



BAYESIA

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PREDICTING QUALITY OF KNOWLEDGE ELICITATION SESSION

A META MODEL



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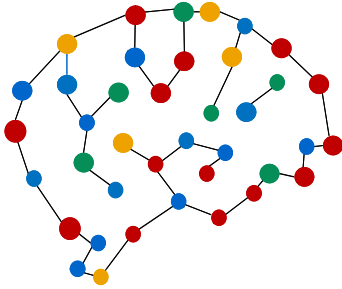
C1 - Internal use

1

This work is about a model we ave built for predicting the quality of knowledge elicitation sessions. This predictive model has been elicited, that's why we have assigned it as a kind of « meta-model » : a elicited model to predict a quality of an elicitation

WHAT IS ELICITATION ?

DIGITALIZING EXPERT KNOWLEDGE

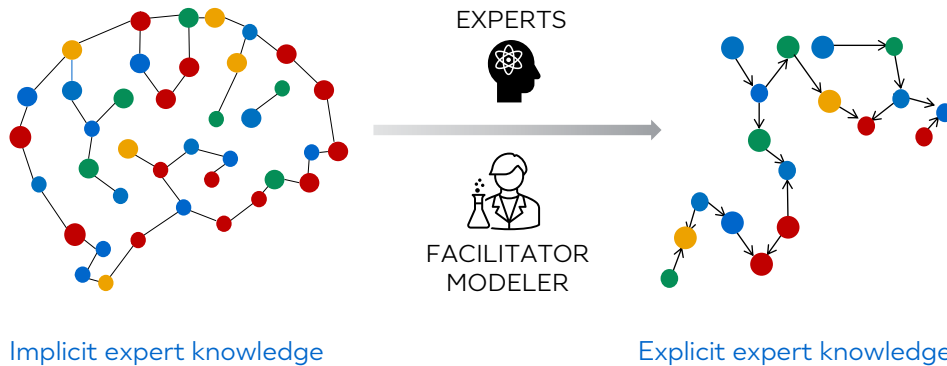


Implicit expert knowledge

Elicitation is a method that can be used for creating causal graphical models thanks to the extraction and formalization of expert knowledge. Implicit and non-material knowledge is made explicit and digitized.

WHAT IS ELICITATION ?

DIGITALIZING EXPERT KNOWLEDGE



Implicit expert knowledge

Explicit expert knowledge

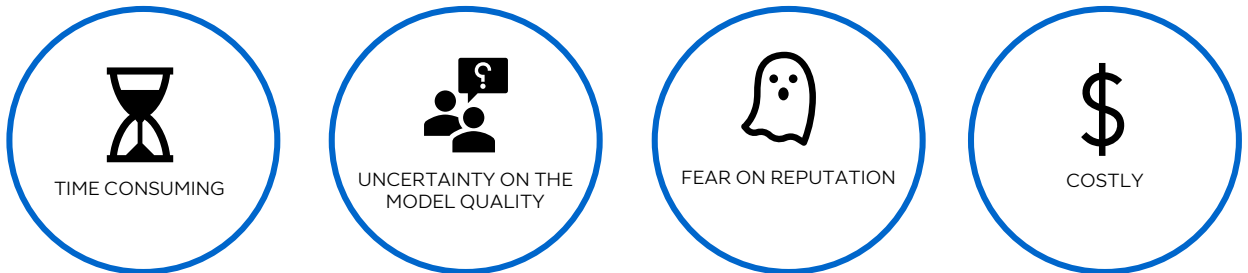
In reality, a product of an elicitation is not necessarily a causal model, but here, we will talk about elicitation of causal Bayesian diagrams. In this case, in addition of the experts, we need a modeler to build the structure and a facilitator is there to be the intermediary between experts and the modeler.

