



# A review of literature on benchmarking

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**Abstract** *Benchmarking is recognised as an essential tool for continuous improvement of quality. A large number of publications by various authors reflect the interest in this technique. Reviews of literature on benchmarking have been done in the past by a few authors. However, considering the contributions in the recent times, a more comprehensive review is attempted here. In this paper, the authors have reviewed benchmarking literature in a way that would help researchers, academicians and practitioners to take a closer look at the growth, development and applicability of this technique. The authors have examined various papers and have proposed a different scheme of classification. In addition, certain gaps that would provide hints for further research in benchmarking have been identified.*

## Introduction

Decision makers are constantly on the look out for techniques to enable quality improvement. Benchmarking is one such technique that has become popular in the recent times. Though benchmarking is not new, it has now found more subscribers, and occupies a prominent place, helping quality upgradation.

Quite often, the benchmarking concept is understood to be an act of imitating or copying. But in reality this proves to be a concept that helps in innovation rather than imitation, as stated by Thompson and Cox (1997). Many authors have contributed to the literature on benchmarking resulting in more than 350 publications as of June 2002. Considering the growth of publications, some attempts have been made in the past to review the literature.

It is essential that the present attempt is different from the earlier reviews and more broad based in coverage. This paper, besides providing a review of literature on benchmarking, covers the following objectives:

- (1) arranging the publications in an orderly manner to enable easy and quick search;
- (2) classification of literature;
- (3) scrutiny of outcome of publications; and
- (4) identifying gaps and providing hints for further research.

However, it is not the intention here to provide any overview or summary of benchmarking technique. Readers are suggested to look into the cited



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literature, for example Camp (1989a, b, c, d, e, 1990, 1992, 1993), Fuld (1989), etc., for learning about the basics of benchmarking.

This paper first provides a comparison among the earlier reviews on benchmarking and highlights the outcome in each case. Next, a new methodology for classifying the literature is suggested. The growth and categorisation of publications are presented in a graphical form for easy understanding. The papers have been closely examined and scope for further work has been identified.

### **Earlier reviews of literature on benchmarking**

It was found out during the current research that at least six literature reviews have been made in the past and all but one were studied by the authors. The different reviews in chronological order are:

- (1) "Roadmap to current benchmarking literature", Andrew E. Jackson, Robert R. Safford and William W. Swart, 1994, *Journal of Management in Engineering*, November/December, pp. 60-7.
- (2) "A review of key publications on benchmarking: part I", Mohamed Zairi and Mohamed A. Youssef, 1995, *Benchmarking for Quality Management and Technology*, Vol. 2 No. 1, pp. 65-72. "A review of key publications on benchmarking: part II", Mohamed Zairi and Mohamed A. Youssef, 1996, *Benchmarking for Quality Management and Technology* Vol. 3 No. 1, pp. 45-9.
- (3) "Benchmarking: a select bibliography", S.N. Vig, 1995, *Productivity*, Vol. 36 No. 3, October/December.
- (4) "A review of benchmarking literature", Czuchry, A.J., Yasin, M.M. and Darsch, J.J., 1995, *International Journal of Product Technology*, Vol. 10 No. 1/2, pp. 27-45.
- (5) "A framework for benchmarking in the public sector literature review and directions for future research", Jeffrey J. Dorsch and Mahmoud M. Yasin, 1998, *International Journal of Public Sector Management*, Vol. 11 No. 2/3, pp. 91-115.
- (6) "Theory and practice of benchmarking: then and now", Mahmoud M. Yasin, 2002, *Benchmarking: An International Journal*, Vol. 9 No. 3, pp. 217-43.

Out of the six publications cited here, the fourth one, namely "A review of benchmarking literature" by Czuchry *et al.* (1995) was not available to the authors at the time of preparation of this article and hence the authors could not use the valuable information of this publication for a comparative study. Outcomes of the different reviews are shown in Table I. Further, a comparison among the earlier attempts to review literature on benchmarking is made using certain attributes.

Sl. No.	Title of paper	Outcome
1	“Roadmap to current benchmarking literature”, by Jackson <i>et al.</i> (1994)	The paper gives a guideline for the classification of literature on benchmarking, based on the types of benchmarking and associated issues and comments on each article in terms of these criteria
2	“Review of key publications on benchmarking: part I and part II”, by Zairi and Youssef (1995c, 1996)	The papers spell out in detail about the contents of only books on benchmarking in terms of the practicability and applicability of the resource material. Publications in journals and conferences are omitted in this paper
3	“Benchmarking: a select bibliography”, by Vig (1995)	The paper is targetted towards personnel in libraries, to enable them track authorwise classification of articles on benchmarking
4	“A framework for benchmarking in the public sector literature review and directions for future research”, by Dorsch and Yasin (1998)	In the paper., the authors have identified, that the academic community is lagging in terms of providing and advancing models and frameworks that integrate the many facets of organisational benchmarking. The authors also mention that most of the benchmarking know-how available is the results of practitioners’ efforts
5	“The theory and practice of benchmarking; then and now”, by Yasin (2002)	The paper, summarises that despite the increasing scope of benchmarking activities and the number of organisations utilising benchmarking, the field of benchmarking remains to a large extent without a unifying theory to guide its advancement. Also, a call is given to develop innovative methodologies to guide benchmarking practices in e-commerce and supply chain management

**Table I.**  
Outcome of earlier literature reviews

The attributes considered for comparisons are:

- *Focus and objectives*: this refers to a brief coverage of the publications in terms of the content and the applicability.
- *Number and type of publications covered*: the number of publications listed and whether they are text books, journal papers, conference proceedings or periodicals.
- *Review methodology*: this looks at the way in which the literature has been reviewed and classified.

