

Testing a Make-or-Buy Process

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Track: Operations Strategy

Abstract

The make-or-buy question represents a fundamental dilemma faced by many companies. Existing make-or-buy approaches seem to be helpful in shaping make-or-buy strategy. However, they are generally too highly aggregated to address specific make-or-buy decisions. In order to bridge this gap, a make-or-buy process has been developed and tested. This process was designed using the principles of Multi-Attribute Decision Making (MADM) to compare in-house capabilities with supplier capabilities. This paper presents the tested process and discusses the learning from its application in a number of in-company case studies.

Introduction to Make-or-Buy Decisions

Existing approaches address make-or-buy from different perspectives such as economics (Poppo *et al.* 1995), purchasing (Shore 1970), accounting (Bassett 1991) and strategic management (Venkatesan 1992). However, two main streams were identified in the literature. The first aims at answering the make-or-buy question from a cost viewpoint (Raunick and Fisher 1972, Levy and Sarnat 1976, Meijboom 1986, Bassett 1991, Ellis (1992, 1993), Balakrishnan 1994, Poppo *et al.* 1995, Poppo 1998, Padillo-Perez 1995, Padillo-Perez *et al.* 1999). The concept of transaction cost often plays an important role in many of the models mentioned above. The second approaches make-or-buy from a strategic perspective, acknowledging other factors in addition to cost. It is the second stream, which is addressed in more detail in this section.

In the last decade, various authors have developed several approaches for addressing make-or-buy strategy (Welch and Nayak 1992, Venkatesan 1992, McIvor *et al.* 1997, Probert 1997, Cox 1997, Fine 1998, Baines *et al.* 1999). These approaches are summarised in Table 1.

See Table 1 Make-or-Buy Approaches

The approaches reviewed above appear to be helpful in shaping make-or-buy strategy. However, they seem too highly aggregated to address specific make-or-buy decisions at an operational level. This suggests that the main gap in the literature is the lack of a structured and practical make-or-buy approach to address such decisions at an operational level. The research reported here sought to develop and test such an approach.

Research Method

The research was divided into two main phases (see Figure 1): development and operationalisation of the framework. Using input from theory and practice (interviews and case studies) a preliminary make-or-buy framework was built. The framework provided a relatively comprehensive list of relevant factors to be considered in make-or-buy decisions. However, in order to reach a decision these often need to be traded off. In order to do so, a process was developed that trades off the relevant factors captured within the framework. The process was designed around the principles of Multi-Attribute Decision Making (MADM) and consisted of comparing in-house and supplier capabilities using the factors within the framework. The process was initially applied in four in-company case studies, refined, and then further tested in four additional cases using action research. As a result of applying the process the framework was also refined and tested.

See Figure 1 Research Method

The main criteria for assessing the process were: 'feasibility', 'usability' and 'utility' (Platts 1990). Feasibility refers simply to whether it is possible to follow the proposed process. Usability refers to how easy the process is to use. Utility refers to the usefulness of the process in reaching the decision and generating further actions. These three criteria were divided into sub-criteria (see Table 2) and they were assessed by means of a questionnaire, discussion with the participants and observation.

See Table 2 Assessment Criteria

Make-or-Buy Framework

This framework is a graphical representation of why operational make-or-buy decisions are made and shows relevant dimensions to be studied in approaching such decisions (see Figure 2).

See Figure 2 Make-or-Buy Framework

The external environment, on which the company has little or no influence, usually activates triggers for the make-or-buy analysis. For instance, increased price competition in the market place usually forces companies to reduce costs. The triggers are the reason(s) for undertaking the make-or-buy review and can be easily identified by asking why the decision is being made. The framework suggests four areas to cluster relevant factors for make-or-buy: technology and manufacturing processes; cost; supply chain management; and logistics; and support systems. Within these areas a number of factors are suggested. The performance measures are closely linked to the triggers. They aim at providing some criteria to evaluate the extent to which the targets suggested by the triggers are achieved. For instance, if the trigger is cost reduction, cost saving should be the key performance measure. However, other measures such as flexibility and quality should not be neglected. Finally, the arrows coming out from the performance measures to the external environment show that make-or-buy is not a static issue. The performance measures for these decisions feedback into the external environment and possibly activate other triggers that raise again the make-or-buy question.

