SIXTH RESEARCH CONFERENCE
ON SUBJECTIVE PROBABILITY, UTILITY,
AND DECISION MAKING

WAR
1977
SAW

Warszawa, September 6–9

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Preface

This second volume of conference papers contains information to be added to the first volume. The program is not quite definitive, however; new papers and other changes may be announced at the opening of the conference.

Contents

Program

Program

Tuesday, September 6

Chairperson: Gerard de Zeeuw

9.00 Opening address by the president of the Polish Academy of Sciences

Major papers:
9.15 O. Svenson, Sweden:
Process descriptions of decision making
Discussant: To be announced

10.15 A. Biela, Z. Chlewinski & Cz. Walesa, Poland:
Developmental aspects of decision making
Discussant: L. D. Phillips, England

11.15 Break

11.30 P. Humphreys, England:
Decision aids: aiding decisions
Discussant: D.v. Winterfeldt, Austria

Chairperson: Wojciech Gasparski

Specific papers:
14.30 F. D. Tuggle & F. H. Barron, USA:
A theory of human decision making: Elements

15.10 M. Toda, Japan:
What happens at the moment of decision?

15.50 W. F. v. Raaij, Netherlands:
Techniques for process tracing in decision making

16.30 Break

16.45 X. Zamek-Gliszczynska, Poland:
The decisional model of workers' motivation

17.25 W.A. Wagenaar, H. Timmers, Netherlands:
The pond and duck weed problem: Some experiments on the perception of exponential growth

Invited lecture:
19.00- Ward Edwards, USA:
20.00 The adolescence of decision analysis

Wednesday, September 7

Chairperson: Helmut Jungermann

Major papers:

9.00   C.A.J. Vlek & W. F. v. Raaij, Netherlands:
        Analyzing values for decisions: An exploratory exposition
        Discussant: K. Berka, Czechoslovakia

10.00   D. Wendt: West Germany:
        Decision making in collectives
        Discussant: K. Szaniawski, Poland

11.00   Break

11.30   B. Fischhoff, USA:
        Decision analysis: Clinical art or clinical science?
        Discussant: J. Korvin - Mikke, Poland

Chairperson: Jozef Kozielecki

Specific papers:

14.30   M. Lahdenpää & U. Lehtinen, Finland:
        On phased models and managers´ and consumers´ decision
        making

15.10   M. Nowakowska, Poland:
        Perception of social power in decision making groups

15.50   F. Bronner & R. de Hoog, Netherlands:
        Political choice in the Netherlands: a decision theoretical
        approach

16.30   Break

16.45   J. Radzicki, Poland:
        Effect of relations between own and partner´s inputs and
        outcomes on utility of own and partner´s payment and work

17.25   J. Krivohlavy, Czechoslovakia:
        The role of decision analysis in societal endeavours

Conference program

Thursday, September 8

Chairperson: Sarah Lichtenstein

Major paper :

9.00   R. L. Keeney, USA:
        Practicing decision analysis in geotechnical and
        environmental fields
        Discussant: W. Gasparski, Poland

10.00   Break

10.30   Work in progress session

Chairperson: Lennart Sjöberg

Specific papers:

14.00   J. A. Wise, K. Borchering & R. Schaefer, West Germany, USA:
        Subjective probabilities and cognitive structure

14.40   T. Engländer, Hungary:
        Analogous and digital processes in probabilistic in-
        ferences

15.20   K. Borchering & R. Schaefer, West Germany:
        Calibration of probabilistic estimates as a function
        of objective difficulty, subjective difficulty, and
        misinformation

16.00   Break

16.15   G. N. Wright & L. D. Phillips, England:
        Personality and probabilistic thinking - an experimental
        study

16.45   T. Tyszka, Poland:
        Contextual multiattribute decision rules

Open

Friday, September 9

Chairperson: James Wise

Specific papers:

8.30   M. Zaus & D. Wendt, West Germany:
       Some problems in the design and assessment of hierarchical
       goal structures in multi-attribute utility analysis

9.10   V. M. Ozernoi, Soviet Union:
       Feedbacks in multiple criteria decision analysis

9.50   O. Huber, West Germany:
       Dominance among some multidimensional decision strategies
       under real - and fictive - payoff conditions

10.30 Break

11.00 Working groups in parallel sessions:

       Process description analysis
       Organizer: C. A. J. Vlek, Netherlands

       Developmental aspects of decision making
       Organizer: W. Hommers, West Germany

       Expert judgment
       Organizer: B. Brehmer, Sweden

       Risk and the acceptability of new technology
       Organizer: L. Sjöberg, Sweden

       Implementation of decision analysis
       Organizer: C. A. S. Staël von Holstein, Sweden

14.30 H. Nurmi, Finland:
       Tutorial on some psychological applications of the
       theory of fuzzy sets

15.30 End session

Additional specific papers

POLITICAL CHOICE IN THE NETHERLANDS: A DECISION THEORETICAL
APPROACH

Fred Bronner
Veldkamp Market Research
Amsterdam

Robert de Hoog
Instituut voor Wetenschap der
andragogie
University of Amsterdam

1. Introduction

Voting behavior in political systems which are characterized
by periodical and free elections has always been in the focus
of political science research. In various countries large scale
research during election years has been carried out. Until the
election of 1964 the dominant concept in the United States was
"party identification" as the main predictor of political pre-
ference. It was assumed that an individual acquired this iden-
tification early in his life and used this identification as
a short cut device to select the candidate or party he pre-
ferred.

