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# Consulting as Outsourcing of Decision Making

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## ABSTRACT

We consult others for purpose of asking help for our making correct decisions. We propose a framework based on *subjective utility models* (SUM)[1] that facilitates communication between the client and the consultant. Our model is closely related to the concept of *value of information* in decision analysis (see Clemen[2] for example). However, our model can be applied to a wider variety of contexts in which the client cannot evaluate the value of information for herself. We then characterize different problem settings in which different types of consultants may become effective. We further characterize client-consultant relationship management on choosing whom and how to consult. Particularly, we characterize friends, or other forms of *personal* human relationships, and discuss how they can be more helpful than acquaintances under certain contexts.

**Keywords:** causal model, communication, consulting, subjective utility, value of information

## 1. INTRODUCTION

Are you the one who knows yourself best? It depends on what you mean by yourself.

No doubt, doctors know more than you about how certain parts of your body function. In many cases, that is why you see doctors as patients. You do not necessarily need drugs or operations to cure your diseases. In many cases, you simply want the prescriptions of doctors so that you can change how you live your daily life to regain health.

A CEO of the company may say that he knows best about how to optimally manage the company. However, in many cases, a company is an enormously complex entity and different experts should deal with different facets of management.

Both companies and individuals have to deal with their

own complex systems. Though each company and individual are different from each other, there may be some orderly scientific knowledge covering many companies or individuals if you focus on different aspects.

In this view, individuals are like vectors, each of whose components may be dealt with by different disciplines of science. Thus, depending upon the monetary budget and opportunity (free time) you have, you may consider outsourcing many narrow well-defined decisions of life to the experts in the market. A best example is that of a doctor given above.

Now, especially for individuals, the vector is no doubt far from being completely covered by science. In other words, many of the components of the above-stated vector do not find any solutions in the currently existing fields of science. That is why you know most about yourself if you want to deal with aspects on which there exist no doctors for you. In the area that you consider most personal, you may have to have an internal dialogue within yourself to organize your mind.

You may find friends and your loved ones extremely valuable to deal with the intermediate region. Your friends may know quite a lot about different facets of life than you, but not so much as experts. However, they know quite a lot about you as well. Since standard sciences only deal with extremely universal aspects, as big firms only produce mass-market products, they may not necessarily deal with your personal problems. Your friends on the other hand may deal with your problems with smaller personal models, as small companies may deal with niche markets like regional markets.

In order to deal with the situation stated above, we provide a formal framework that describes the spectrum of decision outsourcing from your own decision, asking for friends advice up to consulting experts in the market.

In our framework, a multi-faceted decision problem of a client is represented by a multi-variate subjective utility model. A consultant, like a friend or an expert, focuses on limited aspects but she may give a client better solutions to the problems limited to the specified aspects than the

client himself. In many cases such as psychiatric counselings, the consultant may even specify the decision problem itself. Our framework facilitates communication between the client and the consultant related to issues stated above.

Quite naturally, when the client knows that he faces a situation stated above, he also faces the problem of choosing whom to consult. Our framework also assists such a client-consultant relationship management.

The paper proceeds as follows. First, we introduce the basic framework for representing the marginal contribution that a consultant may bring about to the decision of the client. Then, we characterize different situations in which different types of consultants become effective. Finally, we discuss briefly consultant-client relationship management.

## 2. VALUE OF A CONSULTANT

### 2.1. Basic Model

We first assume that a client (she) is an individual with a coherent value system. This implies that a client may be a corporate actor whose members work for the maximization of the group value (see Coleman[8] for example). We represent the value with a utility function  $u : X \times D \rightarrow \mathfrak{R}$ , where  $X$  and  $D$  are state variables and decision variables respectively and  $\mathfrak{R}$  is the set of real numbers. For simplicity, we assume that  $u$  represents all possible relevant causal relationships between the input variables and the subjective goal. Note that  $u$  is the degree of subjective level of happiness as a *consequence* of the decision made. For simplicity, we assume that the decision situation is deterministic such that it is certain that it is *in principle* possible to know the exact value of  $x \in X$ .