Apart from these distinguishing attributes, certain common parameters like, the name of publication, author(s), year of publication, journal of publication are also used. This comparison is shown in Table II.

Attribute	1	2	3	4	5
1 Title	Roadmap to current benchmarking literature.	A review of key publications on benchmarking: part I and part II	Benchmarking: a select bibliography	A framework for benchmarking in the public sector: literature review and directions for future research.	Theory and practice of benchmarking: then and now
2 Author(s)	Andrew E. Jackson, Robert R. Safford and William W. Swart	Mohamed Zairi and Mohamed A. Youssef	S.N. Vig	Jeffrey J. Dorsch and Mahmoud M. Yasin	Mahmoud M. Yasin
3 Year of publication	1994	1995/1996	1995	1998	2002
4 Published in	<i>Journal of Management in Engineering</i> , November/December, 1994, pp. 60-7	Part I – <i>Benchmarking for Quality Management and Technology</i> , Vol. 2 No.1, 1995, pp. 65-72. Part II – <i>Benchmarking for Quality Management and Technology</i> Vol. 3 No. 1, 1996, pp. 45-9	<i>Productivity</i> , Vol. 36 No. 3, 1995, pp. 521-4	<i>International Journal of Public Sector Management</i> , Vol. 11 No. 2/3, 1998, pp. 91-115	<i>Benchmarking: An International Journal</i> , Vol. 9 No. 3, 2002, pp. 217-43
5 Focus and objectives	The paper gives a summary matrix approach to current benchmarking topics with an objective to reduce the task of reviewing benchmarking literature for	The authors have concentrated on a detailed review of some of the key books written by “gurus”, of benchmarking, with a view to help educational and training processes	This article is a bibliographical compilation of the various text books and literature on benchmarking. Articles and books up to the year 1994 have been included	The paper provides an insight to the examples of benchmarking from the literature while determining the extent to which benchmarking has been utilised in the private sector <i>vis-à-vis</i> the public	The paper contrasts the earlier stages of benchmarking that stressed a process/activity orientation, to the recent trends where the focus of benchmarking has switched to strategies

(continued)

**Table II.**  
A summary of previous literature surveys on benchmarking

Table II.

Attribute	1	2	3	4	5
<p>benchmarking opportunities or academic research. Summaries of textbooks, and journal and periodical articles are included in this review</p>	<p>in companies embarking on or launching a benchmarking project. Part I reviews the following books: <i>Benchmarking: The search for Industry Best Practices that Lead to Superior Performance</i>, by Robert C. Camp; <i>Strategic Benchmarking: How to Rate Your Company's Performance Against the World's Best</i>, by Gregory H. Watson; <i>Benchmarking: A Tool for Continuous Improvement</i>, by C.J. McNair and K.H.J. Leibfried. Part II reviews the following books: <i>Best Practice Benchmarking: The Management Guide to Successful Implementation</i>, Sylvia Coding; <i>Competitive Benchmarking: An Executive Guide</i>, by Mohamed Zairi</p>		<p>sector. The authors have searched the published literature relating to benchmarking in the order of their appearance up to the year 1995 using electronic databases. The review of the publications has been classified as either practitioner-type or academic-type, depending upon the type of journal in which the article appeared</p>	<p>and systems. Examples of traditional benchmarking from literature, which include Xerox's initiative in 1980s, Nissan/Infiniti, ICI Fibers, and Texas Instruments, are provided in the paper. Also, the literature related to benchmarking is surveyed from 1986 to 2000. The review focuses on benchmarking practices in the manufacturing, service, and public sector operational performance. As in the previous review by the same author, the articles have been classified as either practitioner-type or academic-type</p>	

(continued)

Attribute	1	2	3	4	5
6 Number of publications covered	Seven benchmarking books and 116 papers and periodicals	5	96	121	159
7 Type of publications covered	Books, papers and periodicals	Text books	Papers and text books	Articles	Articles
8 Methodology	In order to provide the reader with state-of-the-art view of benchmarking literature. A summary matrix developed by benchmarking subject matter experts is used	A chapter-wise comprehensive review of each of the books is followed	The bibliographical index to the articles and books is provided in alphabetical order	The articles have been reviewed by the authors, giving details of the year of publication, author(s) names, scope of content, the domain of application (manufacturing, service, support function, public sector, general articles and applications)	The articles have been reviewed by the authors, giving details of the year of publication, author(s) names, scope of content, the domain of application (manufacturing, service, support function, public sector, general articles and applications)

Table II.

