MAKE AND BUY STRATEGY AS A RESULT OF AN INSOURCING PROJECT

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Purpose: The aim of the article is to develop a formalized model which explains the decision to use the 'make and buy' strategy.

Design/methodology/approach: The article presents a review of the latest literature on the 'make and buy' strategy for a selected component or service, together with a case study of the use of the 'make and buy' strategy resulting from the implementation of an insourcing project in a manufacturing company. The model was built using mathematical analysis.

Findings: The formalized model of the 'make and buy' strategy presented in the article is focused on factors related to cost savings. It uses analytical verification to determine whether the savings associated with insourcing the process of manufacturing the analysed product outweigh the costs associated with its launch in-house (with the size of demand determined on the basis of historical data).

Practical implications: In the context of this article, 'make and buy' consists of simultaneously producing and purchasing the same product or service by the organization, which in the literature is sometimes referred to as dual-sourcing, concurrent sourcing, bisourcing, plural sourcing or partial integration. The use of the proposed model may be useful for entrepreneurs from the point of view of optimising the costs of their business.

Originality/value: Proposal of a formalized model which explains the decision to use the 'make and buy' strategy.

Keywords: make and buy, insourcing project, case study.

Category of the paper: Research paper.

1. Introduction

The 'make or buy' decision is one of the basic and most often reoccurring dilemmas faced by entrepreneurs. It is assumed that once a decision has been made, it can be changed by an entrepreneur and the processes that used to be carried out within the organisation can be transferred outside (outsourced) or the processes of manufacturing a product that used to be purchased outside can be incorporated into the organisation's structures (insourcing).

Both outsourcing and insourcing have a direct impact on the formation of company boundaries (Galvin, and Tywoniak, 2019; Gulbrandsen, 2017; Cyfert, 2012), and as the research shows, the most common reasons for using both insourcing and outsourcing are cost savings (Quélin, and Duhamel, 2003; Espino-Rodríguez, and Ramírez-Fierro, 2018; Gunasekaran et al., 2015; Hartman et al., 2017; Mols, 2019). A common-sense approach to solve the 'make or buy' dilemma indicates that the result may be either the in-house delivery of a particular component/service or the purchase of that component/service on the market with varying collaboration. This approach dominates in the literature, where the analyses are most often based on the theory of transaction costs and firm capabilities. In many articles on sourcing, 'make or buy' strategies are treated dichotomously as either making or buying, but in reality both methods are used for the same goods. This is all the more surprising since, in the light of the new institutional economics, in the case of the 'make and buy', the entrepreneur covers the costs of management both by the hierarchy and by the market. In literature, this phenomenon is sometimes referred to as make and buy, dual-sourcing, competitive sourcing, bisourcing, plural sourcing or partial integration.

2. Research objective and methods used

The objective of the research is to develop a formalised model that explains the decision to implement the 'make and buy' strategy. In addition, the article will present a review of the literature on the 'make and buy' strategy for a selected component or service, together with a case study of the application of the 'make and buy' strategy resulting from the implementation of an insourcing project in a manufacturing company. To achieve this research objective, literature studies, case studies, direct interviews, statistical data analysis and econometric modelling were used.

3. Literature review

In literature, the act of simultaneously buying and producing the same components is most often referred to as 'make and buy'. However, the same meaning is sometimes assigned in the literature to the dual-sourcing, concurrent sourcing, bisourcing or partial integration. Table 1 gives an overview of the frequency of use of individual phrases in popular databases of scientific articles. It should be noted that partial integration and dual sourcing have also meanings different from 'make and buy'. Taking this into account, most authors decide to

describe simultaneous buying and manufacturing of the same component or service as 'make and buy'.

The frequency of use of 'make and buy' strategies in business practice is related to the industry and the degree of development of the market on which the company operates. In data for 1997-2007, Magyari shows an increase in the average frequency of use of 'make and buy' sourcing of material input products by US manufacturing firms from 41.4% to 48.6%, while for the transportation equipment industry it was 70.1% and 72.6% respectively. The lowest percentage of 'make and buy' was for the plastic products industry and amounted to 35.8% and 36.9% respectively (Magyari, 2017, p. 64). Arvanitis et al. shows the frequency of use of 'make and buy' in knowledge acquisition strategies among internal R&D performers for manufacturing and services from Switzerland (29.9% and 27.2% respectively) and Netherlands (33.1% and 42.6% respectively) (Arvanitis et al., 2015, p. 369).