The client makes a decision based on a subjective utility model (SUM)  $\hat{u} : \hat{X} \times \hat{D} \rightarrow \mathfrak{R}$ , where  $\hat{D} \subset D$  and  $\hat{X} \subset X$ . In general, the SUM of the client does not need to be valid. The client also has personal information on the state variables, represented by a probability distribution  $\hat{p}$  on  $\hat{X}$ . A consultant may be a management scientist or operations researcher who can help the client to search for the optimal solution within a well-defined known model. However, in this paper, we assume that once the client is equipped with a SUM, she can maximize the subjective utility. Thus the client chooses alternative  $d^* = \arg \max_{d \in \hat{D}} \sum_{x \in \hat{X}} \hat{p}(x) \hat{u}(x, d)$ . Since the SUM does not need to be valid in general,  $u(d) \neq \hat{u}(d)$

in general.

The intervention of consulting is represented by the change in the SUM and the information of the client. Denote the relevant variables before and after the intervention with subscript *ea* (stands for ex-ante) and *ep* (stands for ex-post) respectively. The value of consulting intervention is then

$$u(d_{ea}^*, x^*) - u(d_{ep}^*, x^*)$$

where  $x^* \in X$  represents the true state.

Note that the value is in general known neither to the client nor the consultant. We have to define different value concepts depending upon the knowledge of the model user. If the usage of the above model is confined to the client alone, there is a narrow epistemological restriction on the kinds of change brought about by learning. On the other hand, when we let the consultant use our model, much wider range of epistemological situation of the client can be treated (see Matsumura and Kobayashi[7] for the details behind this epistemological issue). The aim of this paper is to characterize different consulting situations based on the different epistemological stances in which the client is situated.

### 2.2. Value of Information

Before we proceed to analyses of concrete situations, we review a basic model of value of information in decision analysis in order to clarify the kind of issue we are trying to tackle. Decision analysis assumes that the SUM of the decision maker is valid and complete. Thus, we assume that  $\hat{u} = u$ ,  $\hat{X} = X$ ,  $\hat{D} = D$  and so forth. Decision analysis tries to represent all sorts of uncertainty regarding the decision situation with probability. The consultant shares the SUM with the decision maker but has a more precise knowledge on the state variable. Thus, the value of consulting can be represented by expected value of information (EVI):

$$\sum_{x \in X} \hat{p}_{ep}(x) u(d_{ep}^*, x) - \sum_{x \in X} p_{ea}(x) u(d_{ea}^*, x)$$

$\hat{p}_{ep}$ , which represents the consultant's knowledge, is more sharply distributed around the real state variable  $x^*$  than  $\hat{p}_{ea}$ , which represents the client's knowledge.

In most cases, it is not possible to get a precise quantitative assessment of  $\hat{p}$  of both the client and the consultant, thus the qualitative intuition is important. There are basically two strategies to raise the value of information. One is to focus on the kind of information that may make a big difference. For example, macroeconomic forecasts are notorious for their low precisions, but investors may

gain millions if they can make the forecasts better by only a few percents. Another strategy is to raise the precision.

We will see how these two aspects may appear in different situations in the subsequent sections.

### 3. CONSULTING IN DIFFERENT PROBLEM SETTINGS

#### 3.1. Working with Perspectives

In this section, we will see how the client and the consultant may deal with the perspective management of the decision problem (see Kobayashi and Kijima[1]).

Let us assume that the decision situation has many facets described by multi-variate SUM, such that  $X = \times_{i \in M} X_i$  and  $D = \times_{j \in N} D_j$ , where  $X_i$  and  $D_i$  are state variables and decision variables respectively. For simplicity, we assume the uniqueness of language  $M$  and  $N$ .  $M' \subset M$  and  $N' \subset N$  represent the restricted perspective (frame). The client makes a decision based on the SUM  $\hat{u} : \times_{i \in M'} X_i \times \times_{j \in N'} D_j \rightarrow \mathbf{R}$ .

Specialists are a kind of experts who focus on narrow aspects  $N'' \subset N$  with high precision. Generalists focus on wide aspects with lower precision. Especially, whether to hire a specialist depends critically on how much his expertise is relevant to the decision problem in concern. In big decisions such as the design of mass-produced products, the client tends to hire specialists on very many details. For decisions with a tighter budget, choice of a consultant is a difficult issue.

Decision makers tend to be confined to narrow perspective, particularly when they rely on alternative-focused thinking[5]. Depending upon the form of a contract, a consultant may help the client to enhance her perspective. The following model illustrates how the consultant may help.