As has recently been shown by Verba, Nie and Petrocik (1976)
this concept was considerably weakened during the next elections
in which the role of political issues as important cues for
party preference increased. On a theoretical level the work
of Ordeshook and Riker (see e.g. Davis, Hinich, Ordeshook,
1970; Ordeshook, Riker, 1973; Ordeshook, 1976), though written
from a more general framework concerning the electoral process,
provided a new impetus to the concept of decision rules. In
this concept the voter does not select a party or a candidate
just because he traditionally is a supporter of that party,
but only after more or less carefully judging and balancing
the advantages and disadvantages connected with the different
candidates or parties on a number of important characteristics.
This process is represented by a range of possible utility
functions that characterize each voter.

Until recently few research has been carried out in the United
States on these possible decision rules (see for an exception
Shapiro, 1969). Nonetheless, it is quite clear that using the
insights and theoretical assumptions which have been developed
in the field of decision theory, research concerning political
decision rules can be organized and improved. Based on these

ideas we decided to test empirically a model of individual
voting behavior that is structurally equivalent to a multi-
attribute utility decision rule under certainty. In this
theoretical framework we conducted two types of experiments
which will be described in the next section.

2. Experiments

Two types of experiments were carried out in May 1976 by the
authors:

Type 1: this experiment was directed toward testing the axioms
of an additive utility model in a descriptive context. These
axioms (or "prediction") have been put forward by von Winter-
feldt and Fischer (1975) and Humphreys (1975) and are related
to the axioms of additive conjoint measurement (Krant, Luce,
Suppes, & Tversky, 1971). In order to test these axioms we
constructed hypothetical parties (which showed a strong simi-
larity to existing parties) and presented them in two different
sessions to 50 participants.

Type 2: this experiment, partly based on ideas of Wright (1975)
and rule based theory (Segal & Stacy, 1975), is based on the
assumption that people are capable of indicating a similarity
(if it exists) between their own rules for decision and rules
that in verbal terms can be derived from more formalized
models. In the experimental situation we first made the partici-
pants familiar with four different decision rules, and tried
to establish whether there was a similarity between one or
more of the presented models and their own rule(s) for select-
ing political parties. Furthermore we checked this use of rules
for other decision situations.

3. Conclusion

Our paper will describe the experiments in more detail. Con-
cerning the results: there is a sizable part of the participants
for which an additive model can be accepted as a reasonable
approximation of their decision rules, while for another part
a multiplicative model may be a better representation. Further-
more, there are indications for the use of sequential rules
and a relation with   background characteristics of voters.

Literature

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      stadt, 1975.

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      process. In American Psychologist, 1975, 30.

The pond-and-duckweed problem; three experiments on the misperception of exponential growth

W.A. Wagenaar and H. Timmers

Summary

The representation of duckweed multiplying itself in a pond is used as a research paradigm to study perception of exponential growth. The advantage of this paradigm is that growth is presented in a direct non-numerical way. The results show that the misperception observed when growth is presented by means of tables or graphs, occurs in the pond-and-duckweed situation as well. By manipulating the way the process is presented it is possible to obtain some insight into the sampling strategies used by the subjects when they subjectively extrapolate the perceived functions. These experiments lead to the conclusion that subjects base their extrapolations on three or four samples only.

Introduction

Many problems the world as a whole is faced with are related to growth. Economical growth and growing populations induce shortages of space, energy, raw materials and food, and an increase of such seemingly unrelated quantities as cost of living, pollution, crime rate, rate of divorce, number of scientific publications. Usually these processes start with an exponentially growing phase; later saturation should occur, leading to a levelling off, thus producing the so-called logistic curve (de Solla Price, 1963). The above-mentioned processes are generally still in the phase of acceleration, as is illustrated by the sample of statistics presented in Fig. 1. Since any attempt to control such processes will depend on the cooperation of individual citizens some insight in the intuitive evaluation of exponential growth might contribute to the solution of growth problems.

