



DECISION-MAKING IN R&D PROJECTS, A FRAMEWORK BASED ON FUZZY LOGIC

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Industrial context, drug development projects

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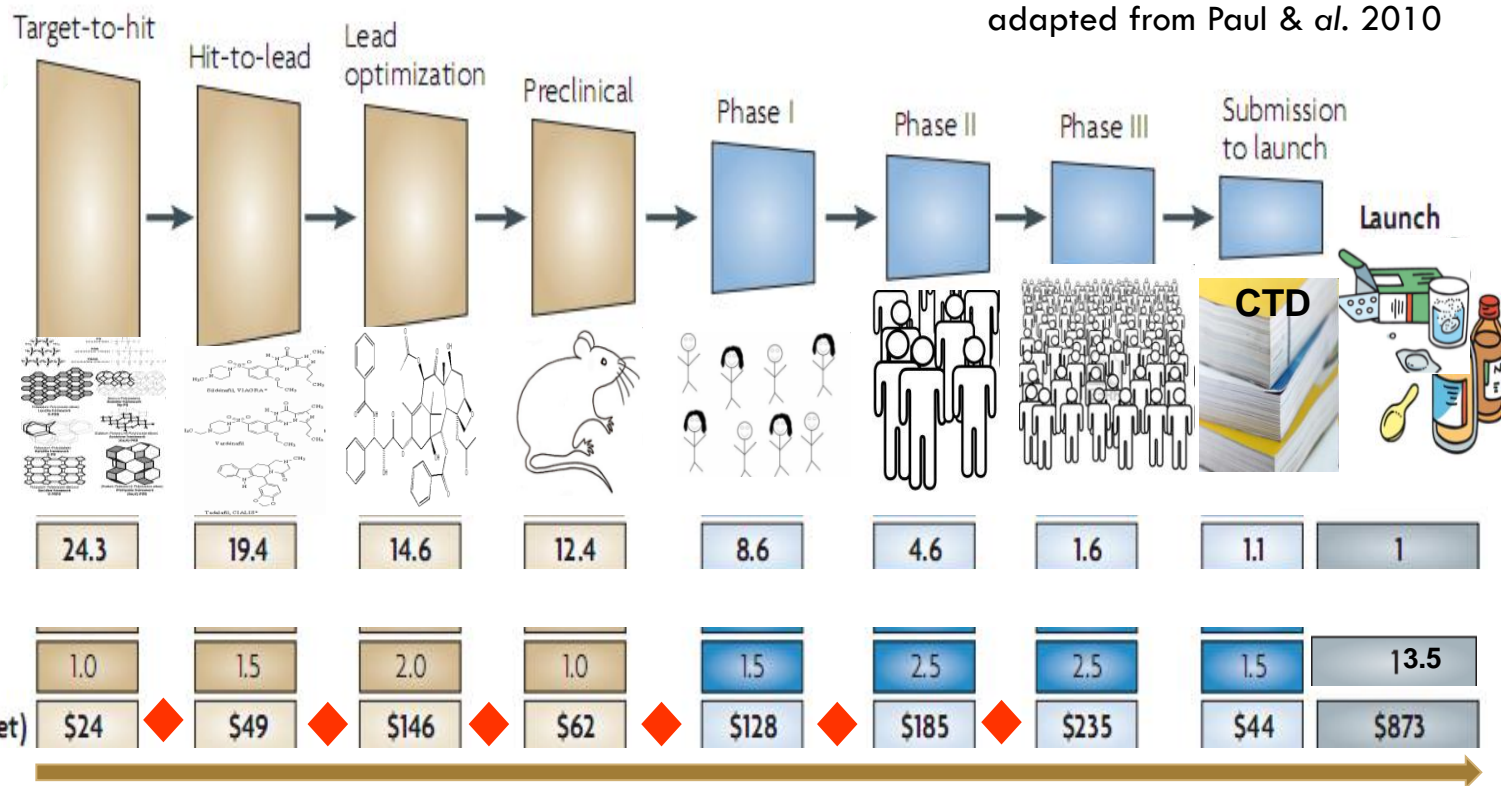
adapted from Paul & al. 2010

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VP needed for 1 launch

Cycle time (years)

Cost per launch (out of pocket)



◆: Go/ No Go decision milestones

≈13.5 years

Decision milestones in R&D projects

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- Go/No Go decisions' characteristics:
 - ▣ **collective decision-making:** steering committee,
 - ▣ **a high degree of uncertainty:** innovation in product development process,
 - ▣ **non-emergency situations:** risk in the future.

