UPDATE

The evolution of performance measurement research

Developments in the last decade and a research agenda for the next

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Abstract

Purpose – This paper provides an update of Neely *et al.*'s (1995) literature review "Performance measurement system design". It was commissioned to appear in a special issue of the *International Journal of Operations & Production Management* to celebrate the journal's 25th anniversary.

Design/methodology/approach – The paper employs a citation/co-citation analysis of work in the field of performance measurement to explore developments in the field globally.

Findings – The paper argues that scholars working in the field of performance measurement agree about the key research questions despite the fact that they come from different disciplinary backgrounds. The paper identifies the key contributors to the field based on a citation/co-citation analysis and argues that the field is now entering a phase of empirical investigation and theoretical verification of some core concepts.

Research limitations/implications – The research reported in the paper is limited to work that deals directly with performance measurement. It excludes related research – such as literature on management control and performance management – and clearly could be extended to include these literatures.

Originality/value – The paper will be valuable to scholars working in the field of performance measurement who wish to understand how the field has developed and evolved and/or those who are interested in avenues for future research.

Keywords Performance measurement (quality), Performance management, Balanced scorecard, Accounting, Operations management

Paper type General review

Background

In 1992, the Institute for Manufacturing at Cambridge University was awarded a substantial grant by the UK's Engineering and Physical Sciences Research Council to explore manufacturing strategy and performance measurement. At the outset of that research my colleagues and I undertook substantive reviews of the performance measurement and manufacturing strategy literatures, which resulted in two

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"Performance measurement system design: A literature review and research agenda" by Neely *et al.* was first published in *IJOPM* Volume 15 Issue 4 (1995), pp. 80-116. It has been republished in this issue as part of the 25th anniversary celebrations for the journal.

publications – "Performance Measurement System Design: A Literature Review and Research Agenda" (Neely *et al.*, 1995) and "A Framework for the Design of Manufacturing Strategy Processes: A Contingency Approach" (Mills *et al.*, 1995). When the first of these papers was selected for inclusion in this special issue the editors asked me to provide an update on the state of performance measurement research, based on work completed during the last decade. To ensure that this update was grounded in empirical evidence I decided to undertake a citation/co-citation analysis of publications relating to performance measurement. The paper that follows summarises this study by explaining the methodology used, presenting the data gathered and reviewing the implications of these data for the research community. The paper ends by proposing a revised research agenda for the field of performance measurement, which explores how future research can build on work completed to date.

Performance measurement: enduring research questions

The challenges posed by performance measurement are enduring. The first ever edition of the *Administrative Science Quarterly*, published in 1956, contained a paper entitled "Dysfunctional Consequences of Measurement" (Ridgway, 1956). In that paper, Ridgway explored the relative strengths and weaknesses of single, multiple and aggregated performance measures, bemoaning the "strong tendency to state numerically as many as possible of the variables with which management must deal". A few years earlier – in 1952 – Chris Argyris, in his classic text *The Impact of Budgets on People*, reported that managers claimed to "feed machines all the easy orders at the end of the month to meet [their] quota" (Argyris, 1952). These two themes – the desire to quantify and the unanticipated consequences of measurement lead that doyenne of management – Peter Drucker – to argue that one potential solution was to introduce "balanced" sets of measures. "Market standing, innovation, productivity, physical and financial resources, profitability, manager performance and development, worker performance and attitude, and public responsibility" are appropriate performance criteria says Drucker in his 1954 publication *The Practice of Management* (Drucker, 1954).

