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# Strategy development in tourism destinations: a DEA approach

**Abstract.** The aim of the paper is to introduce an application of Data Envelopment Analysis (DEA) for benchmarking the efficiency of (tourism) service production processes on the level of tourism destinations. After a brief discussion of the latest benchmarking research studies in tourism, an efficiency model for tourism service processes will be developed (Parasuraman 2002). The latter postulates simultaneous consideration of major input resources needed to provide destination experiences (Vuorinen et al. 1998; Fuchs et al. 2002). Comprehensive efficiency measures for a benchmarking group comprising a total of 21 Tyrolean destination units are subsequently obtained by the aid of the Data Envelopment Analysis (Charnes et al. 1978). These empirical findings form the basis for a newly applied strategy development approach for tourism destinations. The paper concludes by discussing major strengths and weaknesses of the presented benchmarking approach and gives recommendations for future research.

**Keywords:** Destination strategy, data envelopment analysis, destination benchmarking, destination efficiency.
**JEL codes:** C52.

## 1. Introduction

Destinations are regarded as the amalgam of tourism products offering an integrated experience to tourists to be interpreted subjectively with respect to travel itinerary, cultural background, purpose of visit, educational level and/or past experience (Buhalis 2000, p. 97). Consequently, the goal of destination management is to assess the adequacy and effectiveness of the product, facilities, services, programs, and destinational resources that all together provide memorable destination experiences for visitors (Bieger 1998; Flagestad/Hope 2001). Hence, the core destination management activities are periodic monitoring of visitor satisfaction and regular resource stewardship involving effective maintenance of those resources that are highly vulnerable to damage caused by tourism (Crouch/Ritchie 1999, p. 149). Indeed, successful tourism destinations consider customer satisfaction as the most important source of their competitive advantage. Tourist satisfaction is regarded as a customer-driven measure of destination performance where the customer is the main source of information for identifying those *standards* that should be established in order to close potential performance gaps (Weiermair/Fuchs 1998; Kozak 2002).

As a quality management and improvement technique, benchmarking is defined as such '*standard* against which something can be measured or judged' (Camp 1989a, p. 248). Benchmarking is also thought of as the 'search for industry best practice that leads to superior performance' (Camp 1989b, p. 68). Similarly, Vaziri (1992) states that benchmarking is a continuous process comparing an organisation's performance against that of the best in the industry considering critical consumer needs and determining what should be improved. Some authors identified its benefits fourfold as showing organizations how to better meet customer needs, identifying their strengths and weaknesses, stimulating the continuous operational improvement and finally creating innovative ideas in a cost-effective way (Karlof/Ostblom 1994; Mentzer et al. 1995; Cox/Thompson 1998). Despite small differences, benchmarking definitions have one common theme: The continuous measurement and improvement of an organisation's performance against the best in the industry to obtain information about new working methods or successful practices. Thus, benchmarking approaches are built upon performance comparison, gap identification and change management process (Kozak 2002, p. 499).

## 2. Benchmarking in tourism

Benchmarking studies have been applied most notably to the manufacturing industry by stressing the link to total quality management (Johns et al. 1996). The few existing examples of benchmarking within the tourism industry are mainly those involving hotel operations (Morey/Dittman 1995; Boger et al. 1999; Wöber 2000) or applications in food and beverage management (Siguaw/Enz 1999). However, valuable benchmarking studies were recently performed also within the context of destinations (Thomason et al. 1999; Go/Govers 2000; Fuchs et al. 2002; Kozak 2002; Fuchs/Weiermair 2004). For instance, Kozak and Rimmington (1998, p. 184) have argued that there is considerable potential for improving service quality by means of benchmarking not only within the small tourism business sector, but also within tourist destinations. Particularly, they suggest: 'Benchmarking of a small organization against another is unlikely to make a real impact on destination image and tourist satisfaction […]; whereas destinations can benchmark the extent and quality of the small business component of their offering and plan strategically to develop it effectively, while tourists are likely to experience greater levels of satisfaction' (Kozak/Rimmington 1998, p. 185/187). Obviously, tourists may also benefit from a clearer indication of the services to be offered, so that their expectations can be matched more closely with performance which in turn can increase their satisfaction with the destination (ibid. 1998, p. 184).

### *2.1. Efficiency benchmarking in tourism*

Productivity is the key determinant of value being closely related to those factors which influence value, namely quality, service and price (Heskett 1990). As benchmarking issues are closely tied up with productivity comparisons, efficiency is expressed as the ratio of outputs to input resources of a productive unit *compared* to others (Hawdon/Hodson 1996). But in tourism, because of the nature of the tourism product, the measuring of efficieny is not without its problems and traditional productivity concepts will be less precise (Fuchs 2002b). The main obstacles with comparative productivity measurement in tourism are known as the definition problem, relating to the intangibility of the tourism output; the measurement problem, asking which units of measurement are appropriate; and the *ceteris paribus* problem, which makes comparing one tourism unit with another, or even the same unit over time, difficult to do (Jones/Hall 1996, p. 227; Fuchs 2002b). Historically, productivity is a construct of the manufacturing industry but applied to service industries. Partially, this has been possible because some services show elements of manufacturing in them (e.g. production-lining and/or the industrialisation of services). Nevertheless, it is not very helpful to think of services in terms of manufacturing, as both, manufacturing as well as service operations process some combination of the three principal productive elements, namely: material, information and people. Thus, for intensive people-processing operations (such as tourism) an only material focused conception of productivity is likely to be inappropriate, if not downright misleading (ibid. 1996, p. 228). Despite such reservations, productivity within tourism has up to date been considered at two broad levels: At the macro level, productivity considers the industry as a whole enabling policy makers and economists to compare one sector with another and/or to evaluate productivity improvements over time (e.g. Mayrhuber et al. 1998). Other studies have been carried out at the organisational level, in which the productivity of the firm is the focus of interest – usually the relative efficiency of one firm compared with another or the efficiency of one firm over time (see for example Witt/Witt 1989; Ball 1994; Johns 1996; Wöber 2000/02). Another common goal is the comparison of operating units within a chain (e.g. franchise) or affiliated group (Ball 1996; Fuchs 2002a). To summarize, the problems of efficiency measurement in tourism stem from the characteristics of services which have already been identified by Sasser et al. (1978):

