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Efficiency, Profitability and Quality of Banking Services

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Efficiency, Profitability, and Quality in the Provision of Banking Services

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Abstract

This paper develops a general framework for combining strategic benchmarking with efficiency benchmarking of the services offered by bank branches. In particular, the *service-profit chain* is cast as a cascade of efficiency benchmarking models. Three models—based on Data Envelopment Analysis (DEA)—are developed in order to implement the framework in the practical setting of a bank's branches: an operational efficiency mode, a quality efficiency model and a profitability efficiency model. The use of the models is illustrated using data for the branches of a commercial Bank. Empirical results indicate that superior insights can be obtained by analyzing operations, service quality, and profitability simultaneously than the information obtained from benchmarking studies of these three dimensions separately. Some relations between operational efficiency and profitability, and between operational efficiency and service quality are investigated.

1 Introduction

Commercial banks—assaulted by the pressures of globalization, competition from non-banking financial institutions, and volatile market dynamics—are constantly seeking new ways to add value to their services. The question "What drives performance?" is at the top of the minds of managers and policy makers alike, as the first step in understanding superior performance and, hence, striving for it. Substantial research efforts have gone into addressing this question, starting from the strategic level and going down to operational details.

A key study benchmarking the strategies of leading retail banks was carried out by the Bank Administration Institute, see Roth and van der Velde (1992). This study—based on the opinions of heads of retail banking at all US commercial banks—established the linkage between marketing, operations, organizational structure, and human resource management in achieving excellence. These findings led to the formulation of the service management strategy encapsulated in the triad *operational capabilities-service quality-performance* (C-SQ-P), see Roth and Jackson (1995). The C-SQ-P triad is, in turn, a focused view of the *service-profit chain* described earlier by Heskett et al. (1994), based on their analysis of successful service organizations. This strand of research aims at developing a complete and accurate view of the links between the services provided by an organization and its bottom line (e.g., profits). Research based on case studies of successful organizations puts forth propositions on plausible links of the service-profit chain; empirically-based research—using surveys and other market data—aims at establishing the validity of the propositions.

In parallel to the investigations in identifying the drivers of performance, we have seen substantial research efforts in benchmarking the efficiency of commercial banks; see Berger and Humphrey (1997) for a comprehensive survey. Efficiency measurements, of course, imply an a priori knowledge of the inputs and outputs of a bank. For example, research on operational efficiency—the most widely studied efficiency issue—assumes as inputs the resources of a bank (e.g., personnel, technology, space etc) and as output some measurable form of the services provided (e.g., number of accounts serviced, or loans and other transactions processed etc). More recent innovative studies benchmark the effects of human resource management practices (Harker and Hunter 1997), look into the efficiency of alternative delivery processes (Frei 1995), and investigate the effects of the environment (Athanassopoulos et al. 1997). These efficiency benchmarks are constructive: not only they identify the most efficient unit—bank, branch or delivery process—but they also aid in explaining efficiency differences, see, e.g., Berger and Mester (1997).

How does *strategic benchmarking* relate to *efficiency benchmarks?* Simply put, strategic benchmarking identifies the links of the service-profit chain, while efficiency benchmarks focus on one link at a time, and ask which units in the benchmarking set have the most efficient link. For instance, Roth and van der Velde (1991) point out that top retail banks excel in operations, among other things. Berger, Leusner, and Mingo (1994) benchmark the branching network of a large U.S. commercial bank in order to establish its operational efficiency and prescribe changes that would lead to improved operations. Strategic benchmarking tells us the things that really matter; efficiency benchmarks tell us how to do these things well.

We hasten to add that the interplay between strategic and efficiency benchmarks has not been made formal. True that most questions on efficiency benchmarks are based on our understanding developed from strategic benchmarks, but no scholarly work has been done in formally linking the two. The interplay is evident in the proceedings of the Wharton Conference on the Performance of Financial Institutions (Harker and Zenios 1997), but the only paper that makes a concrete step in bringing together these two lines of research is Athanassopoulos (1997). He develops an efficiency benchmarking method for linking service quality with profits and tests his method on a sample of retail bank branches. In the empirical results of his paper lies an important observation: incorporating multiple drivers of performance in the framework of efficiency benchmark studies yields superior insights than isolated efficiency analyses of different links of the service-profit chain. For example, Athanassopoulos demonstrates that enhanced improvements in X-efficiency of branches are obtained if we account for potential improvements in service quality as well.

In this paper we link operations, service quality, and profitability in a common framework of efficiency benchmarks. We develop the paper cognizant of the risks we are running in giving the impression we are attempting to put forth an all encompassing benchmarking framework. We are well aware that such a framework can not be developed as the issues involved are too many, highly complex, and intricately intertwined. To confound the difficulties we point out that the strategic benchmarking literature is far from being conclusive. The main theme of this paper is that several drivers of performance should be benchmarked simultaneously. It is not sufficient to identify the links of the service-profit chain, or to benchmark one link at a time. Several links should—and can—be benchmarked together, as integral parts of the chain.

At what organizational level should the broad benchmarking we advocate take place? Depending on the research or management issue at hand this benchmarking can be done either at the level of organizations (i.e., banks benchmarked against each other as whole organizations), or at the level of an organizational unit (e.g., branches of a bank's network, or the retail banking divisions of multiple banks benchmarked against each other). Strategic benchmarking is typically done at the level of organizations, while efficiency benchmarks have appeared at many different levels.

Our study is focused on the network of branches. Branches remain the major delivery vehicle of banking services in Europe and the performance of the branch network is bound to have a significant impact on the bank as a whole. Berger, Leusner, and Mingo (1994) discuss the benefits derived from branch efficiency analysis; we do not stop to review these benefits here, nor do we claim that branch benchmarking is the best way to proceed. In this paper we focus on the branch, since the commercial bank (in Cyprus) that sponsored the empirical part of our study was interested in gaining insights into the performance of its network of branches as a first step in assessing its ability to compete in a European market. (Cyprus is not currently part of the European Union, but accession talks are scheduled to start in 1997 and commercial organizations are taking active steps to prepare themselves for the change.)

The specifics of our development are as follows: In Section 2 we describe three links in the service-profit chain: operations, quality of services, and profits. For each link we propose an efficiency benchmarking model, based on the non-parametric technique of Data Envelopment Analysis (DEA), see, e.g., Charnes, Cooper and Rhodes (1994) and Appendix A. In Section 3 we suggest the framework for linking the efficiency models together. Section 4 operationalizes several aspects of our framework, applying it to the network of branches of a major commercial bank in Cyprus.

