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Uncertainty in Pricing Decisions in Competitive Bidding for Service Contracts



Research context:

- **Servitisation:** Transformation of market structures to the stage where manufacturing companies have to **compete through** offering **services** as opposed to physical products
- **Examples:** delivery of 'power-by-the-hour' [Baines et al. 2007], supply of the number of flying hours for an aircraft [BAE 2010], support of a submarine through life [Rolls-Royce 2011]
- The delivery of a service is usually embedded in a **service contract**. These are often allocated through the process of **competitive bidding** where the competing suppliers communicate their service specifications and price bid to the customer who then evaluates the bids.

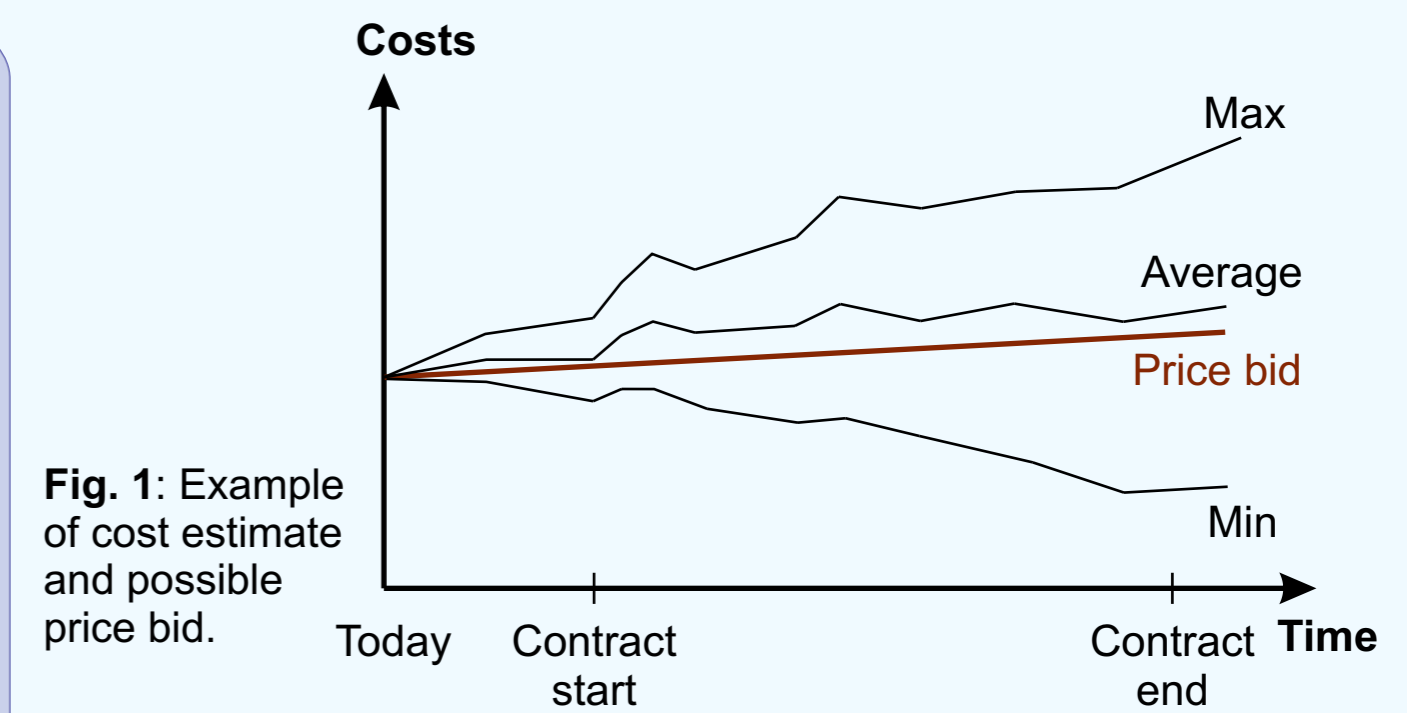


Fig. 1: Example of cost estimate and possible price bid.

Methodology:

The **aim** of this research is to support this decision process by defining a **process** from the identification of influencing uncertainties on the pricing decision to their modelling and inclusion in a decision matrix which depicts the trade-off between the **probability of winning** and the **probability of making a profit**. This means in particular;

What?	How?
1) To define a holistic approach to characterise the uncertainty inherent in a situation as a basis for its modelling and management.	Literature study of uncertainty research.
2) To describe the uncertainty connected to a pricing decision.	Empirical studies with practitioners Results see [Kreye et al. 2012]
3) To define a framework of the uncertainties influencing a pricing decision.	Induction from objectives 1 and 2.
4) To create a decision matrix based on the uncertainty characteristics and the identified modelling techniques.	Case study of contract bidding example.