In experiments reported before (Wagenaar & Sagaria, 1975) it was shown that exponential growth is considerably underestimated when the processes are presented by means of tables or graphs. The general finding was that people tend to extrapolate exponentially, that is with a constant multiplier for successive steps, but with an exponent that is too small. The real exponent was weighed with a factor 0.20 for tabular presentation and 0.04 for
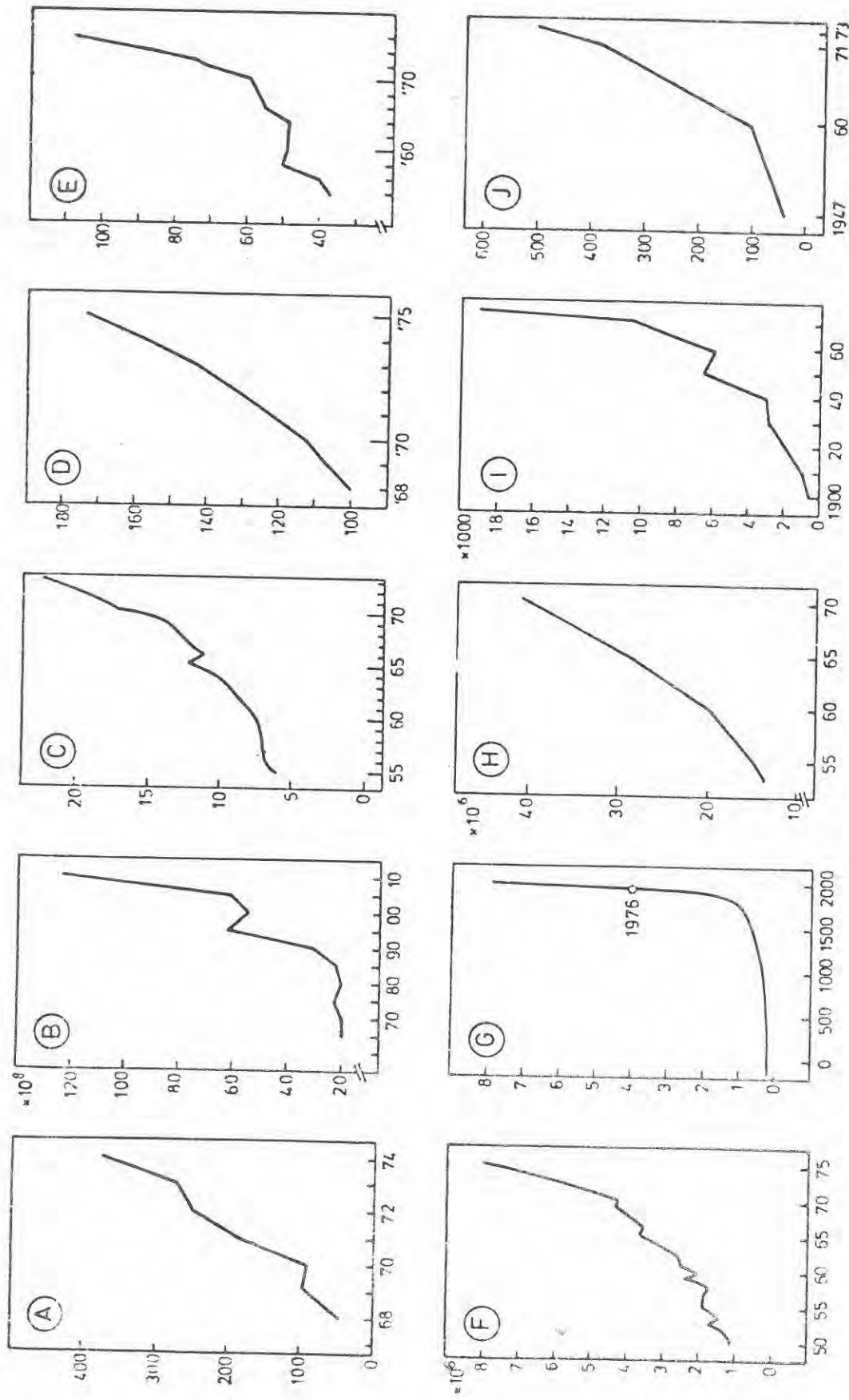
Fig. 1. A sample of statistics displaying exponential growth.
(A) Muggings and holdups in Holland.   (F) Use of aluminum in the USA (tons).
(B) (Expected) food shortage in the world (kg proteine).   (G) (Expected) world population (billions of people).
(C) Use of alcohol in Holland; gr. per person per day.   (H) Energy consumption in the industrialized world
(D) Cost of living in Holland (1968=100).   (barrels of oil equivalent per day).
(E) Price of gasoline in Holland (cents per liter).   (I) Divorces per year in Holland.
                                                              (J) Dutch married women working outdoors (x 1000).

