as its special cases.

In the elicitation stage, we seek the minimum requirements for the elicitation of both utilities and subjective probabilities. In contrast to other traditional approaches, we explicitly use reference sets for the elicitation of utilities, subjective probabilities, as well as lottery preferences.

In the consistency stage, we establish relationships between the preference indices and the consistency assumptions. By differentiating ambiguous and unambiguous uncertainty involved in each act-conditional lottery set and then reference lottery set, various act-conditional and weighted expected-utility models are derived, and the decision weights are interpreted as the consequence effects involved in the probability elicitation.

INTUITIVE PROBABILITY JUDGMENTS OF MEMBERSHIP AND NON-MEMBERSHIP

Kimihiko YAMAGISHI

School of Business and Environment, Shukutoku University, Saitama, JAPAN

The conjunction fallacy is a well-known and robust phenomenon in intuitive probability judgment. The famous "Linda," who is "31, single, participated in anti-nuclear demonstration," etc., is judged more likely to be a feminist bank-teller than a bank-teller. Although some factors are reported to produce the conjunction fallacy, substitution of probability judgment with similarity judgment is the standard explanation for the Linda case.

On the other hand, research in similarity judgment has demonstrated the non-Euclidean property of similarity space. It is possible to name two objects (such as North Korea and the late East Germany) that are BOTH similar and dissimilar to each other.

Assuming these findings, regarding Category C and eXample X, the following was investigated:

(1) If the probability that "X is a member of C" is judged by "How X is similar to C," then the probability that "X is NOT a member of C" is judged by "How X is DISSIMILAR to C."

(2) If X is both similar and dissimilar to C, then both $p(X \text{ belongs to } C)$ and $p(X \text{ does not belong to } C)$ would be judged as high.

(3) If individuals follow the reasoning in (1) and (2), then judged probabilities would contradict each other: Judgments of $p(X \text{ belongs to } C)$ and the same probability as implied by $\{1 - p(X \text{ does not belong to } C)\}$ may disagree systematically.

Can Managers Learn from Experience

Dan Zakay

Department of Psychology, Tel-Aviv University, Israel

Abstract

A survey was conducted among Israeli managers representing different types of organizations. The managers were asked to answer a questionnaire designed to explore how managers learn from outcomes of past decisions. The questionnaire explored all the phases of the learning process starting with initiation of the process and ending with the implementation of the lessons learned. A set of questions was designed to explore what heuristics characterize the learning and what methods (if any) are used in order to overcome potential biases (e.g., hindsight). Based on the findings, typical problems which prevent managers from achieving effective learning are defined. Methods for improving the learning process are discussed.

DIMENSIONS OF RISK PERCEPTION IN MONEY INVESTMENT

Tomasz Zaleskiwicz

Technical University of Wrocław, Poland

Risk is one of the most important dimensions in money investment because investors are never certain if they get a profit. There are many mathematical, financial models used to estimate risk. These models are concerned with value and probability gains and losses. But many managers (also "high risk managers") and lay-people maintain that they are not interested in receiving quantitative information about risk and that they often estimate financial risk intuitively (qualitatively). The main problem of this study was to answer the question "How do people perceive risk of money investments". Participants (130 students of management aged 21.1 on average) completed a survey instrument that elicited ratings for each of 9 investment possibilities (shares, bonds savings in the bank, life insurance, open own business, fund, gold, real estates, foreign currency) on 13 characteristic scales. Five scales were developed during investigations made by Paul Sloyle and his group in the field of ecological and health risk (knowledge about risk, familiar-unfamiliar risk, controllability, distribution of consequences in time, dread). Other eight scales, which could be specific for understanding perception of financial risk were proposed by the author of this study (subjective certainty of profits, magnitude of profits, clarity of information about investment possibility, accessibility to this information, reversibility of losses, confidence, independence of making decisions, possibility of early knowledge about losses). Factor analysis (after varimax rotation) showed that there are three important dimensions (factors) of investment risk perception: 1) known risk (eigenvalue 3.78), 2) certainty of profit (eigenvalue 1.59), 3) reversibility of losses (eigenvalue 1.24). These three factors explained 50.9% of variance. The results also enabled the author to draw a conclusion that Ss categorised every investment possibility into three groups: 1) stable investment possibilities 2) investing in a stock market (perceived as most risky), 3) saving money (perceived as most safe). The results do not draw a conclusion that people when estimating financial risk use not only dimensions of cognitive knowledge but also of emotional nature (certainty, dread). Because financial risk factors which were received in this study are close to ecological risk factors received in other studies we could suppose that risk is a universal construct.