- In this context, some delays result from:
 - ▣ **indecision:** to do not decide,
 - ▣ **invalidation:** to decide and to invalidate the made decisions.

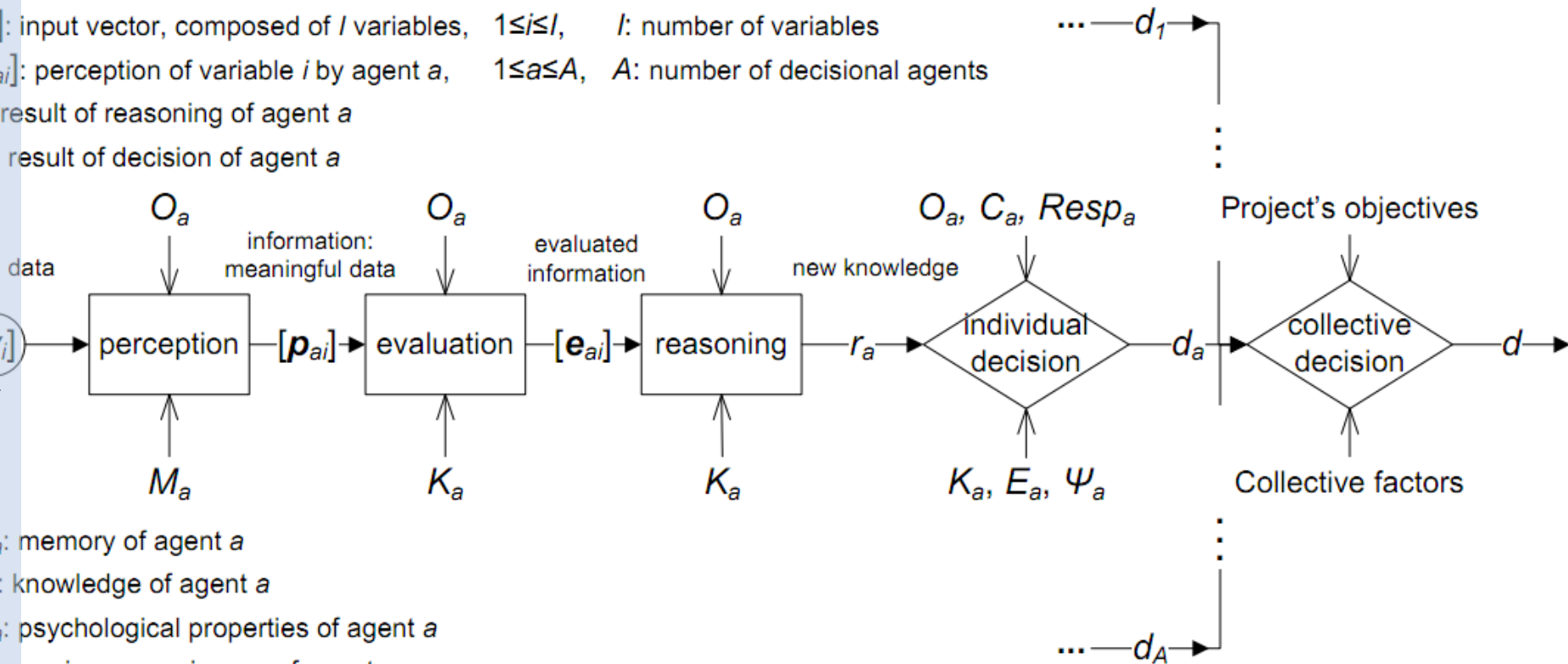
Framework for collective choice stage

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$[v_i]$: input vector, composed of I variables, $1 \leq i \leq I$, I : number of variables
 $[p_{ai}]$: perception of variable i by agent a , $1 \leq a \leq A$, A : number of decisional agents
 r_a : result of reasoning of agent a
 d_a : result of decision of agent a

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M_a : memory of agent a
 K_a : knowledge of agent a
 Ψ_a : psychological properties of agent a
 E_a : previous experiences of agent a
 O_a : objectives of agent a
 C_a : consequences of decision for agent a
 $Resp_a$: responsibilities of agent a