- *simultaneity* refers to the fact that customers must be present for the service to be provided, so that production and consumption are simultaneous;

- *perishability* means that services have only little or no shelf-life; this is leading to the cliché that a restaurant seat not sold today cannot be sold tomorrow;
- *intangibility* of services represents the measurement problem, if it is not possible to quantify output, it is difficult to measure productivity simply as the ratio of input to output (Jones/Hall 1996, p. 229);
- *heterogeneity* means that customers react to service experiences in their own individual way; again, the measurement of output is almost impossible as each customer purchases in effect a very unique experience (ibid. 1996, p. 229).

### *2.2. An efficiency framework for tourism destinations*

Already in the 1980s, the manufacturing view began to be questioned by researchers in the business and operations management field (Heskett 1990). Gummesson identified a general shift away from the manufacturing paradigm based on goods towards the service paradigm derived largely from marketing and modern quality management (Gummesson 1994). The *customer processing* part of service operations is the central aspect of the new paradigm: It is as much an outcome of the work of the consumer as of the server, acknowledging that in paying for the service, customers are paying for something that they themselves help to produce (Jones/Hall 1996, p. 235). The quality of this outcome is mainly determined by both the interpersonal interaction between server and consumer as well as the value adding capability of the encounter as it assists in the making of choices, adaptation and customisation (Fitzsimmons/Fitzsimmons 2001; Parasuraman 2002). Also in the eyes of tourists, destinational services provide benefits, the value of which becomes the function of the elusive characteristics of service quality. Thus, from a destination management perspective they generate income while consuming resources. Figure 1 presents an efficiency framework for tourism destinations. It captures the company and the customer perspective of productivity and portrays the central role of service quality linking the two (Parasuraman 2002; Fuchs et al. 2002). Inputs provided by both the destination and tourists influence service quality, which in turn affects outputs as viewed from a destination and customer perspective.

Relationship 1, in line with the resource-based approach, captures the notion that as destinations channel more resources into the provision of services, tourists input should decline (Grant 1991; Mahoney/Pandian 1992)[1]. The moderating effect proposed by the market-based view of strategy and represented by link 2 suggests that the extent to which changes in destination inputs trigger changes in customer inputs will depend on how the destination can allocate available inputs (Porter

[1] The *resource-based view* suggests that competitive advantage is mainly derived from both the ownership of valuable resources which allows a performance better or cheaper than that of competitors as well as the building up of core competencies in order to combine various types of resources (Wernerfelt 1984; Von Krogh/Roos 1992; Collis/Montgomery 1995).

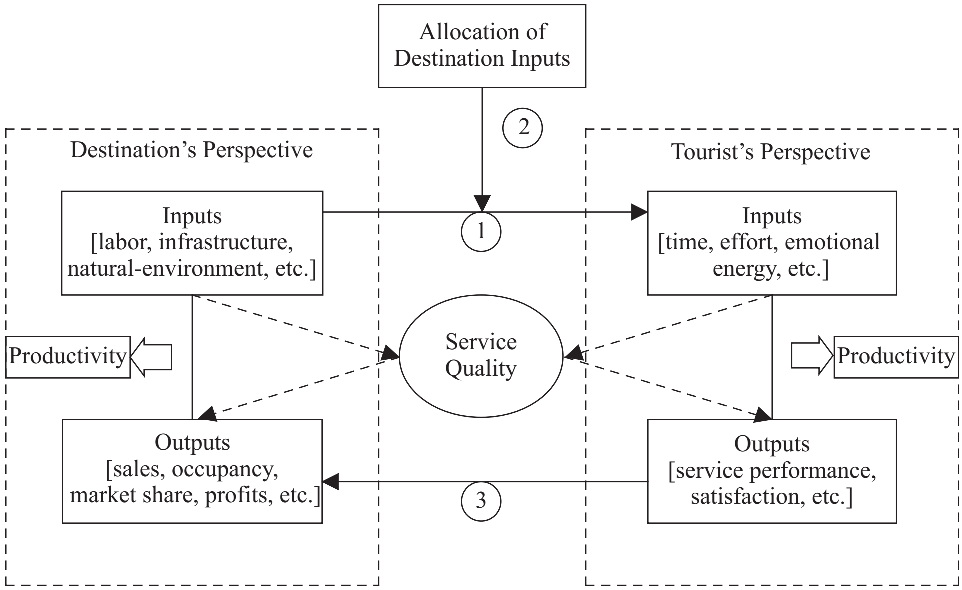


**Figure 1. Destination Efficiency Framework**
adapted: Parasuraman 2002, p. 8

1980, 1985; Osterloh/Frost 1996)[2]. Finally, relationship 3 demonstrates the positive impact of tourists' output on the output of tourist destinations (Parasuraman 2002, p. 8). Optimising tourism service quality, consequently, has two effects: On the one hand it should improve and/or secure the quality perceived by tourists. On the other hand it should make the conversion of destination inputs to outputs more efficient. Thus, destination management has to improve its multidimensional output rates and to control related resource inputs. Moreover, it may be argued that tourism services are produced by many subsystems that *jointly* deliver these services along a given destination service chain (Heskett 1990). In economic language, subsystems within destinations combine a number of input resources in order to transform them to desired output levels. Consequentely, both input resources as well as the economic output of these production-consumption processes should be considered simultaneously by comprehensive destination efficiency measures. A highly valuable technique to benchmark operational efficiencies of service units

