The efficiency of accounting service provision

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Keywords *Outsourcing, Benchmarking, Small- to medium-sized enterprises, Accounting, Data envelopment analysis*

Abstract *The paper uses a procedure called data envelopment analysis (DEA) to compare internal against external (outsource) efficiency in the delivery of finance function activities. The approach allows a direct comparison between the in-house efficiency of UK small, medium and large companies in managing their accounting activities both with UK outsource contractors and also against the rather larger and more numerous contractors observed in Italy. The paper finds that, through comparative advantages, outsourcing presents a more efficient solution for the management of very small firm accounting than internal provision. Furthermore, there is evidence that substantial scale benefits continue to be available to outsource contractors, while inefficiency on internal provision is mainly technical. The paper concludes that outsourcing provision is likely to offer worthwhile savings to small firms, allowing them to shed competitive weaknesses and operate at efficient or best practice levels. At the same time, by converting an internal fixed cost, fixed capacity activity into a flexible, variable cost activity, SMEs have the potential to transform a previously unmanageable activity into an efficient or best practice activity that can grow or contract with the business.*

Introduction

Outsourcing, as a credible alternative to in-house provision is, defined as the provision of services to an organisation by an unconnected outside supplier (Earl, 1991; Huff, 1992; Friedberg and Yarberry, 1991). The delegation of discretion in the day-to-day management of the outsourced activity differentiates it from classical sub-contracting, where a complete (fully specified) contract exists.

This paper positions outsourcing between classical market transacting and traditional sub-contracting. Outsourcing incorporates the managerial delegation aspects of the former and the long-term nature of the latter. Further, to account for firms which never had internal provision and rely from the beginning on service providers, outsourcing is considered as the provision of an activity that is normally (but not always) realised using in-house resources.

The authors are grateful to the Institute of Chartered Accountants in England and Wales (ICAEW) for their financial support and to their members for providing invaluable data. In addition, the European Social Fund (ESF) for their transnational financial support. Thanks go to Professors Luciano Olivotto and Massimo Warglien for their invaluable comments and insights and to the two anonymous reviewers for their guidance through the review process.

Business Process Management Journal, Vol. 8 No. 3, 2002, pp. 195-217. © MCB UP Limited, 1463-7154
DOI 10.1108/14637150210428925

In this way, the reduction of management control found in classical market transactions is considered along with the long-term nature of subcontracting.

Recent improvements in cost and effectiveness of communications, together with digitisation and imaging technologies, have increasingly extended the option of transferring in-house activities to outsourcing contractors down to smaller firms.

This has been reflected in the growth of shared service centres, which offer cost and processing efficiencies through scale beyond those available to an in-house operation. Low communication costs mean that service centres also offer a means to exploit large differences in international costs, since location of service activity becomes immaterial. Financial telecommunications and software companies have themselves been prominent in this process of international transfer, with telecommunications companies outsourcing their international communication management to cheaper locations (McClelland, 1992). At the same time many service suppliers have re-engineered their business to become partners to multinational companies (Booker, 1991).

Technology development and exchange of digitised information presents opportunities for the small firm to access scale-based and otherwise unattainable best practice efficiencies offered by outsource providers (Quinn and Hilmer, 1994; McFarlan and Nolan, 1995). In spite of these, evidence suggests that small firms continue to suffer scale-based disadvantages evident in higher failure probability (Gill, 1985), worse access to financial support (Keasey and Warton, 1993; Burns and Dewhurst, 1996) and poor managerial skills. High environmental volatility and low separation of responsibilities in small businesses result in interactive and highly integrated and informal management structures that make outsourcing more complex in SMEs. In this paper we attempt to estimate the nature of this problem and whether the growing availability of smaller-scale service providers is amenable to small companies.

Despite the slow uptake of external contracting by SMEs, the total outsourcing sector is still estimated at £2.3bn (*Accountancy Age*, 1992) in the UK, with Europe's (*Computer Weekly*, 1997) estimated as a whole to be worth about £9bn, consisting primarily of IT and networked contracts. Other service support activities (often recognised as non-core), such as finance administration, payroll and pensions management, are estimated to be worth only £100m annually (*Accountancy Age*, 1996).

One potential reason for the slow uptake by SMEs is the thinness of the alternatives to in-house provision. Large companies are well served by major international service providers, while shared service centres appropriate to SMEs are relatively less common. Another is that identifying non-value-adding activities and arranging an outsource transfer involve benchmarking skills typically not present in the smaller firm.

This is particularly the case with possibly the most common business process – accounting. Measuring accounting activity is complex, since the quantity and quality of service output are more difficult to quantify than for

operational activities with dedicated inputs and (more) tangible outputs. The multiple common resources used in accounting to provide a variety of accounting output(s) make the capture of complex interactions and outputs difficult enough to inhibit outsourcing.

This paper uses a procedure called data envelopment analysis (DEA) to capture resource utilisation in relation to volume and complexity characteristics of the finance department. It extends the analysis to comparison with outsourcing performance to facilitate comparisons of internal versus external performance. The sample also incorporates an international perspective, using evidence of accounting outsourcing through Italian collaborative service centres. In doing so, the paper aims to identify the most efficient platform for SME accounting and the contributing factors underlying performance differentials, so as to reduce the information disadvantage of the smaller firm in the make or buy process.

The remainder of the paper is structured as follows. Part I discusses outsourcing and the underlying rationale for finance function outsourcing together with the motives, as they apply to SMEs, together with a description of the role and difficulties in measuring the performance of accounting activities. Part II outlines the hypotheses drawn for the research, while part III reports on the properties of a linear programming technique called data envelopment analysis (DEA) and its methodological properties that render it an appropriate tool in the context of small firm make or buy decisions. Part IV discusses the rationale for the selection of accounting input and output activity drivers, while part V outlines the data used to capture performance differentials. Results are provided in part VI with concluding comments on SME outsourcing potential discussed in part VII.

Outsourcing and interfirm efficiency

Outsourcing is approached in three stages:

(1) evaluation;

(2) negotiations; and

(3) control.

During the evaluation stage, companies attempt to identify current performance and reasons for performance differentials to identify the possible opportunity advantage from outsourcing. During negotiations risks are identified and appropriate mitigation strategies employed and, at the control stage, the emphasis is on managing the relationship with the service provider rather than the activity itself.