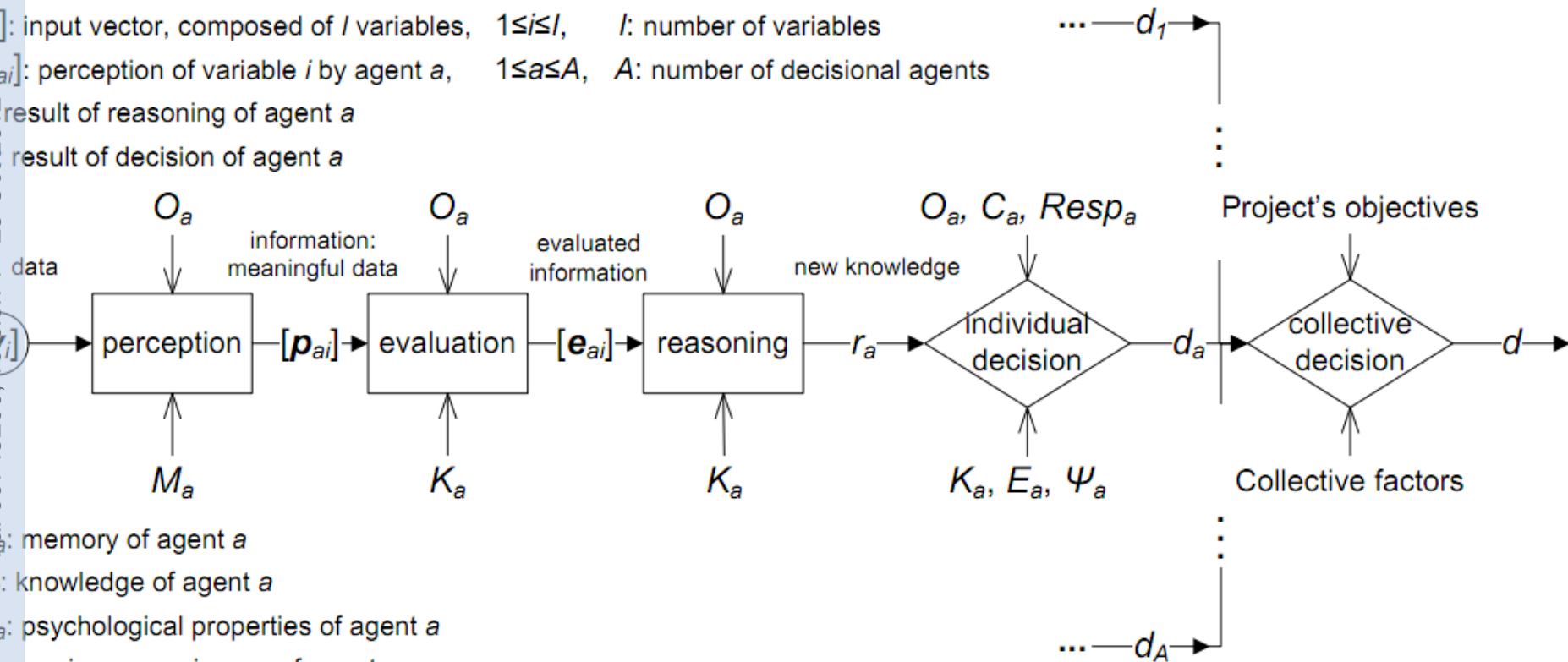
Framework for collective choice stage

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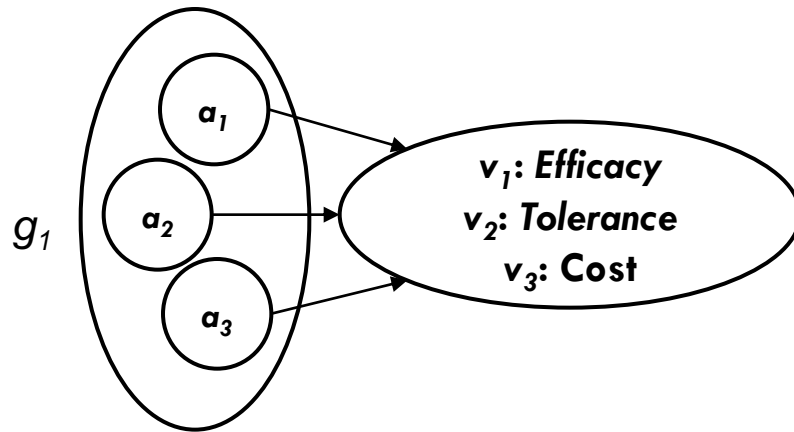


Objectives :

- 1) study and analyze previous conflicts ,
- 2) anticipate future conflicts.