[2] Porter (1980) looks at the firm as a collection of interrelated economic activities which require different resources to perform. Thus, the *configuration* of economic activities is the essential strategic task by relating an industrial organisation to its market environment concerning power and profitability (Flagestad/Hope 2001, p. 447). To summarise, competitive advantages according to the *resource-base view* emerge mainly from the heterogeneity of resources, whereas the *market-based view* focuses on their purposeful differentiation (Løwendahl/Revang 1997, p. 3).

is the data envelopment analysis (Charnes et al. 1978; Vuorinen et al. 1998)[3]. This benchmarking method has the ability to compare efficiencies of multiple service units (e.g. destinations) that provide similar (i.e. tourims) services by explicitly considering their use of multiple resource inputs to produce multiple outputs (i.e. tourism services) (Hawdon/Hodson 1996)[4]. The next section presents the model more deeply.

## 3. Efficiency benchmarking with Data Envelopment Analysis

Under the restriction that each unit's efficiency is benchmarked against its individual criteria (i.e. weighting scheme of resource configuration), efficiency of a target unit can be empirically obtained as a solution to the following problem: Maximize the efficiency *h* of unit 1 under the restriction that the efficiency of all other units within the benchmark group is ≤ 1. Hence, the upper efficiency limit is fixed at 100%. The algebraic Data Envelopment Analysis (*DEA*) model looks as follows:

$$\max \cdot h_1 = \frac{\sum_{r=1}^{s} u_{r1} y_{r1}}{\sum_{j=1}^{m} v_{j1} x_{j1}} \quad \text{subject to} \quad \frac{\sum_{r=1}^{s} u_{r1} y_{ri}}{\sum_{j=1}^{m} v_{j1} x_{ji}} \leq 1 \quad \text{for each } i = 1, 2, \ldots, n \text{ DMUs}$$

$h_1$ = Efficiency of unit 1 to be estimated
$y_i$ outputs of the $i_{\text{th}}$ unit
$x_i$ inputs of the $i_{\text{th}}$ unit

Variables to be estimated:
$u_r \geq 0$ for $r$ = 1, 2, …, $s$ different outputs
$v_r \geq 0$ for $r$ = 1, 2, …, $s$ different inputs.

However, to solve this fractional model with linear programming techniques a reformulation is required. The objective function must be restated as a linear function by arbitrarily scaling the inputs for the decision making unit under evaluation to a sum of 1 (Hartwich/Kyi 1999, p. 5; Fitzsimmons/Fitzsimmons 2001, p. 591). For each decision-making unit (DMU) the constraint equations are similarly reformulated into the so called *'multiplier form*'. This first *DEA* model was originally proposed by Charnes, Cooper and Rhodes and is referred to as the *CCR* model (Charnes et al. 1978).

[3] So far there exist some interesting tourism benchmark studies which have attempted to employ this technique (Johns et al. 1997; Mayrhuber et al. 1998; Tarim et al. 2000; Wöber 2000/2002; Fuchs 2002b).

[4] Data envelopement analysis corporates multiple inputs and multiple outputs into both the numerator and the denumerator of the efficiency ratio wihout the need for conversion to a common dollar basis. Thus, it circumvents the need to develop standard costs for each service.

$$\max \cdot h_1 = \sum_{r=1}^{s} u_{r1} y_{r1} \text{ subject to } \sum_{r=1}^{s} u_{r1} y_{r1} - \sum_{j=1}^{m} v_{j1} x_{ji} \leq 0$$

for each $i = 1, 2, \ldots, n$ DMUs

$$\sum_{j=1}^{m} v_{j1} x_{j1} = 1$$

$$u_r \, v_j \geq 0 \qquad \text{the } \textit{primal} \text{ model.}$$

To obtain efficiency results for each DMU in the benchmarking group, the linear programming problem (LP) must be solved *n* times, once for each DMU. For LP it is generally true, that the more constraints (e.g. DMUs) the more difficult the problem is to solve. However, for any LP it is possible to formulate a partner (i.e. dual) LP using the same data. The solution to either the original (i.e. primal) or the partner (i.e. dual) provides the same information about the problem being modelled. *DEA* is no exception to this, as switching to duality reduces the number of constraints in the model (Hartwich/Kyi 1999, p. 6). Hence, it is usual to solve the dual *DEA* model rather than the primal. The former is constructed by assigning a *dual variable* to each constraint in the primal model. The equivalent dual *DEA* model looks as follows:

$$\min \Theta \text{ subject to } -y_{r1} + \sum_{i=1}^{n} \lambda_{i1} y_{r1} \geq 0 \,;\, \Theta_1 x_{i1} - \sum_{i=1}^{n} \lambda_{i1} x_{r1} \geq 0 \,;\, \lambda_{i1} \geq 0$$

$\Theta_1$ = Efficiency score for unit 1 to be estimated Variable to be estimated
$y_i$ outputs of the $i_{\text{th}}$ unit $\lambda_1$ = *n*-dimensional constant
$x_i$ inputs of the $i_{\text{th}}$ unit the *dual* model.

Improvements for inefficient units are arrived at by proportionally reducing the inputs till they hit the envelope. However, many cases may be assumed when higher efficiency can be reached but not only through a proportional reduction of inputs. Rather, it may be sufficient to reduce only one input. The problem arises because of the sections of a piecewise linear frontier running parallel to the axes (ibid 1999, p. 7). In Figure 2 this is the case for DMU F and G (Coelli et al. 1998, p. 27). However, the variable $\Theta$ as included in the above mentioned *DEA* model cannot reflect this type of *unproportional efficiency increase*.