Much of the outsourcing literature has focused on the negotiations stage, taking the form of descriptive surveys (Loh and Vankatraman, 1992), with some formal event studies (Loh, 1992; Peak, 1994) and a number of case studies (Lacity, 1992; Lacity and Hirschheim, 1993; Huber, 1993) covering managerial issues, customer/provider relations and the contracting side of outsourcing.

Transaction cost economists (Coase, 1937; Williamson, 1981, 1985a; Robins, 1987) have also made significant headway in explaining the management of outsourcing risks: uncompetitive supply markets, information imbalance, limited decision-making capacity, and potential to "shirk" from obligations are four such risks that may exceed the transaction costs of maintaining the activity directly under management's in-house control. Transaction cost economics has also been useful in controlling the agreement, where the focus is on monitoring to avoid "hold-ups" (Klein, 1996), ensuring that the implicit terms of the contract are adhered to (Axelrod, 1984), and promoting collaborative, mutually beneficial exchanges (Sriram *et al.*, 1992).

Although essential for outsourcing, the emphasis on negotiations has resulted in little empirical work on the connection between performance measurement as a means of positioning internal versus external possibilities and on the means through which these are formulated. The absence of such information increases the risk of outsourcing the wrong activity on the wrong basis (Klepper and Jones, 1993).

Even in the IT domain where outsourcing is most developed, the focus remains on outsourcing typologies and motives for externalising transactions. Lacity *et al.* (1996), for example, recommend that companies separate functions into portfolios, benchmark in-house against external provision and evaluate the competitiveness (or otherwise) of outsourcing markets. In doing so, companies identify:

- areas where outsourcing may be easy (outputs clear-cut, quality monitoring straightforward and competitive outsource markets);
- areas where collateral effects on other activities will be low (the outsourced function connects with low frequency/intensity with core activities); and
- areas where the scope for competitive advantage through outsourcing is low (Prahalad and Hamel, 1990).

Outsourcing activity can generally take two forms: tactical and strategic (Antonucci and Tucker, 1998). Tactical outsourcing occurs where there will be no presumption that the relationship will be permanent, and so outsourcing may simply be an enhanced form of subcontracting. On the other hand, if outsourcing is used as a strategic tool, it will generally be linked with re-engineering, alliance and core competence strategies (Quinn and Hilmer, 1994).

Tactical outsourcing is motivated by cost reduction, the availability of capital funds or to eliminate a difficult to manage function (Antonucci and Tucker, 1998, p. 18). On the other hand, strategically outsourcing activities for which the firm has neither a critical strategic need nor special capabilities (Quinn, 1992) and focusing on areas where the firm has a pre-eminence (Quinn *et al.*, 1990) allow companies to access resource capabilities well beyond those available in tactical outsourcing. Some at least of these include a high return on in-house resources, access to superior capabilities, improved responsiveness to

customer needs and the possibility of erecting barriers against present and future competitors (see Quinn and Hilmer (1994) for a full discussion).

A particularly appealing feature of strategic outsourcing in SMEs is that it potentially provides a vehicle for buying into contractors who have themselves achieved competence in a core activity (North, 1991; Kogut and Singh, 1998). Economies of scale and scope are also of major importance in make or buy considerations, since efficiency differentials between small and large firms (and potential service suppliers) may reflect scale, scope or technical (competitive) advantages[1] that may not be available for in-house provision in small firms. These issues are particularly relevant in smaller firm make or buy, since the overall business may operate in a niche, and core processes operate at adequate scale, but the accounting performed in-house may incur scale and/or technical diseconomies.

Decision frameworks, though, are of little value, if performance cannot be quantified, since satisfaction will always be a function of expectation. Furthermore, the identification of core commodity (Prahalad and Hamel, 1990) is far from straightforward. Business support activities such as accounting (the focus of this paper) have an integrating role with the core function and involve multiple inputs and multiple outcomes or "outputs". Some of these may be quantifiable (employee inputs, IT expenditure, asset utilisation and process cycle time), but others (including accuracy and inbound error rates) are poorly recorded in most businesses. Productivity measures in service activities can therefore at best be described as "fuzzy" (Bell and Morey, 1994).

The relative novelty of outsourcing has outpaced the development of application frameworks to structure such decisions. Despite the useful fit between the data envelopment analysis methodology (see Charnes *et al.*, 1978; Charnes and Cooper, 1980) adopted in this paper to control, check and challenge (Neely, 1988) accounting provision, its influence on organisational analysis has spawned very little work on the connection, not least where the research concerns business support activities.

If competencies can be identified and isolated, and a gap between current performance and best practice quantified, a basis then exists to review the provision of an activity, as shown in Figure 1. Where an inefficient activity does not relate to a core competence, outsourcing could be justified, if scale factors explain underperformance, since accounting is a derived demand and cannot grow/contract simply to achieve an efficient outcome. Similarly, if technical inefficiency is observed in an activity in which the firm does not have a pre-eminence, outsourcing is still justified. If, however, the activity interacts so tightly with the core nucleus of the firm that it is inseparable, a second approach consists of process redesign. A third approach consists of insourcing additional work, particularly where inefficiency is the penalty associated with sub-scale. The upper, right-hand quadrant then describes situations where proprietary information in a core activity restricts outsourcing, and attention focuses on alternative service attributes including cost and quality.

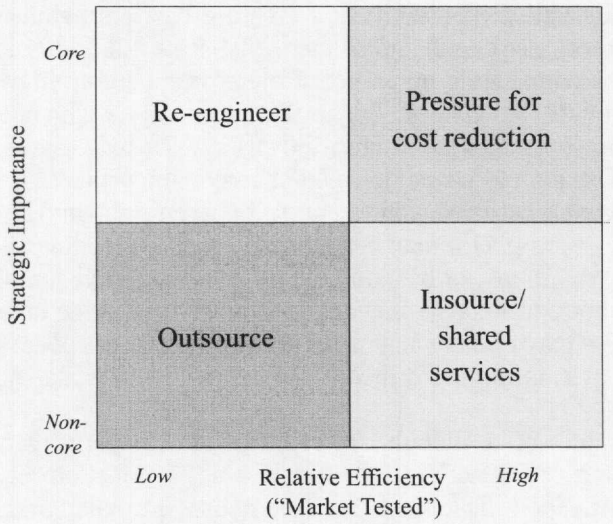


Figure 1.
The efficiency matrix

The strategic information content of performance measurement then provided an additional decision variable in make or buy. As Stainer and Stainer (1998, p. 4) contend, "those who have never effectively measured their performance cannot seriously claim to know how their business might progress".