Table 1.
The use of terms related to 'make and buy' in selected databases of scientific articles

Phrase	Article database		
	Web of Science Core Collection (Article Title or Topic)	Scopus (Article title or Abstract or Keywords)	Google Scholar (all files)
Bi-sourcing	4	5	114
bisourcing	1	1	118
Make and buy	37	53	3,380
Make-and-buy	37	53	3,380
Dual sourcing *	195	240	7,130
Dual-sourcing *	195	240	7,130
concurrent sourcing	16	19	1,010
partial integration *	253	416	56,800

Note. * partial integration and dual sourcing have also different meanings than make and buy.

Data source: https://www.scopus.com/; https://apps.webofknowledge.com/; https://scholar.google.pl/.

Table 2.
The advantages of a "make and buy" strategy

Advantages	Source
Balance between the quality and the security of component supply	Du et al., 2006, p. 246; Du et al., 2009, p. 216.
Better bargaining position	Du et al., 2006, p. 246; Du et al., 2009, p. 216; Stenbacka, and Tombak, 2012, p. 392; Sako et al., 2016, p. 1065
Costs savings	Beladi, and Mukherjee, 2012; Neghab, and Poormoaied, 2011
Better understanding of the manufacturing process	Arvanitis et al., 2015, p. 360; Krzeminska et al. 2013, p. 1620; Parmigiani, 2007.
Avoiding quality debasements and cheating safeguarding against opportunism)	(Mols, 2019, p. 408; Heide, 2003.
Reducing the risk of deliveries discontinuation	Mols, 2019, p. 408; Du et al., 2006, p. 246; Du et al., 2009, p. 216.
Allowing benchmarking, increasing internal and external incentives.	Krzeminska et al., 2013, p. 1620. Adelman, 1949, p. 113; Mols, 2019, p. 408.

Table 2 shows the benefits of the 'make and buy' strategy in the light of the literature review. They can be divided into those related directly or indirectly to the costs and those related to the company's strategy.

As far as the disadvantages of the 'make and buy' strategy are concerned, it is necessary to note the fact of bearing the transaction costs related to purchasing from external suppliers simultaneously with the costs related to the management of production processes within the organization. Therefore, in order to implement the 'make and buy' strategy, the company must at least balance the disadvantages with the benefits.

4. Case study of implementation of the 'make and buy' strategy

4.1. Characteristics of the studied enterprise

The company employs more than 100 people. Its business profile is production and sales of building materials. It operates in the form of a limited liability company owned entirely by a foreign owner who also operates in Germany, within the same industry.

The company has a factory located in Poland to which three warehouses are allocated for both its own and imported products. Before the decision about insourcing was made, an external company was responsible for warehouse management. The main parameter deciding on mutual settlements with an external contractor in accordance with the contract, in terms of warehouse service, was the number of metric tons of goods serviced by the warehouse each month. In the year 2013, before the insourcing, one warehouse (located at the factory) would service four thousand metric tons per month. At the same time, about 50% of the goods were sent to the remaining two warehouses and the rest was sent directly to the customers.

In the factory warehouse, seven people were employed by an external supplier, including a warehouse manager. At the same time, the warehouse itself (building, plot, racks) was owned by the company.

4.2. The reasons for launching an insourcing project with the 'make and buy' strategy

The main factor that determined the decision to implement insourcing were the potential savings resulting from the integration of the warehouse management processes into the structure of the parent company. The employee responsible for analysing the benefits of implementing an insourcing project estimated the possible level of savings at 20%. At the same time, the company identified the risk associated with the need to incur personnel costs in periods where the level of warehouse utilization fell below the profitability threshold for the whole project. Once they analysed the way that work was organized in a foreign company that owns a Polish factory, it was decided to outsource the operation of the warehouse located directly at

the factory and to keep the other two warehouses under the management of an external supplier. Another factor determining the insourcing of the warehousing process was the possibility of closer and more flexible integration with the rest of the company through arbitrary modifications of the process.

4.3. The execution of an insourcing project

Insourcing was carried out by taking over the employees of an external company and employing them in the company that took over the process. Additionally, the warehouse handling equipment also became the subject of negotiations, as a result of which part of the forklift trucks were purchased from the previous contractor. Due to the differences in the level of salaries in both companies, taking over the employees required salary negotiations, which were successfully completed. The entire staff moved to the new employer without changing the workplace.

In the meantime, there was a possibility of improving the process of issuing products from the warehouse to one of the main customers (about 25% of dispatched goods from the warehouse). The improvement involved sending the goods to the customer's central warehouse, rather than to each store separately. In order to implement the improvement, it was necessary to implement an IT system that would enable the identification of the contents of each pallet. In the opinion of the company's management, this change was much easier and cheaper to execute in the company's own structure than in the case of the necessity to negotiate changes with an external partner.

