



# Benchmarking in civil aviation: some empirical evidence

Benchmarking in  
civil aviation

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## Abstract

**Purpose** – This paper aims to explore the use of best practice benchmarking in civil aviation.

**Design/methodology/approach** – Evidence was gathered from two international questionnaire surveys of the top 200 airlines and the top 200 airports. Supplementary evidence included interviews with airline and airport managers.

**Findings** – The profile of responses was a good match to the samples. Benchmarking was identified as the most used performance improvement technique for both airlines and airports. Larger airlines were more likely to engage in benchmarking. Ease of usage and the cost relative to other performance improvement techniques were important factors in determining benchmarking uptake. Problems of data comparability and competitive sensitivity were raised. Airports had a greater tendency to concentrate on benchmarking with similar organisations and placed a relatively greater emphasis on its use for performance measurement over process improvement.

**Research limitations/implications** – Further research should include a sample of detailed case studies to investigate exactly how different airlines and airports are using benchmarking.

**Practical implications** – Performance measurement has become increasingly important in aviation as markets become more competitive and the number of asymmetric shocks seems to increase.

**Originality/value** – The surveys revealed a very high utilisation of benchmarking, although a range of activities were actually being undertaken under the banner of benchmarking. The high uptake of benchmarking is probably due, to the turbulent nature of civil aviation that has placed significant economic pressures on managers.

**Keywords** Airlines, Airports, Benchmarking

**Paper type** Research paper

## Introduction

Airlines and airports face challenging, dynamic market environments that in the short term are extremely sensitive to the world economic and political situation. Long-term growth of around 4.5 per cent per annum in air traffic has been forecast (Airports Council International, 2003), but events such as September 11, the recent SARS



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outbreak and poor economic conditions have seen an overall stagnation and reduction of traffic during the period 2001 to 2003 although some market sectors have performed better. Historically airlines have made very low margins, 8 per cent on average. The pressure from competition, deregulated market forces and, in certain regions the challenge from low cost airlines, has presented management with the problem of how to improve airline economic performance. Airports have traditionally made much better returns than their airline business partners. Lack of direct competition, more stable and diversified income streams and public financing and ownership have contributed to their superior financial performance in the past. The introduction and success of retail and commercial non-aviation related business has continued to drive financial performance today. In general, airport management has moved from being focussed on operations under public ownership to an era where the management goal is to deliver a return on capital invested for shareholders, many of which are now private companies. The pressure on airport management to deliver improved performance across a diverse range of activities has increased over time in line with airports now being viewed largely as facilities that should be financially self sufficient.

This paper seeks to identify the nature and prevalence of benchmarking activity in civil aviation. It utilises primary source material from two international surveys of airlines and airports supplemented by interviews with airline and airport managers, to provide a picture of the current utilisation of benchmarking activities in civil aviation. The structure of this paper is as follows. The next section describes the research methods used. This is followed by a review of the prevalence of benchmarking in civil aviation compared to other performance management techniques. The final two sections of the paper look at benchmarking by airlines and airports respectively.

### **Research methods**

The set of airlines sampled was the top 200 airlines as ranked by, in terms of passenger kilometres performed, *Air Transport World* in terms of total passengers for 2001 (*Air Transport World*, 2002). The top 200 were chosen because it represented the major players in the industry who account for over 75 per cent of airline passenger kilometres performed. At the start of the survey, 12 airlines listed in the top 200 were no longer operating and therefore were deleted from the list. The next 12 airlines still in operation were added to make the sample up to 200. The set of airports sampled was the top 200 as ranked by ACI in terms of total passengers for 1999 (Airports Council International, 2000). The top 200 was viewed as an appropriate sample because these airports have approximately 3 million passengers or more per annum. There are significant economies of scale at this size (Doganis, 1992; Graham, 2001).

For both surveys, each questionnaire sent out was given a unique identification number to ensure repeat mailings were only sent to non-respondents. A copy of the questionnaire and a covering letter were sent out to airlines on 10 February, 17 March, 28 May and 27 August 2003 and to airports on the 15 August, 26 September and 7 November 2000. A total of 200 were sent out in the first mailing for both surveys. For airlines, two remained undeliverable and during the survey period a further two airlines ceased operations. Of the remaining 196 questionnaires, two airlines declined to participate and 43 were returned completed, a response rate of 23 per cent. For airports, five remained undeliverable. Of the remaining 195, four airports declined to participate and 58 were returned completed, representing a response rate of 32 per cent.