Make-or-Buy Process

The framework depicted above provides a number of relevant factors to be considered in specific make-or-buy decisions. However, these factors need to be traded-off in order to reach a decision. In order to do so, a decision making process which compares in-house with supplier capabilities was proposed. This process was designed around the principles of Multi-Attribute Decision Making (MADM). The process consisted of four main stages and can be completed in 6 weeks, as shown in Figure 3.

See Figure 3 Make-or-Buy Process

Stage 1 refers to the preparations phase, which entails creating a multi-disciplinary team, selecting the part, assembly or family of parts for analysis and briefing the team.

Stage 2 is concerned with data collection. Here, three workshops are organised in order to collect the information required to carry out the analysis. Workshop 1 consists in prioritising the make-or-buy areas and factors. Using the rankings, weightings are then generated using the centroid method (Kmietowicz and Pearman, 1984; Olson and Dorai, 1992). The weightings generated should reflect the relative importance of each area and factors to the decision under consideration. Workshop 2 is concerned with the assessment of internal and external capabilities using a set of proformas which cover the four make-or-buy areas. These proformas use a five-point scale for the assessment. Workshop 3 consists of capturing the

costs incurred in both producing internally and externally. These costs are then compared and rated on a five-point-point scale.

Stage 3 consists of data analysis using a spreadsheet which provides the following:

- Final scores for in-house and for the supplier. The highest score indicates the best option.
- Weighted gaps for each make-or-buy area which highlights the strengths and weaknesses of the best option.
- A sensitivity analysis which tests the robustness of the final outcome.

Stage 4 refers to feeding back the results to the team.

Key Learning Points from the Development, Refinement and Testing the Framework and Process

Framework Findings

The application of the framework in eight in-company cases did not reveal any other relevant factors to be considered in make-or-buy decisions. However, some difficulty encountered in the prioritisation exercise, pointed out that there was a potential inter-relation between the factors. Although inter-related factors needed to be considered during the process, these potential interrelations did not hinder the exercise. The framework proved to be feasible in terms of its operationalisation. Furthermore, although make-or-buy has a dynamic nature, in order to keep the framework simple, it does not include a time dimension. However, in practical terms applying the framework at different points in time can help to overcome this issue. Finally, the static nature of the framework to some extent limits the considerations of investment and cash flow. Nevertheless, if a cash flow analysis is needed, a separate but complementary study can be undertaken.

Process Findings

Overall, the process proved to be feasible, usable and useful. In terms of feasibility the participants felt that overall the information required to carry out the process was available. However, collecting evidence to support the ratings and costing information were the areas where the most difficulty was encountered. With respect to the overall time scale of the process, the participants thought that this was right. In terms of usability, the participants commented that the objectives and the tools used throughout the process were clear. However, they highlighted that the participants needed to be familiar with the terminology used throughout the process. Additionally, they said that the tools used in the process were easy to use. The workshop format approach was thought to be appropriate. The participants commented that it helped them to share their views and to ensure that all aspects were considered. Furthermore, they said that the process encouraged teamwork. In terms of utility, the process was considered useful. The decision areas and factors investigated were thought to be relevant. The participants particularly valued the comprehensive review of factors rather than considering price only.

Conclusions

This research has contributed to both to the academic understanding of the subject and the improvement of industrial practice. The two main contributions of this work are the following:

- A make-or-buy framework
- A make-or-buy process

The make-or-buy framework was developed to underpin the decision making process. In contrast with existing frameworks, this framework provides a holistic view of make-or-buy and captures relevant factors in a structured manner. It takes a step forwards providing performance measures for the assessment of the business benefits delivered by individual

decisions, an issue which has often been ignored in the existing make-or-buy literature. Finally, the fact that the framework has been developed in several iterations using input from theory and practice contributes to its robustness and comprehensiveness. Although it cannot be claimed that the account of factors is totally comprehensive, its application in eight in-company cases did not reveal any other relevant factors to be considered.