The paper makes several contributions: In addition to developing the general framework outlined above, some of the efficiency benchmarking models developed next are also new in the literature. The operational efficiency model relies heavily on existing literature; the profitability and quality efficiency models are new additions to the literature. Finally, the empirical results provide insights that have not been obtained from other studies. However, these insights are based on data from a single bank in a small and tightly regulated economy and it is not necessarily true that they are universally applicable.

2 Drivers of performance of bank branches: Some links in the chain

It is a widely held belief—originating in the days of the PIMS (Project Impact of Market Strategies) study—that quality is a key driver of profit performance. For example, Schoeffler, Buzzel, and Heany (1974) measured a positive effect of product quality on the return on investment for 57 corporations with 620 diverse business units. Today the focus has been on customer perceived quality, especially when dealing with service operations. The Bank Administration Institute project (Roth and van der Velde 1991) proclaimed customer-perceived quality as the driver of retail banking in the 1990s. The service-profit chain of Heskett et al. (1994) clarifies the role of quality, and its inter-relationships with operational aspects of a service organization. The arguments in Heskett et al. proceed as follows: *(i)* profit and growth are stimulated primarily by customer loyalty; *(ii)* loyalty is a direct result of customer satisfaction; *(iii)* satisfaction is largely influenced by the value of services provided to customers; *(v)* value is created by satisfied, loyal and productive employees; *(vi)* employee satisfaction results primarily from high-quality support services and policies that enable employees to deliver results to customers.

While this service-profit chain is yet to be validated using empirical data, it does provide the framework for efficiency benchmarking models. We develop in this section three models that can be used to benchmark the three links of the service-profit chain captured in the C-SQ-P triad. The first model deals predominantly with operations; the second deals with quality; the third deals with profitability.

It is important to note that there is not a unique way for building these models. For example, when we talk about service quality (SQ) do we refer to customer perceived quality, or quality as determined by some objective measures (e.g., queue length and waiting time), or quality as perceived by the branch's management (internal customer perceptions)? When we refer to profitability do we measure the efficiency with which costs are transformed to profits, or do we consider revenue growth as well? Answers to these questions, and details on the inputs and outputs of each model, can be determined based on the specific question at hand, and the availability of data. The next subsections describe in detail the three models—operational efficiency, quality efficiency, and profitability efficiency—as used to carry the empirical work in Section 4. The models are based on DEA, see Appendix A, and each one is specified simply by determining its inputs and outputs.

2.1 Operational efficiency model

There is a vast literature on models for benchmarking operational efficiency of bank branches. The literature, broadly speaking, adopts either a production approach or an intermediation approach. In the former case the branch is considered as a "factory" delivering services to its clients in the form of transactions. Benchmarking models examine how well different branches combine their resources (personnel, computers, space etc) to support the largest possible number of transactions. The intermediation approach considers various types of costs as the inputs, and those are combined to support the largest possible number of revenue generating accounts. Sherman and Gold (1985) motivate most of the research on the production approach, and Berger, Leusner, and Mingo (1994) proposed the intermediation model. The model described here does not differ in any essential way from other production models in the literature. See Zenios et al. (1995)nociteZZAS95 for further discussion of this model, its novelties and its use in practice.

2.1.1 Model inputs

The model uses two broad sets of inputs. One set captures the resources used by the branch. The specific inputs in this set are illustrated in Figure 1. The second set of inputs includes the number of accounts in different account categories. This information, while typically viewed as an output of a branch, is considered here as an input since it reflects the *micro-environment*. In particular, it reflects the steady state market conditions for the particular branch. The clientele structure is tightly linked to a specific branch, and it changes very slowly with time. Hence, for the purpose of a static analysis this information is part of the operating environment of the branch. Figure 1 also summarizes the types of accounts used as inputs.

2.1.2 Model outputs

The output of the model is the total amount of *work* produced by the branch in order to support the given client base. Work is the time expended in processing all transactions that take place at each branch during each day. The type and number of tasks required to complete a transaction are typically known through a work measurement system, and an accurate estimate of the "standard" time spent on each transaction is obtained from this system.

2.2 Quality efficiency model

The importance of achieving high levels of quality has been discussed extensively in the literature, especially when dealing with the service industry, see, e.g., Zeithamel, Parasuraman, and Berry (1990). Service quality (SQ) is considered by many as the key to gaining competitive advantage, and its importance for the Banking industry, in particular, has been documented in Roth and van der Velde (1991, 1992). It is difficult to find today a bank that has not initiated some kind of service quality improvement program.

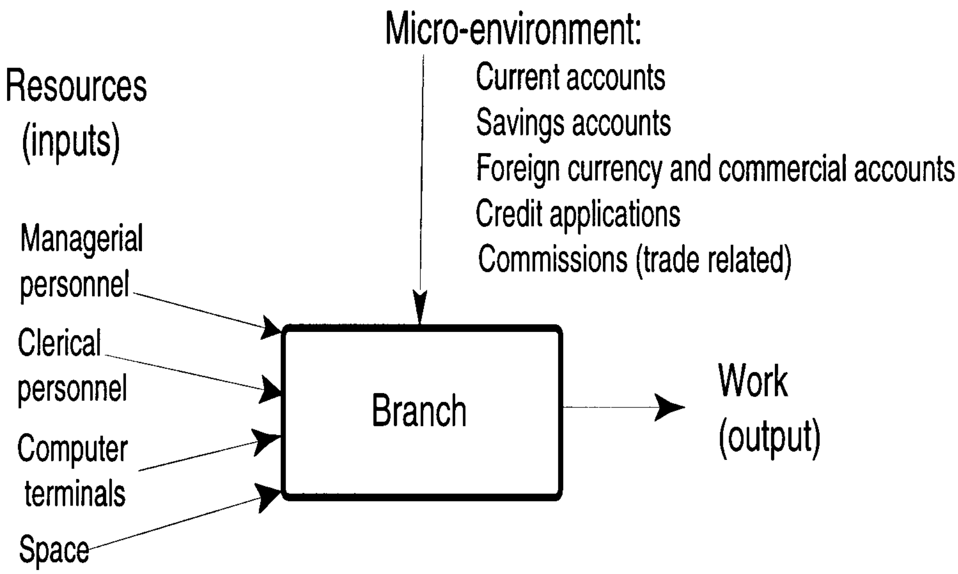


Figure 1: The inputs and outputs of the production model for benchmarking the operational efficiency of a branch.