How can this problem be dealt with? Technically, the optimization has to include those extreme cases which run parallel to the axes. This can be achieved by replacing the constraint that the resource coefficients *u* and *v*, respectively, are $\geq 0$

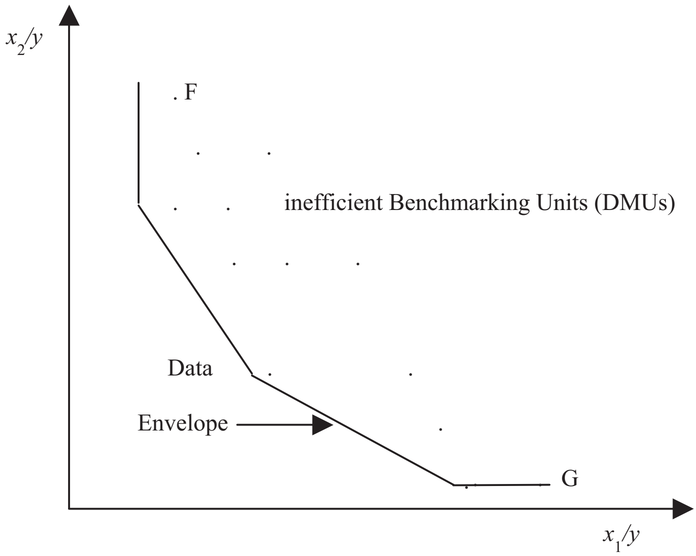


**Figure 2. Piecewise linear convex isoquant**
(adapted: Coelli et al. 1998, p. 27)

by the constraint that the latter are greater to some infinitesimal small positive quantity ε in order to avoid any input or output being totally ignored in determining the efficieny (Hartwich/Kyi 1999, p. 8). This concept leads to the following *DEA* model:

$$\max \cdot h_1 = \sum_{r=1}^{s} u_{r1} y_{r1} \text{ subject to } \sum_{r=1}^{s} u_{r1} y_{r1} - \sum_{j=1}^{m} v_{j1} x_{ji} \leq 0$$

for each $i = 1, 2, \ldots, n$ DMUs

$$\sum_{j=1}^{m} v_{j1} x_{j1} = 1; u_r, v_j \geq \varepsilon.$$

The corresponding dual problem changes to:

$$\min \Theta - \left( \sum_{j=1}^{m} \varepsilon s_{j1}^{+} + \sum_{r=1}^{s} \varepsilon s_{r1}^{-} \right)$$

$$\text{subject to } -y_{r1} + \sum_{i=1}^{n} \lambda_{i1} y_{r1} - s_{r1}^{-} = 0 \text{ ; } \Theta_1 x_{i1} - \sum_{i=1}^{n} \lambda_{i1} x_{r1} - s_{j1}^{+} = 0 \text{ ; } \lambda_{i1} \geq 0$$

ε = some marginally small, but positive value
$s_r^+$ = slack variables for $s$ outputs
$s_j^-$ = slack variables for $m$ inputs.

The above presented *DEA* model implies constant returns to scale (*CRS*). However, this assumption is only appropriate when all units are operating at an optimal scale. But economic reality, due to imperfect competition, resource constraints, process characteristics, etc., may cause a DMU not to operate at optimal scale (ibid. 1999, p. 9). To overcome this problem, a *DEA* model which explicitly considers variable returns to scale (*VRS*) may be defined by adding a *convexity constraint* $\sum \lambda_{i1} = 1$ to the above equation, meaning that under circumstances of variable returns to scale λ should add to one (Banker et al. 1984; Cooper et al. 2000):

$$\min \Theta - \left( \sum_{j=1}^{m} \varepsilon s_{j1}^{+} + \sum_{r=1}^{s} \varepsilon s_{r1}^{-} \right)$$

$$\text{subject to } -y_{r1} + \sum_{i=1}^{n} \lambda_{i1} y_{r1} - s_{r1}^{-} = 0 \; ; \; \Theta_1 x_{i1} - \sum_{i=1}^{n} \lambda_{i1} x_{r1} - s_{j1}^{+} = 0 \; ; \; \sum_{i=1}^{n} \lambda_{i1} \geq 1 \, .$$

The *VRS* model forms a convex hull of intersecting planes which envelope the data points more tightly than the *CRS* conical hull and, thus, provides efficiency scores that are greater than or equal to those obtained using the *CRS* model (Figure 3).

To summarize, *DEA* is able to compare a group of decision-making units (DMUs) in order to identify the relatively inefficient ones. *DEA* also measures the magnitude of these inefficiencies and discovers *strategies* to reduce these inefficiencies

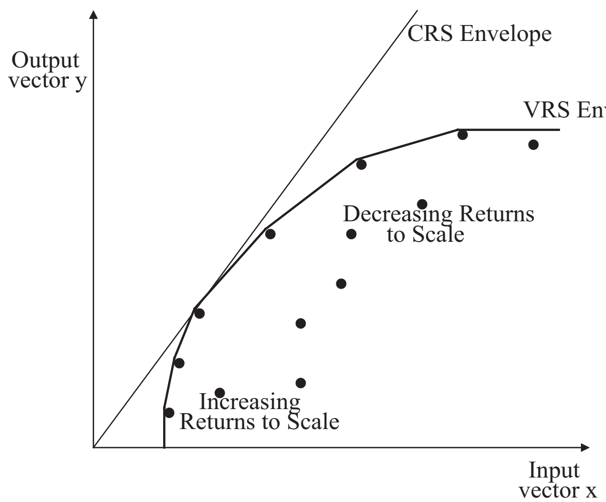


**Figure 3. CRS and VRS envelope**
adapted: Cantner/Hanusch 1998, p. 59

(Fitzsimmons/Fitzsimmons 2001). In practice, *DEA* portrays efficiency score values for each participating benchmarking unit and indicates optimal improvement paths by either suggesting which inputs should be saved (i.e. *input efficiency*) or by suggesting how much select output levels should be augmented (i.e. *output efficiency*). The next section employs the *DEA* approach in a tourism destination context.