The make-or-buy process has been demonstrated to be feasible, usable and useful during its application in eight in-company case studies. It proved successful in assisting manufacturing managers to address make-or-buy decisions in a holistic and structured manner and in helping them generate clear actions.

The make-or-buy framework and the decision making process provide a new way of addressing make-or-buy decisions.

References

- Baines, T., Whitney, D. and Fine C. (1999) “Manufacturing Technology Sourcing Practices in the USA”, *International Journal of Production Research* Vol. 37 No. 4, pp. 939-956.
- Balakrishnan, S. (1994), “The Dynamics of Make-or-buy Decisions”, *European Journal of Operational Research*, Vol. 74, pp. 552-571.
- Bassett, R. (1991), “Make-or-buy Decisions”, *Management Accounting*, November, pp. 58-59.
- Cox, A. (1997) “*Business Success*”, Earlsgate Press, United Kingdom.
- Edwards, W (1977) “Use of Multi-Attribute Utility Measurement for Social Decision Making” in D. E. Bell, R. L. Keeney and H. Raiffa, *Conflicting Objectives in Decisions*, pp. 247-276, Wiley, New York.
- Farmer, T. (1987) “Testing the Robustness of Multi-Attribute Utility Theory in an Applied Setting”, *Decision Sciences* Vol. 18 pp. 178-193.
- Ellis, G. (1992), “Make-or-Buy: A Simpler Approach”, *Management Accounting*, June, pp. 22-23.
- Ellis, G. (1993), “Solving Make-or-Buy Problems with Linear Programming”, *Management Accounting*, November, pp. 52-53.
- Fine, C. (1998) “*Clockspeed*”, Little Brown and Company, London.
- Kmietowicz, A. W. and Pearman, A.C. (1984) “Decision Making with Linear Partial Information”, *The Journal of Operational Research Society* Vol. 35 No. 12, pp. 1079-1090.
- Levy, H. and Sarnat, M. (1976), “The Make-or-buy Decision”, *Journal of General Management*, Vol. 4 No. 1, pp. 46-50.
- McIvor, R. T., Humphreys, P. K. and McAleer, W. E. (1997), “A Strategic Model for the Formulation of an Effective Make-or-buy Decision”, *Management Decision*, Vol. 32 No. 2, pp. 169-178.
- Meijboom, B. R. (1986), “A Two-Level Planning Procedure with respect to Make-or-Buy Decisions, Including Cost Allocations”, *European Journal of Operational Research*, Vol. 23, pp. 301-309.
- Olson, D. L. and Dorai, V. K. (1992) “Implementation of the Centroid Method of Solymosi and Dombi” *European Journal of Operational Research* Vol. 60 No. 1, pp. 117-129.

- Padillo-Perez, J. M. (1995), *The Make-or-Buy Problem: A review, a taxonomy and a multiple criteria decision methodology*, Published doctoral dissertation, Arizona State University, United States of America.
- Padillo-Perez, J. M. and Diaby, M. (1999), “A Multiple-Criteria Decision Methodology for the Make-or-Buy Problem”, *International Journal of Production Research* Vol. 37 No. 14, pp. 3203-3229.
- Platts, K. (1990) “*Manufacturing Audit in the Process Strategy Formulation*” PhD dissertation, University of Cambridge, United Kingdom.
- Poppo, L., Olin, J. and Zegner, T. (1995), “Opportunism, Routines and Boundary Choices: A Comparative Test of Transaction Cost and Resource-Based Explanations for Make-or-Buy Decisions”, *Academy of Management Journal*, Iss. 001-4273, pp. 42-46.
- Poppo, L. (1998), “Testing alternatives Theories of the Firm: Transaction Cost, Knowledge Based and Measurement Explanations for Make-or-Buy Decision in Information Services”, *Strategic Management Journal* Vol. 19 No. 9, pp. 853-877.
- Probert, D. R. (1997), *Developing a Make-or-buy Strategy for Manufacturing Business*, Institute of Electrical Engineers, United Kingdom.
- Raunick, D. A. and Fisher, A. G. (1972), “A Probabilistic Make-Buy Model”, *Journal of Purchasing*, Vol. 8 No. 1, pp. 63-80.
- Shore, B. (1970), “Quantitative Analysis and the Make-or-Buy Decision”, *Journal of Purchasing*, February, pp. 5-11.
- Venkatesan, R. (1992), “Strategic Sourcing: to Make or not to Make”, *Harvard Business Review*, November-December, pp. 98-107.
- Welch, J. A. and Nayak, P. R. (1992), “Strategic Sourcing: A Progressive Approach to the Make-or-Buy Decision”, *Academy of Management Executive*, Vol. 6 No. 1, pp.23-31.

