

## **ANALYSIS OF THE “MAKE OR BUY” DECISION PROCESS IN A RESEARCH AND DEVELOPMENT SME**

Mohammad Ali Sarkandi  
Manufacturing and Materials Department  
Cranfield University  
Cranfield  
Bedford, MK43 0AL, UK  
m.a.sarkandi@cranfield.ac.uk

Paul Baguley  
Manufacturing and Materials Department  
Cranfield University  
Cranfield  
Bedford, MK43 0AL, UK  
p.baguley@cranfield.ac.uk

Ashutosh Tiwari  
Manufacturing and Materials Department  
Cranfield University  
Cranfield  
Bedford, MK43 0AL  
a.tiwari@cranfield.ac.uk

### **ABSTRACT**

Start-up SMEs face various challenges and difficulties during their existence and due to their nature they often lack knowledge and resources to fully address these challenges. Unlike large companies which have access to various resources, those resources are a significant gap for SMEs and the business owners have to rely on their own limited knowledge. The “Make or buy” decision is a critical decision in an organisation. This decision can affect current and future costs, capability and competences in the company and by taking best practice approaches and measures towards the decision making, extensive costs can be potentially saved. In this study, literature best practices have been reviewed. In addition a small company has been studied and the current practices of the company have been compared to academic best practices. The result of the study will be used to improve the “Make or buy” decision process in the company.

**Keywords:** SME, cost engineering, Make or buy

### **1 INTRODUCTION**

Small and medium sized enterprises (SMEs) are an important part of a country’s economics and potentially contribute the most to a country’s economic growth. Hence helping SMEs will contribute to the recovery of the whole economy. Currently SMEs suffer from demand shock and shortage of credit. SMEs are more dependent on credit than large industries and they are mostly affected by direct and indirect linkage effects. Especially enterprises linked with other countries (Chowdhury 2011).

“Make or buy” decision is a crucial decision for an organisation and can have important effects on the future and existence of the organisation. In SMEs which have less access to extensive financial resources this decision is more critical. In addition, SMEs often lack the systems and knowledge for management and don’t have access to best practices. Knowledge in SMEs is mainly gained through experience and tactic leaning (Ates *et al.* 2013). In SMEs, management practices are directly related to manager’s personal skills and characteristics and because they usually hold several roles both operational and strategic, they don’t have necessary time resources and focus for managerial tasks (Fuller-Love 2006).

The research is done with the partnership of Samad power Ltd. Samad power is a SME, designing a micro cogeneration or Combined Heat and Power (CHP) system which is mainly intended to provide electricity and hot water for domestic users. The product is a technology breakthrough for small size CHPs. The Power output is intended to be at about 2 kW.

## 2 LITERATURE REVIEW

SMEs form 99.6% of UK's businesses and contribute to 49.5% of the economic added value and account for 54.3% of employment in the private non-financial sector. In addition "37% of SMEs are active in high-tech manufacturing and knowledge intensive service sectors which are considered key for the future competitiveness of the country" (European Union 15/10/2012).

European Union (15/10/2012) reports that the SME sector in the UK "is still struggling to cope with the crisis" and "of the key SME indicators, only the gross value added is now on a steady positive trend".

The first theoretical "Make or buy" decision making model was developed by Ronald Coase in 1937 and further development can be found in Oliver Williamson's (Williamson 1975) research in 1975. Coase (1937) introduced the "idea of transaction cost" in economics and developed the economic theory of the firm which was the basic model for "Make or buy" decision. Amenudzi (2009) in a structured review of "Make or buy" related research stated that "most of the decision making frameworks identified in the literature are not regarded as a standard tool or mechanic for making "Make or buy" decision, but had been used as an aid in decision making".