Application case to pharmaceutical R&D projects

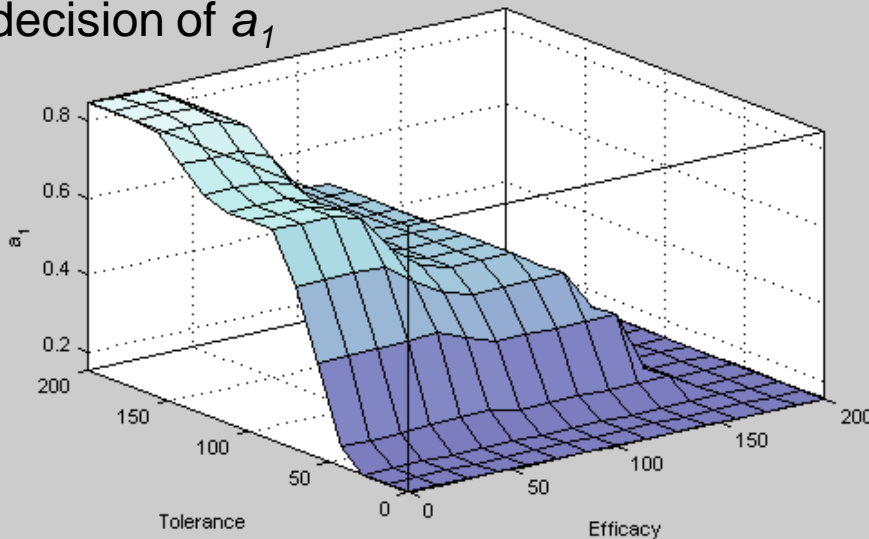
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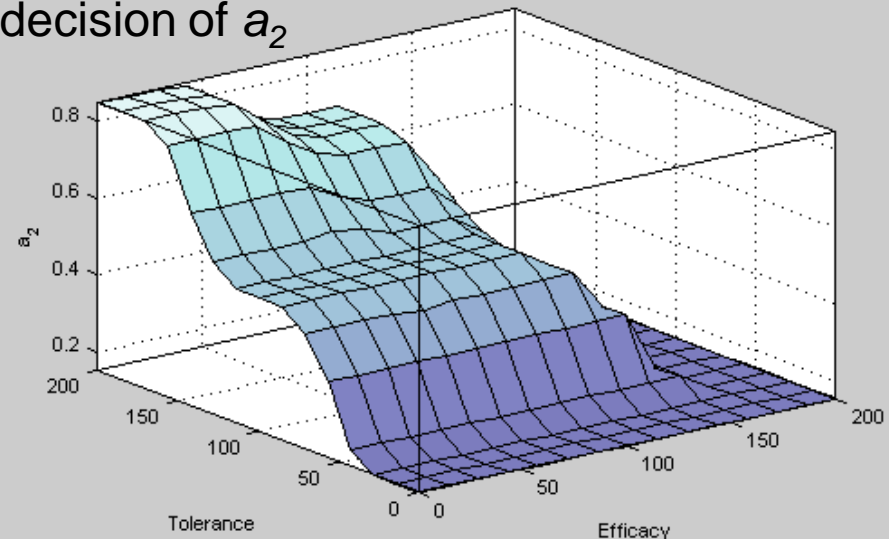
$$0 \leq v_1 \leq 200 \text{ mg}$$
$$0 \leq v_2 \leq 200 \text{ mg}$$
$$0 \leq v_3 \leq 10,000 \text{ €/kg}$$