One of the challenges that service managers face is *how* to deliver services of high quality (Parasuraman, Zeithamel, and Berry, 1994). The benchmarking model developed here assists in identifying those branches of a bank that deliver superior quality, and aid the rest in their quest for quality improvements.

Most efficiency benchmark models developed for bank branches consider operating efficiency and/or profitability (see Berger and Humphrey (1997) for an international survey of recent studies). The importance of delivering high volume of output of superior quality, although recognized, has not been incorporated in any benchmarking model in the literature. Branches ignoring service quality may report high volume of products and services offered, as well as profits, but lose their advantage in the long-run due to eroding service quality. The DEA model of this section benchmarks branches to identify those that utilize in the most efficient way their resources to deliver high quality to their clients.

2.2.1 Model inputs

The inputs of the model are those used for the operating efficiency model (see section 2.1.1). Other determinants of service quality, such as personnel

Reliability	The ability to perform the promised services accurately and dependably.
Responsiveness	The willingness to help customers and provide prompt service.
Assurance	The knowledge and courtesy of employees and their ability to convey trust and confidence.
Tangibles	The appearance of physical facilities, equipment, personnel and communication materials.
Empathy	The caring, individualized attention provided to the customer.

Table 1: Perceived dimensions of service quality.

training, education and so on, can also be incorporated in the input set.

2.2.2 Model outputs

The output of the model is the level of service quality (SQ) achieved. Service quality can be described in terms of *objective* and *perceptual* characteristics. Objective characteristics include such things as service time, call wait time, credit application approval rates etc. These characteristics are easily quantified. Perceptual characteristics on the other hand depend on the clients' perceptions which include dimensions of service reliability, responsiveness and so on, as summarized in Table 1. A number of different instruments for measuring SQ have appeared in the literature in the last decade, and the debate is still ongoing regarding the appropriateness of some of these instruments (Cronin and Taylor, 1992, Parasuraman, Zeithamel, and Berry, 1994). It is not our intention to develop a new SQ instrument, but rather to incorporate an existing instrument into our benchmarking framework.

The DEA quality efficiency model can analyze the process for delivering quality to clients in order to understand what are the *standards* of the objective characteristics that lead to a perception of improved quality. The quality standards developed are based on both the capabilities of the branch given its resources, and the customers' perceptions. Once the desirable standards are established we can then investigate means for achieving these standards utilizing each branch's resources. Figure 2 illustrates the quality efficiency benchmarking model as a two-stage process.

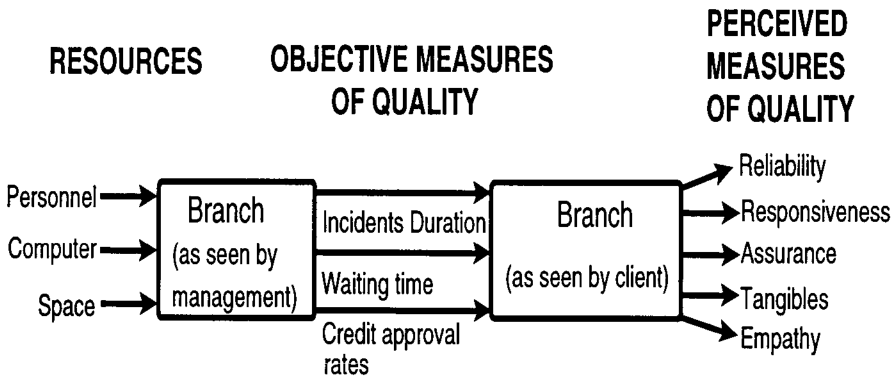


Figure 2: The two-stage model for benchmarking quality efficiency using both objective and perceptual measures of quality.

2.3 Profitability efficiency model

We now turn to the final link of the chain and address directly the issue of profitability efficiency. Substantial research has been done on this key issue, specifically for banks. Depending on the economic foundation assumed—cost minimization or profit maximization—alternative models have appeared in the literature, but they are all of the econometric type aiming at the calibration of cost or profit functions. These functions can then be used to assess whether a given bank (or branch) is operating at the most profitable (or least costly) point.

In this section we formulate the model for benchmarking the profitability efficiency of bank branches against each other, using once more DEA along the lines of the models for operational and quality efficiency. Several alternative models could be formulated depending on the economic foundation we assume. We concur with the opinion of Berger and Mester (1997) that "the profit efficiency concept is superior to the cost efficiency concept for evaluating the overall performance of the firm" and suggest a model for assessing profitability.

2.3.1 Model inputs

The inputs are—as in the previous two models—the resources used by the branch and the revenue generating accounts. We note here that for some types of accounts (e.g., savings) the "number of accounts" is indicative of the demands imposed on the branch's resources for service and maintenance,

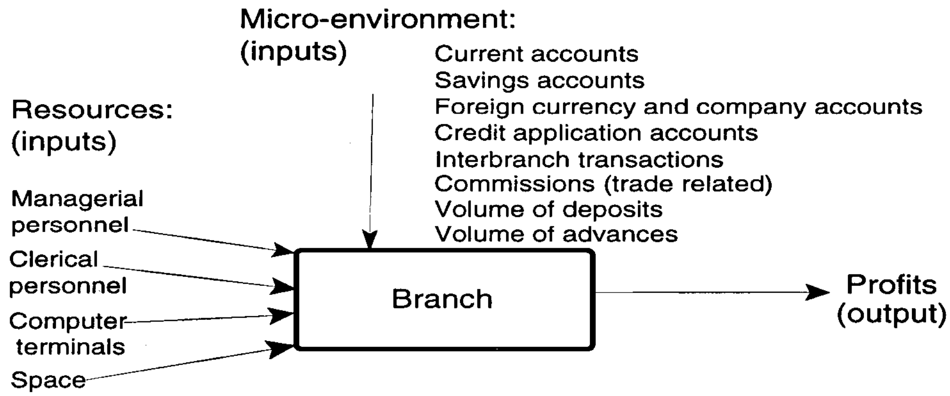


Figure 3: Inputs and outputs of the profitability efficiency model.

while the volume of deposits in these accounts is indicative of their contribution to profits. Hence, the accounts of each branch are measured differently than what was done in the previous models; see Figure 3.

2.3.2 Model outputs

The model given here addresses short-term profitability, and its output is the profit generated at each branch. Revenue growth could be incorporated as a more appropriate output, but then other inputs should also be included such as service quality, demographics of the region where the branch is located, and competition. The model can be trivially extended if such data is available.