Information provided by a number of major airlines and some major airports was on the strict condition that they remained anonymous. Therefore no individuals or organisations are identified in this paper. The quotes reproduced in this paper were provided in answer to open ended questions in the survey instruments[1].

**Demographics and non-response bias**

The respondent airlines and the airlines in the sample were classified into geographic regions using the categories as defined in *Air Transport World* (2002): Africa/Middle East, Asia/Pacific, Europe, Latin America/Caribbean and North America[2] (Table I). The profile of the respondents was then compared to the profiles of the overall samples. In order to perform a chi-square test, the categories of Latin America/Caribbean, and Africa/Middle East were combined into a “rest of world” category for airlines and Latin America/Caribbean, Asia/Pacific and Africa/Middle East for airports so that the expected values of the categories were greater than 5. The chi-square tests showed that the profiles of respondent airlines and airports were not significantly different to the profile of the samples at the 5 per cent level (airlines:  $\chi^2 = 4.02$ , ns; airports:  $\chi^2 = 4.90$ , ns). However it should be noted that the actual probability for airports was 0.09. It can be seen from Table I that North American airports are proportionally over represented and the rest of the world under represented. This high response rate by airports in North America may be a consequence of the strong public utility ethos at North American airports with respect to public information provision. Overall the geographic spread of the respondents is a good match to the geographic spread of both of the samples.

The representativeness of the respondents can also be confirmed by examining the profiles of the total number of passengers handled per annum by the sample airlines and airports and the respondents (Table II). Chi-square tests showed that the profiles of the respondent airlines and airports were not significantly different to the profile of the samples at the 5 per cent level (airlines:  $\chi^2 = 2.19$ , ns; airports:  $\chi^2 = 1.14$ , ns). The range of number of passengers handled per annum by the respondents is a very good match to that of the samples.

**Benchmarking in the context of other performance improvement techniques**

The questionnaire instruments included a question aimed at identifying the relative usage made of performance improvement techniques (see Table III).

Region	Percentage of sample airlines (n = 196)	Percentage of respondent airlines (n = 43)	Percentage of sample airports (n = 195)	Percentage of respondent airports (n = 58)
Europe	37	52	40	38
North America	21	16	34	48
Asia/Pacific	23	16	17	10
Latin America/Caribbean	11	7	6	2
Africa/Middle East	8	9	3	2

**Table I.**  
Geographic profile of the respondents and the samples

It is noteworthy in the context of this paper that benchmarking was identified as the most used performance improvement technique for both airlines and airports. The evidence of benchmarking activity revealed in the two industries will be further considered in separate sections. Although the two businesses are inter-related, they are very different, so that direct comparisons between the two industries should not be made. However it is interesting to recognise that these distinctly different industries both use benchmarking to improve business performance more so than alternative performance techniques.

**The use of benchmarking by airlines**

Airline management has long recognised the importance of comparing airline performance both within the airline and in relation to the performance of other airlines. Cost data comparisons from published sources by organisations such as the International Air Transport Association (IATA), the International Civil Aviation Organization (ICAO), the UK Civil Aviation Authority and periodicals such as *Air Transport World* and *Aircraft Economics* are available for use by management to assess comparative performance and as a starting point for exploring the reasons behind the performance differences. Some of these differences can be explained by geographical variation in labour and other input costs. In addition to published statistics a number of reports providing “benchmark” statistics and comparisons of

**Table II.**  
Number of passengers handled per annum by the respondents and the samples

Passengers handled/million	Percentage of sample airlines (n = 196)	Percentage of respondent airlines (n = 43)	Percentage of sample airports (n = 195)	Percentage of respondent airports (n = 58)
1 to 4 <sup>a</sup>	61	51	30	29
5 to 9	22	26	29	24
10 to 19	8	9	19	23
20 and above	9	14	22	24

**Note:** <sup>a</sup>Only includes up to the 200th largest airline and 200th busiest airport

**Table III.**  
Performance improvement techniques used by respondents

Technique	Percentage use by airlines <sup>a</sup> (n=41)	Percentage use by airports <sup>a</sup> (n=56)
Benchmarking	88	72
Quality management systems (e.g. ISO9000/BS5750 or similar)	54	23
Balanced scorecard	44	25
Activity based costing	34	36
Business process reengineering	39	23
Total quality management (TQM)	22	41
Environmental management systems (e.g. ISO14000)	17	27
Value based management	15	9
Business excellence model/EFQM	7	12