**Phase 1:
Developing a Preliminary
Framework**

Literature
Review

Empirical
Research

- Interviews with industrialists
- Interviews with academics
- Case studies (A, B and C)

PRELIMINARY
MAKE-OR-BUY FRAMEWORK

**Phase 2:
Operationalising the Framework**

2.1 Developing and Refining

Process
Step 1
Step 2
Step 3

Case D

Case E

Case F

Case G

REFINED MAKE-OR-BUY
FRAMEWORK AND PROCESS

2.2 Testing

Case H

Case I

Case J

Case K

MAKE-OR-BUY FRAMEWORK
AND PROCESS

Figure 1. Research Method

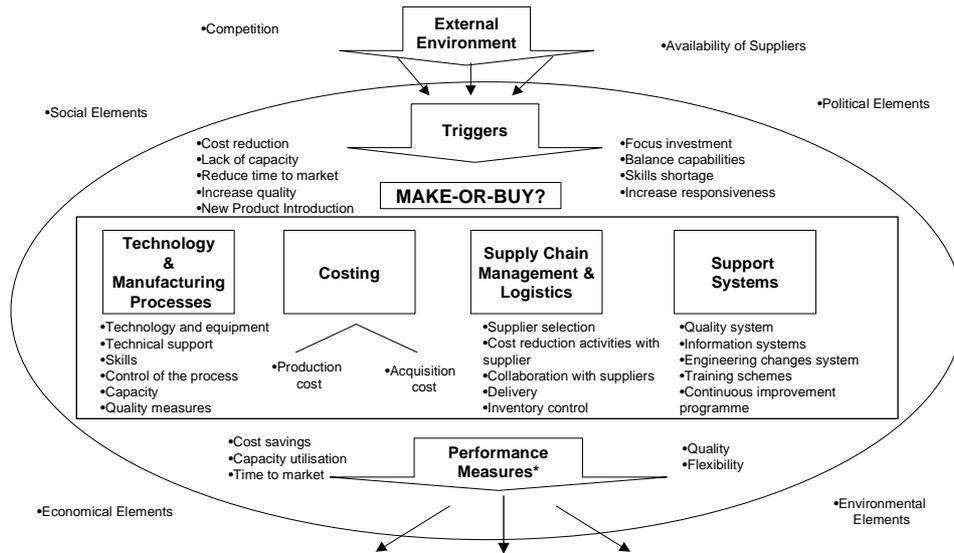


Figure 2. Make-or-Buy Framework

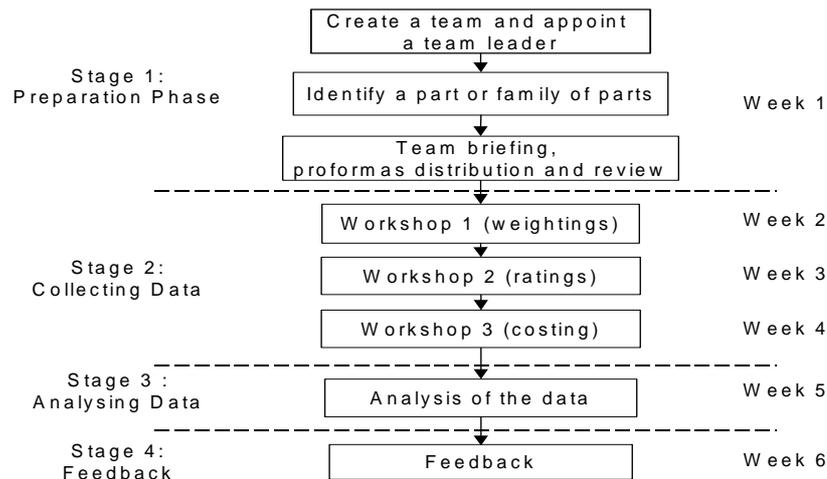


Figure 3. Make-or-Buy Process

Authors	Year	Key Points
Welch and Nayak	1992	Strategic Sourcing Model (SSM) <ul style="list-style-type: none"> Conceptual framework to support managers in accounting for strategic and technological factors. The model consists of three main dimensions: significance of process technology for competitive advantage, maturity of the process technology across industry and process technology position vs. competitors.
Venkatesan	1992	Strategic Sourcing Process This process aims to make sourcing decisions consistent with a strategy in highly engineered products. The approach is based on three principles: <ul style="list-style-type: none"> Focus on those components that are critical to the product and that the company is distinctively good at making; Outsource components where suppliers have a distinctive comparative advantage, greater scale, fundamentally lower cost structure or stronger performance incentives and Use outsourcing as means of generating employee commitment to improving manufacturing performance.
McIvor, Humphreys & McAleer	1997	Conceptual Framework for Evaluating Make-or-Buy Decisions This model is a generic framework based on three main criteria: <ul style="list-style-type: none"> Core competencies Capabilities (internal vs. external) Cost (internal vs. external)

Authors	Year	Key Points
Probert	1997	<p>Strategic Make Vs. Buy Decisions</p> <p>The methodology proposes four main phases of analysis:</p> <ul style="list-style-type: none"> • Initial business appraisal. This phase addresses issues related to the direction of the business and the customer preferences. • Internal/external analysis. This is the heart of the review. Most of the information needed to make the decision is generated at this stage. Details of the company's internal performance as well as the competitors' performance