

## Elements of perception regarding consumption of lightning in Geneva area: a survey research

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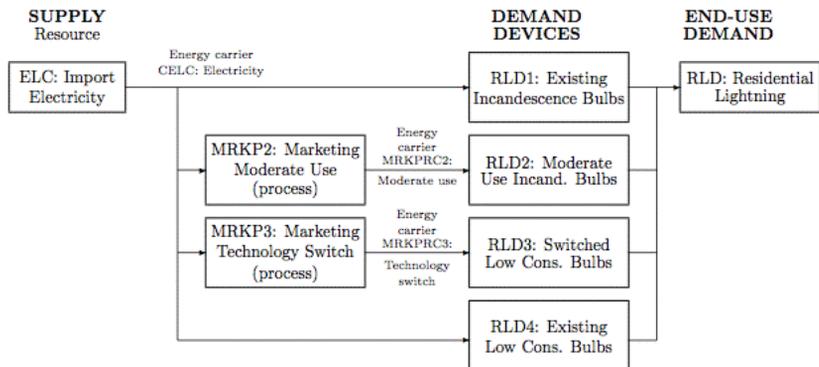
## Context

Social MARKAL: built on municipal MARKAL-Nyon  
Only lightning demand

More than 2.5 years of research

Bounds, virtual marketing process technologies

# Process technologies: marketing



## Outline of the survey research

1. Context - lighting
2. Methodology
3. Descriptive statistics
4. Hypotheses testing

# Methodology

Empirical research:

a survey conducted Sept 2009 – March 2010

sample size 393 in the Geneva area

random sampling strategy to be able to make inferences

Questionnaire with

- 18 multiple choice questions
- 1 open question
- 8 socio-economic questions

## Methodology (2)

Typically 4 types of questions:

1. Attitude – measured with a Likert scale

level of agreement to a statement

2. Behaviour – precise measurement

how many bulbs do have at home? (exact answer, ratio, interval)

3. Information – yes, no, do not know

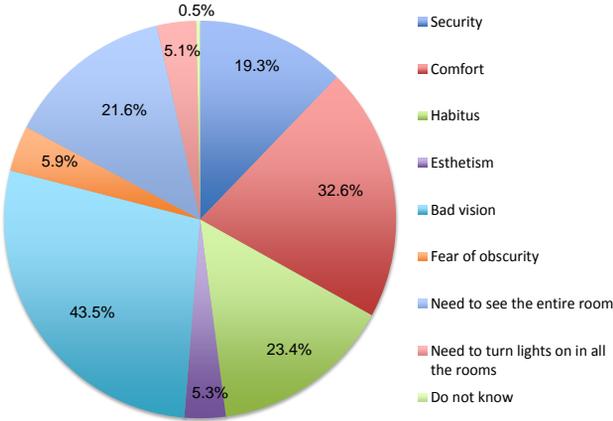
4. Hypothetical scenarios

if you were better informed, would you... (yes, no)

Hoevenagel R., (1994), "An assessment of the contingent valuation method", in *Valuing the Environment: Methodological and Measurement Issues*, Ed Pethig R, Kluwer Academic Publishers, pp. 195-227.

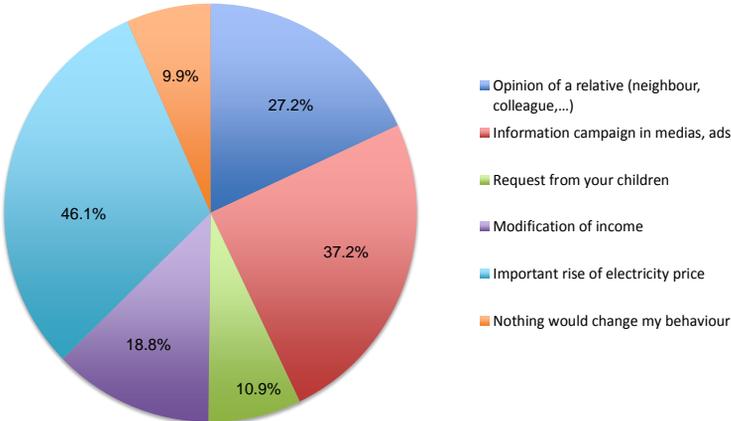
# Descriptive statistics

Q1: For what reason do you turn on the lights when entering a room?  
(2 answers possible)