If the clock is turned forward thirty years then we find that the same themes are still being discussed. Power's book *The Audit Society: Rituals of Verification* bemoans the rise of the "Audit Society", arguing that practitioners and policy makers have become obsessed with measurement and regulation (Power, 1997) – the desire to quantify. Hayes and Abernathy explore the unintended consequences of this obsession in "Managing our way to economic decline". They argue that inappropriate performance measures and poorly designed incentive schemes were partly to blame for a short-term US business culture, which damaged the country's competitiveness and economic prospects (Hayes and Abernathy, 1980). Johnson and Kaplan expanded these arguments, claiming that not only did measurement systems result in unintended consequences, but also that the measurement systems many firms used were woefully inadequate because they provided managers with redundant information as they were based on assumptions that were grossly outdated given the changing nature of organisational cost structures (Johnson and Kaplan, 1987). Alfred Chandler made similar points in *The Visible Hand*, which emphasised that many of the basic principles of accounting had remained largely unchanged since they were first developed in the 1920s by the DuPont cousins and Donaldson Brown (Chandler, 1977).

These recurring themes – the desire to quantify and the unanticipated consequences of quantification – appear to have resulted in frequent "re-discoveries" of Drucker's 1954 suggestion that balanced measurement systems should be developed (Drucker, 1954). Throughout the 1980s and early 1990s, numerous authors suggested measurement frameworks that might be appropriate – the performance pyramid (Lynch and Cross, 1991), the results-determinants framework (Fitzgerald *et al.*, 1991), the performance measurement matrix (Keegan *et al.*, 1989) and, of course, the balanced scorecard (Kaplan and Norton, 1992). The result was that a dominant research question in the mid 1990s, at least for the operations management community with an interest in performance measurement, was how can these so-called "balanced performance measurement systems" be developed and deployed. There followed a rich stream of work on the design and deployment of performance measurement systems, which reported on research to develop processes for designing measurement systems and barriers to their successful implementation (Bourne *et al.*, 2000; Dixon *et al.*, 1990; Neely *et al.*, 1996).

Citation analysis: exploring the methodology

To examine these developments more fully and the basis of empirical evidence a citation/co-citation analysis of research on performance measurement was conducted. Recent advances in information technology and online data storage have considerably eased the process of citation/co-citation analysis. The dataset used in this paper was constructed using the ISI *Web of Science* database. Every publication that contained the phrase "performance measurement" in its title, keywords or abstract was identified and downloaded. This search identified 1,352 papers published in 546 different journals. The earliest paper included in the dataset was published in 1981 and the most recent in 2005 (84 per cent of publications included in the dataset have been published since January 1995).

The data were downloaded using the Sitkis software (Schildt, 2002). Before conducting the analysis a substantive review of the generated dataset was undertaken. Every record that related to the 20 most cited authors was reviewed and confirmed (the top 5 per cent of citations) and the title of every journal in the dataset was checked. Other obvious errors in the dataset were corrected in line with current best practice for bibliometric analysis (Schildt, 2002).

The 1,352 papers included in the dataset provide some 31,646 citations, covering 25,040 works and drawing on 16,697 different lead authors[1]. The most frequently cited authors were: Bob Kaplan (398 citations), Andy Neely (153 citations), Rajiv Banker (134 citations), Abraham Charnes (111) citations and Robin Cooper (70 citations). As can be seen from these data, there were only four lead authors whose works were cited more than 100 times and interestingly these four lead authors have somewhat different disciplinary backgrounds – accounting (Kaplan), operations management (Neely), accounting/operations research and information systems (Banker) and mathematics/operations research (Charnes). Of the remaining citations – twelve lead authors were cited between 50 and 100 times, 266 were cited between 10 and 49 times and 11,929 (71.4 per cent) were cited only once.

The spread of journals from which citations appeared is interesting. In total, the citations were drawn from 11,443 different journals. The most frequently cited journals were the *Harvard Business Review* (650 citations), the *International Journal of*

Operations & Production Management (552 citations) and the *Journal of the American Medical Association* (339 citations). Together these three journals accounted for some 4.9 per cent of citations, while the top ten journals accounted for 10.2 per cent of citations and 73.6 per cent of journals contained only paper that was cited in the dataset. This diversity of source materials – large number of rarely cited works and journals – is indicative of a widely distributed and relatively immature field of academic study, which has relatively little consensus about its core theoretical foundations.

