

APPARAISAL OF FUZZY SOCIAL UTILITY

- 1 - Introduction.
- 2 - Research question
- 3 - Methodological principles
- 4 - Validations of the components of the value.
- 5 - Fuzzy identification of the relative value ex-handle.
- 6 - Classification of the preferences (ex-post).
- 7 - Development of the balanced experton
- 8 - Monetary equivalent of the utility
- 9 - Conclusion.
- 10 - Bibliography

Summary

The study reports on an evaluation of the value of the social utility of the organizations of social economy (OES). We do not propose to do this in a traditional way (imposing to the surveyed people, to choose between quantified securities "precise", but rather by respecting the system of evaluation which we are accustomed to practise daily, that of expression of vague "or "fuzzy " semantic preferences ", such as for example, "I found this film very good". Such a system requires to be used from the point of view of an evaluation to resort to particular methods using the principles of fuzzy logic. Among the possibilities offered by the applications of fuzzy logic we will retain that of EXPERTONS. This method is used relatively little, and has, to our knowledge, never been employed in social economy.

Michel Garrabé

michel.garrabe@univ-montp1.fr

November 2004

GRES

GRUPE DE RECHERCHE EN ECONOMIE SOCIALE
CEP -UNIVERSITY OF MONTPELLIER (FRANCE)
Faculté de Sciences Economiques
Avenue de la Mer
Site de RICHTER C.S. 79606
34960 MONTPELLIER Cedex 2 FRANCE

APPARAIASAL OF FUZZY SOCIAL UTILITY

1 - INTRODUCTION.

In this paper, we will try to take on a certain number of questions that a preceding study ¹ had left without answer. Our recurring concern remains to try to measure the value of the social utility of the organizations of social economy (OES).

For that, we concentrate our effort on the identification and the modelling of the components of the social utility. We wish to persevere the same objective in the previous paper which is to identify, if possible a money value of this social utility, by testing certain proposals within the framework of targeted investigations.

We do not propose to do this in a traditional way (imposing to the surveyed people, to choose between quantified securities "precise", but rather by respecting the system of evaluation which we are accustomed to practise daily, that of expression of vague "or" fuzzy "semantic preferences", such as for example, "I found this film very good".

Such a system requires to be used from the point of view of an evaluation to resort to particular methods using the principles of fuzzy logic. Among the possibilities offered by the applications of fuzzy logic we will retain that of expertons. This method is used relatively little, and has, to our knowledge, never been employed in social economy.

2-RESEARCH QUESTION

In a preceding work (2003), we had proposed resorting to the technique of the "charts of valued preferences" to identify and measure the components of the social utility of a category of cultural OES. This method consisted in presenting at the parties involved in the experiment, a chart on which appeared different values in euros spread out between 0 to 100€, among which inquired could choose.

This method applied film club, in which we had identified the productive components. The method used allowed us to measure the value of three properties of this category of association: the spectacle, the cognitive contribution and user-friendliness.

The technique used consisted in presenting a list, to surveyed the subjects of the study, and requesting them to choose a precise value amongst units. Although largely used, this practice did not allow to take into account the subjective inaccuracy of the individual choice, which a subject to constraint of evaluation. Moreover the fact of deciding that ex post (at the exit of a spectacle) on the relative place of each component causes confusion between the position a priori of the actors, with respect to each one of its components relative to the others and influences it events of the meeting (quality of the spectacle, discussion, or social bond) on their hierarchy a priori.

Within the framework of this present work, we will begin for our application, the same type of association test as in the preceding study, but we will propose to take into account the difficulty in carrying out a choice of precise value. For that, we will use a procedure allowing us to retain a vague choice, within the framework of protocol of investigation. Its aim being the identification of the values of proprieties which could be vague or fuzzy.

¹ Garrabé Mr. (Nov. 2003): Social utility and authorized capital intern LIKINGS University of Montpellier www.creslr.org/ores/travaux.asp

Moreover, we will also propose to study the question of the classification and the weighting of the various properties for the actors, starting from a specific protocol of identification of the ex-ante preferences. The information obtained by actor will be used for then to balance the satisfaction measured ex post.

Lastly, compared to our preceding study, our investigation will carry on a different population of actors concerned, that of the members of "ciné club" exclusively. We had previously studied the valued preferences for members and beneficiary, we will retain here only the point of view of the members what will enable us to measure values by sticking exclusively to the preference of the members of "ciné club" we shall thus have much more reliable values.

3-METHODOLOGY

The method adopted to measure the vague preferences of the actors concerns the principles of fuzzy logic. Among the principal tools available, fuzzy, random subsets fuzzy, Φ blurs, we experts will retain the latter.

3.1-Phasage

The methodological protocol of this study will include a certain number of successive stages.

A-the validation of the components of the value presented has as the properties of the associative production. We will return to a question posed, already carried out, to confirm the preceding results, on this point.

B Fuzzy identification of the order of the preferences and the relative value ex-handle of each component starting from a traditional figure of statistical representation, that of an equilateral triangle, allowing to represent the three properties of the social utility, with like property a summation of unit value.

