

**WHAT HAS 25 YEARS OF P/OM RESEARCH
TAUGHT US ABOUT PRODUCTIVITY?**

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ABSTRACT:

Achieving productivity growth that is both sustained and sustainable is clearly a concern of Governments across the world, yet what has 25-years of research in production and operations management taught us about productivity and to what extent have these lessons been incorporated into mainstream public policy debates. Using data gathered over the last 25 years in the International Journal of Operations and Production Management (IJOPM), the Journal of Operations Management (JOM) and the International Journal of Production Economics (IJPE) this paper argues that the P/OM community has largely failed to engage with the policy community, not because the research undertaken by the P/OM community is irrelevant to the policy community, but because the P/OM community has failed to capitalize on its relevance. Using a framework based on the OMA model – opportunity, motivation and ability - we explore the reasons why this is the case for individual P/OM scholars and the community as a whole.

Keywords: P/OM, productivity, policy, impact

INTRODUCTION: P/OM'S 25 YEAR ANNIVERSARY

2005 is an important anniversary for those working in the field of Production/Operations Management [P/OM]. Twenty-five years ago the field experienced something of a renaissance. 1980 saw the publication of the first issues of the *Journal of Operations Management* (JOM) and the *International Journal of Operations and Production Management* (IJOPM). Buffa marks P/OM's renaissance in the first paper in the Journal of Operations Management, the first sentence of which reads:

“The field of Operations Management has evolved from a purely descriptive origin through the Management Science/Operations Research phase, and *is now* [italics added] in the process of finding itself as a functional field of management”(Buffa, 1980).

In his paper Buffa identifies three distinct phases in P/OM's evolution. The first - P/OM's descriptive phase – ran until the mid 1950s. During this time P/OM was effectively synonymous with the entire field of industrial management. Then, as academics began increasingly to specialize functionally, the P/OM community found itself “left with a nearly empty basket of techniques: time and motion study, plant layout, Gantt's production control boards, the simple EOQ model, and simplistic descriptions of how production systems worked”(Buffa, 1980). Management Science/Operations Research [MS/OR] came to P/OM's rescue and prevented its extinction. However, by the late 1970s, many of the MS/OR tools were being applied

to problems in other functional fields of management, with the result that P/OM was once again left with a rather empty bag of techniques.

Buffa's third phase of evolution involved P/OM emerging as a legitimate functional field of management and he suggested that this process was in full flow by 1980. Others writing about the same time or commenting subsequently on the evolution of the field would echo this position (Filippini, 1997; Neely, 1993; Prasad and Babbar, 2000; Voss, 1984).

There is widespread agreement that growing concerns about international competitiveness and productivity, coupled with the increased threat from developing industrial economies [including Japan] contributed significantly to the growth of interest in P/OM in the early 1980s (Hayes and Abernathy, 1980; Miller et al. 1981; Voss, 1984). Fortunately this coincided with increased interest in the strategic role of operations, stimulated by the early work of Wickham Skinner and colleagues at Harvard (Hayes et al. 1988; Skinner, 1969).

Together these developments resulted in a blossoming of the field of P/OM throughout the 1980s that has continued to the current time. Debates still rage about the development of cumulative capabilities (Ferdows and De Meyer, 1990; Flynn and Flynn, 2004) and the role of operations in supply chains (Bessant et al. 2003).

Twenty-five years is a long time in the development of any field and an appropriate point at which to ask reflective questions about what has been achieved as a result of all of the talking. The P/OM community prides itself on relevance. The editorial

statements of the field's key journals claim that they "seek to further the understanding of operations management by researchers and practitioners" [Journal of Operations Management] and "draw together information at the forefront of the discipline, providing sound guidance for those concerned with the management of systems, whether in academic institutions, industry or consultancy" [IJOPM].

Interestingly neither journal mentions the policy community as an audience for the work of operations management academics. Yet the policy community is clearly an important one to speak to. Indeed much of the angst about international competitiveness and productivity – those key factors that helped raise the profile of P/OM in the early 1980s – are at the heart of the policy debate in most developed countries. Productivity, the oft used proxy for international competitiveness, is a topic of significant and enduring interest across the globe (European Union, 2003; HM Treasury , 2004b; Porter and Ketels, 2003; US Department of Commerce, 2004). Sustained and sustainable productivity growth is widely accepted as a critical determinant of a country's short and long term economic well-being and hence the quality of life of its citizens. Of more direct concern to those of us living in Europe are the data suggesting that Europe has a productivity problem when compared with the United States (European Union, 2003; HM Treasury , 2004b; Porter and Ketels, 2003). In the UK, for example, official statistics suggest that the UK economy lags the US, France and Germany by 20-30% in terms of GDP per hour worked; although the most recent data suggests that the GDP per worker gap between the UK, France and Germany in particular, may be closing (O'Mahony and de Boer, 2002; HM Treasury, 2004b).