Performance measurement research: analysis of citations data

At a more detailed level, it is possible to explore the frequency of citations for individual pieces of work. Once again the pattern of citations is diverse, further supporting the suggestion that the field of performance measurement is immature with little consensus. Only 10 works are cited more than 30 times (Table I). Eighty-seven per cent are cited only once and 99 per cent are cited less than 5 times. The most striking observation about the data included in Table I is the dominance of Bob Kaplan and David Norton and the balanced scorecard. Given that research data suggest that between 30 and 60 per cent of firms have adopted the balanced scorecard (Rigby, 2001; Silk, 1998; Williams, 2001; Speckbacher *et al.*, 2003, Marr *et al.*, 2004), this dominance is not surprising, but it is interesting, especially when one bears in mind the relative paucity of empirical research into the performance impact of measurement frameworks, including the balanced scorecard (Franco and Bourne, 2003).

Author	Journal	Year	Citations
Kaplan, R.S. and Norton, D.P.	The balanced scorecard: measures that drive performance, *Harvard Business Review*, January-February, pp. 71-79	1992	119
Kaplan, R.S. and Norton, D.P.	*The Balanced Scorecard: Translating Strategy Into Action*, Harvard Business School Press, Boston, MA	1996	63
Charnes, A.; Cooper, W.W. and Rhodes, E.	Measuring efficiency of decision-making units, *European Journal of Operations Research*, 2, 6, pp. 429-444	1978	56
Dixon, J.; Nanni, A., and Vollmann, T.	*The New Performance Challenge, Business One*, Irwin, Burr Ridge, IL	1990	49
Neely, A.D., Gregory, M. and Platts, K.	Performance measurement system design: a literature review and research agenda, *International Journal of Operations & Production Management*, 15, 4, pp. 80-116	1995	42
Eccles, R.G.	The performance measurement manifesto, *Harvard Business Review*, January-February, pp. 131-137	1991	41
Lynch R.L. and Cross, K.F.	*Measure Up!*, Blackwell Publishers, Cambridge, MA	1991	40
Kaplan, R.S. and Norton, D.P.	Putting the balanced scorecard to work, *Harvard Business Review*, September-October, pp. 134-147	1993	36
Banker, R.D.; Charnes, A. and Cooper, W.W.	Some models for estimating technical and scale inefficiencies in data envelopment analysis, *Management Science*, 30, 9, pp. 1078-1092	1984	34
Kaplan, R.S.	Using the balanced scorecard as a strategic management system, *Harvard Business Review*, 74, 1, pp. 75-85	1996	34

Table I.
Most frequently cited performance measurement works

At a more detailed level of analysis it is possible to review the frequency of citations over time. Figure 1 shows this for the 10 most frequently cited works. In total, these 10 most frequently cited works are cited 514 times between 1991 (the first time of citation for any of them) and 1995. Kaplan's dominance of these rankings, as previously highlighted, is emphasised by the fact that 56.8 per cent of these 514 citations are to his work with David Norton on the *Balanced Scorecard*, a figure that has increased in the last few years (60 per cent of 2002 citations, 58 per cent of citations in 2003 and 59 per cent of citations in 2004).

The second point to note about the data in Figure 1 is the relative stability of citations for the most frequently cited papers in terms of their continuing appearance in the citation rankings. This position contrasts with a more general analysis of the production and operations management (P/OM) research literature reported (Neely and Lewis, 2005). That study found that in the 1980s the most frequently cited P/OM works were practitioner books and papers, such as *The Machine That Changed the World* (Womack *et al.*, 1990) and Schonberger's work on Japanese manufacturing techniques (Schonberger, 1982, 1986). While by the late 1990s the most frequently cited works were more theoretical or methodological pieces, such as the work of Barbara Flynn, Kasra Ferdows and Jeff Miller (Ferdows and De Meyer, 1990; Flynn *et al.*, 1990, 1994; Miller and Roth, 1994). Neely and Lewis argued that this increasing shift in the P/OM literature to more theoretical and methodological pieces suggested an increasing academic professionalism of the P/OM field. The data on performance measurement suggest that this academic professionalism of the field has not yet occurred, which raises the interesting question – why? It is to this question that this paper now turns.