### **Preamble to literature review**

Over the last five years, the authors had several opportunities to collect and study literature pertaining to benchmarking. Two main reasons are:

- (1) interactions with industries with focus on quality management; and
- (2) one of the author pursuing doctoral studies in the field of quality management.

As a part of the research it was decided to classify and analyse the literature in detail. The course of action included the following steps:

- (1) Updating the database to ensure that literature is as current as possible. The collection of literature has been reviewed till June 2002.
- (2) For literature search, both hard copy search in established libraries in India and electronic search in World Wide Web were made.

The well-known search engines available at [www.goto.com](http://www.goto.com), [www.altavista.com](http://www.altavista.com) and [www.google.com](http://www.google.com) were specifically used to ferret the literature pertaining to benchmarking from a wide variety of sources on the internet. While the authors have tried their best to include as many publications as possible, they do not claim that their listing is complete or exhaustive in nature.

- (3) Developing a classification scheme was the next step. First a bibliographical list of all publications was developed and a file was created in Excel spreadsheet.
- (4) Keeping these observations in mind the authors decided to approach the review process in a different way, as illustrated in the next part of the paper.

### **Methodology and scheme of review**

The classification scheme proposed in this paper includes a simultaneous parallel categorisation that highlights the growth of literature from time to time and also the coverage of benchmarking specific to different groups like:

- *Benchmarking: general aspects or fundamentals.* All publications under this category deal with very general and fundamental concepts of benchmarking, essentially for first time readers. Fundamentals are usually covered to a large extent particularly when the discipline is in the introduction and growth stage. This can be confirmed by the number of publications, which appeared in the early time period of the time scale considered.
- *Benchmarking: specific applications and case studies.* People are more interested to know about applications and success stories. Therefore this should be a useful group. Under this categorisation, all literature dealing with applications specific to manufacturing and non-manufacturing sectors are shown.

- *Benchmarking: innovations/extensions/new approaches.* When the technique reaches a saturation stage in terms of its popularity, novel approaches and innovations start appearing in the literature. This category is considered to recognise and appreciate the novel approaches or paradigm shifts in benchmarking techniques or its applications.
- *Benchmarking: applicable to education sector.* This category is specially included here for academicians and also forms a major aspect of the present research. Another reason is the affiliation of both the authors to engineering education institutes.

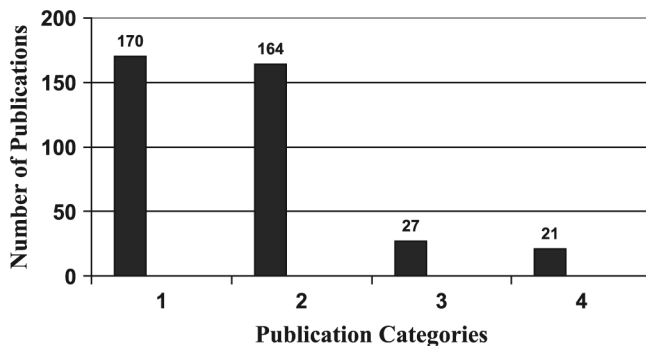
It is understandable that a very strict demarcation in the categorisation is not possible since there may be certain overlaps in the publications analysed.

A Pareto diagram of the number of publications in different categories is given in Figure 1.

All the publications in the categories described earlier have further been coded based on the chronological appearance of the article, for the convenience of the readers. The first code in the form a number from 1 to 4, refers to the categories 1 to 4 illustrated above. Coding has been done from 1980 onwards, since the concept of benchmarking emerged during the 1980s. Also, the time interval for the first category is taken as ten years.

This is adopted, since the number of publications during the first ten years are not many. Publications after 1990 have been categorised on a time interval of two years. Thus, the time periods are represented as “a”, (ten years: January 1980-December 1989), “b”, to ‘h”, (two years each: January 1990-January 2002). This time based coding is displayed in Table III.

As an example, the article “Measuring the unmeasurable” by Brisley (1983) is coded under 1-a. This means the publication was made during January 1980-



**Key:**

- Category-1 → Benchmarking: General/Fundamentals/Models
- Category-2 → Benchmarking: Specific Applications/Case Studies
- Category-3 → Benchmarking - Innovations and Extensions/New Approaches
- Category-4 → Benchmarking - Services

**Figure 1.**  
Pareto diagram showing the number of publications



**Table III.**  
The coding pattern  
for classification  
based on time of  
publication

Category	Time frame							
	January 1980- December 1989	January 1990- December 1991	January 1992- December 1993	January 1994- December 1995	January 1996- December 1997	January 1998- December 1999	January 2000- December 2001	January 2002 onwards
	a	b	c	d	e	f	g	h
1	1-a	1-b	1-c	1-d	1-e	1-f	1-g	1-h
2	2-a	2-b	2-c	2-d	2-e	2-f	2-g	2-h
3	3-a	3-b	3-c	3-d	3-e	3-f	3-g	3-h
4	4-a	4-b	4-c	4-d	4-e	4-f	4-g	4-h

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December 1989 and it deals with category 1, namely “Fundamentals of benchmarking”. Similarly, a publication coded under 4-c means the publication came out during January 1992-December 1993 and is related to category 4, “Benchmarking education sector”.