Various mechanisms for tackling the productivity gap have been proposed. HM Treasury in the UK, for example, has identified five key levers:

- Improving *competition*, which promotes consumer choice and encourages flexible markets and increased business efficiency;
- Promoting *enterprise*, by removing barriers to entrepreneurship and developing an enterprise culture. An enterprising and competitive economy will mean the UK is well-placed to respond to opportunities in a rapidly changing and increasingly integrated global market;
- Supporting *science and innovation*, to promote the development of new technologies and more efficient ways of working. Increasing rewards to innovation mean that the UK will increasingly depend on its ability to create new knowledge and translate it into innovative goods and services;
- Raising *skills* levels, to create a more flexible and productive workforce, which can adopt innovative technologies and enable individuals to move into new areas of work. This need is reinforced by the rapidly rising skills levels in emerging markets such as China and India; and
- Encouraging *investment*, to increase the stock of physical capital, including through stronger, more efficient capital markets. Capital markets are becoming increasingly integrated in the global economy (HM Treasury, 2004).

Strikingly, much of the research that is used to defend these five levers are studies that adopt a meta-unit of analysis: focusing on economies, industry sectors, or occasionally firms. Clearly analysis at this level is important, but one could argue that the insights generated by this relatively macro analysis could usefully be supplemented by more micro, within firm analyses that seek to explore, in depth, the factors that drive productivity - research that members of the P/OM community would be well placed to execute. Indeed research that some have executed (Anonymous 1990; Oliver et al. 1996).

Researchers from other communities have clearly recognized this issue. Members of the National Institute of Economic and Social Research [NISER] have undertaken a series of widely-cited matched plant studies to explore plant level variations in productivity. But these studies, which have been undertaken by teams of economists, have not been informed by the core operations management literature, despite exploring issues that are at the heart of the P/OM agenda. A point aptly illustrated by some of the most recent and topical work on management practices and productivity. Colleagues at the London School of Economics – Nick Bloom and John Van Reenan – have been studying the relationship between the uptake of lean manufacturing practices and productivity in France, Germany, the UK and the US (Bloom and Van Reenan, 2005). Their study, which is a well-designed and executed one, is receiving significant press and policy attention, yet it ignores fundamental principles of operations management. Implicitly the study assumes there is one best way to manage – lean manufacturing – and it ignores any impact that fundamental manufacturing plant characteristics, such as volume and variety, might have. Why is this? Why is it that territory that so clearly falls within the remit of the P/OM

community is so easily colonized by others? Even more importantly, to what extent has the P/OM addressed issues of productivity and international competitiveness over the last twenty-five years? After all we have already argued that it is these issues that led to a resurgence of interest in P/OM. If the P/OM community has failed to address these issues in a way that has impacted the policy community then why and what could we do about it in the future?

The remainder of this paper sets out to explore these questions. The paper consists of four further sections. The first builds on the brief literature review already presented and explains the methodology used in this research – predominantly a meta-analysis of published papers. The second presents the results of the first stage of this analysis, exploring the extent to which members of the P/OM community have undertaken research relevant to the productivity debate. In the third section Government reports are explored and analysed in an attempt to establish the extent to which P/OM research has informed policy debates. The fourth section explores the reasons why P/OM research appears to have had little impact on policy debates, utilizing the opportunity, motivation and ability framework.

METHODOLOGY: ANALYSIS OF PUBLICATIONS

Three questions underpin this research: [1] to what extent have P/OM scholars undertaken and published research relevant to policy debates on productivity; [2] to what extent have policy makers taken account of this research; and [3] what are the potential reasons for the observed answers to these questions? For the purposes of this paper the authors decided to tackle the first two of these questions empirically and the

third theoretically, although clearly it is possible to gather empirical data on the third question as well.

