Achieving Procurement Excellence Through A Bayesian Network Modelling Approach

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Abstract

Procurement as one of the activities in Supply Chain Management has recently received great attention from researchers due to it not just being a support function, but a key strategic tool for organizations to build their competitive advantage. Although the different stages that come under the purchasing process (such as initiation, planning and monitoring) have been studied in the literature extensively, they are done in isolation and not by taking the overall purchasing goal into consideration. This drawback and the inefficacy and ineffectiveness of the current purchasing practices are highlighted in the literature by several reports and research publications and they stress on the need to have better procurement practices to achieve savings of millions of dollars per year. Considering the inefficiency of the current fragmented approaches towards improving purchasing practices, this research aims to take a defragmented approach towards this strategic activity by including all of the key variables that affect the quality of purchasing into one single mathematical model. Using such an approach, the objective is to enlighten a buyer with the required information by which informed procurement decisions can be taken and transform him/her to a smart buyer. This mathematical approach towards purchasing will enable us to understand the key variables that affect purchasing, as well as their interdependencies and how they affect the level of a buyer's smartness. The research will provide a smart buyer enabler framework towards improving purchasing practices in supply chains.

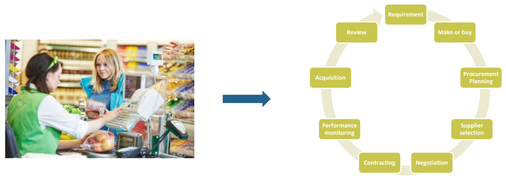


Fig 1. The evolution of Procurement

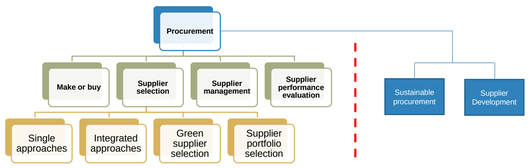


Fig 2. The Procurement process in terms of previous research

Research Issues

- Lack of a comprehensive model that includes all variables at the same time.
- No evidence of a measurable metric for procurement performance.
- The interdependencies between KPIs have not been considered.
- The effect of any step towards improvement could not be expressed.
- No framework for trade-off analysis exists when objectives are contradictory.

Objectives

- ✓ Providing a mathematical model to measure procurement performance
- ✓ Capturing a comprehensive set of KPIs for procurement performance
- ✓ Broadening the Smart Buyer concept by providing a measurable definition
- ✓ Providing a pathway to transform a buyer into a smart buyer
- ✓ Enabling procurement decision making when objectives are contradictory

Method

My research method includes the three following stages which have also been described in Fig 4.

Stage 1: Quantifying the current level of smartness

Stage 2: Adjusting the KPIs to achieve an optimum level of smartness given the current resources

Stage 3: Recommendations and scenario planning towards achieving procurement excellence

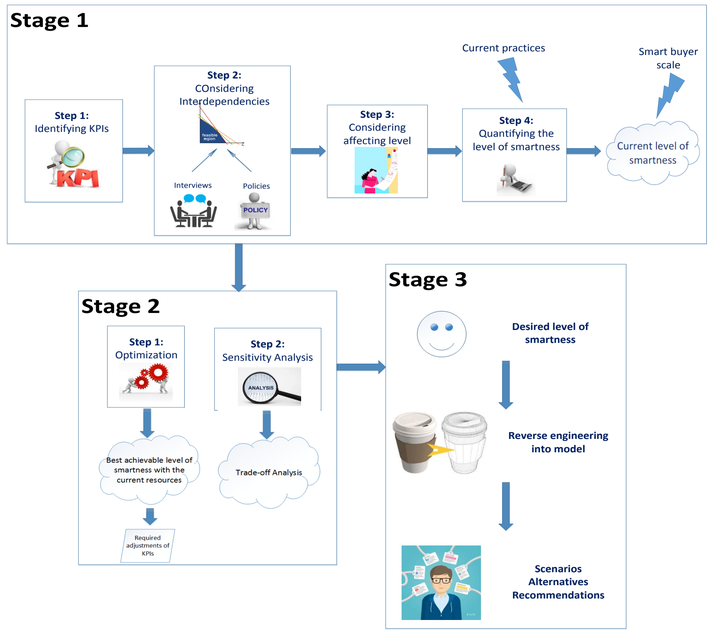


Fig 4. The Smart Buyer enabler framework

Model

In the first stage of the methodology, the relevant KPIs and the interdependencies between them have been mapped as follows:

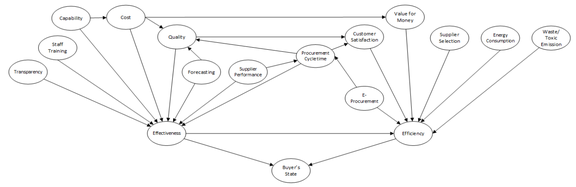
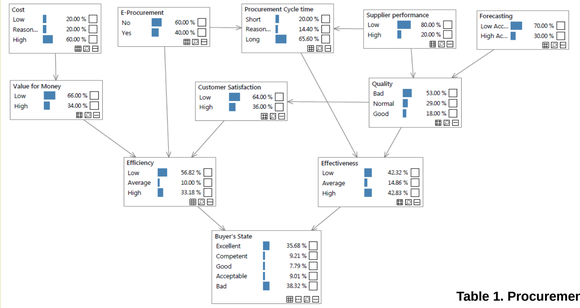


Fig 5. The Bayesian Network

In the next section, this network is simulated in Bayes Server software and the Level of smartness is eventually calculated. Given the level of smartness, we then have to refer to our Procurement Performance Matrix to interpret our results.

Results

Fig 6. The Bayesian Model in Bayes Server



By inserting the current values of the KPIs into the model, the current level of smartness is obtained and results are then interpreted through our performance matrix. The current performance is not good.

Table 1. Procurement Performance Matrix

Procurement Performance Level	Procurement Performance Characteristics
Bad	Not only no efficiency could be sought for procurement practices, but also there is no sign that the primary objective of procurement which is fulfilling effectiveness is being met. Effectiveness and efficiency levels are indicating an unacceptable level of procurement performance and at this stage, the final product or service is not delivered to the end user.
Acceptable	Effectiveness of procurement practices are almost half way met, therefore efficiency could not be achieved for an acceptable level. The KPIs that are used for measuring effectiveness are showing just an acceptable level of effectiveness and since effectiveness is a pre-requisite for efficiency, the efficiency level is low.
Good	KPIs are showing a reasonable performance. However, they have not been adjusted nor analysed for a better outcome. The cause and effects that are caused by the interdependencies between the KPIs are not considered for further improvements.
Competent	Procurement practices are successful and almost efficient. However, further/final improvements towards procurement excellence could be made. Effectiveness of procurement practices has been thoroughly met, however efficiency could still be improved. Given a fixed amount of resources available, different KPIs are adjusted and aligned with each other so that the maximum achievable level of performance is obtained.
Excellent	At this stage, not only effectiveness of the procurement practices is at the highest achievable level, but also efficiency of the procurement operations is at the highest achievable level. Performance measures and their interdependencies are monitored every day and are analysed for further improvements.

The required values for the KPIs To achieve procurement excellence are as follows. The results provide insights for managers and decision makers towards achieving procurement excellence.

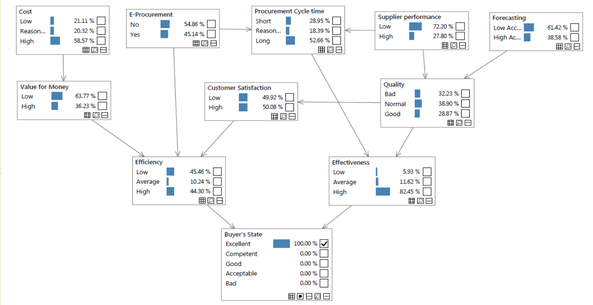


Fig 6. Procurement Excellence

Conclusions

- Procurement KPIs have different levels of impact in achieving procurement excellence. Some KPIs are more effective and critical while others have a smoother impact on the overall outcome.
- Procurement excellence doesn't necessarily require excellency in all KPIs. A proper combination of excellent, competent and good KPIs will result into a satisfactory level of procurement performance.