Whither theory?

There are several possible explanations for why the field of performance measurement has not professionalised from an academic perspective. First, it could be argued that performance measurement is not and never can be a field of academic study because of its diversity. Certainly, as alluded to earlier in this paper, even the most widely cited authors in the field come from a variety of different disciplinary backgrounds – accounting, information systems, operations management and operations research.

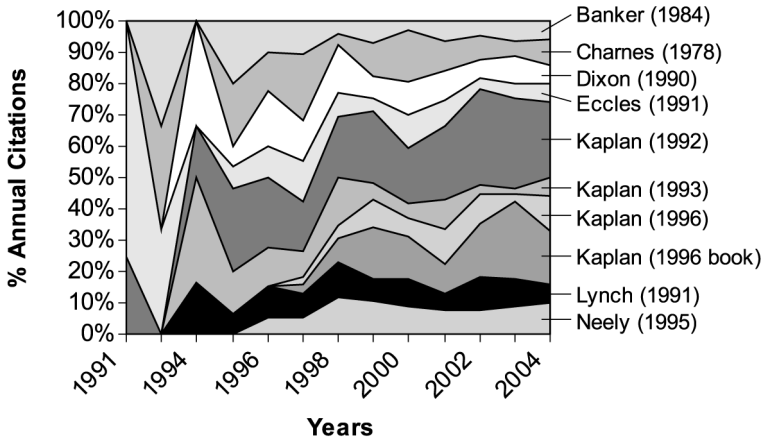

Figure 1.
Changing patterns of citation frequency[2]

It would not be surprising for people from these different disciplines to tackle different research questions, building on different theoretical bases and employing different methodological approaches. The resultant task of integrating the knowledge generated by such a diverse group of scholars to enable the development of a coherent and agreed body of knowledge for the performance measurement community would inevitably be a significant challenge.

One way of exploring the nature and impact of this challenge is by using social network analysis to understand co-citation patterns in the previously described data set. Using the CINET software the networks of the most common citations were analysed (Borgatti *et al.*, 1999). Figure 2 shows the pattern of citations for the most influential articles (those with a citation count of over 10 when the citing articles had to be cited at least 3 times). The width of line thickness indicates the frequency with which the two connected articles were co-cited. The resultant network (shown in Figure 2) contains three broad groups of authors. The central group consists of authors who focus on performance measurement – Dixon, Eccles, Johnson, Kaplan, Lynch, Maskell and Neely. It appears that these authors relate their work to the manufacturing and business strategy literatures, hence the links to the work of Hayes and Porter. The other two sets of authors are somewhat more independent. The pieces by Charnes and Banker are key contributions to the development of the data envelopment analysis methodology, while the work of Palmer focuses on medical research.

Given the relatively dense network at the centre of Figure 2, with the suggestion that authors are concentrating on issues of strategy and measurement then it could be argued that in spite of the different disciplinary backgrounds of these authors – primarily accounting and operations management – they are seeking solutions to a common challenge, namely how to ensure performance measurement systems relate to an organisation's strategy. Figure 3 explores this hypothesis by presenting a social