C Fuzzy identification of the value allotted ex-post to each component by using a scale with vague semantic reference marks,

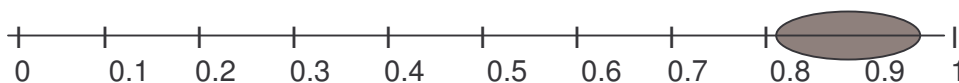
The construction of a scale of semantic values raises the question of the number of valued levels selected. In general 11 levels are retained, but it seems that beyond levels 5 to 7 levels, the discern of the differences is very difficult. In practice that should not pose a problem since a vague choice will be admitted (covering several semantic values). An example is proposed by table N°1.

Table N°1

Level	Value
0	Absolutely false
0.1	Very false
0.2	Almost false
0.3	Rather false
0.4	Falsier than true
0.5	As true as false
0.6	Truer than false
0.7	Rather true
0.8	Almost true
0.9	Very true
1	Absolutely true

Besides, one can go further and think that the recourse to the vague choice authorizes a number of levels much more significant. Nothing prohibits in theory retaining 20, 30 40 levels or more, except that it will be impossible to attach a linguistic value to them.

One can resort to *a rule of fuzzy semantic values* of the following type



In framework of investigation, one asks actors to locate at there suitability location of its choice, on the scale, while surrounding (or while pointing if it is necessary), corresponding space.

D-weighting of the preferences by assigning to information ex-post the securities obtained ex-handle.

The evaluation of the value of the properties must necessarily result in distinguishing the distribution a priori (before the meeting) from the preferences (classification of the 3 properties) and in addition measurement from satisfaction from the actors compared to quality from the event from the cognitive contribution and user-friendliness.

Two investigations were thus necessary. The first, apart from any meeting (possibly before the meeting) in order to determine for each actor the fuzzy quantified hierarchy a priori of its preferences between the three properties. The second having the aim of measuring its fuzzy perception of the quality of the three properties, after the meeting.

In our preceding study this distinction had not been made so that the identification ex-post by the method of the chart of valued preferences did not make it possible to distinguish preferences ex-handle and satisfaction ex-post, with the risk taht the measurement obtained is a confused value. Thus one can grant to the event a strong relative value and may be not satisfied with the event to which one has just attended. In this case the investigation makes it possible to identify this relative value, ex-post does not really measure the total utility.

E-Elabration of the experton The experton is a concept suggested by A.KAUFMANN (1987) which results " from the association of that of fuzzy random subset and of that of confidence interval ²". It results from it a tool built starting from fuzzy information which one determines the law of probability, and of which the expectation of the cumulated probability gives a " défuzzified " value of expertise. We will return in the point following on the method of construction of a experton.

F-proposal of a money value per property From the results obtained (a subset fuzzy \tilde{O}) we will be able to propose a money value, by retaining like value of opportunity the average price of a film show on the market.

3.2-formalization of a fuzzy proposal.

The information suggested spontaneously by the actors of the economic and social life is generally incomplete and vague rather than dubious (SANDRY.S.A. 1997), and the valorisation of the property of a phenomenon is expressed more naturally in current language than in measuring unit. So that when an individual is questioned, by subjecting him, for example to a choice between several numerical values, however rigorous the

² A KAUFMANN (1987): p17

answer is, one is practically ensured to lose information, since this type of investigation does not allow to take into account the opinions located inside an interval.

The recourse to traditional logic (even multivalent) remains insufficient when one approaches fields or types of questions, for which knowledge available is vague, vague and dubious. In these circumstances the nature of information imposes the use of another logic rather than traditional logic: fuzzy logic, called also logical linguistics.

Boolean logic is founded on the concept of variable binary, fuzzy logic on that of fuzzy variable and linguistic variable. The linguistic term of variable is much more general than that of fuzzy variable, which remains a direct extension of the traditional binary variable.

One can define a vague variable, like pertaining to the interval $[0,1]$, associated the function of membership $F_A(X)$, with $A = F_A(x)$, of a fuzzy subset A of the universe of reference U .

The linguistic variable expression introduced by ZADEH, proposes that the values of this variable are not numerical, but symbolic systems, like the words and the expressions of the current language.

An unspecified variable can be represented by a triplet (U, X, D_x) composed of a whole of reference U , a designation X (name of the variable) and of a field of D_x definition, subset of U , or vague whole of reference frame U (case of a vague variable). A linguistic variable is defined by a triplet (X, U, T_x) in which T_x indicates the unit finished or not linguistic values of variable X called terms. In fact vague expressions of the natural language characterize X and which are modelled by vague sets. To specify the characteristic of a linguistic variable "weak", one can associate an adverb to him (modifying) "quite". The modification of characteristics will be translated on the function of membership. By supposing that R is a fuzzy characteristic, derived from another fuzzy characteristic A by the modifier m , one can write $R=m(A)$ or $F_R(x) = mf_A(X)$.

A simple vague proposal is form "X is A", where A is an element of T_x associated with a vague predicate. A made up proposal consists of simple fuzzy proposals, such as "X is A", "is B there", connected between them by connectors, in general, AND (conjunction) and OR (disjunction).