**Note:** <sup>a</sup>Respondents could use more than one method

airline performance have emerged in recent years (Mason *et al.*, 2000; Morrell *et al.*, 2000; Transport Research Laboratory, 2002a). Quality of service indicators are collected by airlines internally and by International Air Transport Association's annual world passenger survey which monitors customer satisfaction with 29 aspects of airline service (IATA, 2002). Each airline can compare itself with the ratings for the rest of the sample to provide a measure of relative performance.

Although the literature identifies a range of data collection methods and a comparison of key performance indicators, the nature and prevalence of benchmarking activities more oriented towards process improvement within the sector have not previously been identified in a systematic way. The question of what formal mechanisms exist for benchmarking has largely remained a mystery. A prime motivation of this study therefore is to address this gap in understanding.

As illustrated in Table III, the level of benchmarking activity across the airline sector was high and more than confirmed the prior expectations of benchmarking prevalence. Table IV shows that international airlines from Europe, North America and Asia/Pacific demonstrated a higher propensity to benchmark, with Europe showing the highest propensity. These three regions are also the strongest performing regions in terms of world airline traffic.

In terms of airline size, larger airlines were more likely to engage in some form of benchmarking activity than smaller airlines (see Table V). Benchmarking was found to be a given part of airline management activity at all airlines handling ten million passengers or more that responded to the survey. This is consistent with the findings of Holloway *et al.* (1999) who found that larger organisations were more likely to benchmark than smaller ones. This said, the prevalence of benchmarking activity is still high among the airlines handling between one and nine million passengers per annum. During interviews, comments from airline management revealed that "benchmarking is a very good tool for improvement". Evidence collected suggested the

Region	Percentage benchmarking ( <i>n</i> = 41)
Europe	95
North America	86
Asia/Pacific	86
Latin America/Caribbean	67
Africa/Middle East	67
Overall weighted average	88

**Table IV.**  
Prevalence of airline  
benchmarking by region

Passengers handled/million	Percentage benchmarking ( <i>n</i> = 39)
1 to 4	80
5 to 9	91
10 to 19	100
20 and above	100
Overall weighted average	88

**Table V.**  
Benchmarking in relation  
to airline size

ease of usage and the cost relative to other performance improvement techniques were also important factors in determining its uptake.

Airline alliances were found to provide useful frameworks for benchmarking activity with the survey discovering that 49 per cent of airlines undertook benchmarking with alliance partners. Given the trend towards globalisation of the industry, benchmarking with alliance partners is a further means beyond the established commercial agreements of leveraging management benefits from alliances and creates a natural opportunity for benchmarking activity that ought to be less prone to data sensitivity and confidentiality issues.

The pressure for improved performance and the dynamic nature of airline management with respect to looking for new ways to measure airline performance is perhaps reflected by the surveys finding that 62 per cent of the airlines that responded to the survey had introduced new performance measures within the last two years.

The questionnaire instrument included the opportunity for respondents to describe their benchmarking experiences. Most comments were positive such as “it is good to check how we are doing and to identify industry trends” and “useful as a driver for creating a sense of urgency”. However although generally favourable, not all airlines reported equally favourable experiences. One respondent describing the outcomes as “unremarkable” and another commented that benchmarking was “difficult due to availability of data.”

There is a tendency for airlines to look within the industry for benchmarking partners (see Table VI) as opposed to benchmarking and learning from organisations that have similar processes but are part of non-air transport related organisations. “It was good experience, letting us position our company towards the other airlines” The value of comparison with similar organisations and the difficulties associated with obtaining certain commercially sensitive data was highlighted by a number of managers. One stated that benchmarking was:

Very useful even if, for commercial reasons, the exchange of information is limited and slow with competitors. Other airlines are very easy to approach and good at sharing process, and technology applications, experience. Naturally large culture and environment (and resistance sometimes) issues can make adaptation or replication difficult.