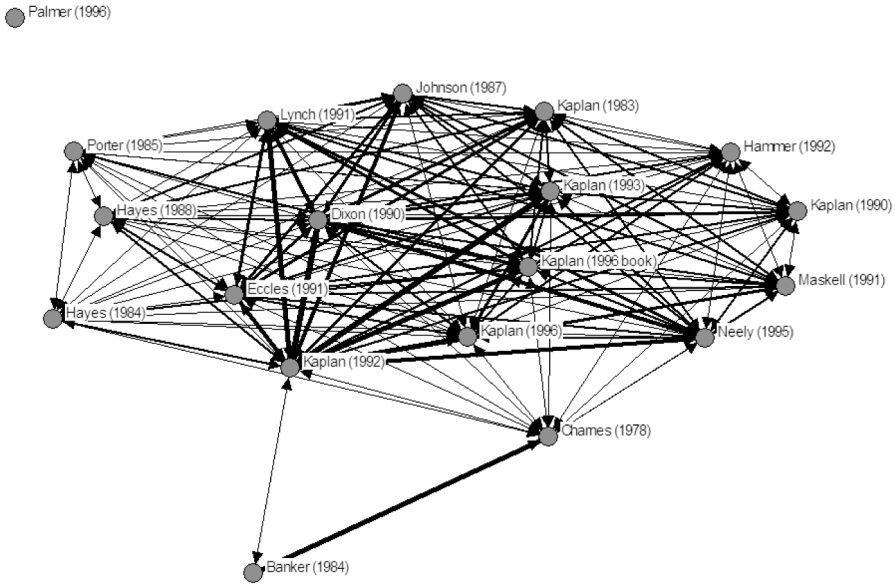

Figure 2.
Citation/co-citation analysis for most influential works

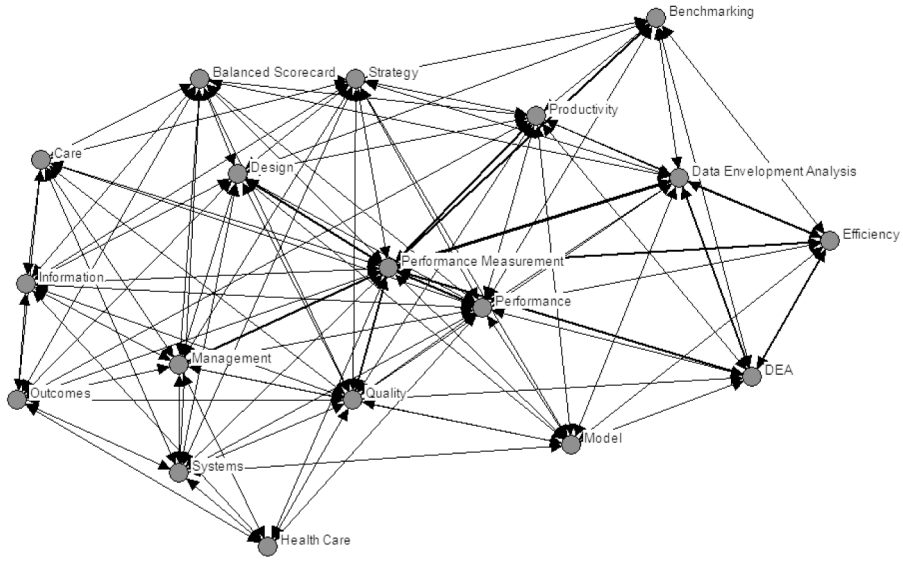

Figure 3.
Keyword analysis for most influential works

network of keywords for the most frequently cited works (only works with over 20 citations are included in this analysis). Figure 3 adds further support to the hypothesis proposed above – namely that issues of strategy and how to align measurement systems with strategy – are core to the performance measurement discourse. However, Figure 3 also emphasises that significant associated work has been carried out in the fields of health care (to the left of the figure) and data envelopment analysis (to the right of the figure).

Taken together Figures 2 and 3 and the accompanying discussion suggest that the first explanation for the failure of the performance measurement community to professionalise – namely a failure to agree on the core research questions and issues given the diversity of people involved in the field – is unlikely to be valid. Indeed there appears to be a reasonably integrated set of themes that individual researchers are exploring – most particularly those associated with the relationship between organisational strategy and measurement.