It is known, that the union of two fuzzy subsets A and B of X , is the fuzzy subset made up of the elements of X affected of largest of their degree of membership, given by $f(A)$ and $f(B)$. It is defined like element $D=A \cup B$ of $F(X)$ such as:

$$\forall x \notin X, f_D(x) = \max(f(A), f(B))$$

If $D=A \cup B \cup \dots \cup N$, then:

$$\forall x \notin X, f_D(x) = \max(f(A), f(B), \dots, f(N))$$

The intersection is defined like element $D=A \cap B$ of $F(x)$ such as:

$$\forall x \notin X, f_D(x) = \min(f(A), f(B))$$

Si $D' = A \cap B \cap \dots \cap N$, then:

$$\forall x \notin X, f_{D'}(x) = \min(f(A), f(B), \dots, f(N))$$

3-3 Principles of construction of an experton

That is to say property (u) of an organization (for example its social utility), on which one questions each individuals I , $I \in [1, \dots, n]$ concerning the $C(h)$ characteristics, $H \in [1, \dots, m]$ of this property (for example its productions of services, contribution cognitive, amenity...).

1 - One defines the evaluation of I like a vague unit $\tilde{S}_i = \{\mu_{\tilde{S}_i} C(h)\}$

$$\forall H, \mu_{\tilde{S}_i} C(h) = \mu_{\tilde{S}_i}^{\min} C(h) = \mu_{\tilde{S}_i}^{\max} C(h) \in [0.1] \quad (1)$$

$$\text{or } \mu_{\tilde{S}_i} [\mu_{\tilde{S}_i}^{\min} C(h), \mu_{\tilde{S}_i}^{\max} C(h)] \subset [0.1] \quad (2)$$

2 - The aggregation of the evaluation is obtained by regarding $\mu_{\tilde{S}_i} C(h)$ as the examples of random variables $\mu_s C(h)$ taking their value in $[0.1]$.

3 - One establishes their laws of probability starting from limiting securities MIN and MAX of the evaluations. From each level of the rating scale obtained, one builds an experton. The laws of probability are then defined on 11 levels of semantic scale.

$$\forall H, P(\mu_{\tilde{S}_i}^{\min} C(h) = \mu) = \frac{n_{\mu}^{\min}}{N} \quad (3)$$

$$P(\mu_{\tilde{S}_i}^{\max} C(h) = \mu) = \frac{n_{\mu}^{\max}}{N} \quad (4)$$

n_{μ}^{\min} and n_{μ}^{\max} represent the frequencies of μ like securities MIN and MAX of the evaluations of the $C(h)$ character and N the number of surveyed people.

4 - Finally the laws of probability are transformed into a function of cumulative distribution which constitutes an experton obtained starting from securities MIN and MAX of each one of the property.

$$F(\mu_{\tilde{S}_i}^{\min} C(h) = \mu) = \sum_{\eta=\mu}^1 P(\mu_{\tilde{S}_i}^{\min} C(h) = \eta) \quad (5)$$

$$F(\mu_{\tilde{S}_i}^{\max} C(h) = \mu) = \sum_{\eta=\mu}^1 P(\mu_{\tilde{S}_i}^{\max} C(h) = \eta) \quad (6)$$

The experton once built, one can calculate the expectation of securities MIN and MAX, which gives us a fuzzy subset result, which can be brought back to a specific result.

4-VALIDATION OF the COMPONENTS OF VALUE PRESENTED LIKE the PROPRIETES OF the ASSOCIATIVE PRODUCTION.

A concern preliminary to the identification of the vague choices was to validate the properties which will be retained like components of the social utility in our case. The identification of the properties of a film club resulted from a preliminary study and had already been the validation purpose. The question was: identification of the surplus.

1 - Do you think that to come to the Film club is a different step to go to see a film in a traditional room? yes not

2 - Do you think that the Film club brings to you " something " in more than simply viewing of the film? yes not

3 - So yes you think that this " something " moreover is:

- interest of a discussion/présentation of film, its author, his actors yes not

- interest of a different environment more convivial, favourable with the contacts yes not

The results of inquiry had enabled us to retain these three properties like relevant for the continuation of our step.

5-FUZZY IDENTIFICATION OF the RELATIVE VALUE OF EACH PROPRIETES FOR EACH ACTOR.

5.1-presentation of the purpose of the investigation

After having confirmed the validation of the choice of the properties retained within the framework of the study, our concern will be to measure the relative value of each one of these properties.

The determination about preference ex-handle of surveyed, but more still the degree preferably relative of each property will be a significant operator to develop the satisfaction of each one among it ex-post.

Indeed, one must understand that if a property is regarded ex-handle as most significant a priori, his total utility ex-post will depend not only on his ex-post quality, but also on the importance of expectation of the actor relating to it. So that one can propose that total satisfaction relating to the use of a property is measured by the importance of waiting of which it is the purpose affected of the value of its utility ex-post.

One is thus led to identify and measure " expectation " or value ex-handle of the properties selected, which will constitute a value of weighting of the values ex-post making it possible to identify the final resulting value.