## 4. A *DEA* application to tourism destinations

Since destination productivity may technically be defined as the ability to use inputs for providing services with quality matching the expectations of tourists, a *DEA* indicator should ideally consider variables which include both quantitative as well as qualitative dimensions of input and ouput resources. Particularly, (tourism) service output has to be seen as the *value* for the consumer (i.e. tourist) and for this reason destination output may be defined by its underlying quality levels (Vuorinen, et al.1998, p. 392). However, a fundamental dissimilarity with the concept of efficiency for a business (e.g. service) firm and a tourist destination remains. Among the latter, efficiency goals have to be related to a set of options, making destinations different in terms of ownership of assets, social structures, community involvement (i.e. stakeholder relations) and ecological implications (Fuchs et al. 2002, p. 27). Thus, strategic success for destinations has to be related to economic development, into which quality of life for the local community, quality of visitor experience and environmental concern are simultaneously integrated (Flagestad/Hope 2001, p. 450). Hence, in empirically measuring the progress towards more efficient production processes in tourism destinations, the perceptions of stakeholders are to be examined to identify the extent to which tourism fulfills the core elements of meeting the interests of local residents (e.g. quality of life issues regarding both social as well as economic factors), satisfying the requirements of tourists (i.e. value creation perspectives) and preserving the value of the natural environment (i.e. ecological aspects) (WTO 1993; Miller 2001; Flagestad/Hope 2001). Such a compound destination efficiency ratio may be comprehensively constructed as follows in the Figure 4.

### *4.1. Empirical results*

The below presented destination benchmarking approach using data envelopment analysis incorporates 21 tourism summer resorts for which both valid and comparable tourist satisfaction data on the community level exist. The data come from a study on tourists' satisfaction with destination quality carried out during the sum-

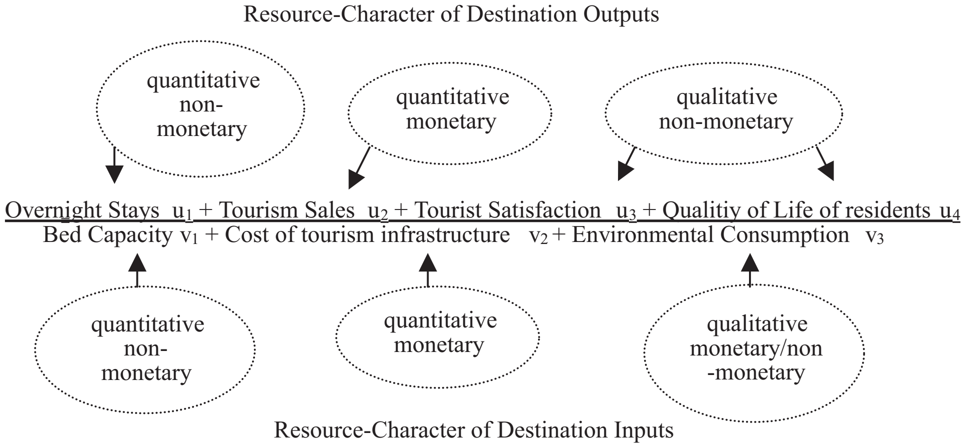


**Figure 4. DEA-Indicator to benchmark destination efficiency**
adapted: Fuchs et al. 2002, p. 30

mer season 2002 in 21 different Tyrolean tourism communities (Parasuraman et al. 1988; Fuchs/Weiermair 2004). Next to seven destination specific satisfaction areas which are typical for Alpine summer resorts (and are further discussed below) the questionnaire contained a total-satisfaction measure with the destination[5]. A total of 2,571 standardized interviews with tourists vacationing in the destination were arranged. Data regarding the quality of life of local residents have not been gathered. However, a monetary output dimension has been considered in the form of tourism sales. This figure was obtained at the level of tourism destination through price data for different hotel categories multiplied by the corresponding overnight stays during the summer season 2002 (Fuchs/Weiermair 2004). Next to this monetary based destination output and the qualitative output indicator of tourist satisfaction the below presented destination efficiency model has been constructed corresponding to the set of World-Tourism-Core Indicators for Sustainable Tourism (WTO 1995). To be more precise, at the input side next to the bed-capacity, destination input data have been available at the community level with regard to salaries for tourism employees (as a proxy for their qualification) and the energy and recycling costs which are devoted to tourism businesses. Furthermore, tourism advertising expenditures have also been included. However, the functional relationship between sales and media spending is less clear, as the advertising budget is often based on either recent and/or projected incomes. When tourism sales (or forecasts) are down, advertising is cut and when tourism businesses are on a roll destination management will

[5] The exact wording of this item is read as: „What is the degree of overall satisfaction with your holiday destination?“. The item was measured by an eleven-point Likert scale.

authorize larger campaigns. Thus, the relationship is reciprocal as the input-output effect goes in both directions. In order to take into consideration this non-recursivity phenomenon, tourism advertising costs have been defined as a *uncontrolled* input variable. Consequently, this specific resource dimension serves only to improve the comparability between the 21 tourism destination units included in the benchmarking approach using Data Envelopment Analysis. Figure 5 summarizes the final benchmarking indicator for measuring destination efficiency.