Hypothesis testing

The aim of this paper is to understand whether or not outsourcing offers a more efficient solution for the management of SME accounting; the paper compares finance function performance of a basket of UK companies, representing all size categories against that of outsource provision. Specifically, the following hypothesis is formulated:

H0. Outsourcing vendors operate at higher efficiency levels than SMEs in servicing finance/accounting activities.

If the hypothesis holds, we could conclude that outsourcing offers a more efficient solution for the management of SME finance/accounting activities.

Scope economies are not sought in this paper, since almost all outsourcing arrangements are between a smaller and larger entity, and any resulting increase in service offerings (scope) follows from the larger and more specialist resources a provider bears. A case in point is Shell and the accountancy firm Ernst & Young, who formulated an ambitious joint venture service company, "Tasco", to provide Shell's accounting needs and to extend services to multinational companies. By transferring its accounting work, Shell is able to provide the new company with critical mass in processing at the start-up stage to capture the benefits from any continuing scale and cost savings. Tasco could then extend service offerings to the Shell group of companies (scope), and exploit the reputational benefits created by Shell to pursue third-party work. Since any resultant scope advantages accrue post-outsourcing, the paper

focuses on the impact of scale and technical inefficiency on underlying performance. This leads to a further two hypotheses:

H1. Scale inefficiencies are significant determinants of overall inefficiency in the operation of SME finance/accounting activities.

H2. Technical inefficiencies are significant determinants of overall inefficiency in the operation of SME finance/accounting activities.

Accounting performance methodology

A non-parametric linear programming methodology called DEA was used in the examination of the multi input-output conversions occurring in the in-house finance function and external outsource provision. Since the technique does not require any assumption about the relevant production function, the technique makes it possible for the "efficient" solution from the particular group and range of inputs and outputs investigated to emerge (see Appendix).

DEA is attributed to Charnes *et al.* (1978) and Charnes and Copper (1980) and is particularly attractive in the context of make or buy, since it provides a straightforward methodology for investigating the performance of decision-making units (DMUs) in converting multiple inputs and multiple outputs[2] into a singular efficiency measure that is not based on a population average, but on actually achieved or "revealed best practice".

As originally developed, DEA compares specific productive units with a similar set to determine whether any in the set are relatively more efficient, and therefore lying on the efficiency frontier relative to less efficient DMUs located below the frontier. This concept of "relative efficiency" measurement and efficiency frontiers was originated by Farrell (1957) and is implemented in DEA by comparing the resources (inputs) and outcomes (outputs) of each DMU with what could be obtained from linear combinations of the inputs and outputs of all other reference DMUs. The relative measure of efficiency makes it suitable in cases where there is no theoretical or scientific basis for classifying any absolute optimum (Charnes *et al.*, 1978), where the production function governing inputs and outputs is poorly understood and where studies need to discriminate between technical inefficiency and non-exploited economies of scale.

Since the publication of Charnes *et al.* (1978), where DEA was used to investigate the efficiency of "follow-through" programmes in schools, DEA has been used in a wide variety of situations by researchers, with total referenced studies exceeding 1,100 (Emrouznejad and Thanassoulis, 1996a, b). Although no study has utilised DEA in the context of outsourcing, parallels can be drawn from Brown and Gardener (1995) in examining the impact of scale inefficiency on the strategy of 25 European banks. Also, in Glass *et al.* (1997), when examining productivity change in university departments between 1989-1996 and the impact of scale and technical factors in explaining productivity change.

DEA model formulation

By capturing the efficiency of multiple inputs and outputs in a single efficiency measure, the technique provides a means of comparing the "relative efficiency"

of companies performing accounting internally against outsourcing providers performing comparable activity.

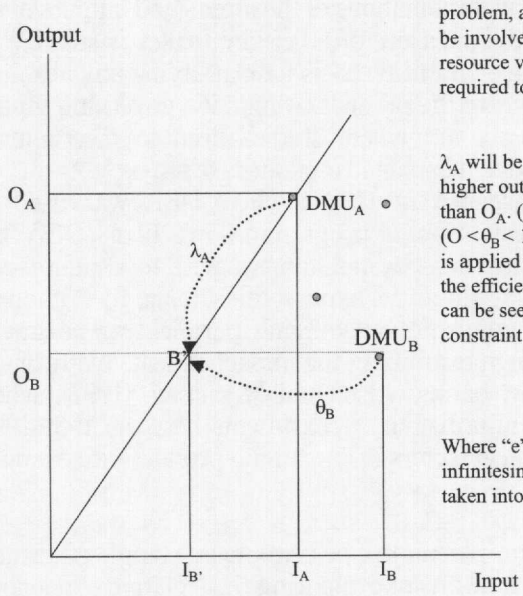
Although this paper uses a multi-dimensional input/output model, run under both constant (CRS) and increasing returns to scale (VRS), Figure 2 represents DEA in its simplest form, using a one input/output, input minimising constant returns to scale model (Charnes *et al.*, 1978).

Extending this to multiple inputs and outputs, the model can be interpreted as calculating the maximum reduction in inputs for DMU_i (represented by the lowest possible value of the efficiency of DMU_i , θ_i) that would be concurrent with a maintained level of output, if best practice identified within the sample was used.

The projected point for DMU_i (that can be seen as a "virtual" DMU providing the output of DMU_i but at the efficiency level of the best practice) is obtained by using combinations of inputs of other DMUs capable of providing the same output as DMU_i. These combinations are represented by the vector λ of n elements.

$X\lambda$ and $Y\lambda$ represent this optimal (theoretical/virtual) combination of inputs (X) and outputs (Y), which provide a "projected point" for DMU_i. The first constraint shows that the "virtual DMU" for DMU_i deploys an amount of input equal to the current use in DMU_I, reduced by the factor θ_i^1[3]. The second constraint shows the optimally weighted combination of DMUs, which consists of the current output of DMU_i plus a residual shortfall.

It should be noted that these computations are repeated for each DMU in the analysis. If there are n DMUs in the model, this requires the solution of n linear programmes, each one giving a relative efficiency measure for each DMU in



DMU_A is best practice since it provides more output per unit of input than DMU_B. B' is the "projected point" for B in an input minimisation problem, and shows the level of input that should be involved in producing O_B on DMU_A's resource vector. λ_A is the proportion of A's inputs required to provide O_B at best practice levels.