If there is broad agreement about the core questions, then why else might the field have failed to professionalise? One potential explanation is the age of the field. It could be hypothesised that the field of performance measurement is still relatively immature. It is worth noting that the 10 most cited articles identified in Table I were published in the period 1978 and 1996, with eight of them being published in the 1990s. The earlier publications – those by Charnes *et al.* (1978) and Banker *et al.* (1984) – are concerned with the data envelopment analysis methodology. All of the later publications are concerned with the link between strategy and measurement, identified as a central theme in the field. So in essence it could be argued that the field of performance measurement – in terms of coalescing around a central question – is less than 15 years old and given this the limited professionalisation to date is not surprising.

Of course, this observation immediately raises an additional question – namely will the field professionalise in the coming years? As previously discussed the

recently published performance measurement literature can be classified into five broad phases. In the 1980s, the dominant theme was a discussion of the problems of performance measurement systems – their tendency to result in short-termist and/or dysfunctional consequences with associated damaging impact on competitiveness. In essence, this phase involved a process of "problem identification" – recognising and discussing the weaknesses of measurement systems and their organisational impact. By the early 1990s potential solutions – e.g. measurement frameworks such as the balanced scorecard – were being proposed. This phase can be characterised in terms of the search for "frameworks" that might provide useful ways of addressing the previously identified problems. The third phase – "methods of application" – involved the search for ways in which the proposed frameworks could be used. Throughout the late 1990s processes and methodologies for populating measurement frameworks were being developed and discussed by the research and practitioner communities. More recently, people have begun to call for more robust empirical and theoretical analysis of performance measurement frameworks and methodologies. As increasing numbers of organisations have adopted the proposed measurement frameworks – especially the balanced scorecard – it has become easier to gather empirical data on their impact (see for example, Banker *et al.*, 2000; Ittner and Larcker, 2003; Neely *et al.*, 2004). The evidence gathered during this phase of "empricial investigation" has resulted in questions being asked about the theoretical validity of measurement frameworks and methodologies (see for example, Brignall, 2002; Nørreklit, 2000), which in turn results in a new phase of enquiry – "theoretical verification". The questions raised cause new problems to be identified and hence the cycle starts again (see Figure 4).

The future of performance measurement research

The phases in this evolutionary cycle are not as clearly delineated as this description suggests, but the cycle appears to be a reasonable proxy for understanding the development of the performance measurement field. For example, recent empirical investigations of the performance impact of the balanced scorecard have delivered mixed results (Banker *et al.*, 2000; Ittner and Larcker, 2003; Neely *et al.*, 2004). These findings have resulted in authors questioning the veracity of some the assumptions

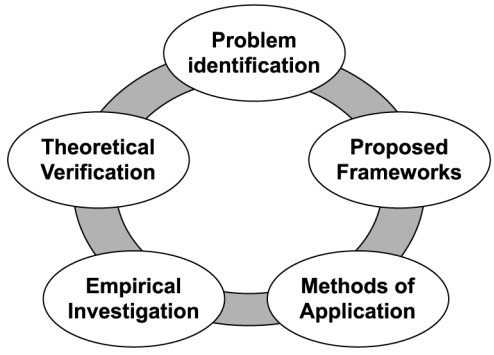

Figure 4.
The evolution of the field of performance measurement

underpinning the balanced scorecard. Some have argued that the static and linear nature of strategy maps – key tools for designing and deploying balanced scorecards – are problematic. Strategy maps assume a logical and causal set of relationships between dimensions of organisational performance, yet in reality these relationships are recursive and dynamic (Brignall, 2002; Nørreklit, 2000). Others have argued that there is a danger that organisations implementing balanced scorecards can become too obsessed with performance measurement, potentially at the expense of performance management (Neely *et al.*, 2004). These streams of work result in new research problems being identified – namely how to develop dynamic rather than static measurement systems and how to ensure an appropriate focus on enterprise performance management, rather than simply performance measurement.