graphical presentation. Mathematical sophistication of the subjects nor experience with growth processes changed this effect. These results are in agreement with a _misperception hypothesis_, rather than with a _misaggregation hypothesis_. The misperception hypothesis claims that the error is essentially perceptual, i.e. that the growth tendency is misperceived whereas the extrapolation is correctly executed. The misaggregation explanation states that nothing is wrong with the perception of growth in the presented stimuli, but that subjects cannot extrapolate a tendency correctly perceived (cf. the discussion on these two explanations of the conservatism effect in revision of opinion experiments, e.g. Edwards, 1968). If misperception occurs it is quite possible that changes in the way growth processes are presented to the observer will influence the degree of underestimation. This suggestion is supported by studies on the extrapolation of exponential functions with negative exponents (Timmers & Wagenaar, 1977). One important feature of tabular and graphical representations is that they exclude the element of time: a dynamite explosion develops in microseconds; the process of milk boiling over occurs within a few seconds; colonies of influenza bacilli develop within some hours; price indices grow over years and populations accumulate over ages. Presentation of these processes by tables or graphs neglects these differences because a large part of the history of a process is presented; however, in reality people are often only confronted with the present state of a process (cf. high prices, full parking lots, dirty rivers) while for the history they have to rely on memory. Does this factor change the effect of underestimation?

A study on the extrapolation of processes covering several years (Wagenaar & Timmers, 1976) showed a marked effect of the past history being presented or not. In the present experiment the past history is limited to a maximum of eight minutes.

Another aspect of tables and graphs is the quantitative nature of the representation; many processes do not present themselves in a pronounced quantitative way: one cannot directly count pollution of water, and one normally will not count the number of cars involved in a traffic jam. Therefore extrapolation of such processes is almost certainly not mediated by simple mathematical algorithms. Does this exclusion induce different strategies leading to different extrapolations? Or will the model proposed by Wagenaar & Sagaria (constant underestimation of the exponent) also be valid for non-quantitative representations?

SUBJECTIVE PROBABILITIES AND COGNITIVE STRUCTURE

James A. Wise, Katrin Borcherding and Ralf Schaefer

This paper presents a new empirical test of Wise's (1970) model of sub-jective probability judgements. Previous experiments have always used schematic stimuli, e.g. "faces" (Wise, 1970) or "viruses" (Wise and Mockovak, 1973). In this experiment, only verbal information was avail-able to subjects who assessed their SP's regarding the likelihood of cat-egory identities for unknown stimuli.

In this study ten academic psychologists were first given "ideal profiles" of the types of articles appearing in three professional journals. These profiles consisted of information on five relevant descriptor dimensions. These were:

1. type of article (Experimental, Experimental and Review, or Review and Theory),
2. number of pages in article,
3. mathematical sophistication of article (from graphical through measurement theoretic),
4. number of references from the same journal,
5. academic status of the author.

The task of the subjects was to then look at profiles of unknown articles and, judging them against the ideal profiles, assess their SPs that the unknown article came from the same journal as each of the "ideal articles".

The experiment proper had several adjunct tasks and conditions.

Subjects were required to first make similarity judgements on a set of "unknown" and "ideal" article profiles, these similarity judgements served as a basis for an MDS analysis that derived their cognitive structuring of the profiles.

There was also a learning condition wherein subjects received feedback on their SPs from the perspective of an "expert panel" whose judgements they attempted to match.

Finally, each subject made a second set of similarity judgements and a final 'test' set of SP judgements without feedback.

No profile was repeated twice for the same type of judgement, i.e. similarity or SP, but some profiles were switched between similarity and SP judgements in the experimental conditions. The profiles themselves had been constructed from a structural model of hypothetical journals that served as the basis for the "expert panel" feedback. The construction of the profiles allowed several " invariance", aspects of the structural model to be tested to ascertain whether the subjects' cognitive structuring of the profiles came to exhibit the same invariance characteristics as the model through their learning experience. This was tested by being able to predict where SPs should change and where they should remain the same, even under markedly different types of information.

The subjects were run singly, and the data was analyzed on single Ss.

Generally, the results show different levels of learning for different Ss, and concomitantly different effects of cognitive structuring in SP judgements. But those Ss who learned best also show most strongly that their judgements are not based simply on situational heuristics but on a systematic structuring of information that is revealed to match the invariance requirements of the model.

Learning to make more "optimal" judgements of subjective probability relies on increasing complexity in cognitively structuring relevant information, and not on superficial counting of relative frequencies of ocurrence, or other situational heuristics.

Personality and Probabilistic Thinking - An Experimental Study

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ABSTRACT

This study examines the relationship between authoritarianism conservatism, dogmatism, and intolerance of ambiguity on the one hand, and probabilistic thinking on the other. By probabilistic thinking we mean the tendency to adopt a probabilistic set, discrimination of uncertainty, and the ability to express that uncertainty meaningfully either verbally or as a numerical probability. From orthodox conceptualizations of the personality/cognitive measures one would anticipate strong relationships between these measures and our own various measures of probabilistic thinking. The present study makes it clear that no such relationships are present.