"Make or buy" is defined by Zenz (1994) as the decision of whether to make a product in-house or buy from suppliers. Probert (1997) defines "Make or buy" decision as whether to carry out a process or activity in your own business or to assign it to suppliers. "Make or buy" decision is not only limited to cost or to speed to the market of a product. Dale and Cunningham (1984) have mentioned other factors other than cost in the decision making and evaluated their importance. Suppliers' capabilities and quality are among the decision making elements. Also "Make or buy" decision making not only can be a cost saving decision, but is a strategic activity that can affect the future of company's activities (Fine 2000). Dale and Cunningham (1984) have concluded that "Make or buy" decisions can be "very complex, time consuming, interactive and affect many departments within a company".

Slack *et al.* (2007) mention that other than the short term effects of outsourcing, long term and strategic effects of outsourcing should be considered to.

Anderson and Anderson (2000) mention three "outsourcing traps":

1. A company loses its market dominance when its supplier acquires its proprietary technology and diffuses it to its competitors.
2. A company relies too heavily on a single supplier, which weakens its ability to negotiate favourable purchase agreements.
3. A company outsources a component or service to a vendor to reduce costs, only to encounter higher expenses or reduced functionality when putting the final product together"

Also Anderson and Anderson (2000) suggest 5 points to avoid outsourcing problems:

1. Long term considerations
2. Avoid outsourcing "core capabilities"
3. Partially outsource other critical capabilities
4. Use of more than one supplier
5. Strategic alliance development with suppliers

Due to the nature of SMEs and their vulnerability to environmental changes, many experts believe that SMEs should choose partnerships or strategic alliances in their business strategy to spread investment costs and possible risks and to be able to overcome resource and capability shortages (Li and Qian 2007).

## 3 RESEARCH METHODOLOGY

This study is part of a research topic of "developing a cost reduction and estimation methodology for start-up SMEs developing a novel green product". As a part of this research a case study is carried out in a start-up SME. The first step of the research was understanding the context and was done by

developing background knowledge in the research area and understanding challenges and characteristics of start-up SMEs.

In order to be able to have more in depth understanding of SMEs' activities and requirements, and to be able to affect the company's activities, action research was chosen as the research methodology.

In this type of research, with the location of the researcher in the researched company, closed observation of the SME activities would be used for data collection. Moreover in order to be able to implement the developed methodology, participation of the researcher in some activities of the SME was required. This includes involvement in different company meetings, office works and workshop activities.

The research involved dealing with quantitative as well as qualitative results. The data and findings were recorded by noting in a logbook. The research involved attending various company meetings including general review meetings and technical review meetings. Also it involved involvement in concept design and detailed design process and prototype testing. The minutes of the meetings were written for further analysis. Assisting different sections of the company such as technical, managerial and marketing sections helped to develop a general understanding of the organisation's performance.

The limited company size and the management and staff's optimism towards the researcher, created a preferred opportunity for wider data collection of different sections of the company.

The collected data was classified by dates and were analysed using different organisational mapping tools and data analysis methods. The company's function was modelled using IDEF0 diagrams in Microsoft Visio and the functions, inputs, outputs, mechanism and controls were entered using data collected from Samad. The current Make or buy method used in the company was mapped in the IDEF0 modelling.

Also as a part of the research a structured literature review was done by reviewing research outputs in the area of "Make or buy" and especially SMEs related research. A total number of 60 papers were review on the subject of SMEs relater "Make or buy" research.

#### **4 CASE STUDY**

A case study is being done on a company active in research and development of products. The company is a start-up small company based in Milton Keynes and consists of 12 employees. The company started up with the development of a domestic micro Combined Heat and Power (CHP) product called the Turbo Green Boiler (TGB) and developed its business by adding distribution of solar thermal units to its activities. Currently the engineering team has added engineering consultation and design to its activities. The company started with a team of 5 engineers and added other specialities including marketing and finance staff to its team.

The TGB development is at the stage of technology demonstration and the team is working towards a fully functional prototype. Most of the components of the product will be outsourced by Commercial off-the-Shelf (COTS) purchases. Some parts will be designed and built in-store and some will be manufactured externally and some parts may be both designed and manufactured externally.