Similarly, all the publications, based on this coding pattern, are identified in Table IV, by their serial number as given in the bibliographical list.

### **Observations and comments**

In this review, 382 publications in total are analysed for the purpose of providing insights to the growth and development of benchmarking concept. These publications include specific papers in national/international journals, and conferences. Other articles such as exclusive reports in news magazines, newsletters, special columns and editorials are left out as the authors feel that they deal with general information in a limited manner. Similarly books written on benchmarking are also omitted from the review.

Further, 170 publications belong to general aspects or fundamentals of benchmarking, 164 papers pertain to specific applications/case studies in benchmarking, 27 publications come under innovations/extensions/new approaches in benchmarking and finally, 21 publications fall under the category of benchmarking applicable to education sector.

Figure 2, provides statistics of the mix of publications. As seen in Figure 2, almost half of the publications speak about the general aspects of benchmarking.

Often it is mentioned in literature that the benchmarking concepts were initiated during 1989, after Xerox popularised it. At this point, it is worthwhile to note that attempts to use this concept were made first, in the year 1983-1984 as indicated by Brisley (1983). In terms of its application in the industry, Guilmetle and Carlene (1984) explore the utility of benchmarking in employee training whereas Lewis and Albert (1985) illustrate this concept as a viable tool for computer performance evaluation during the year 1985. It is also interesting to note that, as publicised by Subramanian (1984), certain interfirm comparisons were made in the Asian region as early as in the year 1984.

Regarding the application of benchmarking concepts to industry and service sectors, published literature started appearing in a noticeable way only after the 1980's. The contributions in the form of technical papers on general aspects of benchmarking are maximum in number during the period 1992-1995. This is probably due to the initial curiosity and interest generated on the topic. Thereafter there has been a decline, as seen in the chronological listing of publications numberwise in the line graph in Figure 3.

In the sample of literature collected it is seen that there are 163 papers, specific to the category “Benchmarking: specific application/case studies”. Regarding the case studies group, it is observed that one of the first applications, namely benchmarking of purchasing activities was done in the year 1983 as reported by Drozdowski (1983). Subsequently many case studies

Code	References in the bibliographical index
<i>Category 1. Benchmarking: general/fundamentals/models</i>	
1-a	Brisley (1983), Camp (1989a, b, c, d, e), Fuld (1989), Furey (1987), Guilmette and Carlene (1984), Johnne and Snelson (1988), Pryor and Katz (1993), Tucker <i>et al.</i> (1987)
1-b	Benson (1991), Biesada (1991), Bowers (1991), Camp (1990), Davis (1990), Dickey (1991), Faidley and Musser (1991), Geber (1990), Linsenmeyer (1991), Martin (1991), Maturi (1990), Meyer (1991), Tyndall (1990), Walleck <i>et al.</i> (1991), Welleck <i>et al.</i> (1991), Whiting (1991)
1-c	Altany (1992), Atherton (1993), Biesada (1992), Bogan and English (1993), Bookhart (1992), Brown (1992b), Bruder (1992), Camp (1992, 1993), Chapple (1992), Chung (1993a, b), Dale (1992), Day (1992), Enslow (1992), Ettorre (1993), Fink (1993), Fitz-Enz (1992a, b, 1993), Flower (1993), Forger (1992), Foster (1992), Gardner (1992), Hall (1992), Haserot (1993), Henricks (1993), Hequet (1993), Hiebler (1993), Hogg and Hogg (1993), <i>HRFocus</i> (1993), Hunter and Shearman (1992), Istvan (1992), Jennings and Westfall (1992), Julien (1993), Kharbanda (1993), Kimmerling (1993), King (1993), Kobe (1993), Lenckus (1993a), Main (1992), McGonagle and Fleming (1998), Micklewright (1993), Miller (1992b), Mittelstaedt (1992), Monczka and Morgan (1993), Nandi (1993), Newman (1992), Ogilvie (1993), Overman (1993), Pansley (1993), Payne and Blackburn (1993), Port and Smith (1992), Prestly (1993), Pryor (1989), Ransley (1993), Richardson (1992), Ryan (1993), Sasenick (1993), Sharman (1992a), Sheridan (1993a, b), Shetty (1993), Sillyman (1992), Singleton-Green (1992a, b), Soderberg and O'Halloran (1992), Spadolini (1992), Sprow (1993), St Clair (1993), Stratton (1993), Tuttle (1993), Vaziri (1992, 1993), Venetucci (1992), Weatherly (1992), Weimer (1992), Weisendanger (1992, 1993)
1-d	Anderson (1994b), Anderson and Pettersen (1994), Anderson and Camp (1995), Burgess (1995), Carris and Bartlett (1994), Czuchry <i>et al.</i> (1995), Fleisher and Burton (1995), Goldwasser (1995), Grayson (1994), Hollstein (1995), Jackson <i>et al.</i> (1994), Kinni (1994a, b), Lema and Price (1995), Longowitz and Rao (1995), Malec (1994), Moad (1994), Ottenhouse (1994), Pulat (1994a, b), <i>Purchasing</i> (1994), Rigby (1995), Tutchter (1994), Vig (1995), Zairi (1992, 1998a)
1-e	Balm (1996), Bassi and Cheney (1997), Colding (1997), Dhawan (1996), Elmuti <i>et al.</i> (1997), Elmuti (1998), Fowler (1997), Harrington (1997), Lincoln and Price (1996), Malcolm (1997), Morgan (1996), Powers (1996/1997), Rogers (1997), Schumann (1996), Shen-Then (1996), Simmons (1996), Singh (1997), Smith (1997), Thompson and Cox (1997), Zairi and Ahmed (1999)
1-f	Ammons (1999), Bhutta Khurram and Huq (1999), Dorsch and Yasin (1998), Fetter (1998), Hillier <i>et al.</i> (1998), Holloway <i>et al.</i> (1998), McGonagle and Fleming (1993), Wah-Fond <i>et al.</i> (1998), Zoins (1998)
1-g	Battaglia and Musar (2000), Dervitsiotis (2000), Longbottom (2000), Per and Hollensen (2001), Prado and Prado (2001)
1-h	Carpinetti and De Melo (2002), Tucker <i>et al.</i> (1987), Yasin and Zimmer (1996)
<i>Category 2. Benchmarking: specific applications/case studies</i>	
2-a	Cavenato (1988), Drozdowski (1983), Fifer (1989), Lowis and Albert (1985), Subramanian (1984)
2-b	Bemowski (1991), Eccles (1991), Press (1991), Quality and Productivity Management Association (1991)