$$\frac{(\text{Price Level x Overnights})\ u_1 + \text{Tourist Satisfaction}\ u_2}{\text{Carrying Capacity}\ v_1 + \text{Advertising Costs}\ v_{contr} + \text{Energy \& Recycling Cost}\ v_2 + \text{Salaries}\ v_3}$$

**Figure 5. DEA – Indicator to benchmark destination efficiency**

In order to calibrate the proposed model an *output-maximising DEA* seeking to maximise output given current inputs has been chosen, since the modification of destination resources may be considered to be rather inflexible in the short-run. With regard to the scale assumptions a *variable* returns-to-scale model (*VRS*) has been considered to be most appropriate, as it is not to be expected that tourists may double their satisfaction level when, for example, the carrying capacity is doubled (Banker et al. 1984). For the benchmark group being made up of 21 different Alpine tourism destinations, the following efficiency score value's distribution emerged (Table 1)[6].

The first observation underlines that half of the benchmarking group consists of efficient destinations (i.e. efficiency score = 1). However, differences exist with respect to the *frequency* to act as peer unit for inefficient destinations. For example, unit 12 proved to serve 9 times as a reference for calculating efficiency score values for less efficient destination units (see again Table 1). Obviously, destination units 8, 21, 19, and 6 form 'their own' data hull, therefore, they do not play a role of reference in determining improvement recommendations for inefficient destinations. The latter, however, do not show a large variance in their inefficiency levels which on average stand at 0.946. For three inefficient destination units (i.e. unit 13, 20 and 16) an unproportional increase with respect to the two output dimensions has been considered as optimal (Coelli et al. 1998). For example, it is recommended to destination unit 20 to simultaneously increase its tourism sales by around 31% as well as its tourist satisfaction index by around 10% to become the best in class unit. For all other inefficient units a proportional output increase is proved as being optimal. Finally, to each inefficient unit corresponds a set of efficient units associated with it in defining its relative inefficiency (Fitzsimmons/Fitzsimmons

[6] *DEA* has been calibrated with the help of *Banxia Frontier Analyst* ® (available at Banxia Software, Glasgow G4 0LT, UK).

**Table 1. Efficiency results of Destination Benchnmarking with DEA**

| Destination unit * | Efficiency score | Reference frequency | Recommended improvement(s) in % |
|---|---|---|---|
| 12 | 1 | 9 | - |
| 4 | 1 | 6 | - |
| 9 | 1 | 5 | - |
| 5 | 1 | 4 | - |
| 3 | 1 | 3 | - |
| 11 | 1 | 1 | - |
| 14 | 1 | 1 | - |
| 8 | 1 | 0 | - |
| 21 | 1 | 0 | - |
| 19 | 1 | 0 | - |
| 6 | 1 | 0 | - |
| 1 | 0.9980 | - | 0.20 |
| 10 | 0.9911 | - | 0.91 |
| 13 | 0.9895 | - | 9.04 (sales) & 1.06 (satisfaction) ** |
| 18 | 0.9580 | - | 4.38 |
| 7 | 0.9577 | - | 4.42 |
| 2 | 0.9286 | - | 7.69 |
| 15 | 0.9240 | - | 8.22 |
| 17 | 0.9226 | - | 8.38 |
| 20 | 0.9081 | - | 31.59 (sales) & 10.12 (satisfaction) ** |
| 16 | 0.8916 | - | 56.92 (sales) & 12.15 (satisfaction) ** |

* For ensuring anonymity destination units are re-coded numerically

** Unproportiaonal efficiency increases resulted with regard to the two output variables tourism sales and tourist satsifaction (Coelli et al. 1998)

2001, p. 593). Knowledge about this *efficiency reference set* gives the destination management a clear picture about the similarity of its own resource configuration with that of efficient benchmarking units (i.e. *peer group*). Table 2 summarizes such reference contributions belonging to the efficiency set of destination unit 7[7].

**Table 2. Reference contributions of efficiency set for destination unit 7**

| Reference set for unit 7 | Tourism sales | Tourist Satisfaction |
|---|---|---|
| 12 | 0.633 | 0.452 |
| 9 | 0.261 | 0.142 |
| 4 | 0.106 | 0.406 |
| Total | 1.000 | 1.000 |

[7] These relative weights attached to each efficient unit in calculating the efficiency scores (e.g. for unit 7) are the *shadow prices* associated with the respective efficient-unit constraints in the LP-solution (Banker et al. 1984; Fitzsimmons/Fitzsimmons 2001, p. 594; Wöber 2002).

The latter results help destination unit 7 to better understand which benchmarking partners are most adequate to be involved into future learning processes and eventual co-operation endeavours for strategy development and management of change[8].

### *4.2. Strategy development with DEA*

The following section goes on to explicitly deduce strategic management implications for tourism destinations with the aid of *DEA*. A strategy is defined as a ‚pattern of resource allocation that enables one to remain or improve its own performance. Thus, good strategies neutralize threats and opportunities while capitalizing on strengths and avoiding weaknesses‘ (Barney 1997, p. 29). However, in a world where tourists‘ preferences are rather volatile and technologies for serving tourists‘ requirements are continually evolving, an only externally (i.e. customer) focused strategy orientation does not provide a secure foundation for a long-term strategy. On the contrary, the destination‘s own resources and capabilities are probably a much more stable basis on which to define its identity in terms of *uniqe selling propositions*. In other words, for a destination to enjoy a sustainable competitive advantage in a specific product-market segment, its tourism product differences must be reflected in one or more destinational attributes that are key buying criteria (Bharadway et al. 1994, p. 84). Hence, a definition of the destination product bundle in terms of, what it is *capable* of doing‘ may offer the most durable basis for strategy development (Grant 1991, S. 116).