Related developments emphasise that it is not just within the organisation the future research efforts need to focus. Given increasing tendencies to outsource (either offshore or onshore) then organisations become ever more dependent on their supply chains and/or networks – hence the rise of research exploring the issue of how to measure supply chain performance (Beamon, 1999). Beyond suppliers, there are other stakeholders that are expressing increased interest in organisational performance. The investment and regulatory communities – especially in the wake of recent corporate governance scandals – have become more demanding in terms of external reporting requirements. Indeed in the UK new legislation requires companies from 1 April 2005 to release *Operating and Financial Reviews* (OFR), which provide a forward-looking statement for the benefit of "members" that will assist them in assessing "the strategies adopted by the entity (firm) and the potential for those strategies to succeed" (ASB, 2005). All OFRs are expected to cover:

- The development and performance of the business of the entity during the financial year;
- The position of the entity at the end of the year;
- The main trends and factors underlying the development, performance and position of the business of the entity during the financial year; and
- The main trends and factors likely to affect the entity's future development, performance and position.

Associated with these questions of external reporting, are questions of how to value and report on firm's assets, especially as economies mature and develop and firms seek value and service alternatives to price based competition. It is clear that for many firms ever-increasing proportions of their assets are intangible, grounded in their human and social capital, but how these assets should be accounted for remains an open question (Lev, 2004; Nahapiet and Ghoshal, 1998).

Further complexity is added when one also takes account of the dynamic nature of organisations. Recent studies of measurement system implementation suggest that typical implementations take between 18 and 24 months (Bourne *et al.*, 2000). Yet rarely are organisations stable for this length of time. So a significant challenge for the research community is how can measurement systems that are sufficiently flexible to cope with the constant evolution of organisations be developed? Preliminary efforts have been made to address this question, but clearly much more work is required (Kennerley and Neely, 2003).

Does performance measurement research have a future?

There is clearly a substantial research agenda for those interested in performance measurement. Questions that have to be addressed include:

- How to design and deploy enterprise performance management rather than measurement systems?
- How to measure performance across supply chains and networks rather than within organisations?
- How to measure intangible as well as tangible assets for external disclosure as well as internal management?
- How to develop dynamic rather than static measurement systems?
- How to enhance the flexibility of measurement systems so they can cope with organisational changes.

Yet there is an interesting conundrum – namely that while there remain substantive questions to be addressed the performance measurement research community still appears to draw on a relatively limited set of influential works (the small set of articles summarised in Table I). The question that this observation raises is – why? Why is it that the performance measurement research community is so dependent on a limited number of works from a limited number of contributors? Is it that the field has had its day? That performance measurement was a topic for the 1990s and that interest in the subject is now waning – hence no significant new breakthroughs have been proposed? Or is there a deeper rooted problem?

Data to address the first question can be provided by the citation analysis. Figure 5 summarises the number of publications per year on the topic of performance measurement. These data have to be interpreted with caution for two reasons. First, the *Web of Science* database contains more information on more recent publications. Second, there is arguably an increasing tendency in the academic community to publish. With these caveats in mind, however, it is evident that interest is not waning in the subject of performance measurement. So the question of why no new dominant ideas have emerged recently stands.