**Table IV.**  
Categorisation of all  
publications

(continued)

Code	References in the bibliographical index
2-c	Allan (1993), Azzolini and Shillaber (1993), Bean and Gros (1992), Bredin (1993), Bracken (1992), Brown (1992a), Cecil and Ferraro (1992), Crow and Van Epps (1992), Chung (1993c), Crespy <i>et al.</i> (1993), Davis and Patrick (1993), Ford (1993), Gable <i>et al.</i> (1993), Gamble (1993), Goff (1993), Harari (1993), Inger (1993), Johnson (1992), Karch (1992), Krause and Liu (1993), Lenckus (1993b), Markin (1992), McGaughey (1993), Miller (1992a), Owen (1992), Prairie (1993), Richman and Koontz (1993), Roth (1992), Schefczyk (1993), Schmidt (1992), Sharman (1992b), Shaughnessy (1993), Spitzer (1993), Verschoor (1993), Walsh (1992), Watson (1993), Wendel (1993), Zairi and Whymark (2000a)
2-d	Adam and Vandewater (1995), Anderson (1994a), Baker (1994), Bell and Morey (1994), Bhat (1995), Bowman and Faulkner (1994), Bruder and Gray (1994), Chao (1994), Chen (1994), Clayton and Luchs (1994), Cooper and Kleinschmidt (1995), Delbridge <i>et al.</i> (1995), Holt (1994), Lee and Howard (1994), Lorence (1994), Maheshwari and Zhao (1994), Matzko and Wingfield (1995), Morey and Dittman (1995), Obinata (1994), Oliver and McDonald (1995), Petrick <i>et al.</i> (1994), Poirier (1994), Sinclair and Zairi (1995), Sohal <i>et al.</i> (1999), Sweeney (1994), Voss <i>et al.</i> (1994), Wallace (1995), Zairi (1998b), Zhao <i>et al.</i> (1995)
2-e	Bergstrom (1996), Buscaglia (1997), Chapman and Hyland (1997), Clarke and Manton (1997), Edgett and Snow (1996), Epperheimer (1997), Evans and Dale (1997), Floch <i>et al.</i> (1997), Frederickson (1996), Fuller (1997), Goodman <i>et al.</i> (1996), Hamilton and Gibson (1996), Hiltrop and Despris (1997), Johnston and Kirch (1996), Keehley and Mac-Bride (1997), Lagoe and Aspling (1997), Le Sueur and Dale (1997), Millen <i>et al.</i> (1997), Min and Min (1997), Min and Min (1996), Nacker (1997), Ogava and Ketner (1997), Prior-Smith and Perrin (1996), Ramabadron <i>et al.</i> (1997), Relihan (1997), Roche (1997), Schroeder (1996), Voss and Blackmon (1997), Yasin (2002)
2-f	Ahmed and Rafiq (1998), Ahmed and Zairi (1999), Badrinath <i>et al.</i> (1998), Beaumont and Sohal (1999), Beretta and Dossi (1998), Blinn (1998), Burgess (1998), Buyukozkan and Marie (1998), Coe (1999), Colding (1998), Corbett (1998), Davis (1998), Elmuti and Kathawala (1997), Gilmour (1999), Glass (1998), Hsien-Chen (1998), Jane-Davies and Kumar-Kochhar (1999), Jones (1999), Lagoe <i>et al.</i> (1999), Mann <i>et al.</i> (1998), Mann (1998), Mentzer <i>et al.</i> (1999), Parker (1998), Pfohl and Ester (1999), Simpson <i>et al.</i> (1999), Sohal and Lu (1995), Tang and Zairi (1998a, b, c), Treadwell (1998), Whymark (1998), Zairi and Whymark (2000b), Zairi and Youssef (1995a, b)
2-g	Brah <i>et al.</i> (2000), Chung-Woon (2000), Chung-Woon (2001), Darmont and Schneider (2000), Handerson and Evans (2000), Johnson and Chambers (2000a, b), Kumar and Chandra (2001), Lagoe <i>et al.</i> (2000), Morling and Tanner (2000), Muthu <i>et al.</i> (2000), Nath and Mrinalini (2000), Robson and Prabhu (2001), Rodwell <i>et al.</i> (2000), Sarkis (2001), Shen <i>et al.</i> (2000), Simpson and Kondouli (2000), Ulusoy and Ikiz (2001), Zairi and Youssef (1995c, 1996)
2-h	Davies and Kochhar (2002), Hyland and Beckett (2002), McAdam and Kelly (2002), Mukherjee <i>et al.</i> (2002), Underdown and Talluri (2002)