A methodological question emerges then, it acts to determine a protocol of measurement of these securities ex-handle constituting a system of weighting. The question is brought back to conceive a process making it possible to allot a value relating to each property whose sum would be a unit. This process of identification of fuzzy values ex-handle with nap of unit value conceived we it starting from a figure of traditional representation in descriptive statistics.

In short, what characterizes the approach suggested, here, is consequently the identification and the measurement of the preferences ex-handle and ex-post of each property, by using a method of identification and measurement preserving the vague character of information obtained.

5.2-presentation of the support and its use

- We propose to subject to each surveyed actor, a figure intended to allow us to identify the value of their relative preference for each of the three properties selected.

- This figure is an equilateral triangle whose intersection three heights determines six equal surfaces. Three tops representing the maximum value of each of the three properties (1), whereas the point of intersection the height and of quoted opposite represents the minimal value (0).

- Each surface thus represents a space preferably particular, the six surfaces exhausting the possible combinations of these preferences.

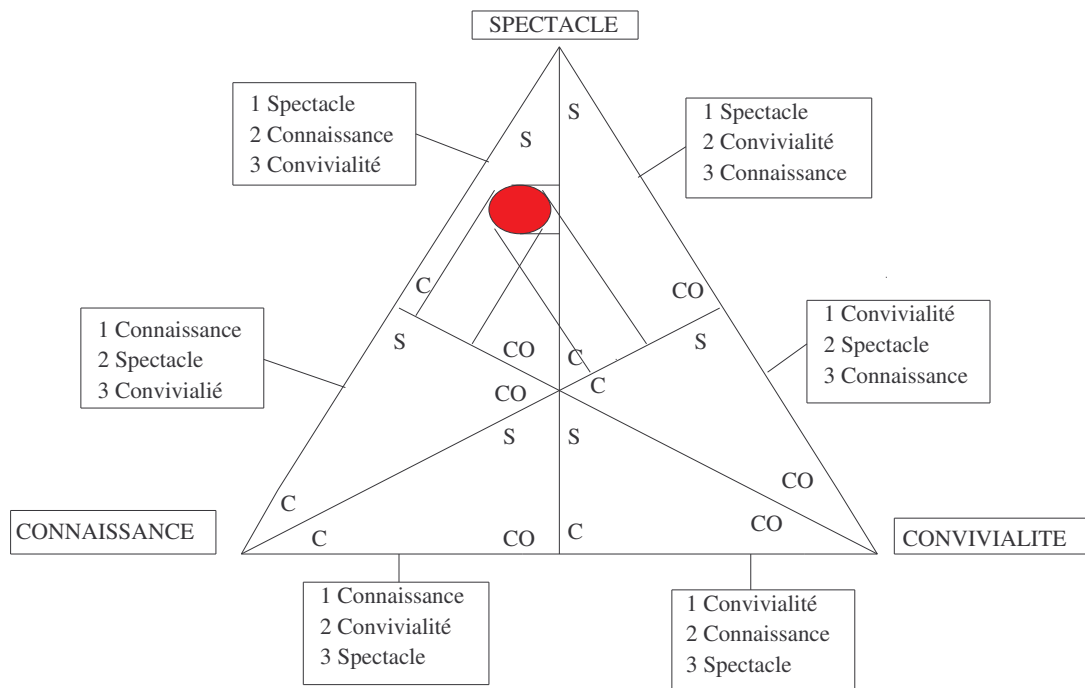
- A the interior of these surfaces, each point of space has clean co-ordinates, proposing an order preferably having a specific value.

- It is requested from the people surveyed to choose a surface preferably corresponding to their order among the six existing possibilities, then with interior of the selected surface to proceed to the choice of a surface of size, form and free localization, to represent at the same time their local preference but also their indetermination and their inaccuracy.

- the drawing of a free surface makes it possible to identify a vague choice. However for reasons of identification of the co-ordinates, it is requested from inquired to propose, if

possible, a surface of convex choice, roughly round or oval. The choice of a figure of significant size (about twenty centimetres of quoted), on average facilitates the drawing of rather small surfaces, whose inaccuracy remains circumscribed.

- From this figure, we can locate on the graduated axes (heights of the triangle), the fuzzy values of the choices (represented by intervals).



For example the localization of the surface chosen on the figure is represented by:

Spectacle > Knowledge > User-friendliness

That is to say the surface Have {0.65-0.75 0.15-0.25; 0.05-0.15 } representative a vague order preferably ex-handle.

5-3. Sample and collection of information

The interrogation of twenty people considered as representative of a group of member, themselves consulted under a relative expertise compared to the user-recipients of the meetings of "ciné-club", gave the following results. The opinions obtained constitute confidence intervals contained in a matrix of valuation of experts. The use of the method on samples of higher size does not pose methodological problems. For the treatment, the programming will be necessary.

Table N°2 Preferences ex-handle of the members.