This approach provides a lot of advantages :

- From a methodological point of view, it allows for a complete change of paradigm because it is based on causal reasoning (we know how to act on an observation in order to modify its consequences)
- It is a hybrid approach in which the expert gives meaning to the data he/she is going to exploit and acquire: the object has a sparse character, i.e., among all the possible dimensions of the problem, only those that make sense are retained
- The result is a graphic model, easily exploitable and updated

CONTEXT

ELICITATION OF CAUSAL BAYESIAN NETWORKS



WHAT IS THE PROBABILITY OF « SUCCESS » OF AN ELICITATION ?

↓
PRIORITIZATION

ELICITATION OF A CAUSAL BAYESIAN NETWORK TO DECIDE IF ELICITATION IS THE BEST TOOL FOR THE PROBLEM

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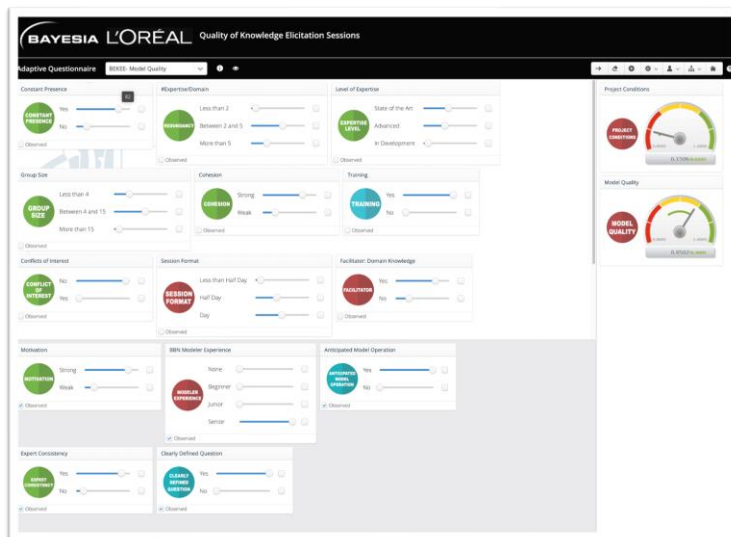
Experts are gathered for sessions during several weeks or several months. Hence, knowledge elicitation sessions can be time consuming for experts and facilitators, without being 100% sure that at the end, the model will present a good quality. In addition to this, experts during those sessions are confronting their knowledge, so controversial discussions can also happen, and reputation of people can be affected. Finally, it can also be cost effective, specially if the company must pay external experts.

Considering all of this, in a context of multi-project management, a tool to decide whether an elicitation is relevant can be useful for prioritization and feasibility analysis. This is the main topic of this talk; we will present how we have elicited a Bayesian network to help experts and management to prioritize elicitation sessions.

The term “meta-model” is associated to the Bayesian network that is presented here, and the term “model” is associated to a given elicitation model to be prioritize.