*Category 3. Benchmarking: innovations and extensions/new approaches*

3-a	Lewis <i>et al.</i> (1985)
3-b	–
3-c	Crespy and Becker (1993), Harkleroad (1992), McGonagle (1992)

(continued)

Table IV.

Code	References in the bibliographical index
3-d	Elnathan and Kim (1995), Guimaraes and Langley (1994), Hutton and Zairi (1994), Lu <i>et al.</i> (1994), Lucertini <i>et al.</i> (1995), Monkhouse (1995), Partovi (1994), Webster and Lu (1995)
3-e	Behra and Lemmink Jos (1997), Hiebeler (1997), Yun (1997)
3-f	Anderson and Moen (1999), Bhattacharjee (1999), Kumar <i>et al.</i> (1999), Madu and Hua (1998), McNamee and Greenan (1999), O'Dell <i>et al.</i> (1999)
3-g	Featherman (2000), Fuller (2000), Razmi <i>et al.</i> (2000), Talluri and Sarkis (2001)
3-h	Jeffcoate <i>et al.</i> (2002), Sharif (2002)
<i>Category 4. Benchmarking: education</i>	
4-a	–
4-b	–
4-c	Shafer and Coate (1992)
4-d	Brennan (1995), Houshmand <i>et al.</i> (1995), Williams (1995)
4-e	Dittenhofer <i>et al.</i> (1996), Fredenberger <i>et al.</i> (1996), King (1996), Parisean (1997), Weeler (1996)
4-f	D'mello (1999), Epper (1999), Godfrey and Godfrey (1999), Howe and Martin (1998), Lomas (1999), Payne and Whitfield (1999), Raghunath (1998),
4-g	Fiekers <i>et al.</i> (2000), Jackson (2001), Wan Endut <i>et al.</i> (2000)
4-h	Laugharne (2002), Shaw and Green (2002)

Table IV.