Submission for POSTER presentation at SPUDM 16 (also submitted for De Finetti Award)

Anticipated regret and decision making under uncertainty: The role of expected feedback

Marcel Zeelenberg
Eindhoven University of Technology
Faculty of Technology Management
PO Box 513
5600 MB Eindhoven
The Netherlands
Electronic mail: M.Zeelenberg@tm.tue.nl.

In this paper I discuss the effects of the anticipation of regret on decision making under uncertainty. Regret is a negative, cognitively based emotion that we experience when realizing or imagining that our present situation would have been better, had we decided differently. The experience of post-decisional regret is for a large part conditional on by the knowledge of the outcomes of the rejected alternatives. I describe a series of studies that show that pre-decisional manipulations of expected post-decisional feedback on rejected alternatives influences decision making. Next I suggest conditions under which we can expect the anticipation of regret to take place. Finally I discuss whether it is rational to have our decisions influenced by the anticipation of emotional reactions to the outcomes of these decisions.

for ORAL PAPER presentation at SPUDM 16 (also submitted
for De Finetti Award)

On the role of regret in ultimatum game

Marcel Zeelenberg
Eindhoven University of Technology
Faculty of Technology Management
PO Box 513
5600 MB Eindhoven
The Netherlands
Electronic mail: M.Zeelenberg@tm.tue.nl.

Jane Beattie
University of Sussex

We discuss the effects of regret in the ultimatum game. The ultimatum game is a very simple game. Two players are allotted a sum of money, e.g. \$10. Player 1 (often called the Proposer) offers some portion of the money (e.g., \$4) to player 2 (the Responder). If the Responder accepts, she gets the \$4, and the Proposer gets the rest (\$6). If the Responder rejects the offer, both players get nothing. Research shows that proposers normally offer a 50/50 split. In one experiment we focused on how anticipated regret might influence the behavior of proposers, and showed that proposers who anticipate the possible regret move away from the 50/50 default split, and make lower offers than a group of control participants.

In a second experiment we had participants play an ultimatum game and provided them with feedback on whether their offers were accepted, or rejected, and with feedback on how close they were to acceptance or rejection. This clearly influenced levels of experienced regret. When participants played another round of the ultimatum game, their offers were also influenced by this feedback.

The results will be discussed in relation to regret theory, and other research focusing on effects of expected feedback on decision making.

**Closet Tightwads:
Compulsive inability to spend and the pain of paying**

Ofer Zellermayer
Carnegie Mellon University

Drazen Prelec
M. I. T.

George Loewenstein
Carnegie Mellon University

Making payments in exchange for goods or services is a pervasive feature of modern society. Yet, despite its apparent routine nature, paying is far from a dispassionate affair. Some payments cause consumers to agonise, while others, albeit perhaps rarely, evoke joy. These feelings about payments have been largely ignored, not only by economists, but by researchers in the field of consumer behavior. This work introduces the "pain of paying" -- the notion that a consumer who pays for a product or service experiences, typically negative, emotions associated with the act of paying. Based on the notion of the pain of paying we predict, demonstrate in a series of surveys, and explore the complexities of, a hitherto unrecognised phenomenon: the existence of a large group of consumers who view themselves as compulsively reluctant to spend money. Hitherto, virtually all attention has been focused on the opposite phenomenon of compulsive or impulsive spending behavior.

SYMPOSIUM A

“Models of Satisficing Inference”

SYMPOSIUM B

“Decision making in action”

Models of Satisficing Inference

Ralph Hertwig, Ulrich Hoffrage, and Laura Martignon

Center for Adaptive Behavior and Cognition, Max Planck Institute for Psychological Research

Leopoldstr. 24, 80802 Munich, Germany

hertwig@mpipf-muenchen.mpg.de

Much research in cognitive psychology, economics, and decision theory attempts to model inference by way of what we call "Laplacean demons"--models that assume the organism has unlimited time, knowledge, and computational might. However, Laplacean demons are fictional characters rarely encountered in everyday judgment and decision making. As Herbert Simon argued, in the real world the decision maker has neither the time nor computational power to find optimal solutions and settles for fast and "satisficing" answers. However, we know of very few precise examples of satisficing algorithms.