λ_A will be > 1 if the projected point O_B involves higher output levels than O_A, and < 1 if O_B is less than O_A. (1 - θB) is the inefficiency level of B ($O < \theta_B < 1$), where θ_B is a scalar reduction factor that is applied to B's current input if B were to move to the efficiency frontier $(1 - \theta_B) \times I_B = I_{B'}$.The graph can be seen as the representation of the first constraint of the model:

$$I_B / (1 - \theta_B) = \lambda_A I_A - e$$

Where "e" in the solution of the problem is an infinitesimal number that represents any slack not taken into account in the model by θ.

Figure 2.
Graphical explanation of DEA

terms of its own defined set of "best practice" comparisons. Piecemental linear combinations of efficient DMUs are used to construct a general efficiency frontier. Since we are interested in the identification of scale inefficiencies, the variable returns to scale (VRS) DEA feature, which restricts the values of λ to 1, was also adopted in this paper (Banker *et al.*, 1984).

Accounting variable selection

Internal firm performance

To consider internal accounting efficiency, a database of mainly smaller UK companies was available from ongoing ICAEW research, commissioned to benchmark internal accounting performance[4]. The research attracted a total of 964 responses, of which 786 were usable from UK-based, public and private sector organisations[5]. This provided the necessary data to measure internal firm efficiency.

Outsourcing provider performance: UK and Italy

UK outsourcing provision is currently focused on "big 5" outsourcing providers offering services to companies employing above 250 employees. Recently, though, a growing number of smaller outsourcing providers have been beginning to take on board the non-core SME activity. These providers, albeit limited in presence, have made the transition from being the firm's external accountant to offer outsource services incorporating many or all of the firms' internal accounting.

From a transaction cost perspective (Williamson, 1979), the presence of a small numbers problem leads to limited competition (Thorelli, 1986), allowing external suppliers to pre-empt a disproportionate share of the benefits of outsourcing. Any bottle-necks in UK outsourcing provision for SMEs, though, are eased by the continuing emergence of new providers and their co-operation makes the kinds of make or buy comparisons intended in this paper possible[6].

In stark contrast, in Italy, the small firm outsourcing market is served by a municipal, not-for-profit organisation called the "Confartigianato". Originally established in 1946 to provide political representation to manufacturing SMEs, today the Confartigianato is an important participant with 84 per cent of its revenue generated from the provision of services to 520,000 SMEs through a network of 119 local associations.

The Confartigianato's menu of services includes assistance for financing and export, bookkeeping and accounting, tax returns and advice, payroll management, assistance with health and safety regulations, insurance, credit information and recovery, and assistance with start-up procedures. While these activities constitute a comprehensive service, a limited number of providers extend beyond this to include management and financial accounting, in addition to a full purchase and sales activity[7].

The popularity of the Italian organisational model is evident through the growth in the number of members and the services taken. Its services are tailored at SMEs employing between zero and 19 employees, which constitute 98 per cent of all Italian companies, and around 50 per cent of all employment in

the Italian economy. Although UK SMEs make up the same proportion of total enterprises, the emphasis of outsourcing provision is on large firms (Table I).

Performance dimensions

Finance department efficiency can be represented across two dimensions: efficiency and effectiveness. Under each lie four performance criteria: cost and productivity that relate to the efficiency dimension, and profit and quality that relate to the effectiveness dimension (Anthony and Herzlinger, 1975) (see Figure 3). For each performance criterion there lies a series of potential process-based performance metrics. In accounting, these could include ROI, ROCE as potential profit metrics, error reporting or audit comments as quality metrics. The cost approach involves setting metrics for process cost, while productivity criteria involve setting specific objectives that finance personnel are expected to outperform (e.g. volumes of invoices p/week).

Tomkins and Green (1988) stress an important limitation of DEA in that it does not evaluate output quality. Indeed it is not inconceivable that the effectiveness of accounting provision might even be negatively correlated with

Table I.
The distribution of companies by size

Size (number of employees)	UK	Italy
0-9	3,526,924	3,338,711
10-19	111,626	115,022
20-49	53,502	48,737
50-249	25,731	16,645
250+	6,640	2,639
Enterprises	3,724	3,522

Source: Eurostat (1996)

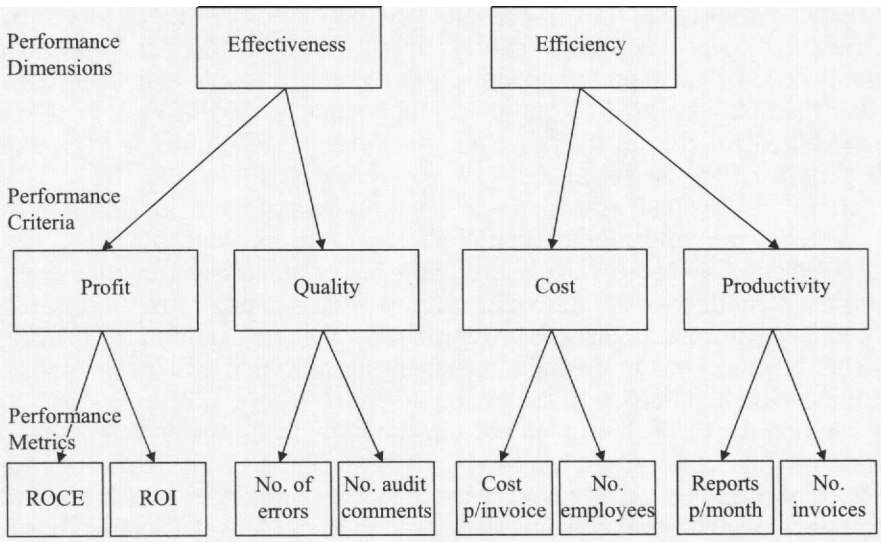


Figure 3.
Performance dimensions

efficiency scores. By examining the efficient or best practice DMEs making up the reference set for any particular less efficient DMU and following through with a qualitative quality assessment, it would be possible to determine whether quality is so high in the less efficient DMU that it warrants using so many more resources than efficient DMUs.

In this paper, though, we are concerned with the efficiency platform of accounting delivery, recognising comparability restrictions in process metrics, the requirement to compare in-house against outsource delivery, and the complexity in obtaining reliable and objective measures for quality (effectiveness) for accounting input/output conversions. Furthermore, the Italian equivalent outsource structure does not provide management reporting services that have a high degree of strategic resource input (Barney and Ouchi, 1986) and are therefore measured in terms of quality.