To address the first question – to what extent have P/OM scholars undertaken and published research relevant to policy debates on productivity – the authors decided to perform an analysis of material published during the last 25 years in three of the field's key journals – the International Journal of Production Economics, the International Journal of Production and Operations Management and the Journal of Operations Management. Arguably these three journals are amongst the most influential in the P/OM community – see Barman et al (2001). Developments in on-line databases and the associated infrastructure have made such bibliographic analyses far more practical. For the purpose of this paper we used the Web of Knowledge as the primary data source. All available publications for the time period 1980-2005 were downloaded. This resulted in a database of 3,216 items, of which 903 were published in IJOPM; 2,113 in IJPE and 200 in JOM. The reason for the widespread variation across the journals in terms of numbers of publications is that at the time of the study the Web of Knowledge contained data on papers published in IJOPM between August 1994 and February 2005, in JOM between December 1999 and February 2005 and in IJPE between September 1991 and March 2005.

Clearly a shortcoming of this dataset is that it is biased towards more recent publications – as it is these for which electronic copies are available. To address this issue we decided to construct a second data set, this time based on citations. One of the advantages of citation analyses is that (at least in theory) successive generations of

scholars build on the work of previous generations. Hence more recent publications should contain references to older, but still influential publications.

The Web of Knowledge contains citation data for publications in IJOPM and JOM, but not for those in IJPE. The citation data for the IJOPM and JOM papers were downloaded into a second database and analysed using the Sitkis software (Anonymous2002). This second database consisted of 1,095 articles, which between them contained 23,307 citations to 22,900 different works. Figure 1 provides a summary of these data sets and illustrates their inter-relationships.

Figure 1: The Structure of the Bibliographic and Citation Data Sets

The two data sets – the bibliographic and citations – were subject to three phases of analysis. The first phase – descriptive – involved a process of uncovering appropriate descriptors of the data. The second phase – analytic – involved analysis of the data and its inter-relationships. Social Network Analysis was one of the tools used to do this. The results of these first two phases of analysis were used in the third phase – interpretative – which seeks to provide a rationale for the observed patterns in the data.

Upon completion of these three phases of analysis we moved to the second research question – to what extent have policy makers taken account of research within the P/OM community. Two methodologies were used to gather data to answer this question – document archive analysis and participant observation [with convenience sampling]. In terms of document archive analysis the authors identified a sample of policy publications produced in the UK, US and Europe. These publications were

reviewed and evidence that they drew on core P/OM work sought. This desk research was supplemented by participant observation, as one of the authors has been involved in several policy processes, including the production of background research papers that have informed both the UK's Creativity and Innovation Reviews.

Clearly the analysis undertaken to address the second research question is less formal than that undertaken to address the first, but this proved necessary for reasons of practicality and data availability. We will return to the third question – what are the potential reasons for the observed answers to the first two research questions – in due course. Figure 2 provides a summary of the methodology employed in the research.

Figure 2: Summary of Methodology Employed

BIBLIOGRAPHIC AND CITATION DATA: DESCRIPTIVE ANALYSIS

As previously discussed the bibliographic database consisted of 3,216 papers published between September 1991 and March 2005. 54 of these papers contain the word productivity in their title, while 272 contain the word productivity in the paper. Figure 3 provides a summary of how these publications split by journal and by year. The data suggest that productivity has remained a small but constant theme in the production/operations management literature since at least the early 1990s. Further support for this observation is provided by a keyword analysis on the same data set. With 41 mentions, productivity is the 35th most frequently used keyword.