a_1 : clinician
 a_2 : toxicologist
 a_3 : economist

decision of a_1



decision of a_2



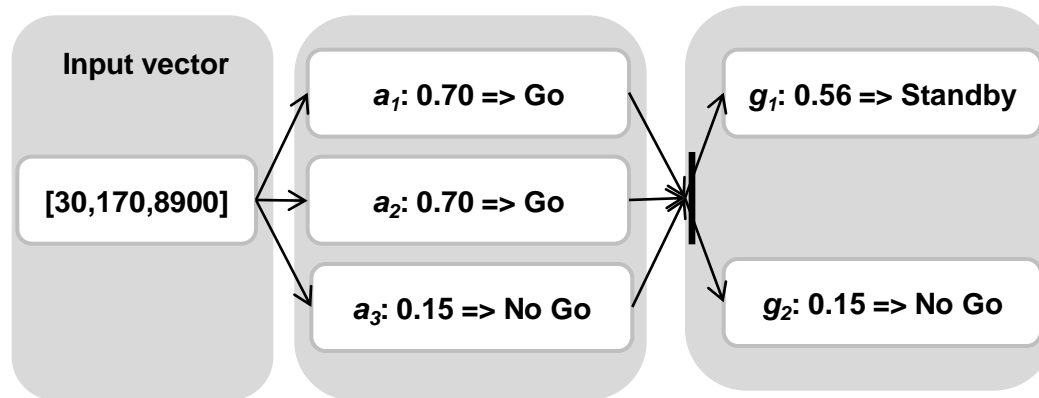
Simulation results

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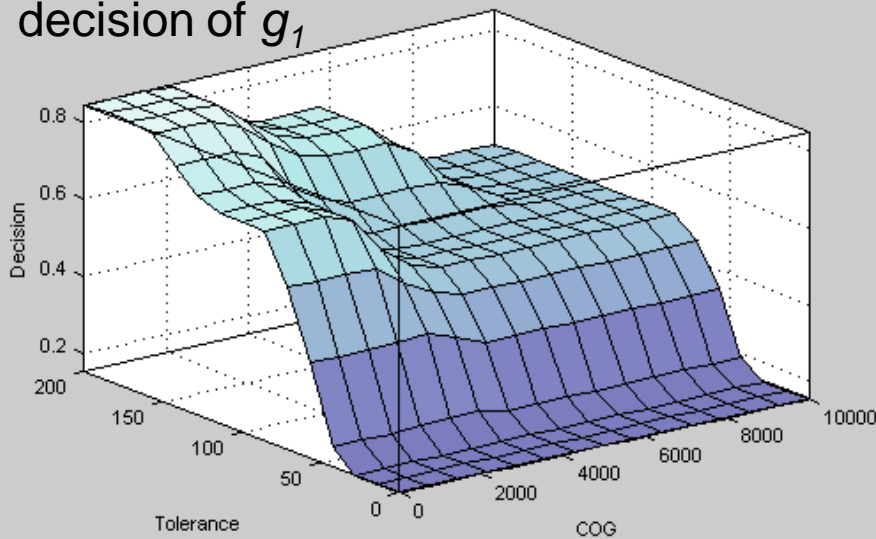
Situations	Decisions				
	Individual			Collective	
Inputs	a_1	a_2	a_3	g_1	g_2
[180, 50, 9500]	0.15	0.15	0.15	No Go	No Go
[90, 130, 4100]	0.50	0.50	0.50	Standby	Standby
[40, 190, 2500]	0.84	0.84	0.71	Go	Go
[35, 130, 5500]	0.72	0.55	0.50	Go	Standby
[100, 190, 4900]	0.50	0.70	0.50	Go	Standby
[130, 80, 1000]	0.55	0.55	0.55	Standby	Standby
[25, 200, 8000]	0.70	0.70	0.15	Go	No Go
[25, 200, 5000]	0.84	0.84	0.50	Go	Go
[25, 200, 1000]	0.84	0.84	0.84	Go	Go

Application case

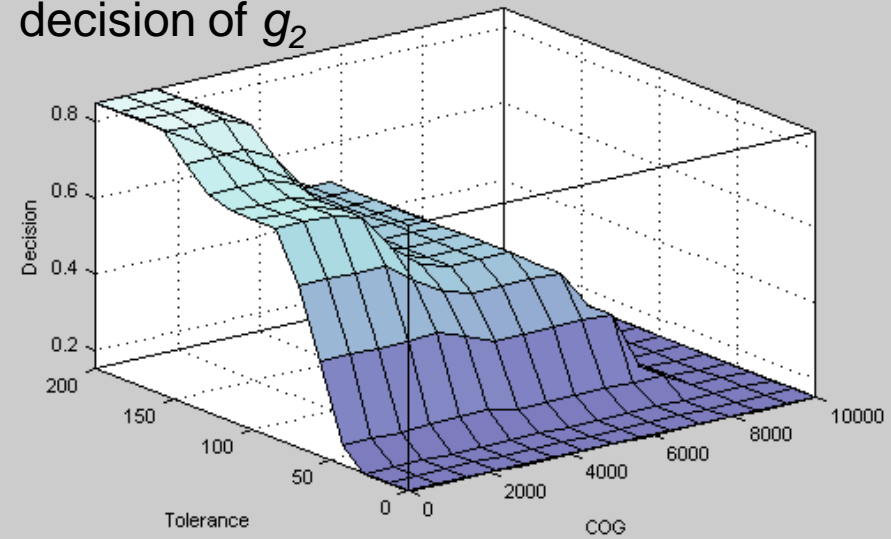
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decision of g_1



decision of g_2



Conclusions and prospects

- The framework helps explicit inference rules used by the agents to decide in order to :
 - ▣ analyze their different behaviors in the group,
 - ▣ anticipate the risk of invalidation of a decision by measuring the dissatisfaction of the agents.
- In a new version of the framework the limitations could be improved, taking into account:
 - ▣ the interdependencies between the variables,
 - ▣ iterative aspect of decision and the interactions between agents.

Thank you for your attention.