QUEST	Surface	Spectacle		Cognitive		User-friendliness	
		MIN	MAX	MIN	MAX	MIN	MAX
1	S>C>Co	0,57	0,68	0,22	0,34	0,05	0,14
2	S>C>Co	0,74	0,85	0,11	0,2	0,01	0,09
3	S>C>Co S>Co>C	0,71	0,77	0,06	0,16	0,11	0,19
4	S>Co>C	0,74	0,82	0,01	0,05	0,17	0,21
5	S>C>Co	0,64	0,7	0,25	0,34	0,01	0,06
6	S>Co>C	0,59	0,64	0,08	0,18	0,2	0,31
7	S>C>Co	0,52	0,58	0,42	0,35	0,02	0,11
8	S>C>Co	0,51	0,56	0,4	0,46	0,01	0,06
9	S>C>Co	0,39	0,45	0,31	0,38	0,2	0,27
10	S>Co>C	0,48	0,58	0,14	0,23	0,26	0,31
11	S>Co>C Co>S>C	0,32	0,38	0,24	0,3	0,35	0,41
12	S>Co>C	0,45	0,5	0,09	0,19	0,35	0,42
13	S>C>Co	0,45	0,52	0,35	0,41	0,11	0,16
14	S>C>Co	0,68	0,74	0,18	0,24	0,05	0,11
15	S>C>Co C>S>Co	0,39	0,46	0,41	0,49	0,1	0,15
16	S>C>Co	0,54	0,67	0,24	0,31	0,08	0,16
17	S>Co>C Co>S>C	0,39	0,46	0,08	0,17	0,41	0,49
18	Co>S>C	0,24	0,36	0,09	0,21	0,51	0,59
19	S>C>Co S>Co>C	0,51	0,59	0,21	0,27	0,18	0,24
20	S>Co>C	0,47	0,58	0,16	0,23	0,25	0,31

5-4 Elaboration of the experton.

A-office plurality ex-handle.

From the preceding observations, one proceeds to the sum of values MIN and MAX by level. What gives the following results.

Table N°3

level	Spectacle		level	Cognitive		level	User-friendliness	
	MIN	MAX		MIN	MAX		MIN	MAX
0	0	0	0	1	0	0	4	0
0,1	0	0	0,1	7	1	0,1	6	6
0,2	1	0	0,2	6	9	0,2	4	6
0,3	1	0	0,3	2	5	0,3	2	4
0,4	3	2	0,4	4	3	0,4	3	2
0,5	8	5	0,5	0	2	0,5	1	1
0,6	3	6	0,6	0	0	0,6	0	1
0,7	4	4	0,7	0	0	0,7	0	0
0,8	0	2	0,8	0	0	0,8	0	0
0,9	0	1	0,9	0	0	0,9	0	0
1	0	0	1	0	0	1	0	0

B-identification of the law of probability

The setting in the form of a law of probability is carried out as we already specified. The number of the observations constitutes the quotient which one assigns to the values of the preceding table.

Table N°4

level	Spectacle		level	Cognitive		level	User-friendliness	
	MIN	MAX		MIN	MAX		MIN	MAX
0	0	0	0	0,05	0	0	0,2	0
0,1	0	0	0,1	0,35	0,05	0,1	0,3	0,3
0,2	0,05	0	0,2	0,3	0,45	0,2	0,2	0,3
0,3	0,05	0	0,3	0,1	0,25	0,3	0,1	0,2
0,4	0,15	0,1	0,4	0,2	0,15	0,4	0,15	0,1
0,5	0,4	0,25	0,5	0	0,1	0,5	0,05	0,05
0,6	0,15	0,3	0,6	0	0	0,6	0	0,05
0,7	0,2	0,2	0,7	0	0	0,7	0	0
0,8	0	0,1	0,8	0	0	0,8	0	0
0,9	0	0,05	0,9	0	0	0,9	0	0
1	0	0	1	0	0	1	0	0

Cumulated C-probabilities: experton ex-handle

From table N°4 one calculates the probability cumulated for each level of each property.

Table N°5

level	Spectacle		level	Cognitive		level	User-friendliness	
	MIN	MAX		MIN	MAX		MIN	MAX
0	1	1	0	1	1	0	1	1
0,1	1	1	0,1	0,95	1	0,1	0,8	1
0,2	1	1	0,2	0,6	0,95	0,2	0,5	0,7
0,3	0,95	1	0,3	0,3	0,5	0,3	0,3	0,4
0,4	0,9	1	0,4	0,2	0,25	0,4	0,2	0,2
0,5	0,75	0,9	0,5	0	0,1	0,5	0,05	0,1
0,6	0,35	0,65	0,6	0	0	0,6	0	0,05
0,7	0,2	0,35	0,7	0	0	0,7	0	0
0,8	0	0,15	0,8	0	0	0,8	0	0
0,9	0	0,05	0,9	0	0	0,9	0	0
1	0	0	1	0	0	1	0	0

5-5 Comment

The experton to which we arrived, for the three identified properties, constitutes an instrument of weighting which we will assign to the preferences ex-post. Indeed, as we it have yet underlined, the importance of relative satisfaction ex-post, on each property, depends on the value a priori granted relative to each one of them. From our point of view weighting plays the same role in the process of valorisation as a probability of occurrence. That will enable us to resort later on to a probabilistic operator to build the final experton.