One hundred forty-three volunteer subjects drawn from the local community in Uxbridge, England, completed questionnaires that measure various aspects of probabilistic thinking, and then filled out booklets containing the personality and cognitive inventories. The intercorrelation matrix of all measures revealed only two appreciable correlations: authoritarians are less frequently correct when they say they are 100% sure and they make less fine discriminations of probability than non-authoritarians. Factor analysis using Jöreskog's unrestricted likelihood method indicated that eleven factors were needed to account adequately for the correlation matrix. Two factors were determined by the personality/cognitive measures alone. The pattern of loadings on these factors was to be expected from previous correlational reports. Six factors were determined by the probabilistic thinking measures alone; two by verbal measures and four by numeric measures. Clearly verbal and numeric ways of dealing with uncertainty involved different processes.

The major finding from the factor analysis was that no factors were determined by both the personality/cognitive measures and the probabilistic thinking measures. Factors that show loadings on one class of measures do not show loadings on any measures in the other class. Computation of canonical correlation coefficients between the personality and cognitive variate and the probabilistic thinking variate did, however, show some

degree of association. The relationship between "generalized authoritarianism" and 100% assessments, suggested by the first canonical analysis, was found in the second canonical analysis to be primarily determined by authoritarianism/rebelliousness rather than by all the components of the personality and cognitive variate taken together.

Our major conclusion from this study is that an authoritarian, conservative, dogmatic person who is intolerant of ambiguity may be just as capable of probabilistic thinking as is a more flexible person. Clearly, major revision is needed in the psychological theories concerning these personality/cognitive measures. We should caution, however, that this study is entirely static in nature; no dynamic probability tasks were involved. It may be that the personality/cognitive dimensions are more salient to dynamic cognitive processes which were not measured by our probability tasks.

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The decisional model of workers' motivation

The cognitive orientation in the new motivational theories has influenced also the work psychologists. The subject of modern research is not need satisfaction and workers' emotions any more but rather the rational decisions of people concerning their own behavior in the organizational setting. It is a question of behavior influencing directly performance, that is, the choice between either the different degrees of effort at work or the different levels of difficulty of the task.

This analysis is based on some concepts similar to but not identical with the notions used in the SEU model. It is accepted that the choice of effort at work depends upon the expected value of rewards /V/ and upon the two subjective probabilities, first that the effort will lead to the performance /E_1/, and second, that the performance will be rewarded /E_2/. According to the general assumption, the worker chooses from among the alternatives the degree of effort for which the so-called "motivational index", i.e., E_1 /E_2 V/ is the greatest. The conventional view is that the workers who give high ratings to great effort at work are in reality more productive than the others. Consequently, the work psychologists used to measure the motivational index to compare it with the objective, external criterion of productivity. This control of the model's predictive value is done in a great number of studies from the first publication of V.H. Vroom in 1964 till now, and each author has introduced some new refinements.

But the results failed to confirm the expectancy model. The motivational index was found to be no better predictor of present or future effectiveness than the simple measure of workers' attitude. Furthermore, some studies have proved that the model comphents have moderately good reliability. The psychologists are looking now for the reasons of such a failure. The methodological difficulties seem to be the most important:

1. The measurement scales used in the studies of the expectancy model were of the interval type at most, hence the multiplication of va-

lence and subjective probabilities measures was a meaningful opera-
tion.

2. The expectancy model was used till now for across-subjects compari-
son but not for individual within-subject choice analysis. The lat-
ter is too complicated in a real situation, due to the limitation
of subject's abilities to differentiate their own subjective esti-
mates. Thus the expectancy model demands a better measuring techni-
ques or a higher self-consciousness of the subjects.

The second kind of restraints has a substantial character. In
the analysis of the dynamics of the decisional process we have assumed
that future decisions of workers are effected by the consequences of
their past choices. If the value of attained rewards is congruent with
the value of expected rewards the particular effort proves to be effec-
tive and the subjective probability of future effectiveness of the same
behavior increases. The congruence between attained and expected value
acts as a reinforcement, i.e. it increases the likelihood of the same
behavior in a similar situation. But the simple reinforcement schedule
does not apply to the human, because it is modifiable by some rather
stable generalized beliefs of people about their own effectiveness in
real-life situations. These mechanisms are known as the locus of con-
trol and as the causal attribution of the obtained results or the acti-
vity itself. Thus, the changes of subjective probability in the decisio-
nal process are determined by a greater number of variables than has
been previously assumed.

The new studies call in question some other assumptions of the ex-
pectancy model, namely, that the greater the number of rewards for the
performance the higher the motivational index of the effort at work.
Now this relation appears to be more complex. There are some suggestions
that external rewards such as money can diminish the value of internal
rewards involved in the job.

The development of research concerning the expectancy model has
shown that its initial form was too simple to be accepted and it has
become too complicated to be used as a predictor of workers' behavior.
But, after all, it has generated many new research problems, especially
concerning the cognitive processes in workers' motivation.