Assume for simplicity that the aspects are additive independent such that the SUM can be represented as  $u(x, d) = \sum_{j \in N} u_j(x_{M_j}, d_j)$ , where  $M_j$  represents the state variables relevant to the choice of  $d_j$  (see Keeney[5] for instance for the details of multi-variate utility models). Now, the client may try to make a decision with a *locally valid* SUM[1]. A SUM  $\hat{u} : \times_{i \in M} X_i \times \times_{j \in N'} D_j \rightarrow \mathbf{R}$  is locally valid at  $d_{-N'} = d_{-N'}^0 \in D_{-N'}$  if for all  $x \in X$  and  $d_{N'} \in D_{N'}$ ,  $\hat{u}(x, d_{N'}) = u(x, d_{N'}, d_{-N'}^0)$ . Typically,  $d_{-N'}^0$  represents the current way of doing things such as customs. Customs tend

to survive since it is by definition locally valid unless you enhance your perspective to other decision variables. Now, a consultant may advise the possibility of changing some decision variables  $N'' \subset N'$  from  $d_{N''}^0$  to  $d_{N''}^*$ .

#### 3.2. Personal Relation

In many cases, personal decisions require information regarding personal data. Business and science however usually do business on the huge market, so that they tend to focus on statistical features. Particularly, research facts in such disciplines as psychology are known to be heavily dependent on statistics. The bad thing is that you are not necessarily the average. We basically have no guarantee that our tastes are similar. Yet, we often rely on the very naïve method of substituting the personal utility with that of the average (representative) individual.

The method is quite powerful since there is often a strong correlation between the people's tastes. For example, three-star restaurants basically taste good. Regarding restaurants at least, having the knowledge of ranking does help and probably often better than not having any consumer evaluation at hand.

A consultant's modelling using representative agent is in a way a crime of conscience having the same structure as the modelling of the client in section x. Though probability assessment is required in the language of decision analysis for modelling statistical situations, it is often neither convenient nor necessary in practice. Particularly, if the client's utility is linear in that variable, modelling for a representative agent and modelling with a probability assessment are identical (see Matsumura and Kobayashi[7] for the details).

When, there is a big diversity in personal tastes, personal friends may become much more of a help to you. They know your personal feelings and problems often much more than experts.

The key point is whether your personality can be represented within the language of the consultant in concern. While there are many statistical pieces of models that deal with very rough average individuals only, there are other scientific disciplines and personalized businesses that deal with different personalities differently. Your friends may understand certain aspects of your personalities very well, but may be totally helpless on other aspects. For example, we hear that many people with severe depression suffer not being understood by their friends. In such a case, professional psychiatrists may have a better framework for projecting the personal situation.

#### 3.3. Correcting Wrong Knowledge

People often make choices based on wrong knowledge. In such a case, the decision maker has no incentive of consulting others for making a better choice since she believes her choice is correct. The intervention of a consultant may thus occur only when it is in the interest of the consultant (or the related party) to change the decision of the decision maker. Examples may include an altruistic person such as a parent hoping for the happiness of his child, a principal that may want to raise the productivity of the agent by letting him make a better choice, or even a fraud.

When you want to educate your child a moral code which she thinks is useless for example, it is no use insisting that it is a must. You should structure the knowledge in such a way that fits the SUM of the child.

Matsumura and Kobayashi[7] deal with a choice-level decision problem with incorrectness regarding the state variable to deal with the structured education. We briefly state how the epistemological class restricts our model. In their model, the functional form of  $\hat{u}$  is assumed to be valid and the model is assumed to be complete. However, instead of the probability assumption of decision analysis, they assume that the decision maker believes in a wrong value of the state variable  $x \in X$  instead of  $x^* \in X$ . They further assume that the consultant knows the correct value  $x^*$ . Thus the value of consulting  $u(x^*, d_{x^*}^*) - u(x^*, d_x^*)$  is known to the consultant. They further consider the cost of education and illustrate the optimal education design.

#### 4. RELATIONSHIP MANAGEMENT

The discussion above implies the following strategy on the side of the decision maker (client).

If the decision maker knows that she often makes mistakes and may not be aware of them, it may pay to hire permanent consultants that may meddle you to make a better choice even when you are not motivated yourself in each piece of decision problem. It may be difficult to sign a long-term contract with such consultants formally since the decision maker does not know what kind of decision problems she will face in the future. Thus, such a form of consulting relationships are usually maintained informally. This is one of the reasons why we may want to have friends and other forms of intangible informal human relationships from whom we do not expect direct benefits.

It is not necessary that the relationship is bilaterally balanced. One of the two may be more capable of helping the other. Such a relationship may of course be main-

tained occasionally by external transfer such as monetary payments. However, many people deal with this issue by having multilateral relationships. If the society members can commit on altruism, then the multilateral mutual help mechanism tends to be more stable than bilateralism.

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