6 CLASSIFICATION OF PREFERENCES EX-POST

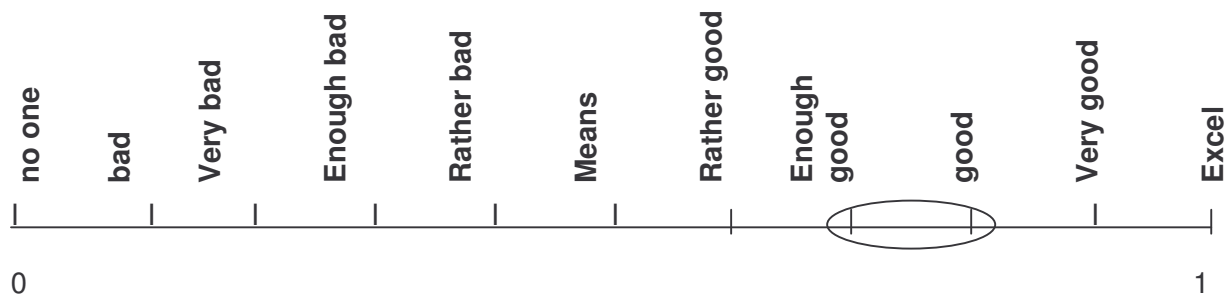
6-1-principle

An investigation makes it possible to identify the fuzzy values granted by members (expert) of a "ciné-club" to the three following characteristics of the whole of a film program presented during the year: the value of films like spectacles, the value of the meetings from the point of view of their cognitive contribution (discussion presentation), finally the value of user-friendliness of the activity.

The protocol resulted selecting 20 people and in proposing to them to answer, most freely possible, in a precise way or not to the put questions.

For that *a scale with vague semantic reference marks* their was proposed for each of the three properties tested of the program, on which inquired could express a vague answer.

The scale with vague semantic reference marks is calibrated ex-post to allow the location of the intervals of evaluation of each one of surveyed.



Each answer was measured starting from the interval (or of their value crisp) observed on the scale. This location requires a precise calibration of the scale and a reading which can require an optical reader and an adapted program. The results obtained are as follows:

6-2-identification of the fuzzy values

The collection of information obtained reveals the following intervals of values for the three properties selected $p_i = \{P_1 P_2 P_3\}$.

Compared to the evaluation of the relative value ex-handle of the three properties, it acts here to measure fuzzy satisfaction ex-post each one of these properties. There is thus no reason so that the sum of these satisfactions is equal to 1.

The results of the examination of the questionnaires make it possible to draw up the following table:

Table N°6. Preferences ex-post.

QUEST	Spectacle		QUEST	Cognitive		QUEST	User-friendliness	
	MIN	MAX		MIN	MAX		MIN	MAX
1	0,62	0,91	1	0,53	0,72	1	0,37	0,44
2	0,72	0,9	2	0,46	0,61	2	0,23	0,58
3	0,81	0,9	3	0,82	0,94	3	0,72	0,84

4	0,9	1	4	0	1	4	0,68	0,81
5	0,73	0,82	5	0	1	5	0,44	0,68
6	0,65	0,83	6	0,42	0,84	6	0,52	0,63
7	0,72	0,92	7	0,73	1	7	0,74	0,82
8	0,74	1	8	0,28	0,52	8	0,57	0,71
9	0,63	0,84	9	0,74	0,92	9	0,8	0,9
10	0,75	0,9	10	0,81	1	10	0,24	0,52
11	0,9	1	11	0,65	0,93	11	0,42	0,54
12	0,62	0,72	12	0	1	12	0,74	0,88
13	0,63	0,84	13	0,42	0,84	13	0,63	0,75
14	0,57	0,82	14	0	0,8	14	0,48	0,63
15	0,64	0,92	15	0	1	15	0,67	0,73
16	0,71	0,83	16	0,71	0,92	16	0,45	0,69
17	0,84	1	17	0,83	0,92	17	0,75	0,83
18	0,75	0,93	18	0,28	0,54	18	0,57	0,82
19	0,62	0,84	19	0,52	0,85	19	0,76	0,84
20	0,61	0,92	20	0,71	0,86	20	0,61	0,68

The scale makes it possible to appreciate values with the hundredth. In four circumstances for the appreciation of the cognitive contribution, one noted an incapacity of answer which resulted in preferring a maximum interval at an arbitrary value.

6-3 Elaboration of the experton ex-post

A-office plurality ex-post

According to the same principle as previously.