DEA variable selection

Since no previous study has utilised DEA in service activity make or buy, the approach used by Wood and Kodwanni (1998) was followed for the selection of variables in the model. According to this criterion, variables should:

- incorporate differences in operating environments, which recognises a firm's non-discretionary exogenous variables as input and output variables;
- not be highly correlated; and
- be logically relevant for the production of expected outputs.

Accounting productivity is governed by "complexity" and "volume" dimensions (Beretta and Dossi, 1998) and the input and output variables chosen must adequately reflect this and be comparable between and across each form of provision.

Beretta and Dossi (1998), in their process-based benchmarking study of the accounts receivable and payable system of the 50 largest Italian companies, chose the number of purchase invoices and the average number of lines per invoice as "volume" dimensions, while the variety of transactions was chosen as a "complexity" indicator, limiting the analysis to similar size categories for comparability.

Input selection

Since labour cost is the main driver in service activities in general and in accounting service in particular[8], the number of qualified employees (those holding or studying for a recognised accounting professional qualification) and support, or clerical employees deployed in the accounting department provided two input measures for in-house accounting. Similarly for outsourcing providers, the number of qualified and support personnel deployed in its accounting "factory" to service client accounting provided two input measures comparable with internal accounting.

Output selection

This study departed from the output variables proposed by Beretta and Dossi (1998), for two reasons. First, although the UK and Italian accounting systems are comparable, international business practices and customs differ markedly, so process metrics including invoice volumes would yield comparability problems that would be difficult to resolve. Second, the paper sought a more generic/macro output measure for accounting efficiency that would not directly be biased by companies performing accounting internally, of providers with dedicated accounting software and of Italian outsource providers with different processes, customs and software.

Accounting volume dimension

The volume of accounting work is likely to be driven by the turnover serviced within the firm. Annual turnover is used to provide the volume output measure for internal accounting. Such a measure would also describe the output of activities of UK external providers on behalf of their clients. Since the Italian external accounting outsourcers provide a more limited range of service, the turnover of clients served is scaled down to adjust for the average resource requirements of UK outsourcers in tackling services not provided by Italian outsource contractors. The aggregate annual turnover of Italian "Confartigianato" members was therefore factored down to reflect this.

The deflation of the Italian providers was calculated by reference to the UK database. Evaluating the allocation split of accounting resources across accounting activities, we could calculate the proportional loads associated with given financial activities. For example, management accounting absorbed 32 per cent of all professional staff accounting resources in the UK database. The Confartigianato did not provide management accounting, so serviced turnover by professional staff was cut by 32 per cent in respect of this activity.

The calculation led to a conclusion that the service mix provided by the Confartigianato would require only 55 per cent of the professional staff time of the full measure and 67 per cent of non-professional staff time. The turnover of the Italian outsourcing providers was factored down by these proportions.

Accounting complexity dimension

Basing input efficiency against turnover per head, though, disregards the complexity associated with the creation of turnover. Turnover serviced by the accounting department may be composed of a small number of high value transactions, or a large number of small and therefore more complex transactions. The development of a "complexity" output variable is therefore desirable in accounting productivity measurement (Beretta and Dossi, 1998).

Beretta and Dossi (1998) used a "variety of transactions" output indicator comprising the number of customer and supplier accounts managed by the finance department. This paper followed this principle, but standardised the number of customer and supplier accounts serviced by turnover to obtain a second output measure of "accounts serviced per Euro of turnover" for firms

with an in-house accounting operation. For outsourcing providers, the number of client accounts serviced per Euro ensured comparability.

Data

UK companies were categorised by turnover into different size groups:

- micro companies (first decile turnover);
- small and medium companies (first quartile);
- large companies (last quartile); and
- very large companies (last decile).

In addition, a proxy for the average of the sample was included. The raw input and output data for UK companies performing accounting internally are reported in Table II.

Eight associations belonging to the Confartigianato (the Italian outsourcing equivalent) provided data on the requisite input and output conversions (It). Two service providers, Casson Beckman and Accountex, also participated from the UK (see Table III).

In all, 15 DMUs were included in the DEA models to derive productivity comparisons of the internal accounting function against outsourcing provision, utilising resource usage (inputs 1 and 2) in relation to volume (output 1a, b) and complexity outcomes (output 2). In this way, traditional uni-dimensional, internal firm comparisons are expanded to multi-dimensional ones, representing the structural performance drivers influencing the amount of resources (and cost) devoted by alternative delivery channels to service accounting.

Results

Internal versus outsourcing performance

The resulting efficiency frontier for professional staff (model I) servicing internal accounting versus outsourcing providers, drawn first, under the

Firm size	Professional staff (Input 1)	Non-professional staff (Input 2)	Annual turnover €s (Output 1)	Serviced accounts (complexity metric)[a] (Output 2)
Micro	1.3	4.4	3,933,818	5.68
Small and medium	2.8	9.7	18,500,000	8.54
Average	8.5	25.7	138,206,647	1.77
Large	16	56	383,608,500	0.49
Very large	17	73	621,521,250	0.29

Notes: Figures in Euros (£1 = €1.5); [a] This surrogate measure of complexity is derived from the numbers of customer and supplier accounts, combined and normalised against the "provider" complexity measure to produce a single metric

Table II.
UK companies performing accounting internally

Outsourcing provider	Professional staff (Input 1)	Non-professional staff (Input 2)	Aggregate client turnover €s	Aggregate client turnover serviced by professional staff €s (Output 1a)	Aggregate client turnover serviced by non-professional staff €s (Output 1b)	Accounts serviced per € (Complexity metric) (Output 2)
Cremona (It)	1.2	10.8	44,282,047	29,355,125	29,668,971	6.57
Mantova (It)	5.2	46.8	206,582,760	113,620,518	138,410,449	3.64
Brescia (It)	4.2	37.8	351,190,691	193,154,880	235,297,763	2.24
Udine (It)	5.3	47.3	254,613,251	140,037,288	170,590,878	4.75
Pordenone (It)	1.9	17.5	96,729,278	53,201,102	64,808,616	4.50
Trieste (It)	0.8	7.7	29,210,802	16,065,941	19,571,237	7.78
Gorizia (It)	1.1	10.4	33,833,608	18,608,484	22,668,517	5.55
Monfalcone (It)	0.4	4.0	4,431,200	2,437,160	2,968,904	21.23
Accountex (UK)	0.9	8.1	42,000,000	42,000,000	42,000,000	0.19
Casson Beckman (UK)	0.4	3.6	16,500,000	16,500,000	16,500,000	0.56