A serious shortcoming of this model is that it adopts a production, as opposed to financial intermediation, approach to the branch's function. There is no measure of *risk* incorporated in the profit measurement. While the model can measure the efficiency with which branches generate profits, it fails to recognize any inefficiencies in the intermediation process as measured by high risk exposure. We stress that this shortcoming is common in the efficiency benchmarks literature, and an important research question is how to incorporate risk-adjusted measures of profitability in the efficiency benchmarks. Risk-adjusted measures of the efficiency of the financial intermediation process have been addressed by Holmer and Zenios (1995), and could be incorporated in an efficiency benchmark model. We also mention the empirical study by McAllister and McManus (1992) that explains efficiency differences in terms of differences in risk exposure.

3 Linking operations, quality of services, and profitability

We return now to the service-profit chain and recast it as a chain of efficiency benchmark models: We consider the branch of a bank taking as input one or more links of the chain, and delivering as output the next link(s). Homogeneous branches are then benchmarked against each other to identify those units that excel. These units indicate how the links of the chain should be put together to provide superior performance.

The sequence of the benchmarking models that capture all components of the service-profit chain are shown in Figure 4. This cascade of models can be used in two different ways (we will illustrate with results in the next section). One use is to run each model separately, and then correlate the results. For instance, the results of the operational and profitability efficiency models can be used to relate operating efficiency to profitability, see Section 4.4. Similarly, the results of the quality and profitability efficiency models can be used to establish the positive relationship between quality and profitability, see Section 4.5. Furthermore, by placing the branches on a two-dimensional space of performance—operational efficiency *vs* profitability, or quality efficiency *vs* profitability—we can identify the concerted managerial actions needed in order to improve performance. For example, a branch that is efficient on the operational side but inefficient on profitability can improve its performance by focusing on changes to the client base through marketing strategies. A branch that is operating inefficient will do well to focus first on the improvement of its operations. The Bank Administration Institute study (Roth and van der Velde 1991) found that "best-in-class retail banks develop both their operations and marketing capabilities simultaneously", and the benchmarking framework suggested here identifies precisely those branches of a bank for which the simultaneous development of capabilities is most beneficial.

An alternative use of the models is to use them in a cascade fashion in order to improve all the links of the chain. For example, the DEA model for operating efficiency can be used first to project all inefficient units onto the efficient frontier, thus removing operational inefficiencies. The virtual (i.e., efficient) units thus created can be used in the profitability efficiency model, thus identifying the most profitable units among the set of all units that are operating efficient. This approach identifies the efficient frontier of those units that are the most profitable when operating at peak operational efficiency. (See Section 4.4 for illustration of this approach with the empirical analysis of our data). Similarity, the quality efficiency model can be used to determine virtual units with superior quality, before these units are used in the benchmarking profitability efficiency. With this approach we determine the peak profitability of the branches in our test set, if they are all first reengineered to deliver superior quality. This approach has been adopted by Athanassopoulos (1997) in linking operational capabilities with quality of services, where further details of the DEA models can be found.

4 Applications to a commercial Bank

In this section we illustrate the application of the models developed above to a commercial bank in Cyprus. The bank we are dealing with is the major commercial bank of the country, with approximately 45% share of local market deposits. Its total assets in 1994 were CYP 2.03B (1 CYP $\approx$ 2 USD), and the before-tax earnings for the same period were CYP 20.3M. A full range of retail banking services is offered to commercial clients and individuals from 144 branches. These branches are scattered among the four major cities of the country and among various villages and tourist resorts. A total of 83 branches are located in urban areas, 41 are located in rural areas and 20 branches operate near tourist resorts along the coast of the island. All branches offer a full range of services: personal and company accounts, foreign currency accounts, and credit applications. However, depending on the client base, each branch is organized to serve better different kinds of business. For example, branches in the tourist regions offer more cash-based transactions (e.g., currency exchange, cashing of traveler cheques etc.), while major regional branches are organized to deal efficiently with commercial accounts, credit applications and the like. Branches are grouped into homogeneous sets (by location as *urban, rural,* or *touristic,* and by size as *small, medium,* or *large).*

4.1 Operational efficiency model

The operational efficiency model (Section 2.1) was applied to benchmark all branches of the Bank. Details on the use of this model and its managerial implications are documented in Zenios et al. (1995). Some of the major findings are reported here as an illustration.

The operational efficiency models assist the branch management in identifying those branches that are the group leaders, and can serve as yardsticks to guide the improvement of performance of inefficient branches. Table 2