The problem of data comparability for benchmarking between airlines was highlighted by: “benchmarking can be of limited value due to widely different circumstances of benchmark”. Targets and benchmarking comparisons “have not always be(en) useful because data not always comparable.” Another airline manager reported that benchmarking partners were selected from airlines that were perceived to be non competitors, typically those operating in different geographic markets. Recent examples of benchmarking from the literature include Southwest Airlines learning about the low cost model of airline operation through visits and spending time with

	Using mainly similar partners	1	2	3	4	5	6	7	Using mainly dissimilar partners
%		13	43	13	22	3	3	3	
%		←	69	→		←	9	→	

**Note:** *n* = 32

**Table VI.** Comparator organisation used by airlines, similar or dissimilar?

Pacific Southwest Airlines in California. Likewise Ryanair spent time with Southwest Airlines to understand how to develop a low cost airline (Calder, 2002).

The selection of benchmarking partners from outside the industry can overcome issues of competitive sensitivity that can make access to certain information problematic. A well reported example of the benefits of this was the case of Southwest Airlines who benchmarked their refuelling and aircraft turnaround processes and practises against Formula 1 motor racing. The valuable lessons learnt improved their turnaround times from 40 minutes to as little as 12 minutes in certain cases (Murdoch, 1997). Lateral thinking and looking outside the industry for examples of best practice might assist management.

Benchmarking activity appears to be balanced between process improvement and performance measurement (see Table VII). For some airlines the perceived need is to develop an understanding of comparative performance, whereas for others the focus is on learning how to improve operations (processes). The balance may reflect the global reaction of the airlines to declining yields, a trend that has increased the pressure on airlines not only to manage the current performance of different business units but to look for opportunities to improve efficiency. The trend for full service airlines to look at and adopt different elements of the low cost model such as direct internet sales, one way fares and charging for snacks and drinks is just one example of process improvements based on learning from other industry participants.

Airlines use benchmarking as much for financial comparisons as for operational comparisons (see Table VIII). Financial benchmarking among airlines is reported by Feng and Wang (2000) and Doganis (2002). Benchmarking applied to operational practices being found to be roughly equally prevalent, and is interesting as relatively few examples of this are covered by the literature (Zairi, 1998). Evidence from interviews with managers showed that competing airlines were sharing engineering and maintenance data and met regularly to share knowledge, particularly when new aircraft types were being introduced into service (Francis *et al.*, 1999). Several competing airlines undertake maintenance for each other by agreement in different geographical regions. The competitive rhetoric of marketing departments is put aside

More to do with process improvement	1	2	3	4	5	6	7	More to do with measurement
%	3	28	12	13	16	16	12	
%	←	43	→		←	44	→	

**Note:** *n* = 32

**Table VII.**  
Is airline benchmarking focussed on process improvement or performance measurement?

Primarily financial measures	1	2	3	4	5	6	7	Primarily non-financial measures
%	3	3	19	44	16	12	3	
%	←	25	→		←	31	→	

**Note:** *n* = 32

**Table VIII.**  
Financial or non-financial benchmarking comparisons in airlines?

in favour of the commercial sense of pooling maintenance resources. There was one example of airlines within the same alliance sending personnel to check third party maintenance by partner airlines to ensure quality was being maintained and to share lessons learned from the airlines' own maintenance experience elsewhere in the world. A case study of Britannia Airlines revealed how they selected benchmarking partners who operated in different parts of the world (Francis *et al.*, 1999).

Benchmarking activity was focussed on comparisons with other airlines as opposed to benchmarking performance historically within and across different parts of their own airline (see Table IX). This is unexpected in some ways because airlines could easily and readily compare year on year performance across their network. This trend may be a further echo of the structural pressure in the highly competitive airline market where comparisons with other airlines might be seen as holding greater potential for performance improvement.

The significance of understanding the implications of work processes and activities of other airlines, particularly competitors, was further highlighted by comments made in response to the questionnaire survey. Airline management saw it as "critical to measure how we are performing, particularly against our competitors" and "with a main competitor we find it [benchmarking] a very valuable tool". Historic comparisons had been exploited by one airline in the wake of a merger to try and capture the best work processes and practices from the acquired airline: "having merged two airlines we are able to use historic benchmarking to a high degree."

Benchmarking was equally used for specific comparisons of particular tasks or activities and more general comparisons of general practices and performance (see Table X)

As well as using benchmark data from agencies such as those mentioned above, the airlines also frequently collected their own internal data. This was carried out through a variety of methods as illustrated in Table XI. Passenger questionnaires were the most prevalent method but most airlines used more than one way of gathering data.