As the number of co-specialized destinational assets needed to market and produce tourism services is rather high, one should ideally start at these destinational subsystems for identifying those strengths which are associated with typical resource configurations within the tourism resort value-chain under study. What is therefore needed for the development of well-grounded destination strategies is the recognition of those destinational areas which are highly typical of the specific destination resort in the eyes of the visitors. From a methodological point of view to overcome this analytical aspect two features should be regarded simultaneously. Firstly, the multidemensional character of the destination output as perceived by the customer (i.e. tourist) has to be explicitly taken into consideration (Parasuraman 1988; Weiermair/Fuchs 1999, p. 1011). Secondly, performance comparisons with the average and/or with the top-25 performer are less adequate than systematic comparisons with ‚best-in class‘ performers which are in addition also showing the most similar resource configuration in terms of their uniqueness (Grant 1991; Bharadway et al. 1994).

[8] Next to the quantification of inefficiency levels for benchmarking partners as well as the indication of specific improvement strategies, the identification of appropriate benchmarking partners for further and intensified learning processes is considered as the third main task of any Data Envelopment Analysis (Cooper et al. 2000; Fitzsimmons/Fitzsimmons 2001; Fuchs 2002b, p. 236).

It can now be shown that both of these analytical objectives can be coped with Data Envelopment Analysis. For this aim, the core destinational value-chain domains within Alpine summer resorts have been identified and operationalized by a set of indicator variables[9]. Hence, comparable satisfaction data exist for a total of seven different value-chain domains within the benchmarking group of 21 Alpine summer destinations (Fuchs/Weiermair 2004). Subsequently, this customer-driven evaluation of multiple destination output dimensions has been used to build up a holistic super-measure of destination efficiency. For this purpose, the input-side has been added by including typical resource configuration aspects of the destination, such as advertising expenditures, carrying capacity as well as tourism sales figures. However, for both, the advertising expenditures as well as for the sales figures there is no clear functional relationship with the multidimensional output of tourist satsifaction. Thus, these aggregations again serve purely to allow comparability between the benchmarking groups and are therefore fixed as uncontrolled input variables. Figure 5 summarizes the *DEA*-Indicator used to benchmark the performance of multiple value chain dimensions of destinations measured by the perceived tourist satisfaction.

$$\frac{\text{Accomodation } u_1 + \text{Restaurants } u_2 + \text{Attractions } u_3 + \text{Sports } u_4 + \text{Culture } u_5 + \text{Wellness } u_6 + \text{Shopping } u_7}{\text{Advertising Costs } v_{1\ contr} + \text{Carrying Capacity } v_2 + (\text{Price x Overnights})\ v_{3\ uncontr}}$$

**Figure 6. DEA – Indicator to benchmark destination value-chain configuration**

This *DEA* approach allows to empirically decipher most important improvement strategies for less performing resorts. The latter are derived at by the comparison of their performance values with those of the most similar *and* best performing benchmarking partner(s). Once again, a variable returns to scale (*VRS*) *DEA* model considering *output efficiency* has been employed. It can now be exemplary shown for the inefficient destination unit seven that its resource configuration is most similar to the (efficient) group of reference destinations 8, 19 and 12 (i.e. in descending order of importance). Obviously, if the destination output-value as experienced by tourists is broken down into its underlying (seven) satisfaction dimensions, a differing reference set emerges (see again Table 2). The most relevant information for strategy development, however, is obtained by the quantified performance gaps among the seven value-chain dimensions as experienced by tourists (i.e. tourist satisfaction). Table 3 summarizes the performance patterns for unit 7 (Column 2).

A performance comparison by *DEA* with similar destination units in terms of their unique resource configuration (i.e. *reference set* 8, 19 and 12) is leading to a

[9] The select destinational items are able to statistically explain the variance of a measure of total satisfaction with the destination at around 0.65 ($R^2$) (Fuchs 2002c, p. 308).

quantifiable base for strategy development. It can exemplary be shown for destination unit 7 that the main strategic target should be the qualitative improvement of the cultural offering component (Table 3). As deduced from the customers' (i.e. tourists)opinions, and hence also of strategic relevance is the quality enhancement of the wellness infrastructure as well as its corresponding services (Table 3).

**Table 3. Strategic targets for unit 7 among destination value-chains obtained by *DEA***

| Satisfaction dimensions | Actual | Target | Improvement UNIT 7 in % |
|---|---|---|---|
| Shopping | 3.81 | 3.93 | 3,02 |
| Wellness | 4.19 | 4.47 | 6,53 |
| Cultural offerings | 3.45 | 3.89 | 12,79 |
| Sport offerings | 4.41 | 4.55 | 3,02 |
| Attraction offers | 4.15 | 4.27 | 3,02 |
| Gastronomic | 4.18 | 4.38 | 4,8 |
| Accommodation | 4.65 | 4.79 | 3,02 |

The items were measured by a five-point Likert scale: 5 = highly satisfied 1 = not satisfied at all N = 150

# 5. Conclusions and research outlook

Efficiency benchmarking offers a first guide of measuring the well-being of tourism destination units and may need to be carefully addressed and measured for (Teague/Eilon 1973; Heap 1996; Fuchs et al. 2002, p. 26):

- *strategic reasons*, in order to compare the performance (i.e. productivity measures remain the basis for benchmarking) of a destination organisation with its competitors or with its strategic (i.e. co-producing) partners;
- *tactical reasons*, to enable performance control of the destination resort;
- *planning reasons*, to compare the benefits accruing from the use of different resource inputs or from varying proportions of the same inputs (i.e. destinational resource configuration structure).