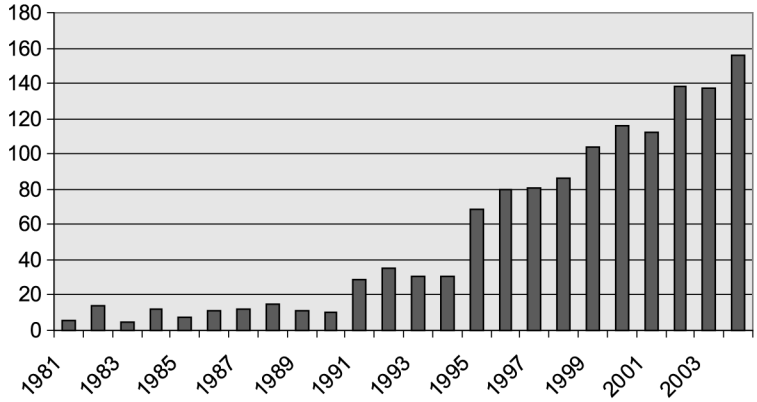

Figure 5.
Performance measurement publications per year

One immediate response is that citation analyses naturally favour older rather than more recent publications and there is certainly some validity to this argument. Figure 1 shows that articles in the field of performance measurement tend to take three to five years to reach a reasonably consistent level of ongoing citation. Given this then it should be possible to segment the citation analysis data on the basis of the most frequently cited articles published in different time periods. As already discussed all of the articles in Table I were published by 1996. Table II shows the most frequently cited articles in the last 10 years on an annual basis. This analysis is particularly interesting as it provides clear empirical evidence of the ongoing dominance of the balanced scorecard in the field of performance measurement. Kaplan and Norton's (1992) original, publication has been the most cited performance measurement article for 8 out of the last 10 years and every year for the last seven.

It could be argued that this dominance of one single concept is a potential threat to the longer-term professionalisation of the performance measurement field. If the research community continues to rely on a single framework, the empirical and theoretical validity of which some authors are beginning to question, then it may not bode well for long-term progress.

So what does this mean in practical terms? The significance and influence of the balanced scorecard cannot be under-estimated. As a framework and a concept the balanced scorecard has energised a generation of both practitioners and academics. The challenge now for the research community, however, is to build on this framework and take the measurement research agenda forward. If we fail to do so then we risk becoming trapped by solutions proposed for problems of the past.

Table II.
Citation frequencies annual count

Year	Most cited	Second most cited	Third most cited	Fourth most cited	Fifth most cited
2004	Kaplan and Norton (1992)	Kaplan and Norton (1996)	Kaplan and Norton (1996a, b)	Neely *et al.* (1995)	Charnes *et al.* (1978)
2003	Kaplan and Norton (1992)	Kaplan and Norton (1996a, b)	Kaplan (2000)	Marshall (2000)	Neely *et al.* (1995)
2002	Kaplan and Norton (1992)	Kaplan and Norton (1996a, b)	Lynch and Cross (1991)	Kaplan and Norton (1996a, b)	Johnson (1997)
2001	Kaplan and Norton (1992)	Kaplan and Norton (1996a, b)	Kaplan and Norton (1996a, b)	Charnes *et al.* (1978)	Dixon *et al.* (1990)
2000	Kaplan and Norton (1992)	Charnes *et al.* (1978)	Kaplan and Norton (1996a, b)	Dixon *et al.* (1990)	Eccles (1991)
1999	Kaplan and Norton (1992)	Kaplan and Norton (1996a, b)	Charnes *et al.* (1978)	Neely *et al.* (1995)	Kaplan and Norton (1996a, b)
1998	Kaplan and Norton (1992)	Dixon *et al.* (1990)	Kaplan and Norton (1993)	Porter (1985)	Neely *et al.* (1995)
1997	Charnes *et al.* (1978)	Kaplan and Norton (1992)	Kaplan (1990)	Dixon *et al.* (1990)	Eccles (1991)
1996	Palmer (1996)	Kaplan and Norton (1992)	Dixon *et al.* (1990)	Plamer (1985)	Charnes *et al.* (1978)
1995	Kaplan and Norton (1992)	Parasuraman (1985)	Charnes *et al.* (1978)	Banker *et al.* (1984)	Kaplan (1983)

Notes

1. In the *Web of Science* database references are recorded using the name of the lead author. Hence the citation analysis is based only on lead authored papers. This is the reason why well-known co-authors, such as David Norton, do not appear in any of the tables.
2. No data are included for 1992 as no references were made to any of these ten papers in 1992.

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