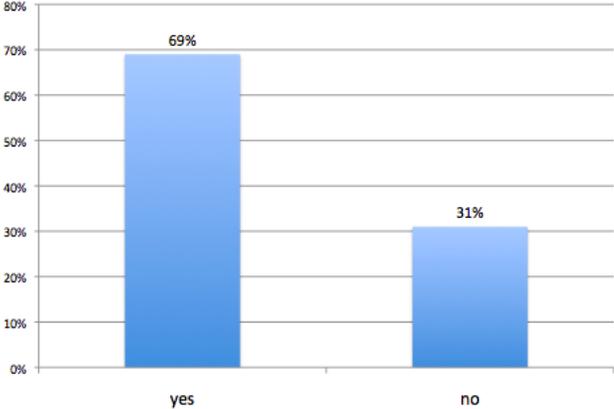
# Descriptive statistics

Q15: Your consumption of electricity could change because of:  
(2 answers possible)



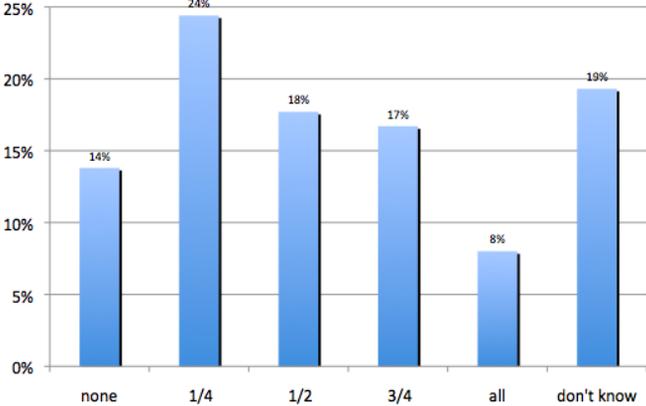
# Descriptive statistics

**Q12: If you were better informed, would you be ready to abandon incandescence bulbs?**



# Descriptive statistics

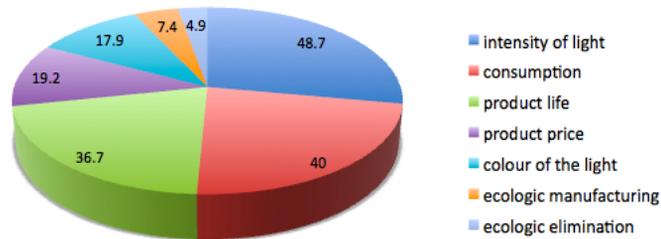
**Q7: How many low consumption bulbs do you have at home?**



One third of people don't have low consumption bulbs or don't know.

## Descriptive statistics

What are the most important characteristics of a bulb?



While people consider economic parameters first, almost a third of importance is given to non-economic properties.

## Hypotheses testing

### Bivariate hypotheses:

- Exploring differences between classes on two variables
  - For example, differences in attitude and behaviour depending on age, education, ...
- Exploring relationships between two variables
  - For example, is there a relationship between an attitude (in favour of more or less sustainable development) and behaviour (purchasing economic bulbs)

## Example:

exploring differences between classes on two variables

H0: Gender **has no influence** on the number of bulbs replaced by low-cons bulbs during the last two years.

H1: Gender **has an influence** on the number of bulbs replaced by low-cons bulbs during the last two years.

Definition of gender variable (nominal): Q20 Your gender (man, woman)

Definition of bulb replacement (ordinal -> transformed scale):

Q8 During the last two years, how many incandescence bulbs did you replace by low-consumption bulbs? (exact number, none, ¼, ½, ¾, all of them, do not know)

## SPSS Table:

exploring differences between classes on two variables

**Hypothesis Test Summary**

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Nombre is the same across categories of Sexe.	Independent-Samples Mann-Whitney U Test	.061	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Result and interpretation:

We can not reject the H0, alpha risk = 6.1% (type I error)

Thus we cannot conclude that gender has a significant influence on this behavioural issue, replacement of incandescent bulbs by low-consumption bulbs.