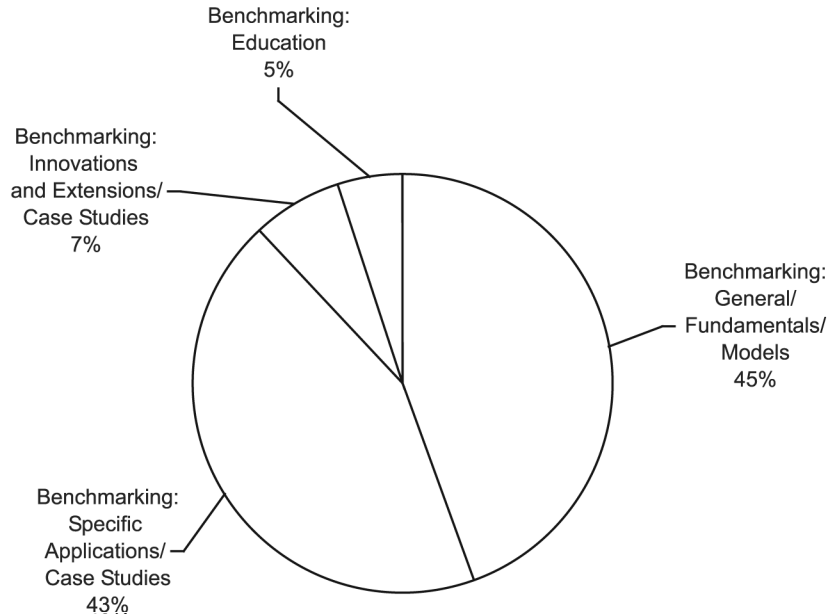
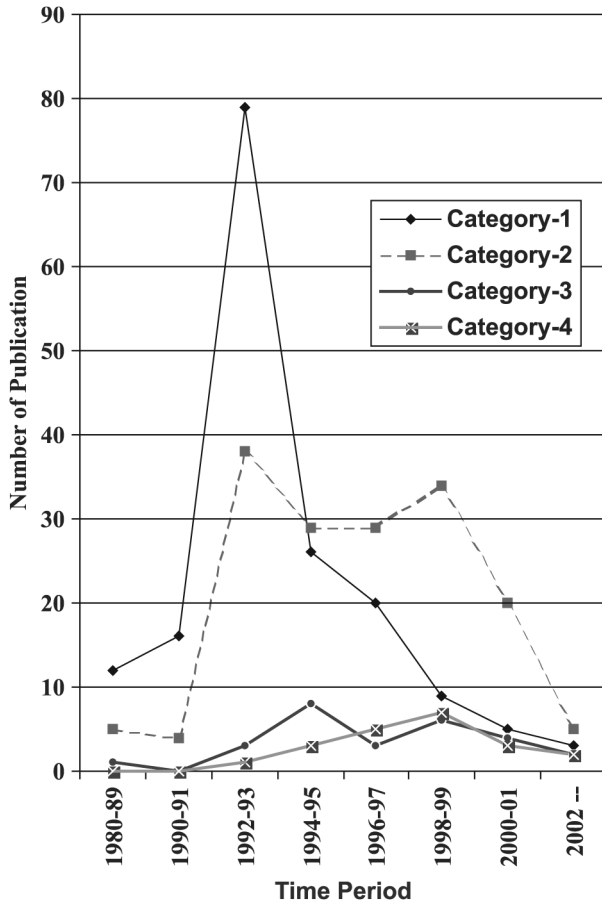


Figure 2.  
Mix of publications



**Key:**  
 Category-1 → Benchmarking: General/Fundamentals/Models  
 Category-2 → Benchmarking: Specific Applications/Case Studies  
 Category-3 → Benchmarking - Innovations and Extensions/New Approaches  
 Category-4 → Benchmarking - Services

**Figure 3.**  
 Graph showing chronological appearance of all publications

have been conducted in the manufacturing sector and also in the service sector. Even here, the number of publications during 1993-1999 are maximum and there after there is a decline.

This suggests that the concept has been applied successfully to almost all functional areas. Table V, shows the application of benchmarking to different functional areas.

It can be seen in Figure 3 that under the category of “Benchmarking: innovations and new approaches”, the number of publications increased from 4 in 1990-1991 to 38 in 1992-1993. However, from 1999 onwards there appears to

Specific areas of application of benchmarking	References in the bibliographical index
Accounting processes	Beretta and Dossi (1998), Sharman (1992b), Verschoor (1993)
Banks	Mukherjee <i>et al.</i> (2002), Wendel (1993)
Benchmarking operations	Bredin (1993), Cecil and Ferraro (1992)
Business re-engineering	Adam and Vandewater (1995), Richman and Koontz (1993), Simpson <i>et al.</i> (1999)
Career management	Epperheimer (1997)
Change management	Clarke and Manton (1997)
Core competencies	Per and Hollensen (2001)
Credit function	Chung (1993c), Gamble (1993)
Employee attitudes	Bracken (1992)
Environment	Bhat (1995), Karch (1992)
Facility management	Johnson (1992)
Finance	Schmidt (1992), Spitzer (1993), Whymark (1998)
Food and drinks industry	Mann (1998)
Health and safety management	Fuller (1997), Inger (1993), Lorence (1994)
Hotel services	Min and Min (1996, 1997), Morey and Dittman (1995)
Human resources	Ford (1993), Hiltrop and Despris (1997), Holt (1994), Parker (1998), Prior-Smith and Perrin (1996), Rodwell <i>et al.</i> (2000)
Information technology	Allan (1993), Goff (1993), Lowis and Albert (1985), Quality and Productivity Management Association (1991)
Law courts	Buscaglia (1997)
Library	Shaughnessy (1993)
Logistics	Cavenato (1988)
Manufacturing	Sarkis (2001), Sweeney (1994), Voss <i>et al.</i> (1994)
Marketing	Gable <i>et al.</i> (1993)
Operational performance	Voss and Blackmon (1997)
Performance measurement	Eccles (1991), Miller (1992a)
Physician workforce	Floch <i>et al.</i> (1997), Goodman <i>et al.</i> (1996), Schroeder (1996)
Pre-project planning	Hamilton and Gibson (1996)
Preventive maintenance practices	Chen (1994), Muthu <i>et al.</i> (2000)
Product development	Ogava and Ketner (1997)
Public sector	Bruder and Gray (1994), Coe (1999), Davis (1998), Frederickson (1996)
Purchasing	Drozdowski (1983)
Research and development	Bean and Gros (1992), Krause and Liu (1993), Nath and Mrinalini (2000), Press (1991)
Retail distribution strategy	Matzko and Wingfield (1995)
Risk management	Blinn (1998), Lenckus (1993b)
Safety management	Relihan (1997)
Sales forecasting	Mentzer <i>et al.</i> (1999)
Sales performance	Mann <i>et al.</i> (1998)
Small and medium industries	Badrinath <i>et al.</i> (1998), McAdam and Kelly (2002)
Spare parts logistics	Le Sueur and Dale (1997), Pfohl and Ester (1999)
Supply chain operations	Ahmed and Zairi (1999), Gilmour (1999)
Telecommunications	Nacker (1997)
Travel management	Bell and Morey (1994)
Treasury	Treadwell (1998), Wallace (1995)
World class manufacturing	Owen (1992)