4.4. Evaluation of results

The anticipated benefits of implementing insourcing proved to be accurate. The company actually achieved a 20% reduction in costs (calculated according to the algorithm described in the contract with an external supplier). The potential risk of reducing warehouse needs was transferred to an external supplier, who was still responsible for servicing the remaining warehouses. In view of the reduced demand for its services, the external contractor undertook negotiations on the terms and conditions of the cooperation agreement.

As the result of the company's development, another warehouse employee has now been employed, while the average weight of goods handled by the warehouse has increased to 4.5 thousand metric tons per month.

5. 'Make and buy' formalized model

When opting for 'make and buy', the key aspect is to balance the benefits described in Table 2 with the total transaction costs and hierarchical costs associated with the production of an item or a service within the boundaries of the company. In order to determine the break-even point for self-manufacturing, it is necessary to determine a stable demand for a product or service over the duration of the investment. Let us therefore assume that the following Qt is the amount of demand for a product/service X per unit of time t (e.g. hours, days, months). The analysis should include historical data from the longest possible period of time, i.e. minimum one year, in order to verify whether there are seasonal fluctuations in demand for X. In figure 1 and table 3 there are examples of demand data for X during the last 54 weeks. Then the maximum time period (n) for which it is possible to store the self-manufactured Q product should be determined. The presented example assumes a 4-week period. Then, a simple moving average (formula 1) is calculated for the assumed period (n = 4).
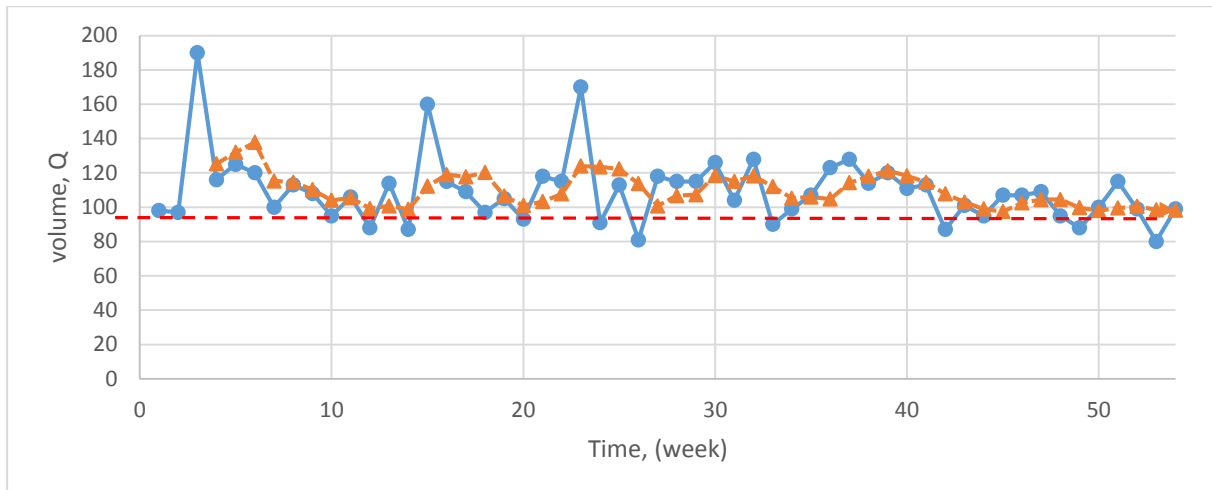

Figure 1. Sample data on the demand for the product X, (circles – volume of X, triangles – simple moving average of X, the dashed line is a minimum of simple moving average of X).

$$\bar{Q}_t = \frac{1}{n}\sum_{i=0}^{n-1} Q_{t-i} \qquad (1)$$

The volume of own production (Op), for which a stable internal demand is ensured, considering the maximum period of storage, is determined as a minimum of the simple moving average for the assumed period (formula 2). Table 4 presents basic descriptive statistics for sample data.

$$Op = \min(\bar{Q}_t) = \min\left\{\frac{1}{n}\sum_{i=0}^{n-1} Q_{t-i}\right\} \qquad (2)$$

In order to make a decision to insource the process and then apply the 'make and buy' strategy, the profitability of such a project should be verified. For this purpose, the Op values should be compared with the break-even point of the investment which consists in integrating the process into the organization's structures. Let us assume the following symbols: P = unit

market price when ordering the quantity Q of product X, Fc = fixed costs related to launching the process of manufacturing product X within the organization, Vc = unit variable costs of manufacturing product X within the organization. The formula determining the economic profitability of the 'make and buy' strategy will take the form as in formula 3.