are collected. • Generate/evaluate options. Having the information from phases one and two, make-in and buy-out options are analysed. • Choose optimal strategy. Considering the different options generated in phase three, the optimal strategy is chosen. <p>The methodology provides a competitiveness/importance matrix that focuses on the assessment of manufacturing technologies.</p>
Cox	1997	<p>Asset Criticality Theory</p> <p>This approach assists in the identification of the resources within the supply chain that are or can be of critical importance to the business. "A Critical asset is that supply chain resource or combination of resources which is of such importance to the process of value appropriation and accumulation, that the possession of it gives its owner or controller the power to define and allocate value throughout the supply chain". The author suggests that the identification of 'critical assets' can be undertaken by:</p> <ul style="list-style-type: none"> • Creating a typology of supply chains • Developing a typology of resources within the supply chain
Fine	1998	<p>The Make versus Buy Decision Analysis Matrix: Decomposability, Dependency, Clockspeed and Industry Competitiveness</p> <p>A four dimensional matrix for analysing make-or-buy decision is proposed. This matrix consists of the following dimensions:</p> <ul style="list-style-type: none"> • Technology (integral versus modular) • Dependency (knowledge and capacity versus capacity only) • Intertemporal (clockspeed – rate of industry evolution) • Competitive (availability of suppliers)
Baines <i>et al.</i>	1999	<p>Methodology for Deciding on the Extent of Vertical Integration in Technology Source</p> <p>The methodology consists of five main stages:</p> <ul style="list-style-type: none"> • Identification of product families (core and non-core) • Competitive strategy audit (how technological capabilities contribute to the competitiveness of product families) • Audit of company and supplier capabilities (technology acquisition, impact and development) • Clarification of opportunities and threats • Forming sourcing decisions

Table 1. Make-or-Buy Approaches

Feasibility	Usability	Utility
<ul style="list-style-type: none"> • Availability of information • Timing • Participation 	<ul style="list-style-type: none"> • Clarity • Ease of use • Appropriateness 	<ul style="list-style-type: none"> • Relevance • Usefulness • Facilitation • Confidence

Table 2. Assessment Criteria