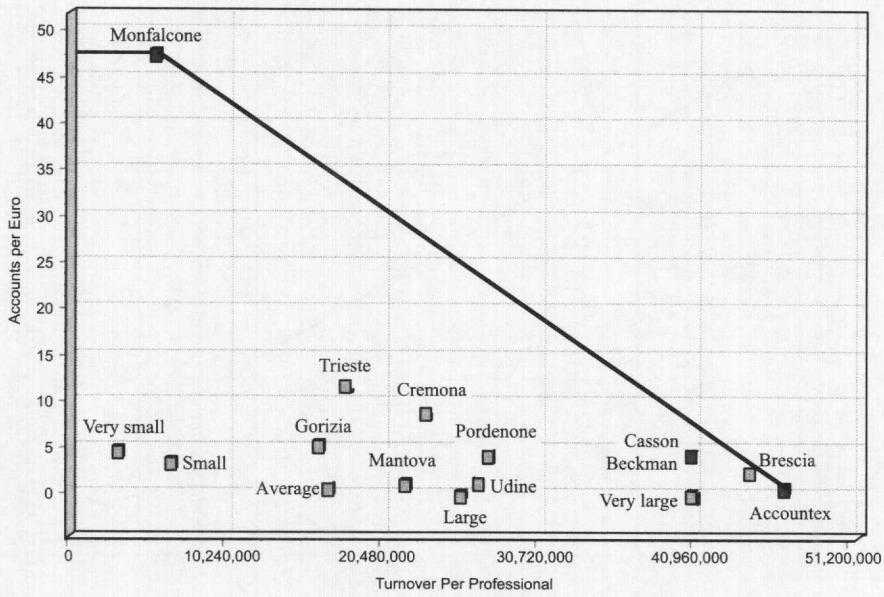
Table III. International outsourcing provision

Notes: Figures in Euros (£1 = €1.5)

assumption of constant returns (CRS), shows three performance clusters (Figure 4). The first represents the two "best practice" performers (Monfalcone and Accountex), defining the shape of the frontier with θ equal to 100 per cent. Also contained within cluster one is Brescia (99 per cent), very large firms (89 per cent) and Casson Beckman (90 per cent).

To capture the essence of these results, consider the two providers defining the shape and location of the frontier. While Monfalcone is the most complex amongst the reference group, since it manages the highest number of accounts per Euro ratio, it manages the lowest volume of turnover. In contrast, Accountex manages high volume but low complexity transactions, but both define the shape of the efficiency frontier. The second cluster consists of the remaining Italian providers (Trieste, Gorizia, Cremona, Mantova, Pordenone and Udine); together with large UK firms. Overall scores for the 15 DMUs in the model demonstrate a 64 per cent gap to best practice. There is then a very large gap to the UK small firm sector, with very low θ scores of 19 per cent for small firms and 14 per cent for micro companies. These scores equate to average gaps to best practice of 83 per cent in the small firm sector. On the basis of these performance differentials, the data confirm *H0* in that external providers of accounting services operate at higher efficiency levels than very small and small firms managing the activity on an in-house basis.

Figure 5 presents results for model II, based on the use of non-professional staff. Cluster one again comprised the best practice Italian outsourcing provider (Monfalcone) and, in this model, also by the performance of very large UK firms. Similar to model I, the dispersion around best practice for the



[Results summary: Very small (14%), small (19%), average (36%), large (55%), very large (89%), Cremona (54%), Mantova (48%), Brescia (99%), Udine (59%), Pordenone (63%), Trieste (58%), Gorizia (44%), Monfalcone (100%), Accountex (100%), Casson Beckman (91%)]

Figure 4.
Professional staff efficiency frontier

remaining Italian outsourcing providers in cluster two is between 30 per cent and 62 per cent, although the performance of the two UK providers falls to around 50 per cent. While the performance of outsourcing provision is still below large and very large firms, it is still substantially above small and very small firms (their potential customer base).

Small and very small UK firms are still in the third performance cluster, although the gap to best practice in non-professional staff activities is lower (averaging 67 per cent) than in the professional staff model.

The results of both models therefore support *H0* and the competitive advantage of outsourcing providers in conducting SME accounting activities relative to potential customers. Furthermore, splitting finance employees by status, we observe the generally superior performance of very large and large UK companies in both categories of activities over small and very small firms.

Although both UK providers and the Italian providers were operating at significantly higher efficiency levels than small firms, they were not operating close to the maximum efficiency as defined by the best practice frontier in cluster one.

One source of difference for the UK providers is that the number of clients serviced per employee is among the lowest in the sample. A number of potential explanations for this exist including the need for these newly established providers to invest more heavily in client recruitment and servicing, in addition to a higher R&D and training spend per professional and non-professional compared with the larger, established Italian collaborative

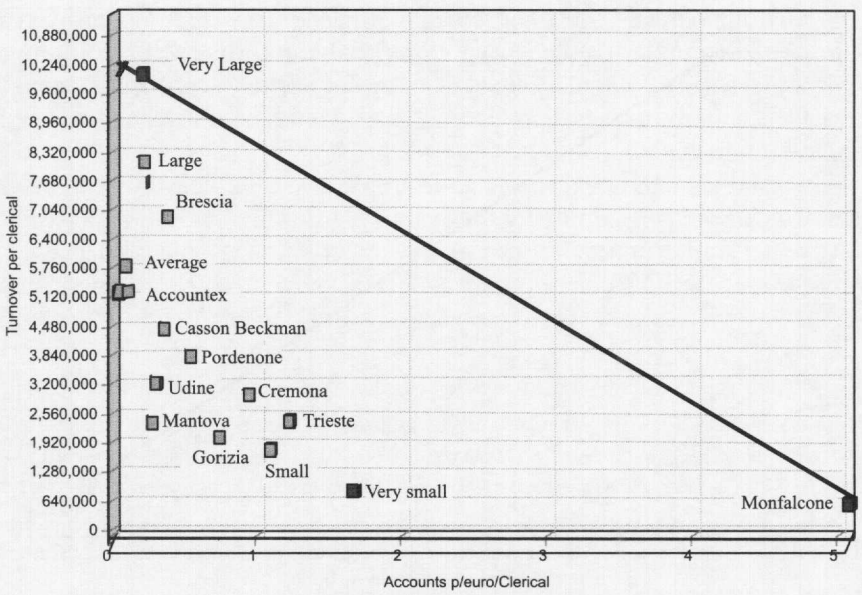


Figure 5.
Non-professional staff efficiency frontier

Results summary: Very small (31%), small (34%), average (58%), large (77%), very large (100%), Cremona (38%), Mantova (30%), Brescia (62%), Udine (37%), Pordenone (41%), Trieste (43%), Gorizia (31%), Monfalcone (100%), Accountex (51%), Casson Beckman (48%)

groups. Another is that they may be operating below desirable scale for service of the activities they offer. This necessitates further analysis of the presence of scale or technical factors in observed efficiency differentials.