Table 3.
Sample data to illustrate formula used in part 5

Week	Volume of X	Simple moving average of X	Week	Volume of X	Simple moving average of X
1	98		27	118	100.75
2	97		28	115	106.75
3	190		29	115	107.25
4	116	125.25	30	126	118.50
5	125	132.00	31	104	115.00
6	120	137.75	32	128	118.25
7	100	115.25	33	90	112.00
8	113	114.50	34	99	105.25
9	108	110.25	35	107	106.00
10	95	104.00	36	123	104.75
11	106	105.50	37	128	114.25
12	88	99.25	38	114	118.00
13	114	100.75	39	120	121.25
14	87	98.75	40	111	118.25
15	160	112.25	41	113	114.50
16	115	119.00	42	87	107.75
17	109	117.75	43	101	103.00
18	97	120.25	44	95	99.00
19	105	106.50	45	107	97.50
20	93	101.00	46	107	102.50
21	118	103.25	47	109	104.50
22	115	107.75	48	95	104.50
23	170	124.00	49	88	99.75
24	91	123.50	50	100	98.00
25	113	122.25	51	115	99.50
26	81	113.75	52	99	100.50
			53	80	98.50
			54	99	98.25

Note: Sample data on the demand for product X in the analysed organization.

Source: own elaboration.

Below the value of Op in the analysed period, the economic premises conditioning the implementation of insourcing process are not met. Failure to meet the condition specified in formula (3) does not preclude the possibility of insourcing. It should be verified whether the internal demand for product X is steadily growing in the analysed period and, if confirmed, the analysis should include a shorter period, e.g. the last quarter of a year instead of a full year. Moreover, the use of the 'make and buy' strategy may be determined by serious consequences of the risk of discontinuity of deliveries of product X, which could affect core processes in the analysed organization.

$$Op > \frac{Fc}{(P-Vc)} \tag{3}$$

Table 4.

Basic descriptive statistics for sample data from table 2

Statistics	Weekly volume of X (Qt)	Simple moving average of X
N	54.00	51.00
Range	110.00	40.25
Minimum	80.00	97.50
Maximum	190.00	137.75
Mean	109.57	109.97
Std. error of mean	2.71	1.35
Std. deviation	19.94	9.65
Variance	397.46	93.20
Skewness	1.89	0.72
Std. error of skewness	0.33	0.33
Kurtosis	5.53	0.00
Std. error of kurtosis	0.64	0.66

Note: own elaboration.

It should be noted that the manufacturing technology adopted for production of X has some capacity limits (Qmax). Qmax can be achieved without increasing fixed costs. Therefore, due to diseconomies of scale, increasing the production volume of product X in-house does not always imply a decrease in unit costs. At times, a small increase in the in-house produced quantity of product X may result in a significant increase in the unit cost of production of product X. For example, in the case study described in section 4, the increase in demand for warehouse services above the size of the currently used warehouse would involve the need to expand the warehouse space or to build a new warehouse, which would significantly increase fixed costs and affect the unit cost. The issues described above make it impossible to assume the continuity of cost functions within the whole range of variability. Therefore, in the case of discontinuity of the cost of production function of X, the break-even point analysis should be conducted for separate ranges of production volumes, for which the cost of production function is continuous. Specifically, it may turn out that despite a stable demand for at least the Op of X products, it is economically sound to produce a quantity that is less than the Op in-house.

6. Summary

The formalized model of the 'make and buy' strategy presented in the article is focused on factors related to cost savings. It uses analytical verification to determine whether the savings associated with insourcing the process of manufacturing the analysed product outweigh the costs associated with its launch in-house (with the size of demand determined on the basis of historical data).

Apart from the formal assessment of the profitability of a process insourcing project, an important issue is the real possibility of purchasing at t time the volumes of product X, which exceeds (taking into account current production and stocks) the volume produced

in-house. According to the theory of transaction costs, the less specific assets are used to produce product X, the easier it is to manufacture. In addition, a company expertise and supplier expertise in production of X is an important factor determining the use of the 'make and buy' strategy. In the research on the 'make and buy' strategy conducted by Parmigiani, this factor was dominant (Parmigiani, 2007, p. 299). Without the expertise of a company that decides to use the 'make and buy' strategy, unexpected problems can arise at the insourcing implementation stage that will increase the initially estimated both fixed (Fc) and variable (Vc) costs of starting the process within the boundaries of the company.

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