## Example:

exploring differences between classes on two variables

H0: There is **no relationship** between turning off lights systematically after leaving a room and parental education to turn off lights.

H1: There **is a relationship** between turning off lights systematically after leaving a room and parental education to turn off lights.

Definition of “turning lights off” variable (nominal):

Q3 Do you systematically turn off lights when leaving a room? (yes, no)

Definition of “parental education” variable (nominal):

Q5 Did your parents educate you to turn off lights when leaving a room? (yes, no, do not know)

## SPSS Table:

exploring differences between classes on two variables

	Observed N	Expected N	Residual
Non	113	196.5	-83.5
oui	280	196.5	83.5
Total	393		

	Observed N	Expected N	Residual
Non	43	130.0	-87.0
oui	321	130.0	191.0
je ne sais pas	26	130.0	-104.0
Total	390		

Test Statistics

	Eteignez-vous systématiquement en sortant d'une pièce	Vos parents vous ont-ils habitué à éteindre la lumière lorsque vous quittez une pièce?
Chi-square	70.964 <sup>a</sup>	422.046 <sup>b</sup>
df	1	2
Asymp. Sig.	.000	.000

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 196.5.

b. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 130.0.

Result and interpretation:

We reject the H0, alpha risk = 0.000

Thus we can conclude that there is a statistically significant relationship between parental education to turn off lights and behaviour to turn lights off when leaving a room.

## Example: exploring relationship between two variables

H0: The number of bulbs people have at home **is not positively rank-correlated** to the desired frequency of information.

H1: The number of bulbs people have at home **is positively rank-correlated** to the desired frequency of information.

Definition of “number of installed bulbs” variable (ordinal):

Q6 How many bulbs do you have at home? (exact no., 0-10, 11-20, 21-30, 31-40, 40+, don't know)

Definition of “information frequency” variable (ordinal):

Q17 What frequency of information would you find useful for you?

(once a year, 2-3/year, once a month, continuously in order not to forget, not at all, don't know)

## SPSS Table relationship between two variables

Correlations				
			Nombre d'ampoules à la maison	A quelle fréquence trouveriez- vous utile d'être informé(e)?
Kendall's tau_b	Nombre d'ampoules à la maison	Correlation Coefficient	1.000	.095 <sup>+</sup>
		Sig. (2-tailed)	.	.047
		N	295	292
	A quelle fréquence trouveriez-vous utile d'être informé(e)?	Correlation Coefficient	.095 <sup>+</sup>	1.000
		Sig. (2-tailed)	.047	.
		N	292	390
Spearman's rho	Nombre d'ampoules à la maison	Correlation Coefficient	1.000	.115 <sup>+</sup>
		Sig. (2-tailed)	.	.049
		N	295	292
	A quelle fréquence trouveriez-vous utile d'être informé(e)?	Correlation Coefficient	.115 <sup>+</sup>	1.000
		Sig. (2-tailed)	.049	.
		N	292	390

\*. Correlation is significant at the 0.05 level (2-tailed).

We can reject the H0 at 5% level (alpha is 4.7% and 4.9%, respectively).

Thus, there is a significant relationship between the number of bulbs people have at home and the desire to be frequently informed about low-consumption bulbs.

# Conclusions

Complete results and analyses in a forthcoming paper (sociological approach).

Future research :

- conduct a new survey research related to transportation, heating, appliances
- adapt the sociological methodology to feed the Socio-MARKAL model

Our contribution :

- developing skeleton questionnaires to distribute to MARKAL community

# Methodology published

## **Socio-Markal (Somarkal): First Modeling Attempts in the Nyon Residential and Commercial Sectors Taking into Account Behavioural Uncertainties**

Emmanuel Fragnière , Roman Kanala , Denis Lavigne , Francesco Moresino , Alexandre De Sousa ,  
Cédric Cubizolle , Christian Decurnex and Gustave Nguene

[http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1522143](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1522143)

## **Behavioral and Technological Changes Regarding Lighting Consumptions: A MARKAL Case Study**, in: Low Carbon Economy, 2010, 1, pp. 8-17

Emmanuel Fragnière , Roman Kanala , Denis Lavigne , Francesco Moresino , Gustave Nguene

<http://www.scirp.org/journal/lce>