Working groups

Theme: Implementation of
decision analysis
Chairperson: Carl-Axel Staël
von Holstein

Outline for the working group "Implementation of Decision
Analysis" by Carl-Axel S. Staël von Holstein, Stockholm.

This conference, like its five predecessors, is concerned
with various aspects of decision theory and decision-making.
Almost all contributions to these conferences have been dealing
with either theoretical developments or studies of behavior in
laboratory or real-life situations. There are only a few
papers that have been directed towards the implementation of
this body of knowledge (based on theory and experience) to
difficult decision problems. The purpose of this working group
is to address the question of how to carry out this implementa-
tion.

Decision analysis might be loosely defined as the practical
application of decision theory to real decisions. A quick
introduction is given by Keeney in his paper for this conference.
Brown et al. (1974) and Howard and Matheson (1974) present the
decision analysis approach in detail. Even though this approach
provides a methodology for analyzing decision problems there
remain questions regarding the implementation of the methodology.
For example, how do you quantify uncertainty, how far do you
model a decision, how do you communicate the results?

The panel members will each be asked to bring up for general
discussion one or more problems that he considers important for
the successful implementation of decision analysis. The follow-
ing are some questions that might be discussed:

- How does one introduce decision analysis to an organi-
  zation?

- What do we model, the environment or an expert's view
  of the environment?

- What would be an efficient procedure for the initial
  structuring of a decision?

- How far do you model a decision?

- How should we validate our models?

- How far do we have to carry procedures for the encoding of judgment and preferences? Are there any efficient shortcuts when there is little time available?

- How should one present an analysis and its results?

- How should one implement recommendations?

- Are there major differences between applications of decision analysis in the private sector and in the public sector?

Hopefully, the discussion will generate researchable problems for people interested in new topics for research in decision analysis, as well as useful insights for those working with implementations of decision analysis.

The following persons have agreed to serve as panel members:

Rex V. Brown, Decisions and Designs, Inc.

George W. Dangel, Ringier & Co AG

Ralph L. Keeney, Woodward-Clyde Consultants

Lawrence D. Phillips, Decisions and Designs, Inc.

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Theme: Decision process
description

Chairperson: Charles Vlek

Sixth Research Conference on Subjective Probability,Utility,and
Decision Making - Warszawa,September 6-9,1977.

Working group on Decision Process Description.

The purpose of this working group is to devote more time and effort
to the goals,methodology,problems,and uses of 'decision process description'
or 'process tracing',than can be made available at the formal conference
discussion of Svenson's paper on "Process descriptions of decision making"
(Conference Preprints,pages G1-G34).That paper may serve as a natural guide
to the discussion.

Those interested in process description seem to (a) reject normative
models of decision making,(b) disagree with Von Neumann & Morgenstern's
contention that a revealed preference is the ultimate basis of utility
measurement and should not be analyzed any further,(c) feel that detailed
knowledge of the cognitive processes preceding an overt choice is essential
for understanding why that choice was made,(d) assume that human behavior
is sequentially organized,adaptive to environmental changes,and subject to
cognitive limitations,and (e) direct their views at the decision behavior
of unaided individuals rather than on the development of a decision technology.

Those interested in process description at the same time seem to be relat-
ively insensitive to a couple of points which may also be considered as
essential for understanding decision behavior,at least in realistic settings
of some complexity.First,decision behavior comprises much more than the
sequential and somewhat fluctuating application of various decision rules.
Subjective problem representation or 'pre-decisional structuring' should
not (again) be overlooked.Secondly,the process description movement begins
to draw attention to the dependence of decision behavior on task character-
istics.A useful formal definition of decision problems and an orderly
classification of decision tasks would enable one,in principle,to discover
which process (elements) goes with which task (aspects).

The discussions of the working group will be initiated and stimulated by
a number of panelists who will sequentially and adaptively deal with a
number of critical questions.Some sample questions are:

- What minimal theory is actually imposed upon process-descriptive responses
before any coding and interpretation of such responses are possible at all?

- What utility may process desciption have for (a) theory construction,
(b) theory testing,(c) development of decision-aiding techniques,(d) the
discovery of behavioral peculiarities and weaknesses?

- Are there any good methods for externalizing pre-decisional activities
other than the ones discussed in Svenson's paper;would anyone present
discuss specific experiences from his own research?

- Is there reason to fear that attempts to describe any complex realistic
decision process leads one into a labyrinth of uninterpretable responses?

- Could process tracing techniques be used to test hypotheses about existing
'stages of decision behavior'?