In summary the airlines that responded to our survey reported a very high use of benchmarking activities. Most of those undertaking benchmarking reported favourable experiences. Tables VI to X illustrate the breadth of activities that

**Table IX.**  
Internal or external  
benchmarking  
comparisons in airlines

	Mainly internal comparisons	1	2	3	4	5	6	7	Mainly external comparisons
%		0	0	9	6	27	43	15	
%		←	9	→		←	85	→	
	<b>Note:</b> <i>n</i> = 33								

**Table X.**  
Is airline benchmarking  
concerned with specific  
tasks or general  
practices?

	Concerned with specific tasks	1	2	3	4	5	6	7	Concerned with general practices
%		0	18	24	16	24	15	3	
%		←	42	→		←	42	→	
	<b>Note:</b> <i>n</i> = 33								

subsumed airline benchmarking. The next section presents our empirical data on airport benchmarking.

### The use of benchmarking by airports

In this section the main findings of the earlier airports survey (see Francis *et al.*, 2002) are presented to give a more complete picture of benchmarking across civil aviation. Airport management has become more commercially orientated in response to changing ownership patterns; moving from management orientated towards operational goals in the past to management in the present focussed on making a financial return. Under private and more commercial forms of ownership, the pressure for improved performance has increased; a trend partly driven by the ever increasing demands of airlines that have identified the link between inefficient airport operations and increased cost implications (Oum *et al.*, 2003).

Historically airports have compared their outputs in terms of passengers handled, aircraft movements and freight processed. Financial and cost data, airport economic efficiency and retail performance has been benchmarked through a number of studies. Some of this work has identified instances of benchmarking between airports being used as a means of seeking improved airport performance (Graham, 2001; Centre for Airport Studies, 2001; Air Transport Research Society, 2002; Chartered Institute of Public Finance and Accountancy, 1980; Transport Reserch Laboratory, 2002b, Airports Council International, 2003). IATA surveys passenger perceptions of airport quality of service and allows airlines and airports to compare performance figures between over 50 airports (Tyler, 2000). In particular financial and operational performance has attracted the interest of government regulators seeking to protect the interests of airlines and consumers from airports oriented towards commercial success. Airports conduct surveys to examine the design level of service delivered to passengers and airlines in relation to benchmark standards laid down by IATA and ICAO (de Neufville and Odoni, 2003; Caves and Gosling, 1999). The survey reported here sought to identify if these “results benchmarking” (see Trosa and Williams, 1996) activities were typical of all benchmarking by airports or if other “process benchmarking” was taking place.

As reported in Table III, best practice benchmarking was the single most commonly used technique by airports with 72 per cent reporting some form of benchmarking activity. As with airlines, size seems to be an important factor. Airports with more than five million passengers per annum were almost twice as likely to engage in some form of benchmarking activity, than those with less than five million passengers per annum (83 per cent compared to 44 per cent).

Method	Percentage of respondents ( <i>n</i> = 39)
Passenger questionnaires	87
Passenger interviews	49
Focus groups	39
Comment cards	62
Other	26

**Table XI.**  
Methods of collecting  
performance  
measurement data by  
airlines

The airports questionnaire included similar questions to the airline survey, in particular questions about the nature of the airports' benchmarking practices. The questionnaire included a series of seven-point scales similar to the airline survey, on which respondents were invited to locate their experience of benchmarking. These scales are reproduced in Tables XII-XVI in order to illustrate the various characteristics of benchmarking experiences amongst the respondent airports.

Benchmarking was almost exclusively undertaken between similar organisations, almost invariably similar airports (see Table XII). One of the few

**Table XII.**  
Comparator organisation used by airports, similar or dissimilar?

	Using mainly similar partners	1	2	3	4	5	6	7	Using mainly dissimilar partners
%		14	40	24	16	3	3	0	
%		←	78	→		←	6	→	

**Note:** *n* = 37

**Table XIII.**  
Is airport benchmarking focussed on process improvement or performance measurement?

	More to do with process improvement	1	2	3	4	5	6	7	More to do with measurement
%		3	5	19	8	19	38	8	
%		←	27	→		←	65	→	