Table N°7

level	Spectacle	
	MIN	MAX
0	0	0
0,1	0	0
0,2	0	0
0,3	0	0
0,4	0	0
0,5	0	0
0,6	8	0
0,7	6	1
0,8	4	7
0,9	2	8
1	0	4

level	Cognitive	
	MIN	MAX
0	5	0
0,1	0	0
0,2	0	0
0,3	2	0
0,4	2	0
0,5	3	2
0,6	0	1
0,7	5	1
0,8	3	3
0,9	0	7
1	0	6

level	User-friendliness	
	MIN	MAX
0	0	0
0,1	0	0
0,2	2	0
0,3	0	0
0,4	3	1
0,5	3	2
0,6	4	3
0,7	5	5
0,8	3	7
0,9	0	2
1	0	0

B-identification of the law of probability

Table N°8

level	Spectacle	
	MIN	MAX
0	0	0
0,1	0	0
0,2	0	0
0,3	0	0
0,4	0	0
0,5	0	0
0,6	0,4	0
0,7	0,3	0,05
0,8	0,2	0,35
0,9	0,1	0,4
1	0	0,2

level	Cognitive	
	MIN	MAX
0	0,25	0
0,1	0	0
0,2	0	0
0,3	0,1	0
0,4	0,1	0
0,5	0,15	0,1
0,6	0	0,05
0,7	0,25	0,05
0,8	0,15	0,15
0,9	0	0,35
1	0	0,3

level	User-friendliness	
	MIN	MAX
0	0	0
0,1	0	0
0,2	0,1	0
0,3	0	0
0,4	0,15	0,05
0,5	0,15	0,1
0,6	0,2	0,15
0,7	0,25	0,25
0,8	0,15	0,35
0,9	0	0,1
1	0	0

Cumulated C-probabilities: experton ex-post

Table N°9

level	Spectacle	
	MIN	MAX
0	1	1
0,1	1	1
0,2	1	1
0,3	1	1
0,4	1	1
0,5	1	1
0,6	1	1
0,7	0,6	1
0,8	0,3	0,95
0,9	0,1	0,6
1	0	0,2

level	Cognitive	
	MIN	MAX
0	1	1
0,1	0,75	1
0,2	0,75	1
0,3	0,75	1
0,4	0,65	1
0,5	0,55	1
0,6	0,4	0,9
0,7	0,4	0,85
0,8	0,15	0,8
0,9	0	0,65
1	0	0,3

level	User-friendliness	
	MIN	MAX
0	1	1
0,1	1	1
0,2	1	1
0,3	0,9	1
0,4	0,9	1
0,5	0,75	0,95
0,6	0,6	0,85
0,7	0,4	0,7
0,8	0,15	0,45
0,9	0	0,1
1	0	0

7-ELABORATION OF the BALANCED EXPERTON.**7-1 Principle and application**

The construction of this experton results owing to the fact that we consider the weighting of the subjective importance of the values of the properties, functions like a traditional probabilistic operator.

Table N°10

Spectacle		Cognitive		User-friendliness		Spectacle		Cognitive		User-friendliness	
MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
1	1	1	1	1	1	1	1	1	1	1	1
1	1	0,95	1	0,8	1	1	1	0,75	1	1	1
1	1	0,6	0,95	0,5	0,7	1	1	0,75	1	1	1
0,95	1	0,3	0,5	0,3	0,4	1	1	0,75	1	0,9	1
0,9	1	0,2	0,25	0,2	0,2	1	1	0,65	1	0,9	1
0,75	0,9	0	0,1	0,05	0,1	1	1	0,55	1	0,75	0,95
0,35	0,65	0	0	0	0,05	1	1	0,4	0,9	0,6	0,85
0,2	0,35	0	0	0	0	0,6	1	0,4	0,85	0,4	0,7
0	0,15	0	0	0	0	0,3	0,95	0,15	0,8	0,15	0,45
0	0,05	0	0	0	0	0,1	0,6	0	0,65	0	0,1
0	0	0	0	0	0	0	0,2	0	0,3	0	0

=

Spectacle		Cognitive		User-friendliness	
MIN	MAX	MIN	MAX	MIN	MAX
1	1	1	1	1	1
1	1	0,71	1	0,8	1
1	1	0,45	0,95	0,5	0,7
0,95	1	0,23	0,5	0,27	0,4
0,9	1	0,13	0,25	0,18	0,2
0,75	0,9	0	0,1	0,04	0,095
0,35	0,65	0	0	0	0,0425
0,12	0,35	0	0	0	0
0	0,14	0	0	0	0
0	0,03	0	0	0	0
0	0	0	0	0	0

7-2 Calculation of the expectations

Table N°11

Spectacle	MIN	MAX	Cognitive	MIN	MAX	User-friendliness	MIN	MAX
0-0.1	1	1	0-0.1	1	1	0-0.1	1	1
0.1-0.2	1	1	0.1-0.2	0,71	1	0.1-0.2	0,8	1
0.2-0.3	1	1	0.2-0.3	0,45	0,95	0.2-0.3	0,5	0,7
0.3-0.4	0,95	1	0.3-0.4	0,23	0,5	0.3-0.4	0,27	0,4
0.4-0.5	0,9	1	0.4-0.5	0,13	0,25	0.4-0.5	0,18	0,2
0.5-0.6	0,75	0,9	0.5-0.6	0	0,1	0.5-0.6	0,04	0,095
0.6-0.7	0,35	0,65	0.6-0.7	0	0	0.6-0.7	0	0,043
0.7-0.8	0,12	0,35	0.7-0.8	0	0	0.7-0.8	0	0
0.8-0.9	0	0,14	0.8-0.9	0	0	0.8-0.9	0	0
0.9-1	0	0,03	0.9-1	0	0	0.9-1	0	0
Σ	6,07	7,07	Σ	2,52	3,8	Σ	2,79	3,438
ϵ	0,61	0,71	ϵ	0,25	0,38	ϵ	0,28	0,34