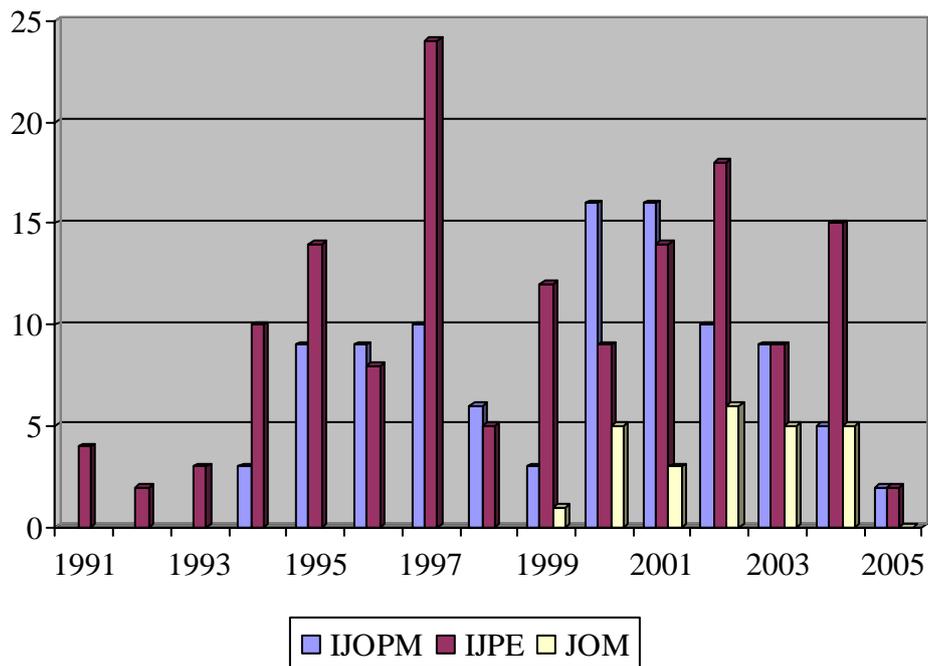


Figure 3: P/OM Publications Containing the Word Productivity

Together these data suggest that productivity has been reasonably central to the P/OM community for an extended period of time. In terms of content, the 54 papers that contain the word productivity in the title can be analysed in terms of whether they deal primarily with the measurement of productivity, understanding the determinants of productivity or improving productivity. Clearly these are not exclusive categories, although we have assumed they are for the purpose of the descriptive analysis. Figure 4 summarises a qualitative analysis of the papers using this categorization framework and illustrates that the majority of papers concentrate primarily on understanding the determinants of productivity, while relatively few (less than 12%) explore how productivity might be improved.

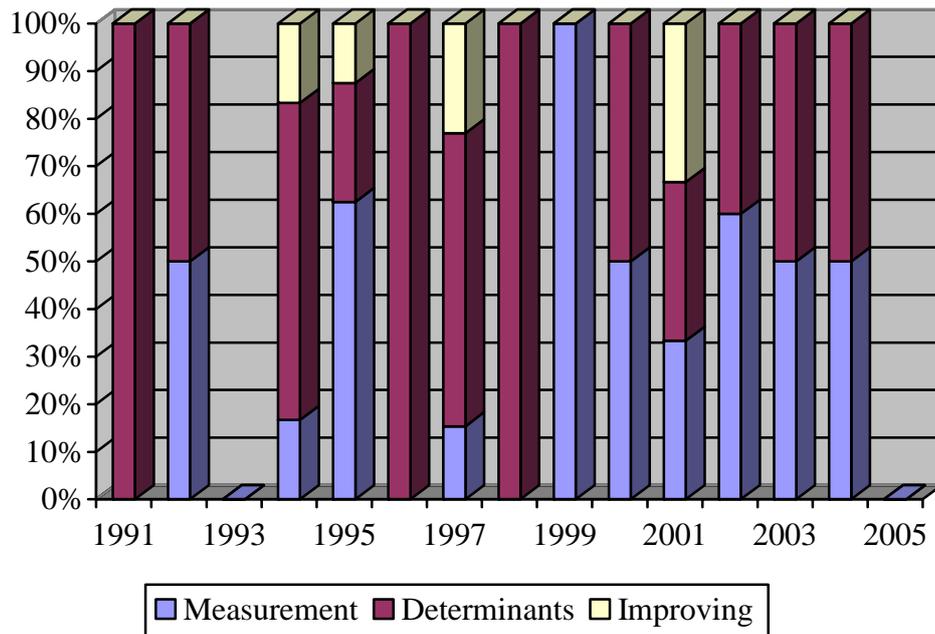


Figure 4: Focus of Papers Containing Productivity in the Title

Moving to the second database, the one containing only papers published in IJOPM and JOM, allows us to explore patterns of citation. As previously mentioned this database contains 1,095 articles and 23,307 citations. An analysis of keywords illustrates a similar pattern to the first database, although more information can be extracted. In the second database the 1,095 papers use 1,786 different keywords. The most frequently used keyword is performance, with 160 mentions. Productivity is used 27 times. Only 58 of the 1,786 different keywords are used 20 or more times and 60% of them are used only once, emphasizing the diversity of interest in the field of production and operations management.

The citation data also allow us to explore the question of what is cited. Only 83 out of 22,900 different articles are cited more than 20 times. 78% of all citations appear only once and 99% of all articles are cited 12 times or less. Table 1 summarises the

10 most frequently cited books and papers. It is interesting to note that none of these were published in the last 10 years.