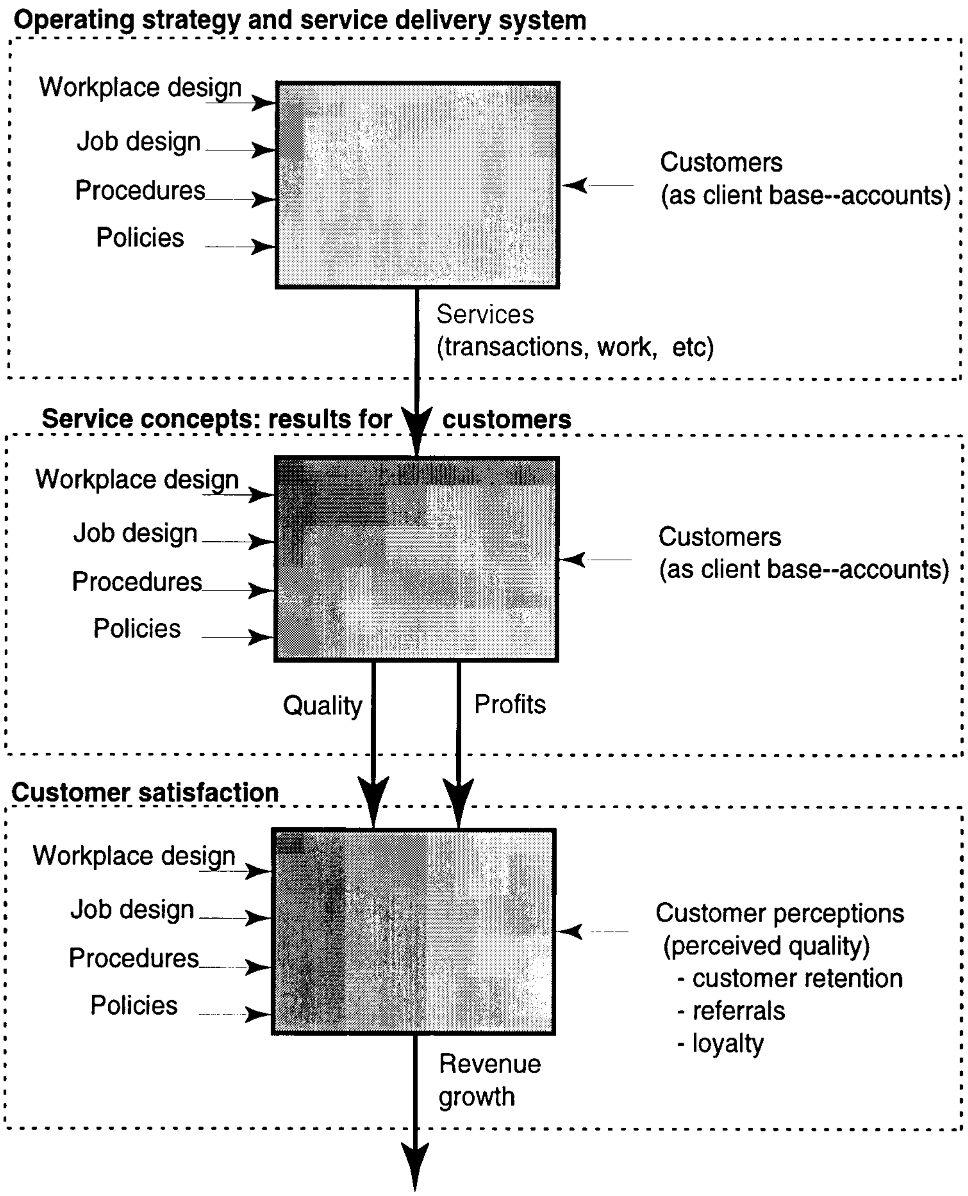


Figure 4: Benchmarking the components of the service-profit chain.

Inputs/Output	Branch X	Branch Y	Branch Z
Managerial personnel	1 (106 hrs)	1 (160 hrs)	1 (158 hrs)
Clerical personnel	2 (213 hrs)	1 (160 hrs)	3 (473 hrs)
Computer terminals	2 (206 hrs)	2 (310 hrs)	4 (612 hrs)
Working space (sq. m.)	120	40	186
No. of current personal accounts	107	54	181
No. of savings accounts	331	307	758
No. of forex/current company accounts	26	8	71
No. of credit applications	142	39	147
Output time (hours)	296	220	451

Table 2: Group leaders—or *yardstick* branches—among small urban branches.

summarizes the characteristics of the group leaders among the set of small urban branches.

The average efficiency of the urban branches is 92.4%, compared to 87.6% and 88.5% of the rural and touristic branches, respectively. These efficiency values are computed for each group separately, and can not be used to indicate which group is the most efficient. These results simply tell us that more urban branches are close to the efficient frontier than, for example, touristic branches. For whatever reasons, managerial practices of urban branches lead to better control of the efficiency of branches in this set.

We use now the model to isolate the environmental effects from the managerial effects. The process compares two groups, trying to identify if there are differences in efficiency among the branches in the two groups. The approach—which is similar to the one proposed by Charnes et al. (1981)—proceeds in three steps:

The Benchmarking Process for Comparing Groups of Branches

Step 1: Run the DEA model on the branches of each group separately, and project inefficient units on the efficient frontier, thus creating virtual units.

Step 2: Pool together the efficient and virtual units from both groups, as obtained in Step 1, and run the DEA model on the pooled data.

Step 3: Test the hypothesis that the average efficiency of the branches in the two groups, as obtained from the results of Step 2, are equal.

The small urban and touristic branches were pooled together, following the adjustments of Step 1. This adjustment removes managerial inefficiencies. The DEA model of Step 2 was then run to measure inefficiency of the pooled data, and measure the environmental effects. A Ryan-Joiner test was run to check for normality of the distribution of efficiencies obtained. As normality was rejected ($p < 0.01$), nonparametric analysis was conducted (Mann-Whitney tests) in order to assess whether the efficiency distributions from the two different groups were identical. The analysis revealed that branches operating in touristic areas are, on average, 6% more efficient than comparable branches in the urban areas ($p < 0.001$). Hence, the environment favors touristic branches, although the managers of these branches have, on the average, worse performance than the managers of the urban branches.

4.2 Quality efficiency model

We implemented the quality efficiency model consider SQ as perceived by the personnel of the branch. The perceptions from external customers are not always available, and collection of such information requires major market surveys and is expensive. SQ perceptions by the personnel of the bank are easier to measure as opposed to perceptions by external customers. Furthermore, there is evidence from the human resource management literature on the strong relationship between the perceptions of internal and external customers, Schneider and Bowen (1985). Hence, internal customer perceptions of service quality can be used as proxy for the—more informative but difficult to obtain—customer perceptions.

SQ perceptions were obtained using an instrument designed by a multidisciplinary team, based on SERVQUAL (Parasuraman, Zeithaml, and Berry 1988). A pilot study was first undertaken three months prior to data collection, during which a questionnaire was administered to the personnel of ten branches, with a response rate of 24%. Based on the results of the pilot study two items that were identified as inappropriate for internal customers were removed, and an overall measure of branch SQ was added. To increase the response rate a cover letter from the Bank management was attached to the questionnaire. The instrument was finally administered to the personnel of 28 medium branches, and 194 completed questionnaires were returned from 26 branches, which corresponds to a response rate of 82%.

Both input minimization and output maximization DEA models were run. The input minimization model provides information on how to reduce consumable resources while delivering the same level of SQ. The output max-

Inputs/Output	Branch X (actual)	Branch Y (virtual)	Peer of X (actual)
Managerial personnel (hrs)	3700	1460	3567
Clerical personnel (hrs)	12320	4340	11322
Computer terminals (hrs)	8768	3128	3227
Working space (sq. m.)	495	153	422
No. of current personal accounts	1211	312	1098
No. of savings accounts	5179	2044	4877
No. of forex/current company accounts	906	95	902
No. of credit applications	1851	448	1546
Service Quality (SQ)	5.6	5.6	??