We obtain the subset following fuzzy Φ thus:

$$\boxed{[0,61 \quad 0,71] \quad [0,25 \quad 0,38] \quad [0,28 \quad 0,34]}$$

To obtain the classification between the three studied properties, the spectacle, the cognitive contribution and user-friendliness, a simple way to proceed is to retain the average of the intervals of the expectations.

$$\boxed{0,66 \quad 0,32 \quad 0,31}$$

What gives the relation preferably:

$$\boxed{P_1 \succ P_2 \succ P_3}$$

It is noted that the value of the properties P_2 and P_3 are very close.

8-MONETARY 8-EQUIVALENT OF the DISTRIBUTION OF the UTILITE

From the last result obtained, it is possible to establish the monetary equivalents of the computed values of the preferences for each property of the social utility.

8-1 Principles

We will retain, as in our preceding work (Nov. 2003) the following principles.

1 We suppose that one to the "ciné-club" initially will see a good film. Therefore if one hesitates to go there, one hesitates initially between two spectacles, the second spectacle being supposed probably also to be a film. One can thus pose that the utility of film of "ciné-club" is at least equal to that of the film substitute.

2 Its price are regarded as the provision to pay maximum for the film substitute, since one chooses finally the film club.

the 3 asking prices to the member-recipients for a meeting are lower than the price of the meeting on the private substitutable market.

4 We will consider in our application that this price is of 7€.

8-2 monetary Equivalent

We will consider the following coefficients:

$$\text{Spectacle: } \frac{(0.61+0.71)}{2.57}=0.51$$

$$\text{Cognitive: } \frac{(0.25+0.38)}{2.57}=0.25$$

$$\text{User-friendliness: } \frac{(0.28+0.34)}{2.57}=0.24$$

If one retains, as we proposed the value of 7€ like value of appropriateness of the meeting of "ciné-club", then we can propose the following monetary equivalents for the properties of a meeting.

$$\underline{\text{Spectacle}} = 7€ * 0.51 = 3.57€$$

$$\text{Cognitive} = 7\text{€} * 0.25 = 1.75\text{€}$$

$$\text{User-friendliness} = 7\text{€} * 0.24 = 1.68\text{€}$$

9-CONCLUSION

The measurement of the monetary equivalent of each property is only one of the possibilities offered to the application of the construction of the balanced experton. The making of a matrix of dissimilarity would make it possible to reveal probable gaps in the judgements of the actors who, without doubt, would offer prospects for analysis of the causes of the dispersion of the judgements.

The method used here, that of the calculation of expertons, although used relatively seldom in attending to the applications needing fuzzy logic, seems to us to raise some restrictions relating to the methods which we had used until now to measure the social utility of the OES.

This paper thus constitutes the second stage of our research. We went from a measurement of the social utility starting from a protocol of choice between values to a protocol of vague choices. It remains that we take into account only one aspect of the social utility, that which is " appropriable ". Part of this social utility is probably inappropriable, diffused and common. The next stage of research is to identify the social utility in the purpose of measuring it correctly.

Bibliography

Club HAIR (1997) subjective: Méthodes Evaluation, application, stakes. (167p). Paris books of the club HAIR

GARRABÉ M (Nov. 2003): Social utility and internal authorized capital. LIKINGS N° 12 (18p) CEP-university of Montpellier www.creslr.org/ores/travaux.asp

KAUFMANN A. (1977) Introduction to the theory of the fuzzy subsets 4 volumes Paris Masson

KAUFMANN A. (1987): Les let us expertons Paris HERMES

LECARDINAL G and ZALILA Z (1992): Treatment of the opinions of experts by let us expertons: application to a jury of architecture Second national days on the applications of the vague sets Nimes Nov. (pp267-273).

LEVRAT CLOSE E A. BOMBARDIER S. and BRÉMONT J (1997): Subjective evaluation of bus comfort with fuzzy International set techniques Newspaper of Intelligent Systems flight 12 (pp891-913).

PONSARD C (1974): The inaccuracy and its treatment économique. Document analyze of it work N°4 Institut of Economic Mathematics (24p) Dijon.

PONSARD C (1986): Vague mathematical models in economy. Working paper N°94 Institute of Economic Mathematics (16p) Dijon.

SAMBUC R (1975): Phi-fuzzy functions, application to the assistance with the medical diagnosis in pathology thyroïdienne Thesis Faculty of Medicine Marseilles

SANDRI S.A (1997): Expert Elicitation, pooling and assessment of opinion in the possibilistic framework in Fuzzy information engineering: has guided turn of applications DUBOIS D., PRADE H. and YAGER R. eds Wiley New York (pp123-133).

SANGALI A (2001): Praise of the blur. Presses of the University of Montréal Quebec.