This workshop proposes inferential algorithms based on simple psychological principles such as recognition and one-reason decision making that work with limited time and knowledge. We report simulations and analytical results exploring how accurate, robust, and fast satisficing algorithms are when making inferences about real-world environments. Next, we present results about how organisms can exploit their own lack of knowledge to make accurate inferences. We discuss satisficing algorithms for quantitative estimation judgments and show how a simple mechanism can account for the well-established hindsight bias. Finally, the performance of a family of satisficing algorithms is compared to that of a probabilistic Bayesian network.

When It Pays To Be A Lazy Thinker: A Simulational Approach

Jean Czerlinski, Gerd Gigerenzer, Dan Goldstein, and Laura Martingon

Center for Adaptive Behavior and Cognition, Max Planck Institute for Psychological Research

Leopoldstr.24, 80802 Munich, Germany

czerlinski@mpipf-muenchen.mpg.de

It's not a surprise that simple algorithms for inference are useful in domains where speed and efficiency are more important than accuracy. However, recent findings (Gigerenzer and Goldstein, 1996) suggest that a simple, lexicographic-like algorithm called Take The Best can be not only faster but also just as accurate as standard, cue-integrative models like Weighted Linear. But how broad is the class of information environments in which Take The Best is accurate? And how does it perform so well in this class?

In this paper we take a two-pronged simulation approach to answering these questions. In the first approach, we examine millions of randomly-generated environments, in which we mostly confirm our intuitions that the more cues a data set has, the more likely that Weighted Linear will outperform Take The Best. In the second approach, we examine a sample of empirical data sets and find that the real world is more complicated than the random one. First of all, we have to divide the data sets into those with abundant information (where the number of cues is more than sufficient for the number of inferences to be made) versus those with scarce information. For we find that different factors--such as average cue intercorrelation--play different roles depending on whether information is abundant or scarce. Our conclusion from the simulations is that Take The Best is an amazingly accurate algorithm across a broad range of information environments, which are characterized in non-obvious ways.

Cognitive Reconstruction in Hindsight: Memory as Inference

Ulrich Hoffrage and Ralph Hertwig

Center for Adaptive Behavior and Cognition, Max Planck Institute for Psychological Research
Leopoldstr.24, 80802 Munich, Germany
hoffrage@mpipf-muenchen.mpg.de

Hindsight bias describes the tendency for people with knowledge of the outcome of an event to recall their original judgment about the event as closer to the outcome than it actually was. We propose a model that explains this effect in terms of cognitive reconstruction: If they cannot retrieve the original judgment from memory, people try to reconstruct the knowledge on which it was based and from this infer what the judgment was. However, this reconstruction of the original knowledge may not be veridical, because feedback is a cue strong enough to shift some knowledge states in the direction of feedback. As a consequence, recollections of the original judgment that are based on inferences from such a systematically distorted knowledge base are--in turn--also shifted in the direction of feedback. We provide experimental evidence showing how this model can account for the majority of judgments in a memory task often used to examine hindsight bias.

Death Tolls, Accident Statistics, and City Populations:
Simple Mechanisms for Quantitative Estimation

Ralph Hertwig, Ulrich Hoffrage, and Laura Martignon

Center for Adaptive Behavior and Cognition, Max Planck Institute for Psychological Research
Leopoldstr.24, 80802 Munich, Germany
hertwig@mpipf-muenchen.mpg.de

How do we arrive at estimates of real-world quantities, such as the number of people who die from heart attacks or fatal car accidents each year, or the population sizes of cities and nations? Although researchers have tried to describe the forces underlying such estimates, to date there have been only a few attempts to work out precise mechanisms of quantitative estimation (e.g., Brown & Siegler, 1993, *Psychological Review*). We propose a family of simple algorithms for estimation, ranging from a mechanism that works with very limited knowledge to a mechanism that assumes considerable knowledge. We compare the performance of these mechanisms to that of multiple regression, a statistical model that uses all available information. Multiple regression is commonly seen as the "optimal" way to integrate various pieces of information into an estimate (e.g., Hammond, 1966, *The Psychology of Egon Brunswik*). Based on simulations and analytical results, we show how well simple estimation algorithms do compared to multiple regression.

Perceptual Anomalies and Strategic Surprises

Joseph Lampel

Department of Management, St. Andrews University, Scotland

Abstract

Strategic surprises are a feature that is common to war, politics, and business. Case studies of strategic surprises have concluded that strategic surprises are usually the result of a misinterpretation of ambiguous information. Such misinterpretation, it is often argued, could have been rectified by collecting additional information, or by the proper use of historical data. By contrast, we argue that the ambiguity of strategic surprises is due primarily to the use of heuristics in situations where decision makers must analyze rare or unique situations. These heuristics are employed quickly under time constraints, and are not amenable to change when more information is collected. In effect, our thesis is that the ambiguity is not inherent in the situation, since all strategic situations are inherently ambiguous, but that ambiguity is the product of the interaction of decision heuristics with situations that are complex and fraught with important consequences to the actors. We examine how different decision heuristics produce different types of ambiguity, and illustrate our typology drawing on case material.