Charles Vlek

Tutorial

Some psychological applications
of the theory of fuzzy sets

Organizer: Hannu Nurmi

FUZZINESS AND PROBABILITY: SOME METHODOLOGICAL CONSIDERATIONS

By Hannu Nurmi, Department of Philosophy, University of Turku,

Kasarmik. 6/10, SF-20500 Turku 50, Finland

Abstract:

The paper aims at sheding light on some of the problematic issues
related to the employment of the theory of fuzzy sets in the study
of human behavior in general and decision making in particular.
It is well-known that the theory of fuzzy sets provides an intui-
tively satisfactory way of modeling the inherent inpreciseness
that seems to surround much of the human behavior. In the paper
we discuss in the introduction the rationale of emplying fuzzy
set theory in the human sciences. At the same time the notion of
fuzziness is related to other intuitively near-by notions, in
particular to that of vagueness. The second chapter of the paper
deals with the interpretations of probability which - as is well-
known - is one of the near-by notions of fuzziness. In the dis-
cussion of the interpretations of probability we use the classic
classification: limiting relative frequency, propensity and subjec-
tive interpretations. The focus of attention is on the types of
evidence used when employing any one of these interpretations.
In the third chapter we outline the elements of the calculus of
fuzzy notions as they have been presented by L.A.Zadeh and others.
This chapter is included just for the convenience of a reader
who has not acquired very much knowledge of the theory of fuzzy
sets and can be skipped by others. In the fourth chapter we dicuss
the specific problems that are related to the interpretation of
some operations on fuzzy sets. It is argues that not all of the

operations usually introduced in the fuzzy set theory are amenable to a straight-forward interpretation in the same spirit as their underlying notion of the concept of fuzzy set. In the fifth chapter we focus upon the particular problems of evidence and inference involving fuzzy concepts and operations. In this chapter we confront the interpretation of fuzziness with that of probability. Particular attention is paid on the differences in methodological apparatus needed in the analysis of statements incorporating either probabilisitic or fuzzy notions. Depending upon the interpretation of probability adopted the evidence used in supporting probabilistic statements may be of different nature. The same applies to statements involving fuzzy notions. As the logic of statistical inference is by now well-developed, it would be of great importance to relate fuzzy concepts to probabilistic ones in the way that would make it possible to utilize the decision rules of statistics in the analysis of evidence pertaining to statements involving fuzzy notions. An attempt to pursue this line of reasoning concludes the paper.

General information

GENERAL INFORMATION

You will find a brochure which contains general information /including a map/ about Warsaw. Besides this, please find enclosed specific instructions.

CURRENCY INFORMATION

When you arrive in Poland you are required to exchange a minimum of $ 10 per day /or the equivalent of that/ during your stay. Note: This does not apply to Invited guests.

Currency may be exchanged at bureaux de change at:

1/ Okęcie - International Airport,

2/ Warszawa Centralna - Central Railway Station,

3/ Narodowy Bank Polski - Polish National Bank, 5 Jasna Street,

4/ All ORBIS hotels,

5/ ORBIS offices at 16 Bracka Street, and 13 Krakowskie Przedmieście

Polish currency:

The currency unit is the zloty /abbreviation: zł./ It is divided into 100 groszys. At the tourist rate of exchange one USA dollar is worth about 33 zł. Banknotes of the following denominations are in circulation: 1.000 zł., 500 zł., 200 zł., 100 zł., 50 zł., and coins 20 zł., 10 zł., 5 zł., 2 zł., 1 zł., 50 gr., 20 gr., 10 gr.,

LOCATIONS OF THE CONFERENCE PLACE AND HOTELS

The Conference will take place at the University of Warsaw /pronounced Universytet Warshavski/, 28 Krakowskie Przedmieście /Krakovskye Pshedmyescye/. At that address, in the campus, the reception desk is in the Kazimierzowski Palace. The reception desk, run by Ewa

Wilczynska., will be open from 2 p.m. till 9 p.m. on Monday and 7 a.m. till noon on Thursday. The Conference rooms are in the Auditorium Maximum. There will be guiding signs in the University grounds.

All the hotels where you have been booked in, as well as the Conference place, are in the center of Warsaw.

ADDRESSES OF HOTELS:

Forum Hotel - 24/26 Nowogrodzka Street, tel 21-09

Bristol Hotel - 42/44 Krakowskie Przedmieście, tel. 26-32-41

ZNP Hotel /Hotel Nauczycielski/ - 31/33 Wybrzeże Kosciuszkowskie,

tel. 26-26-00

Saski Hotel -/ Plac Dzierżyńskiego/ Żabia 9, tel. 20-11-15

Note: Information about your hotel as well last-minute information will be given in a special newsletter to be sent in August.

TRANSPORT IN WARSAW

Warsaw has trams, buses, and taxis. The trams and buses are always rather crowded, but they are extremely cheap. Tram tickets cost 1 zł., bus ticket - 1 .50 zł., express bus - 3 zł., irrespective of distance.