The company has aimed to manufacture the TGB with lowest capital requirement in order to have competitive advantages against competitor products. To achieve this aim cost management methods have to be employed in order to achieve preferred cost results. Prior to selecting any method, an organisation has to be studied and current practices have to be identified and analysed. By identifying these practices, they can be analysed and compared to best practices in academia and current practices in other industries. The Case study was done with the aim to develop a method for "Make or buy" decision making in Start-up SMEs which is a part of a 'Cost reduction and value improvement framework for start-up SMEs'. The developed framework would be validated by running further case studies in the company.

#### **5 RESULTS**

According to European Commission's definition of SMEs and by considering number of employees, the studied company could be classified as a small enterprise, but by considering the turnover side of the definition, it could be considered a micro enterprise. In general the company is on the margin of transforming from a micro organisation to a small enterprise.

It can be observed that resource constraints is a day to day challenge for the company. The resource constraints exist in terms of human resources and financial resources. It can be expressed that lack of human resources is a consequence of financial shortages. Due to the criticality of cash flow in SMEs, selecting correct methods and processes are critical for future existence of the company. Make or buy decision can have long term effects on profitability of a business and wrong decisions can result in devastation of a business.

In the observed company it is seen that the decisions were made by the managers of the company which are also shareholders of the company. In making decisions, as they are shareholders as well, financial consequences of the decision are highly considered. But lack of Cost engineering knowledge is tangible in company's decision making and skilled staff in this area are needed.

For the process of "Make or buy" the company follows a "common sense" process and in developing this process, their engineering background has helped. As mentioned earlier the company lacks Cost Engineering experts, but the CEO has gone through an MBA course. Figure 1 illustrates an example of the "Make or buy" process in the studied organisation. This process was carried-out for a shaft and finally it was decided that the shaft be designed in-house and the fabrication outsourced.

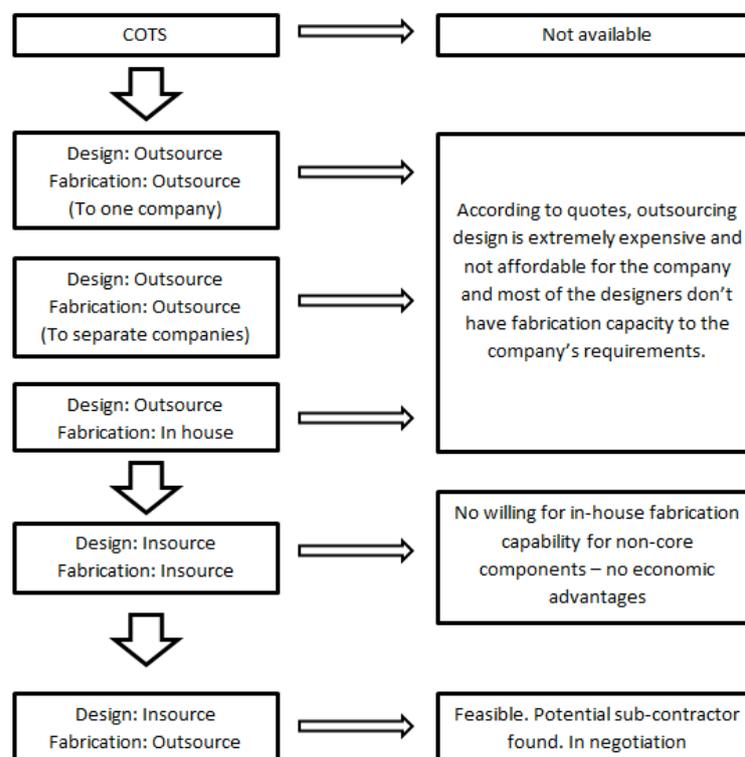


Figure 1: An illustration of people working in a factory.