RESULT

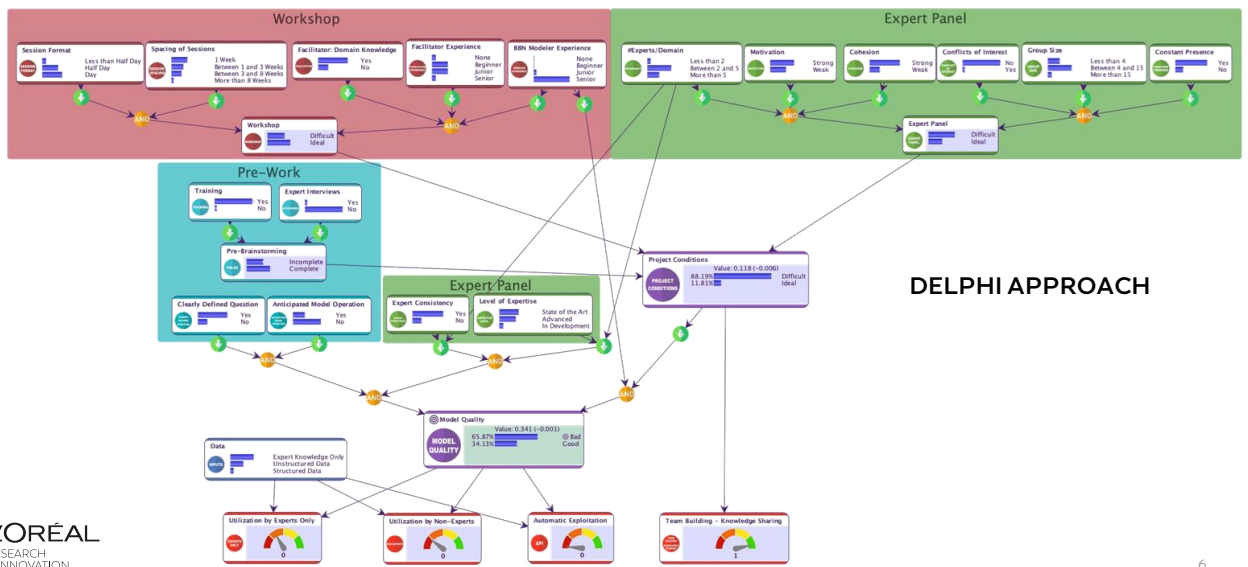
A WEB-SIMULATOR APP



The final result is a Bayesian network that can be used by non-expert thanks to a web-based inference tool for assessing the chance of a successful session

RESULT

A BAYESIAN NETWORK



DELPHI APPROACH

Here is a global overview of the meta-model. It has been obtained after about 4 days of elicitation with 7 experts with elicitation experience, applying the iterative and structured DELPHI approach. For each input, an associated node called “causal influence node” is defined, independently from each others : this kind of structure is called ICI structure.

ICI STRUCTURE WITH NOISY-AND COMBINATION FUNCTION



Session Format	False	True
< 1/2 day	53.564	46.436
1/2 day	14.286	85.714
Day	0.000	100.000

False	True	Confidence	Comment	Time	Expert
80	20	50	••		•••••
79.95	20.05	50	•••••		•••••
70	30	50	•••••		•••••
50	50	50	•••••		•••••
40	60	50	•••••		•••••
40	60	50	••		•••••
15	85	50	•••		•••••

I.C.I : Independance of Causal Influences

For each causal influence, experts are asked to give their weight of a successful session conditionally of the states of its parent node, considering that all other dimension are in a neutral state.

ICI STRUCTURE

DIMENSION REDUCTION



Spacing of sessions	False	True
1 Week	0.000	100.0...
Between 1 and 3 W...	5.714	94.286
Between 3 and 8 W...	22.857	77.143
More than 8 Weeks	44.286	55.714

Format Effect	Spacing Effect	State
False	False	False
False	True	False
True	False	False
True	True	True

WITH ICI STRUCTURE
Table 4 × 2



Session Format	Spacing of Sessions	AND	
		False	True
Less than Half Day	1 Week	53.564	46.436
	Between 1 and 3 Weeks	56.218	43.782
	Between 3 and 8 Weeks	64.178	35.822
	More than 8 Weeks	74.129	25.871
Half Day	1 Week	14.286	85.714
	Between 1 and 3 Weeks	19.184	80.816
	Between 3 and 8 Weeks	33.878	66.122
	More than 8 Weeks	52.245	47.755
Day	1 Week	0.000	100.000
	Between 1 and 3 Weeks	5.714	94.286
	Between 3 and 8 Weeks	22.857	77.143
	More than 8 Weeks	44.286	55.714

WITHOUT ICI STRUCTURE
Table 12 × 2

Once each independent causal influences are defined, they are combined thanks to a combination function : here it's a logical – AND, and the marginal probability distribution of this combination is equivalent to a noisy-and function. The ICI approach has been used mainly for dimension reduction of conditional probability tables. Here is a comparison of the dimension of a combination node with and without ICI.

THANK YOU

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