**Table V.**  
Different functional areas covered by various authors

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be a drop in the number of publications. Here, the paper by O'Dell *et al.* (1999) is worth mentioning since the paper details the applicability of benchmarking in analysing how organisations seek to incorporate various knowledge management approaches into their business. Also, the paper by Guimaraes and Langley (1994) speaks about the relationship between overall company innovativeness and company performance. They also point out that benchmarking innovation involves developing a plan which include dimensions of innovation success: seeking, evaluating, using and fostering innovation.

Another new approach to benchmarking has been highlighted by Fuller (2000), where the use of benefit curves for benchmarking processes has been extensively discussed. Similarly, the paper by Featherman (2000) uses uncertainty modeling as a component of benchmarking, which is a new approach towards benchmarking.

Among the eight papers reviewed under the "Benchmarking: new approaches" category, it is worthwhile to mention the coverage of two papers. First, one by McNamee and Greenan (1999) reports about the competitive analysis model, a new approach to strategic benchmarking of small firms. The second one, by Talluri and Sarkis (2001), describes some geometrical equations that will help analyse benchmarking data.

Finally, in the category dealing with "Benchmarking in education", 21 papers have been reviewed. These papers deal with benchmarking of management education, engineering education, schools and student relations. Figure 3 shows the literature in this category in the order of time.

### **Critical view and conclusions**

There is a proliferation of literature on the topic of benchmarking in the last 15 years, as revealed in this literature review. Considering the gamut of publications it can be said that the benchmarking technique has seen a steady growth and appears to be heading towards maturity level. A scrutiny of the publications show that several aspects of benchmarking along with many interesting and diversified applications, have been covered in sufficient detail. These publications can serve a great deal towards quality improvement. Thus academicians, practitioners and researchers have a good number of sources in the form of more than 300 articles, to study, discuss and debate over many aspects of benchmarking.

The present review of literature on benchmarking, carried out as a part of on-going research, has identified certain issues which have not been satisfactorily addressed or not been addressed at all. These issues can be regarded as inadequacies and they offer scope for further research and exploration. The issues identified are as follows:

- *Cost aspects of benchmarking.* The overall cost incurred in carrying out a benchmarking exercise needs to be established, say in terms of cost



models or cost equations. This would enable the decision makers to decide upon financial commitment before embarking on the benchmarking exercise.

Further it would allow to estimate the return on investment, and to convince the top management. While a precise model is difficult, because of variability of factors involved, an approximate method would be quite useful.

- *Duration of benchmarking exercise.* Guidelines regarding setting up of a timeframe for conducting benchmarking are not available. If a method can be described to decide upon the total time involved in benchmarking exercise, it would prove very helpful in setting targets and deadlines.
- *Human resources in benchmarking activities.* Rationale behind formation of cross-functional benchmarking teams, identification of tasks of benchmarking teams, and responsibility sharing among benchmarking teams, have not been discussed in sufficient detail. The human role in benchmarking activities needs to be clarified in complete depth to ensure better teamwork in a benchmarking project.
- *Selecting benchmarking partner.* Selection of partner or superior performer, their duties and responsibilities, legal and business aspects are to be further elaborated.

Sometimes, the superior performer as recognised in terms of market leadership or achievements/success rate, may not be willing to disclose the business practices. This could be a major deterrent in the benchmarking process. Further best practices followed in a certain successful organisation may not necessarily be the best when adopted by other organisations. Eventually, success rate may also significantly differ across organisations.

These issues need to be resolved to make benchmarking a preferred technique in the quality improvement efforts. The resource requirement for full-scale benchmarking exercise needs to be carefully established particularly for small and medium enterprises. These organisations which are normally tight on budget cannot afford to venture investing sizeable resources. Therefore, any commitment towards benchmarking has to be justified in terms of assured returns. No doubt, benchmarking is a wonderful tool for quality improvement, assuring success as proved by the rich literature cited in this paper. Applying the rule of continuous improvement, benchmarking tool can be further sharpened. It is hoped that this paper has thrown light on certain dark areas of benchmarking thereby demanding further exploration on the topic, to make it more useful and a versatile tool in the quality toolbox.

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