The strategy of the company, so that be able to have a chance in the competitive market and introduce a low price product to the market was to use already existing products in the market. By combining them in a novel, logical and technical working order, a novel low cost product will be built.

In the process of decision making the priority option would be Commercial Off-The-Shelf (COTS). By having defined product specifications, similar parts and products which would satisfy the required specifications and have proven technology would be searched for.

Searching would be done by looking for vendors through the internet and contacting them through phone and email and also enquiring from experienced people in industry.

In the case of finding an appropriate product, a sample product would be ordered and different levels of testing would be performed to ensure the quality and suitability of the part.

One of the decision elements is the cost. As mentioned earlier, one of the main characteristics of the TGB would be low cost, and to ensure the low final cost of the product, low cost components have

to be used in the system. So the purchase price of the found products should be appropriate in relation to final product cost.

Also, during the process of purchase negotiations, the vendors supply capabilities and support capabilities would be considered too. The supplier should have the capability to supply products according to the company’s production volume and manufacturing strategy. One of the other requirements from the supplier is the possibility of minor design changes to the components according to the company needs. This requirement could be overlooked for critical components where the weight of the other elements are higher.

Some available parts may be a component of an already existing product. The selection of COTS for these type of parts depends on the desire of the OEM to sell the part separate of the main product, otherwise other options have to be sought. For some products the price of the assembled product is less than the separate components of the same product.

If an appropriate part is not found, the next stage in the decision making process would be to consider designing the product. There would be several options in terms of insourcing or outsourcing this process. Table 1 illustrates 4 possible options for designing a new part to satisfy company’s requirements in addition to COTS option. These four options are created by having two options of insourcing and outsourcing for both design and fabrication of parts.

Table 1: An illustration of people working in a factory.

		Design	
		Outsource	Insource
Fabrication	Outsource	X	X
	Insource	X	X

COTS +

By experience of requesting for quotation for outsourcing design and fabrication it is found that this option is not feasible and the company cannot afford costs of this option and selecting other options would be more cost beneficial. One of the reasons of ignoring this option is the unwillingness of the designers to hand over detailed design of the parts, very high cost of design from scratch and later modification constraints. Also until now no company was found to have production capabilities close to the studied company’s volume requirements.

The company is not willing to invest in in-house manufacturing capabilities and as most mechanical parts are non-core parts, so the option of in-house manufacturing is not considered.

The option of outsourcing design and fabrication can have two sub-sections. As well as entrusting the design and manufacturing to one organisation, in order to gain economic advantages, the tasks can be given to separate organisations. Even there is the possibility of outsourcing the assembly to subcontractors.

It is understood that some parts of the TGB might have the potential to be considered as core competency such as the combustor. But the main competitive advantage in terms of design could be the way of assembly of the system and the controlling system which includes the control algorithm. It would be preferable to design and fabricate these parts in house. But due to in house production constraints and cost implications, external fabrication would have priority.

There are some obstacles for outsourcing for which one of the major obstacles is the confidentiality of core competence. In order to outsource any of the processes, a solution for this obstacle should be considered. In the studied company case the use of Non-disclosure agreements has been the common act. Also joint partnerships with suppliers in a way that both sides have financial incentives and non-financial interest in the project is another act used by the company.

## 6 CONCLUSION

During this study an SME company has been studied with the purpose of studying current practices in terms of “Make or buy” decision making. The research is done through action research, while the researcher is an observer and participant in the researched company.

During the study the lack of Cost engineering knowledge was seen in company actions and decision makings. The company had no access to Cost Engineering best practices and in the “Make or buy” decision making experience and common sense were the key players. While comparing to best practices, the negligence of some key elements can be seen in the company’s decision making. It is seen that cost is the main element considered in the decision making process. It is important to transfer the best knowledge to the company in an effective way and make them aware of the importance of “Make or buy” decision in the future of their business.

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