Simplicity Versus Accuracy in the Context of Human Inference

Laura Martignon

Center for Adaptive Behavior and Cognition, Max Planck Institute for Psychological Research
Leopoldstr.24, 80802 Munich, Germany
martignon@mpipf-muenchen.mpg.de

The human mind has produced extremely accurate mechanisms for scientific inference. A Bayesian Network, for instance, is a mechanism that offers great precision at the price of exponential complexity. Complexity causes a loss in transparency. The mind becomes incapable of grasping the information contained in a highly connected network. Simpler algorithms are more informative but less accurate. This is what we are taught. In fact we tend to believe that we are condemned to the Rule: The more simplicity, the less accuracy and vice-versa.

As we well know, scientific inference and inference in everyday life are different matters. Models of rationality based on complex mechanisms for inference have been proposed in the past. These models are difficult to specify and require a large amount of computational power, which is not available when we have to choose or decide something under time pressure. Whereas we optimize in science, we satisfice in everyday life. This is the tenet of *bounded rationality*. "Take the Best", "Take the Last", "Take the Next Intersection", "Elimination by Aspects", are examples of simple satisficing algorithms for comparison, choice and even categorization that perform remarkably well under what we may call "human conditions". The surprising fact is that even if we did use the complex mechanisms for scientific inference in everyday life we would not necessarily end up being more accurate. In the kind of environments where humans have to make inferences, the firepower of neural networks and Bayesian networks would be wasted. This is the core of the paper.

Managing Organizational and Project Risks: The Relevance of Human Factors

Agi Oldfield
Kingston Business School, Kingston University, UK

Abstract

Managers are increasingly coming under pressure to manage project and organizational risks more effectively. Although sophisticated Quantitative Risk Analysis (QRA) techniques are useful in Project Risk Management (PRM) they fail to take into consideration human factors, which make the greatest contribution to project failure. Evidence of project failure such as Chunnel Tunnel fire, British library, Bearings Bank, demonstrate that the utilization of even more sophisticated QRA techniques does not provide the manager with a solution for managing risk effectively. Most project failures can be traced back to human factors, an area which is rarely included in the QRA.

Human factors within project and organizational management are classified as People Management issues and thus excluded from the risk analysis process. This paper considers the relevance of human factors for PRM and identifies key elements which need to be explored in order to aid the risk management process. The importance of understanding stakeholder perceptions and perspectives and management issues is emphasized.

SAFETY BARRIER FUNCTION ANALYSIS WHEN NEW SYSTEMS ARE IMPLEMENTED IN A PROCESS INDUSTRY: VERY APPLIED PROBLEM, BUT HOW TO USE DECISION THEORY IN THIS CONTEXT?

Ola Svenson

**Department of Psychology, Stockholm University
S-106 91 Stockholm Sweden**

This contribution describes an attempt to analyze the risks of a subprocess in a nuclear power plant in which both human factors, computer and technical systems interact. The method starts with an analysis of the phases in the subprocess (task analysis) and identifies threats (potential errors) to the process at different stages. The rated degree of belief that each of the different threats will develop into an error are collected. The rated possibilities of arresting the further development of an error if it should occur are also rated by experts in the field. An earlier version of the method has been applied to the refuelling process of a boiling water reactor and the method is now developed so that it becomes more fine grained and can be applied in different contexts. Problems and findings from work with this type of safety analysis and its implications (e.g., organizational) for the development of new systems will be presented and discussed.

Can Managers Learn from Experience

Dan Zakay

Department of Psychology, Tel-Aviv University, Israel

Abstract

A survey was conducted among Israeli managers representing different types of organizations. The managers were asked to answer a questionnaire designed to explore how managers learn from outcomes of past decisions. The questionnaire explored all the phases of the learning process starting with initiation of the process and ending with the implementation of the lessons learned. A set of questions was designed to explore what heuristics characterize the learning and what methods (if any) are used in order to overcome potential biases (e.g., hindsight). Based on the findings, typical problems which prevent managers from achieving effective learning are defined. Methods for improving the learning process are discussed.