Table 3: Description of branch X that delivers insufficient quality, a virtual branch that delivers similar quality utilizing less resources, and a peer branch of comparable size that delivers better service quality.

imization model sets goals for SQ that can be achieved given the resources utilized by the branch. Branch efficiencies, for the group of branches tested, varies from 39% to 100% with an average efficiency of 78.6%. Table 3 summarizes the characteristics of an inefficient branch, and the characteristics of the efficient (virtual) branch obtained by projecting onto the efficient frontier using input minimization. According to the table a virtual branch can be created that delivers the same SQ like our real branch utilizing less resources and a somewhat different account structure. We observe, however, that the virtual branch is much smaller in size than the inefficient branch, and since smaller branches are typically viewed as better SQ providers the size difference deems the comparison unfair. A careful examination of the peer branches helps in identifying efficient branches that are similar to the branch under consideration, thus providing the means for a fairer comparison and more meaningful managerial recommendations for SQ improvement. For example, Table 3 also presents the characteristics of one of the efficient branches that is similar in size to our target branch. A close look at the table reveals that the efficient branch utilizes much less computer resources to provide similar levels of SQ as the target branch. This observation points at the excess resources available at the target branch that should be used to improve SQ.

Another interesting observation from the results of the quality efficiency model is on the effect of the client base on the SQ efficiency of branches. For example, when the model is run without including the current accounts as

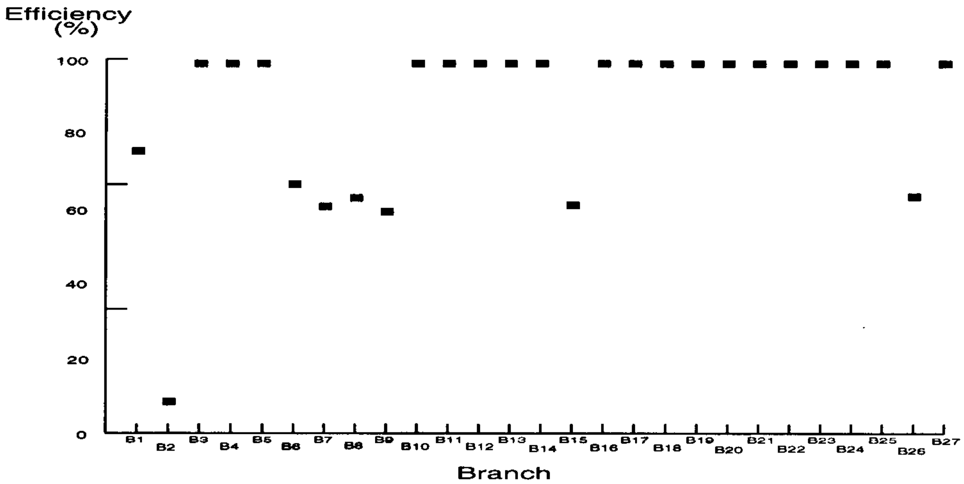


Figure 5: Profitability efficiency of medium urban branches.

an input a number of branches were deemed inefficient. When the current accounts were included some of the branches became efficient, suggesting that the high-quality service of these accounts may justify more resources.

4.3 Profitability efficiency model

The profitability efficiency model is run to analyze branches in the group of medium urban branches. Figure 5 shows the relative profitability efficiencies for the medium urban group obtained by the model. The analysis found that 19 of the branches are efficient (efficiency ratings ranging from 98 to 100%), one branch had efficiency less than 90%, and 6 branches have efficiencies in the range 65% to 80%.

While most branches of this group are efficient, there are 7 branches that deserve investigation. The DEA models provide information that can be used to improve the efficiency of the problematic branches. For example, the peer group of each inefficient branch is used in order to identify branches which appear most frequently as the target branches in peer groups. The branches whose characteristics are summarized in Table 4 emerge as the leaders of the medium urban group. While other branches are also efficient, those particular branches are used most often by the model to construct the virtual branch out of inefficient ones. In this sense, the four branches identified here can serve as the or the *yardsticks* of the group.

While identifying inefficient units the model can not place a monetary

Branch	**Y1**	**Y2**	**Y3**	**Y4**
Consumable resources:				
Clerical personnel	4	9	10	10
Supervisory personnel	3	3	5	4
Computer terminals	4	9	9	10
Working space (sqm.)	159	350	160	390
Revenue generating resources:				
Advances (volume)	1,089,834	4,914,437	12,393,208	7,883,106
Deposits (volume)	5,740,751	10,712,030	16,182,604	13,820,320
Commissions (trade related)	16,500	17,629	57,760	45,351
No. of credit application accts.	286	995	1,231	948
No. of current personal accts.	356	812	877	961
No. of savings accts.	2,617	4,801	3,092	3,727
No. of foreign currency accts.	99	208	405	908
No. of interbranch transactions	3,641	2,735	6,945	5,956

Table 4: Description of the yardstick branches for profitability efficiency of the medium urban group.

value on the identified inefficiencies. However, since cost information is available for the various resources used by a branch we can use the model to cost operational inefficiencies. The procedure is as follows:

The Procedure for Costing Operational Inefficiencies

Step 1: The operational efficiency model is run and inefficient units are projected on the efficient frontier using input minimization. Thus target values are obtained for each branch.

Step 2: The differences between the actual and target values of consumable resources (i.e. personnel, computers, space) are computed.

Step 3: The cost of the difference in consumable resources calculated in Step 2 can be estimated for each branch, since the unit cost of the resources is available. This is the additional profit that would be generated if all branches were to reduce their use of resources to achieve operational efficiency.

Using this procedure we are now able to identify the cost of inefficient operations of the branches. The total savings of consumable resources of each inefficient branch can be added to its profit. The results of this analysis for a 6-month period (July – December 1994) indicate that inefficient branches could reduce their costs by approximately 16,000 USD (on the average). While this amount is not trivial, we will see later that it is very small compared to what can be achieved if we focus on increasing profitability efficiency instead of reducing operating costs.

4.4 Linking operational efficiency with profitability

The joint results of the analysis with the operational and profitability efficiency models are illustrated in Figure 6. Branches fall into four categories, called stars, dogs, sleepers and cows. Sleepers are those branches that are highly profitable, while they are inefficient. Hence, their profitability can be further increased if they are awakened and improve their operational efficiency. Stars are the branches that match their superior operational efficiency with profitability, while cows are lagging in profits and a major reason for this is their operational inefficiency. Finally, for the dogs we conclude from our analysis that enhancement of their profitability can not come from improvements in operations, since they are already efficient on the operational side.