Problem statement:

Within the **range of estimated costs** for fulfilling the service contract, the decision maker has to select **one point** as a price bid to communicate to the customer (Fig. 1).

To do this, the decision maker has to;

- 1) understand the uncertainty in the cost estimate,
- 2) understand other uncertainties that influence the bidding success and the fulfilment of the service contract.

Research results:

- 1) Holistic classification for **uncertainty characteristics in 5 layers** (Fig. 2), **application** to existing **modelling techniques** such as frequentist probability theory, subjective probability theory, imprecise probability theory, Information gap theory, Interval analysis, Possibility theory, fuzzy set theory and Evidence theory

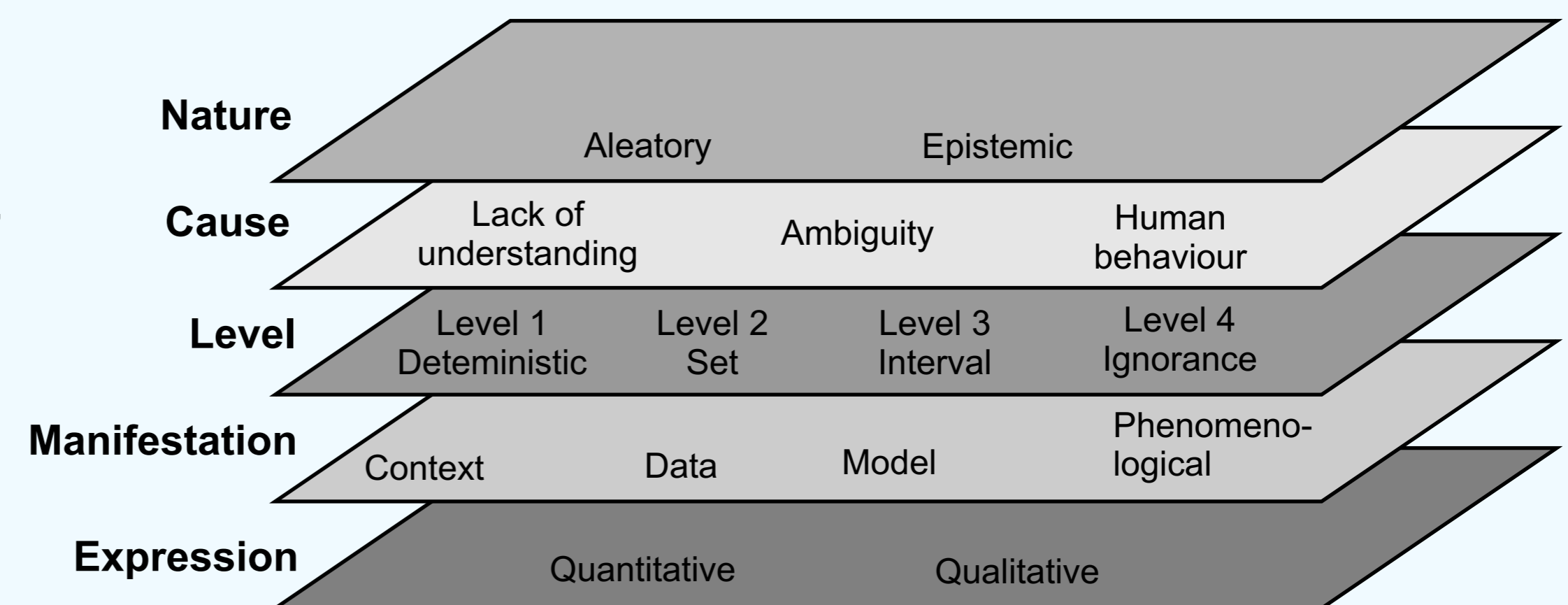


Fig. 2: 5-layer uncertainty classification

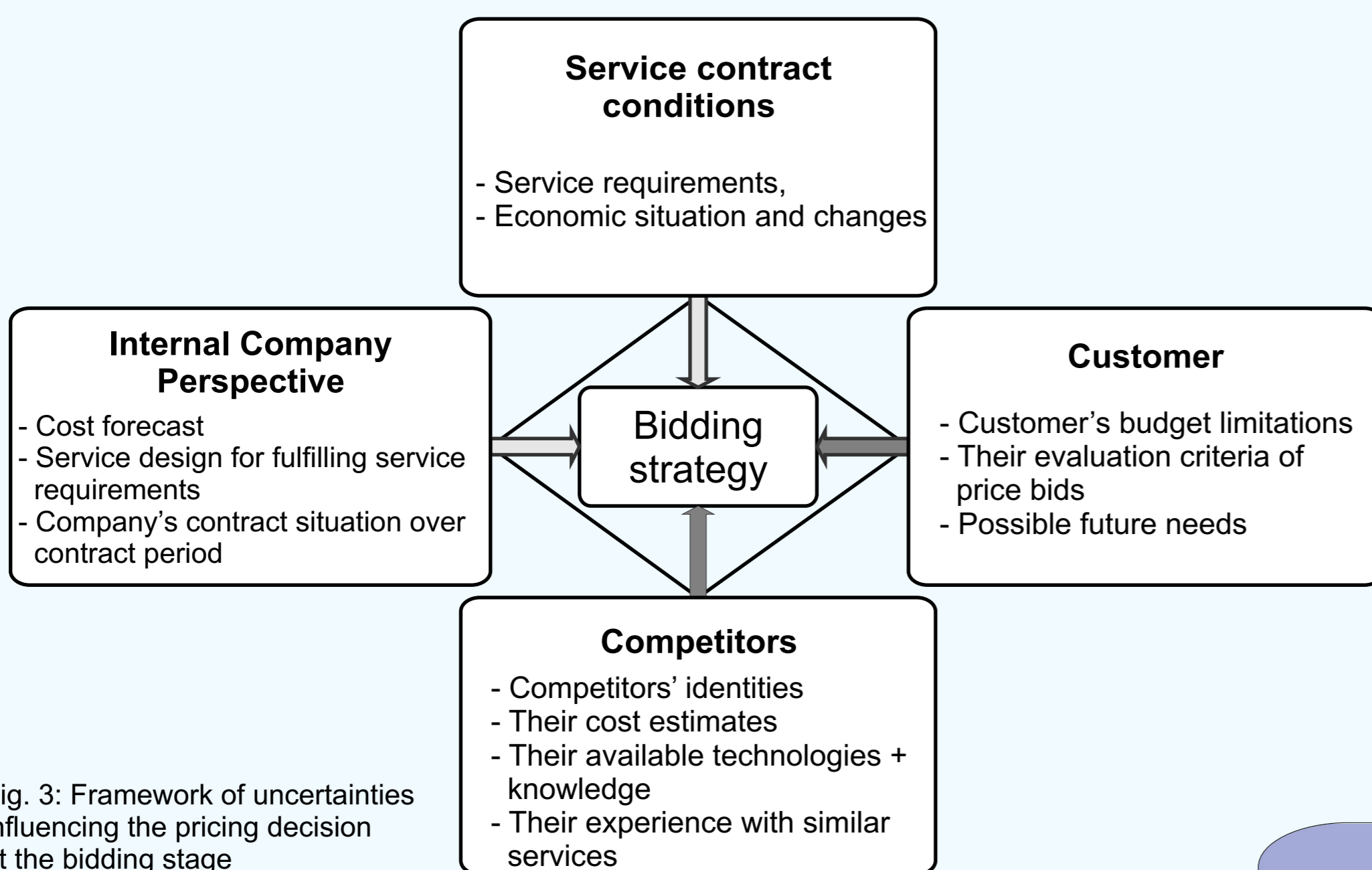


Fig. 3: Framework of uncertainties influencing the pricing decision at the bidding stage

- 2) **Framework** which depicts the uncertainties influencing the pricing decisions (Fig. 3) and **characterisation of this uncertainty** with the **5-layer classification**

- 3) **Identification** of suitable **modelling techniques** through comparison of characteristics in 1 and 2: subjective probability and interval analysis

Further work:

Step 4: Creation of a decision matrix for a case study (Fig. 4): utilising the identified uncertainty modelling techniques to model the uncertainty arising from the **customer** and the **competitors** and include them in the decision matrix as the **probability of winning** and the **probability of making profit**

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	Price bids			
Probability of winning the contract				
Probability of making profit				

Fig. 4: Example of a decision matrix depicting the probability of winning the contract and the probability of making a profit.

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