Probably the greatest promise of destination benchmarking with *DEA* is that the difficult task of performance evaluation of geographically dispersed destination units can be reduced to a single super-measure (Morgan/Rao 2002, p. 123). Such a measure is tied directly to a destination organisation's strategy for competing in a specific product-market segment. *DEA* scores are particularly relevant and understood from destination managers to tourism employees, and across destination value-chain areas and are even linked to the customer (i.e. tourist). Thus, it may be suggested that super-measures obtained with *DEA* are highly relevant for all functional destination areas and sufficient to focus on destinational strategy development (Morgan/Rao 2002, p. 127). Indeed, the emphasis of strategy research is shifting away from central tendency explanations toward the development of theories of best practice. Hence, the opportunities of *DEA* modelling will multiply in the future. Also in tourism, the ability to identify high-performance organizations (e.g. tourism destinations) provides the basis for including best-practice theories of organizational design and strategy implementation (Lewin/Seiford 1997, p. 10; Fuchs et al. 2002). This would involve *DEA* analyses with case studies of high performance organizations defining the frontier of economic possibilities, to arrive at grounded theories of high performing tourism strategies.

The presented *DEA* benchmarking approach has outlined an enhanced quantitative technique to evaluate the efficient use of destination resources vis-à-vis multiple destination outputs. It suggests that this technique will facilitate a clearer understanding of the mechanisms by which destinations can meet their strategic goals of competitiveness (Fuchs et al. 2002). As a result, rather than copying what others are doing, benchmarking could be considered as a learning process for drawing lessons from one organisation and translating them into the unique culture and strategy orientation of the destination under study. In the very end, as a fundamental skill it enables destination management to continuously test its capabilities to uncover improvement opportunities to spur adoption of best practices and to press relentlessly toward ever greater performance (e.g. adaptive innovation). Thus, benchmarking destination resources with the purpose of maintaining and increasing their value are related to - and a precondition for - the strategic success of tourism destinations (Flagestad/Hope 2001). Unlike organisations that unwittingly foster insular, not-invented-here attitudes, successful tourist resorts will embrace a 'we-can-learn-from-everyone' culture (Bogan/English 1994).

As *DEA* is particularly able to combine the amalgam of multiple outputs compared to the aggregation of resource inputs into one super-efficiency measure by using production units that are the best in their class as reference material, the method is very much in line with the basic concept of benchmarking (Charnes et al. 1978; Banker et al. 1984). As a result, *DEA* brings out the resource profile's efficiency ranking of a destination unit and indicates optimal paths for improvement. Here, efficient destinations serve as reference units to further analyse and learn from best practices which should be adapted for sustainable tourism production (e.g. *throughput conditions*). To summarize, *DEA* is particularly powerful on account of the following strengths:

- *DEA* can handle multiple input and multiple output models;
- it does not require an assumption of a functional form relating inputs to outputs;
- DMUs are directly compared against a peer or combination of peers;
- inputs and outputs can have very different measurement unit.

The same characteristics, however, that make *DEA* a powerful benchmarking tool can also create problems. An analyst should keep these limitations in mind when choosing whether or not to use *DEA*:

- since *DEA* is an extreme point technique, noise (even symmetrical noise with zero mean) such as measurement error can cause significant problems;
- *DEA* is good at estimating relative efficiency of a DMU but it converges very slowly to absolute efficiency. In other words, it can tell you how well you are doing compared to your peers but not compared to a theoretical maximum;
- since *DEA* is a nonparametric technique, statistical hypothesis tests are difficult and are the focus of ongoing research;
- since a standard formulation of *DEA* creates a separate linear program for each DMU, large problems can be computationally highly intensive.

Finally, for the practical use of *DEA* in a destinational context, much further effort must be put into the selection of appropriate input and output indicators (Fuchs et al. 2002). However, big opportunities for a more intensive use of *DEA* applications in a destination setting are likely to grow in a multi-user Internet environment. Of course, there still exists a number of research problems to be solved in the future. The most important ones are summarised as follows:

- *DEA* models are static in terms of being instruments for one-period evaluations only. In reality, the behaviour underlying tourism production processes is likely to be dynamic because destination management may take more than only one period of time to adjust their resources to the desired levels (Wöber 2000, p. 458). Here, through real-time applications additional insights can be gained by multi-period analyses such as time series (Mayrhuber et al. 1998). Database systems can therefore convert the *DEA* model from an *ex-post* evaluation instrument to a prospective instrument supporting both budget and resource allocation decisions in tourist destinations (Wöber 2000, p. 458).
- Furthermore, if strategically differently oriented destinations are selected to benchmark with only one single *DEA* approach, potentially inefficient ones may be ranked as efficient because *DEA* allows each DMU to choose those weights that make it perform most favourably (Metters et al. 1999, p. 279). Thus, the benchmark groups should ideally be segregated according to their strategic directions and different models should be constructed for each homogenous destination cluster operating in the same market with similar strategies.
- Finally, *DEA* is a very useful quantitative benchmarking tool, but not the one that should be used in isolation. It must be emphasised that this step of the analysis should not be considered as the final one, but rather as the starting point for intensive further benchmarking exercises where efficient destinations serve as reference units (i.e. *peer groups*) to analyse the best practices which could be adapted for sustainable tourism through-put (i.e. production-process) conditions (Bogan/English 1994).

To achieve this, important feedback can be obtained from tourists' perceptions of their holiday experiences in peer-destinations and/or through applying benchmarking processes to observe and inspect how others are performing (Kozak 2002, p. 515). Thus, it is typically necessary to augment *DEA* benchmarking approaches with industrial engineering studies, operations research, simulation, cost accounting analysis, and above all, regular research in tourism satisfaction.

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