All these tickets can be bought at newspaper kiosks /look for kiosks marked RUCH/. There are no conductors on the trams and buses. You must punch your ticket in a machine provided in the vehicle for that purpose.

For car drivers: it is important to know that, at junctions where
there is no sing, the car on the right has priority, but when appro-
aching a roundabout, the cars on the roundabout have priority.

SOCIAL ACTIVITIES

1. A Reception evening, with coffee and wine, will take place on Monday,
   September 5, in the Kazimierzowski Palace, University of Warsaw.
2. Excursion to the Royal Castle in the lunch break on September 6.

3. The Conference dinner is scheduled for Wednesday, September 7.
   It will take place in the "Krokodyl" restaurant, Old Town Market
   Square - about 15 minutes walk from University of Warsaw. At the
   reception evening everybody will be asked again if he /she/ wants
   to attend the dinner. The dinner will cost 500 zł.
4.   The Opera Theater. We have booked 50 tickets for the Opera
   performance to be held on Thursday, September 8. Tickets are free of
   charge.

Specific transport instructions:

f r o m	t o	m e a n s o f t r a n s p o r t
The International Airport	Forum Hotel	city bus No 175 to Marszałkowska Street
	Bristol Hotel	city bus No 175 to Krakowskie Przedmieście
	Z N P Hotel	city bus No 175 to Marszałkowska Street, then change to city bus No 128 to Jaracza Street
	Saski Hotel	city bus No 175 to Marszałkowska Street, then change to any tram to Dzierżyński Square three tram stops
		The taxi fare to all these Hotels is approximately 40-50 zł.
The Central Railway Station	Forum Hotel	any tram to Marszałkowska Street /one tram stop only!/
	Bristol Hotel	city bus No 175 or No 160 to Krakowskie Przedmieście
	Z N P Hotel	city bus No 128 to Jaracza Street
	Saski Hotel	any tram to Marszałkowska Street /one tram stop/, than change to any tram to Dzierżyński Square
	The Conference place	city bus No 175 or No 160 to Krakowskie Przedmieście
The Conference place	Forum Hotel	city bus No 175, or express bus D to Krakowskie Przedm.
	Bristol Hotel	within walking distance, two blocks away
	Z N P Hotel	city bus No 155 to Świętokrzyska Street
	Saski Hotel	city bus No 111 or No 100 to Krakowskie Przedmieście

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SUGGESTION FOR LUNCH, DINNER, DRINKS, etc.

Restaurants

Higher category:

Bristol   - 42/44 Krakowskie Przedmieście

Cristal - Budapeszt   - 21/25 Marszałkowska Street /Hungarian cuisine/

Europejski   - Ossolinskich Street

Forum   - 24/26 Nowogrodzka Street

Grand Hotel - 28 Krucza Street

Kameralna   - 16 Foksal Street

Kongresowa   - Emilii Plater /Culture Palace/

Krokodyl   - 19 Rynek Starego Miasta /Old Town Market/

Szanghaj   - 55 Marszalkowska Street   /Chinese cuisine/

Warszawa   - 9 Powstancow Square

Victoria   -

Lower category:

Ambasador   - 2 Moniuszki Street

Bazyliszek   - 7/9 Rynek Starego Miasta / Old Town Market/

Habana   - 28 Piekna Street   /Cuban cuisine/

Ha Long   - 2 Grzybowski Square / Viet-Nam cuisine/

Kameralna   - 6 Kredytowa Street

Pod Retmanem - 11 Bednarska Street

Rycerska   -   11 Szeroki Dunaj

Staropolska - 8 Krakowskie Przedmieście /Old Polish dishes/

X Trojka   - Defilad Square /Culture Palace / /Russian cuisine/

Zlota Rybka   - 5/7 Nowy Świat /fish dishes/

Most of the above run dinner dances from 9 or 10 p.m. onwards, for which one must purchase an entrance ticket, which is counted towerds consumption. Guests who do not want to stay for the dinner dance should leave before that hour.

Wine

Amfora   - Pasaż Sródmiejski

Ewa   - 4 Bracka Street /from 10 a.m. till 10 p.m./

U Hopfera   - 53 Krakowskie Przedmieście /from 10 a.m. till 12 p.m./

X U Fukiera   - 27 Rynek Starego Miasta, oldest wine cellar in Warsaw

                /from 10 a.m. till 9 p.m./

X /Winiarna

Coffe, tea, hot chocolate

Alhambra   - 32 Jerozolimskie Av.

Bombonierka   - 13/15 Rynek Starego Miasta

Hortex   - Swietokrzyska Street

Gong   - 42 Jerozolimskie Av. /Tea!/

Kmicic   - 27 Piwna Street

Telimena   - 27 Krakowskie Przedmieście

Tokaj   - 76/80 Marszalkowska Street

U Pana Michala - 4/6 Freta Street

X 22 Lipca /Wedel/ - 8 Szpitalna Street /hot chocolate!/

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