We can further use both the operational efficiency and the profitability efficiency model to cost the effects of inefficient operations and the costs of

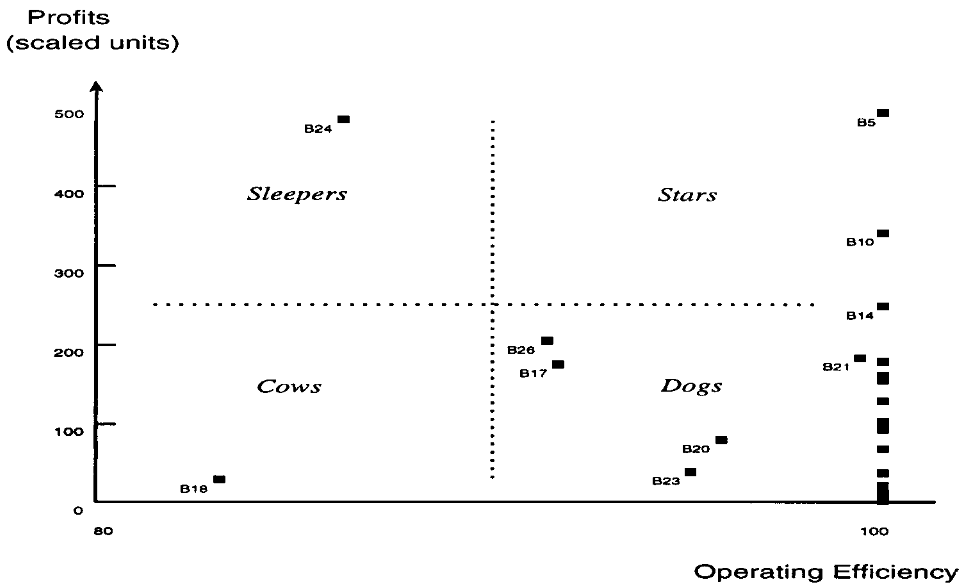


Figure 6: Profitability vs operating efficiency of medium urban branches.

offering inappropriate product mix at each branch. The profitability efficiency model considers both consumable and revenue generating resources as inputs. The consumable resources (personnel, computers, space) are operational variables whereas the revenue generating resources describe the product-mix of each branch. Since the cost of inefficiency due to operations has been determined in the previous section, it is now possible to identify the cost of inefficiency due to product-mix.

The procedure to cost inefficiency due to operations and due to product-mix is outlined below:

Step 1: The profitability efficiency model is run and inefficient units are projected onto the efficient frontier.

Step 2: The differences between actual and target profits are calculated. These additional savings in profits derive partially from the reduction in consumable resources and partially from the improvements in the product-mix offered at each branch.

Step 3: The differences between the actual and target values of consumable resources (i.e. personnel, computers, space) are computed, and the cost of consumable resources is estimated for each branch, since the unit cost and the level of utilization of resources are known.

Step 4: The total cost of inefficiency due to operations obtained in Step 3 is deducted from the total savings obtained in Step 2, giving the total cost of inefficiency due to product-mix.

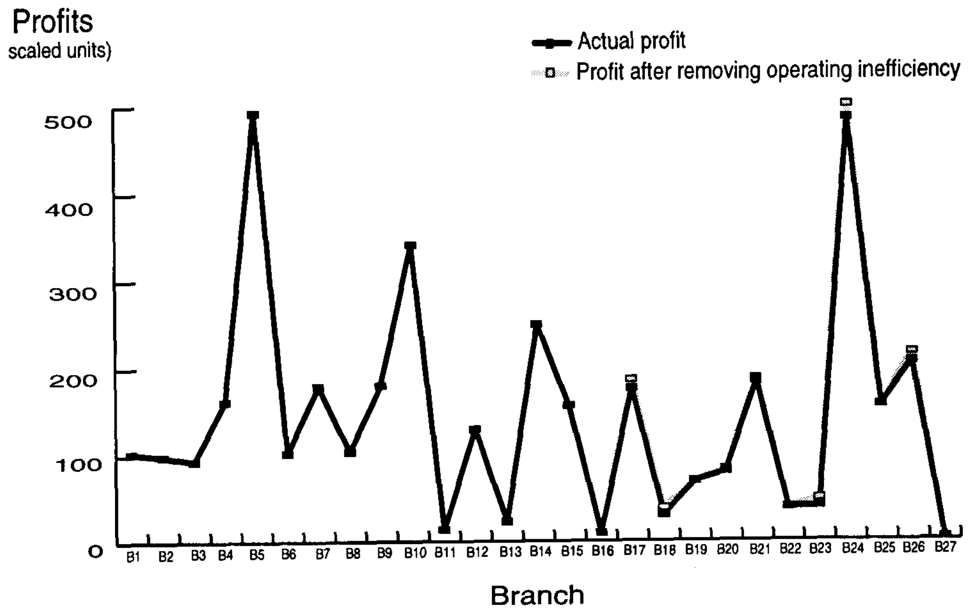
Using this procedure we are now able to separate the cost of inefficiencies into its two components. Figure 7 shows a comparison of the actual profit and the target profit for each branch as suggested by the profitability efficiency model. Note that some improvements in profits can be realized by improving operations (i.e., cost reduction), but substantial additional profits can be realized by increasing revenues. Summary statistics for the the 6-months period (July – December 1994) indicate that, for the group analyzed, there are potential profit increases of the order of 12%. Approximately 40% of this profit increase can be realized by reducing costs, while the remaining 60% can be achieved by adjustments in the product mix.

4.5 Linking operational efficiency with quality efficiency

The service-profit chain has emphasized the effect of operations on quality. Using the operational and quality efficiency models we can investigate this effect. (To our knowledge this is the first formal empirical analysis that supports this particular hypothesis of the service-profit chain. Most other related work has focused on the effect of quality on profits, and work on the relation between operations and quality has been based predominantly on case-studies and experts' opinions). Figure 8 clearly demonstrates the strong correlation between operational efficiency and provision of superior service quality. Most of the branches (66%) are efficient in their operations and in delivering SQ. Only 12% of the branches are efficient, but fail to deliver SQ and another 12% provide high quality while they are operationally inefficient.

5 Conclusions

We have developed a general framework for combining strategic benchmarking with efficiency benchmarking. In particular, the service-profit chain has been cast as a cascade of efficiency benchmarking models. Several models—based on Data Envelopment Analysis (DEA)—have been developed in order to operationalize the framework, and their use has been illustrated using data for the branches of a commercial Bank. Empirical results indicate that superior insights can be obtained by analyzing simultaneously operations, service quality and profitability simultaneously, than the information obtained from benchmarking studies of these three dimensions separately.