Technical vs scale inefficiency

The two DEA models have thus far identified a performance gap but not whether that gap comprises technical or scale inefficiency. The measure of technical efficiency, which is obtained by running the appropriate linear programme under the constraints of constant returns to scale, assumes that all the efficiency is attributable to "pure technical efficiency", i.e. wasted resources (Drake and Howcroft, 1993) in as much as too many inputs are utilised relative to given level of output. In reality, however, some of this technical inefficiency may be attributable to "scale effects" that occur when operating at non-constant returns to scale.

For make or buy decisions, the presence of technical inefficiency would point towards re-engineering potential. If scale factors were significant, a stronger case would then be made for outsourcing[9] or insourcing, since any attempt at internal re-organisation is limited by the scale diseconomies facing smaller businesses, which cannot grow their activities simply to achieve an efficient dedicated accounting function.

To partition between these sources of inefficiency, the DEA models were run again, this time under the constraints of variable returns (VRS), obtaining an efficiency measure which is always $\geq$ the efficiency score under constant returns. The performance gap in this case would be entirely attributed to technical inefficiency.

Taking very small UK firms as an example, overall efficiency, θ, in model 1 (CRS) was 14 per cent, implying an overall inefficiency gap of 86 per cent for professional staff. Running the model now under VRS, θ equals 31 per cent and, by implication, technical inefficiency equals 69 per cent. By deducting technical inefficiency (VRS) from overall inefficiency (CRS), we can arrive at an estimate of disadvantage equivalent to 17 per cent of resources employed (see Figure 6).

Replicating this for each DMU in the model, it is apparent that inefficiency in non-professional activities are primarily scale-driven (52 per cent) rather than technical (17 per cent) (Figures 7 and 8) and, although the root cause of performance gaps differs, small firms are unable to remedy scale inefficiency for two reasons. First, if the demand for accounting grew within the firm, the very small firm would still be technically inefficient and, second, the demand for accounting is a derived demand depending on the level of core activities.

Performance gaps for the Italian outsourcing associations, however, indicate a strong technical issue that points towards a significant re-engineering potential for these large established accounting providers. In contrast, the performance gaps for Accountex and Casson Beckman, the two UK providers, are primarily scale-driven, demonstrating the growth potential to expand to remedy scale inefficiency through growth and client acquisition.

Conclusions

The paper was motivated by the need to reduce the information disadvantage small firms face in their make or buy decisions. A procedure called data envelopment analysis (DEA) was employed on a dataset of UK companies performing accounting internally and on domestic and international outsourcing providers to represent the multi-dimensional performance drivers