**Note:** *n* = 37

**Table XIV.**  
Financial or non-financial benchmarking comparisons by airports?

	Primarily financial measures	1	2	3	4	5	6	7	Primarily non-financial measures
%		8	21	21	32	3	10	5	
%		←	50	→		←	18	→	

**Note:** *n* = 38

**Table XV.**  
Internal or external benchmarking comparisons by airports?

	Mainly internal comparisons	1	2	3	4	5	6	7	Mainly external comparisons
%			8	24	8	21	10.5	18	10.5
%			←	40	→		←	39	→

**Note:** *n* = 38

**Table XVI.**  
Is airport benchmarking concerned with specific tasks or general practices?

	Concerned with specific tasks	1	2	3	4	5	6	7	Concerned with general practices
%		5	16	16	22	24	14	3	
%		←	37	→		←	41	→	

**Note:** *n* = 37

exceptions of airports engaging in best practice benchmarking with organisations outside the airport field was BAA plc who benchmarked car parking processes and passenger throughput flow control by examining the behaviour of Wembley stadium and Ascot race course.

A total of 78 per cent of respondents were engaged in benchmarking using comparative performance data. Virtually all the respondents compared themselves exclusively to other airports, engaging in what can be considered competitive benchmarking (see Camp, 1989). Only two airports indicated that data were used from a different industry sector for a similar function (functional benchmarking), for example comparing data on baggage trolley availability with large shopping centres. One airport merely compared their performance with their own previously collected data.

Some 65 per cent of airports that used benchmarking reported using it mainly for measurement purposes rather than process improvement (see Table XIII). In theory at least, it may be possible for many of the respondents to gain more benefits in terms of performance improvement from benchmarking in the future if they place more emphasis on learning from the processes that are generating the relative measures of performance.

Table XIV indicates that on balance benchmarking was concerned more with financial than non-financial measures. Given the numerous examples of “results benchmarking” by industry agencies referred to above, it is not surprising that there was also a tendency to focus on results more than the underlying processes. This compares with the airlines, where there was a slightly higher tendency to focus on process improvements and non-financial qualitative factors. The authors suggest that further benefits from benchmarking may be realised if airport managers consider looking for exemplar practices of the processes they are trying to manage and improve at dissimilar airports or even generic examples within other industries. However, it is acknowledged that such approaches would be more difficult to carry out.

Table XV shows that both internal and external comparisons are in similar use. It is interesting to compare this to the airlines that used a much higher degree of external comparisons (88 per cent).

Table XVI demonstrates that benchmarking experience related to specific tasks and general practices were fairly evenly split. This is perhaps a reflection of the range of different activities in the name of benchmarking.

Overall the airports responding can be seen as having a greater tendency to concentrate on similar organisations (other airports!) and place a relatively greater emphasis on the use of benchmarking for performance measurement over process improvement. Airports in common with the airlines generally reported positive experiences of their benchmarking activities. However difficulties were encountered in identifying suitable and willing partner organisations that allowed the sharing of comparable data, and being able to do like with like comparisons. One manager summarily captured the feeling of many survey respondents that for benchmarking it is:

Challenging to get needed information and to ensure apples to apples comparisons.

The growth of airport groups, particularly those that are building a global portfolio, will mean that airports within these groups will have advantages in terms of access to

data that would otherwise be considered to be confidential. These airports will be afforded greater opportunity to exploit inter-airport learning.

### Conclusions

The two surveys presented in this paper demonstrate evidence of the widespread use of benchmarking in civil aviation. The high uptake of benchmarking is probably due, in part, to the turbulent nature of civil aviation. This places significant economic pressures on managers, who have frequently turned to benchmarking as a means of improving the performance of their organisations. Whilst not all the experiences were equally successful, the tendency was for them to be considered as beneficial.

Although benchmarking is widely used in civil aviation, the nature of these activities is variable in terms of how and what information is collected and the use(s) made of it. The move towards airline alliances and airport groups has facilitated the availability of benchmarking partners. There are differences between the airlines and airports in terms of some of the specifics of the benchmarking activities. This is not surprising given the different (although inter-related) nature of the industries. What is perhaps more surprising and interesting is the range of activities within each sector taking place in the name of benchmarking.

### Notes

1. Copies of which are available from the authors.
2. In fact ATW distinguishes between Canada, US majors, US nationals, US cargo and US regional/specialty. For the purposes of this research these were all coded as North America.

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