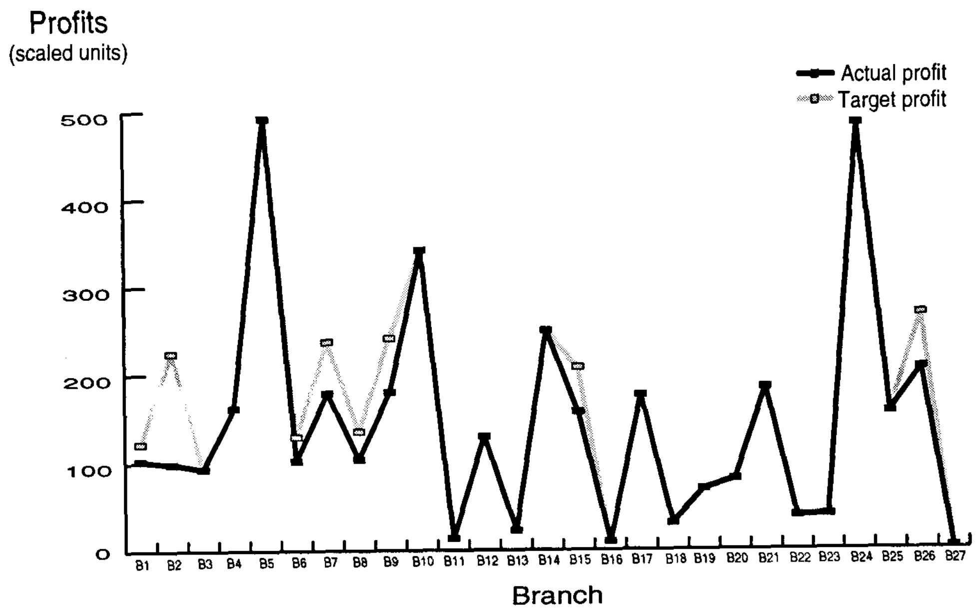


Figure 7: Profitability of medium urban group – Top figure: Actual profits and profits after removing the costs of operational inefficiencies. Bottom figure: Actual profits and target profits estimated by the profitability efficiency model.

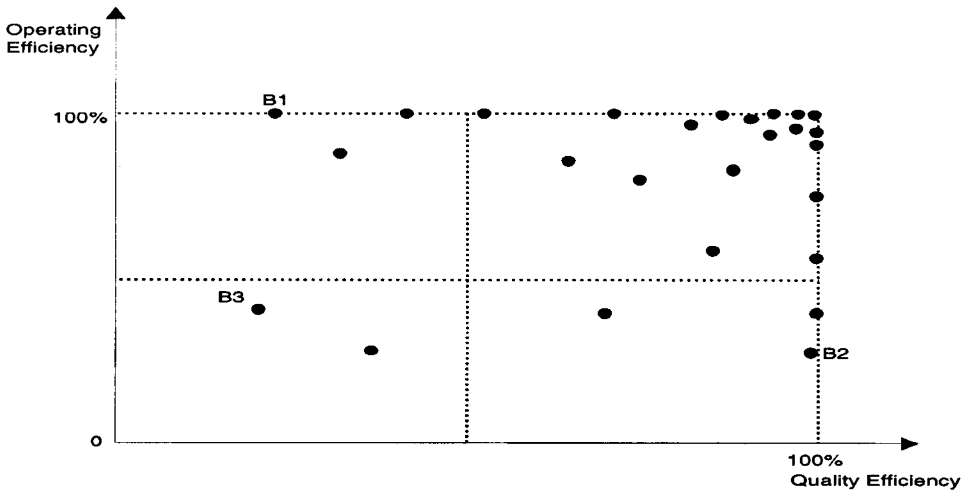


Figure 8: Relative branch position along the dimensions of operational and service quality efficiency.

Specific insights have also been reported for the analysis of the branches of the commercial bank that provided the data, although these insights are not necessarily generalizable due to the unique nature of the Bank we deal with.

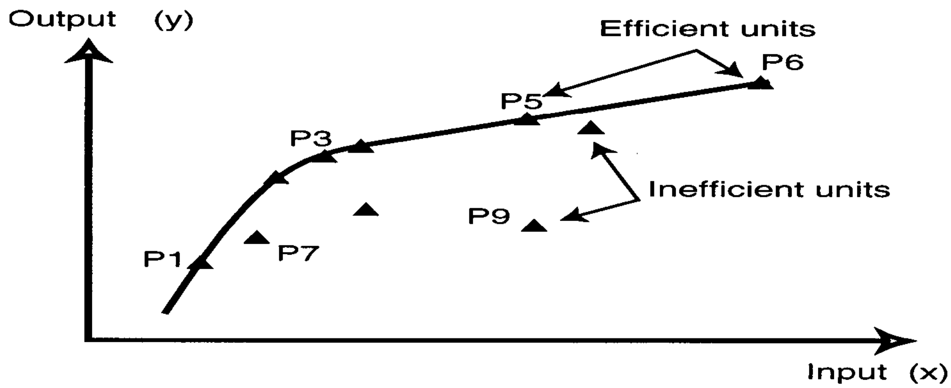


Figure 9: Relative efficiency of example decision making units.

A Benchmarking of Decision Making Units using Data Envelopment Analysis

Data Envelopment Analysis (DEA) is a technique developed by Charnes, Cooper, and Rhodes (1978) to evaluate the relative efficiency of public sector, *not-for-profit* organizations. Accounting and financial ratios are in those cases of little value, multiple outputs are produced using multiple inputs and the production transformations are neither known nor easily identified. DEA has been applied to the measurement of the operating efficiency of schools, hospitals, police districts, mines, the U.S. Airforce, and so on.

Simply put, DEA is a modeling concept via which several decision making units are mapped on to a space of inputs *versus* outputs. It then uses linear programming formulations to fit the envelopment surface. Units on the envelopment surface are efficient. Inefficient units can be projected onto the efficient frontier either by reducing their inputs or augmenting their outputs, thus creating *virtual* units that are close to the real ones but lie on the efficient frontier. DEA models that project units on the efficient frontier by reducing resources are termed *input minimization* models, and those that augment outputs are termed *output maximization* models. A DEA benchmarking model is unambiguously specified once we determine its inputs and outputs, and specify the linear programming formulation that fits the envelopment surface and projects the inefficient units on the efficient frontier.

To illustrate we consider the example in Figure 9 consisting of seven decision making units. Each unit consumes a single input *(x)* to produce a single output (y). These are the coordinates corresponding to points $P_1, \ldots P_7$.

DEA models establish that units P_1, P_2, P_3, P_4 are part of an *envelopment surface*. Unit P_5 could improve its operations either by *reducing* its inputs or by *augmenting* its outputs.

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