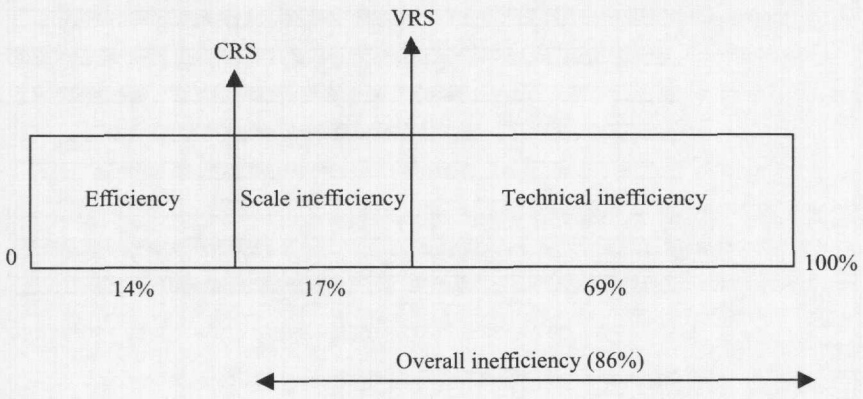


Figure 6.
The decomposition of DEA efficiency results

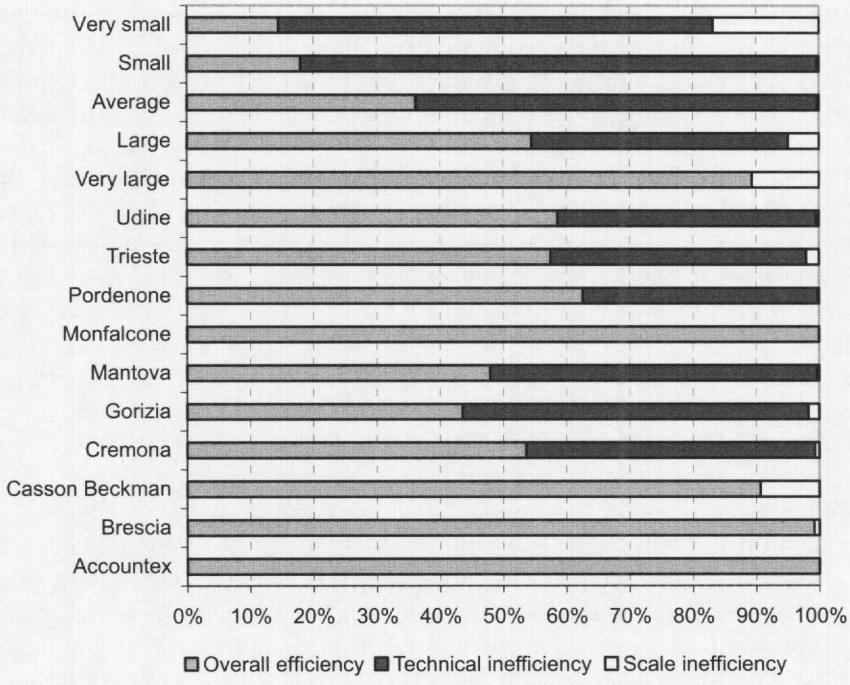


Figure 7.
Decomposition of efficiency for professional staff

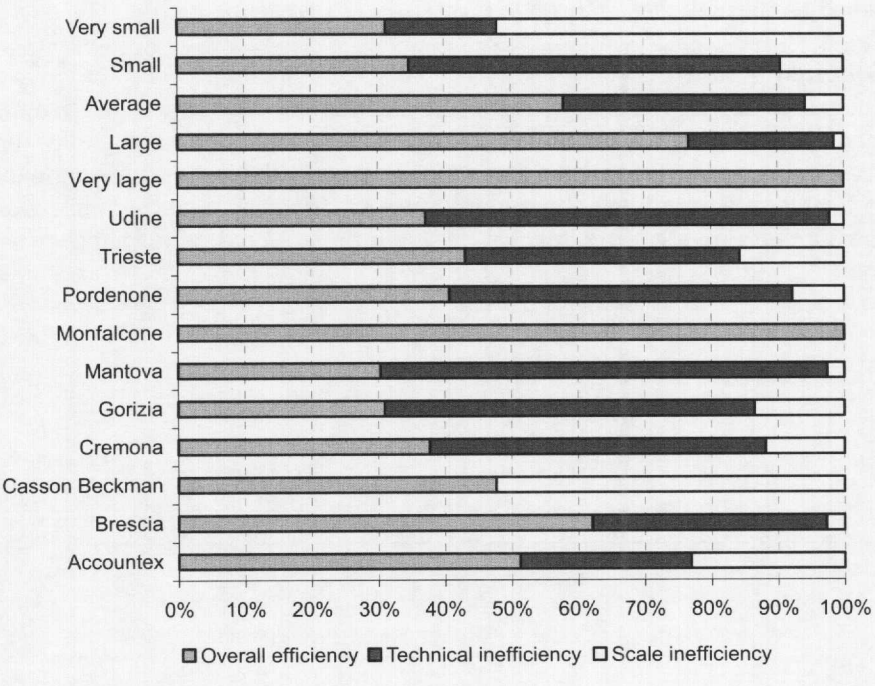


Figure 8.
Decomposition of efficiency for non-professional staff

that influence the amount of resources (and cost) devoted by alternative delivery channels to service accounting.

Utilising this procedure, we have been able to pin-point the most efficient delivery platform for accounting and to understand the reasons for deviations from the "ideal" performance frontier.

Three performance clusters were evident. The first was limited to a small number of Italian outsourcing providers and very large firms operating on the relative efficiency frontier. The remaining Italian outsource providers and the two UK providers participating, together with large UK firms, defined the second cluster. The third encompassed small and micro UK firms, all performing accounting in-house.

On this basis, the paper confirmed that all eight Italian providers, together with the two "new breed" of smaller SME financial outsourcing providers, all offer a more efficient platform for small firm accounting than in-house provision. This service advantage, though, is less significant relative to larger firms.

Taking this finding a stage further, the paper also tested for the presence of scale and/or technical factors in explaining observed deviations from the frontier. Since observed inefficiency was primarily technical in the small firm sector, the implication is that, should the business grow, the firms' accounting function would still be limited by technical inefficiencies that would not be supportive of the firms' core competence. Furthermore, since accounting is a derived demand, the small-scale inefficiency element in this sector limits the potential for remedying underperformance through internal re-engineering alone. In contrast, UK outsource providers could absorb the growth, since scale factors were significant in explaining the differential between current performance and the frontier.

Like the few SMEs in the UK which currently operate their financial activities on an outsourced basis, the outsourcers catchment area is small firms to operate in uncharted waters, since the potential from outsourcing has been ignored in this sector, and few parameters currently exist to simultaneously position and challenge the provision of accounting services. The scale inefficiency, though, in the small firm sector identified in this paper and the clear example of the Italian outsource structure in mitigating problems of establishing trust in outsourcing relations provide high incremental gain, if outsourcing gains momentum.

In the absence of such a coherent, collaborative structure in the UK, SMEs will continue to operate many of their non-core business support activities at a significant competitive disadvantage compared with their large counterparts.

Notes

1. Economies of scale arise when activities conducted on a large scale enjoy lower average costs than small-scale operations. Economies of scope arise where conducting two (or more) activities together offers economies relative to conducting them separately. Technical inefficiency reflects a failure to use best practice compared with other operations using the same resource.

2. Since the publication of Charnes *et al.* (1978), DEA has proved to be a useful tool in a wide variety of research, with total refereed studies exceeding 1,100 (Emrouznejad and Thanassoulis, 1996a, b). The major appeal of DEA is its ability to take account of all the important variables that affect a unit's performance.
3. Less the residual slack not taken into account by θ_i.
4. A benchmarking database was constructed from the response to a postal benchmarking survey, distributed to 4,000 small, medium and large companies. In all, the survey resulted in 400 usable responses (or a 10 per cent response rate) from all-sized companies.
5. The sample comprised 26 per cent small, 10 per cent medium and 64 per cent large.
6. While this development will encourage more businesses to consider comprehensive financial outsourcing in order to concentrate on their core activities, the sheer lack of provision promotes agency problems and information asymmetries
7. This difference is taken into account in the consideration of resource inputs used to service accounting in the differing outsourcing institutions.
8. Accounting for 43 per cent total cost, where financing costs represent 18 per cent, depreciation costs 9 per cent, other costs 30 per cent, (ICAEW, 2000).
9. Non-constant returns consist of either increasing returns (meaning that an increase in inputs would result in a proportionately greater increase in outputs); or decreasing returns (where an increase in inputs would result in a proportionately smaller increase in outputs).

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Appendix. DEA model

CCR Dual-input-oriented model

$\min_{\theta,\lambda,s,e} \quad Z_i = \theta - \varepsilon.u's - \varepsilon.v'e$

subject to:

$X\lambda = \theta X_i - e_i$ Constraint 1

$Y\lambda = Y_i + s_r$ Constraint 2

$\lambda, s, e \geq= 0$

$i = 1, \ldots, m; r = 1, \ldots, s$

Y and X = are the output and input matrices of the n DMUs in the model

X_i and Y_i = input and output vectors for the DMU_i being evaluated

θ = scalar factor that, applied to all inputs of DMU_i, brings resource consumption down to levels on the frontier and hence is the measure of efficiency (can be seen as efficiency of DMU_i expressed as a per cent of the best practice).

λ = vector of weight applied to efficient DMUs to obtain the "projected point" on the frontier of DMU_i being evaluated

ε = a non-Archimedean infinitesimal constant, a very small but strictly positive number

$u's$ and $v'e$ = vectors of the slacks in outputs and inputs respectively

n = number of DMUs

m = number of inputs used

s = number of outputs produced