Reference	Citations
Hayes, R.H. and Wheelwright, S.C. "Restoring Our Competitive Edge: Competing Through Manufacturing", John Wiley and Sons, New York, 1984.	120
Womack, J.P.; Jones, D.T. and Roos, D. "The Machine that Changed the World", Rawson Associates, New York, 1990.	76
Swamidass, P.M. "Manufacturing Strategy, Environmental Uncertainty and Performance: A Path Analytic Model", Management Science, 33, 4, 1987, pp. 509-524.	60
Ferdows, K. and De Meyer, A. "Lasting Improvements in Manufacturing Performance: In Search of a New Theory", Journal of Operations Management, 9, 2, 1990, pp. 168-185.	58
Skinner, W. "Manufacturing: Missing Link in Corporate Strategy", Harvard Business Review, 47, 3, 1969, pp. 136-146.	57
Flynn, B.B.; Schroeder, R.G. and Sadao, S. "A Framework for Quality Management Research and an Associated Measurement Instrument", Journal of Operations Management, 11, 4, 1994, pp. 339-357.	56
Flynn, B.B.; Sadao, S; Schroeder, R.G.; Bates, K.A. and Flynn, E.J. "Empirical Research Methods in Operations Management", Journal of Operations Management, 9, 2, 1990, pp. 250-285.	55
Schonberger, R.J. "Japanese Manufacturing Techniques", Macmillian, New York, 1982.	53

Miller, J.G. and Roth, A.V. "A Taxonomy of Manufacturing Strategies", Management Science, 40, 3, 1994, pp. 285-305.	52
Schonberger, R.J. "World Class Manufacturing", Macmillian, New York, 1986.	51

Table 1: The Ten Most Frequently Cited Books and Papers

BIBLIOGRAPHIC AND CITATION DATA: ANALYTIC PHASE

One of the criticisms of citation analysis is that it can unfairly privilege older works, which by definition have had more time to be cited. A strategy for overcoming this problem is to look at annual citation counts. These data can illustrate whether particular works are gaining or waning in popularity. Figure 5 presents the annual citation counts for the ten books and papers listed in Table 1. It is interesting to note that all ten books and papers appear to have stood the test of time, in that they have all been consistently cited over the years. Importantly, however, there is some evidence that the pieces that seek to make methodological contributions are gaining an increasing share of citations, at the expense of the more practice based works.

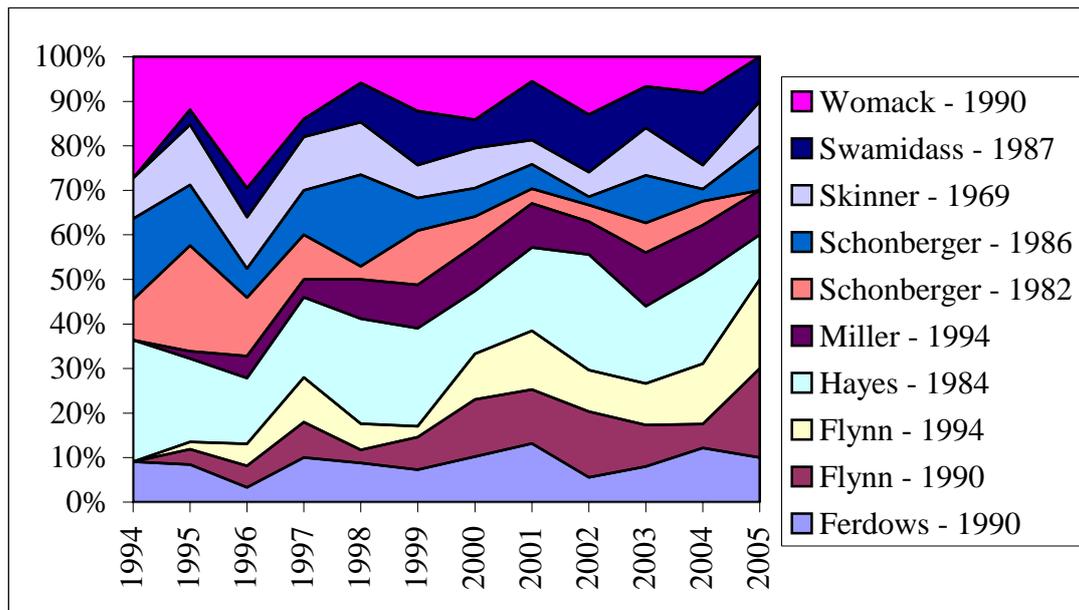


Figure 3: Annual Variation in Citations for the Ten Most Cited

This point can be illustrated by further analysis of the ten most frequently cited works. Three of these can be classified as practice based works – the two books by Schonberger and the book by Womack et al. Two – both of the papers by Flynn et al – can be categorized as methodological contributions, while the rest can be classified as theoretical contributions. Figure 6 shows how the share of citations for these works varies over time given this classification.

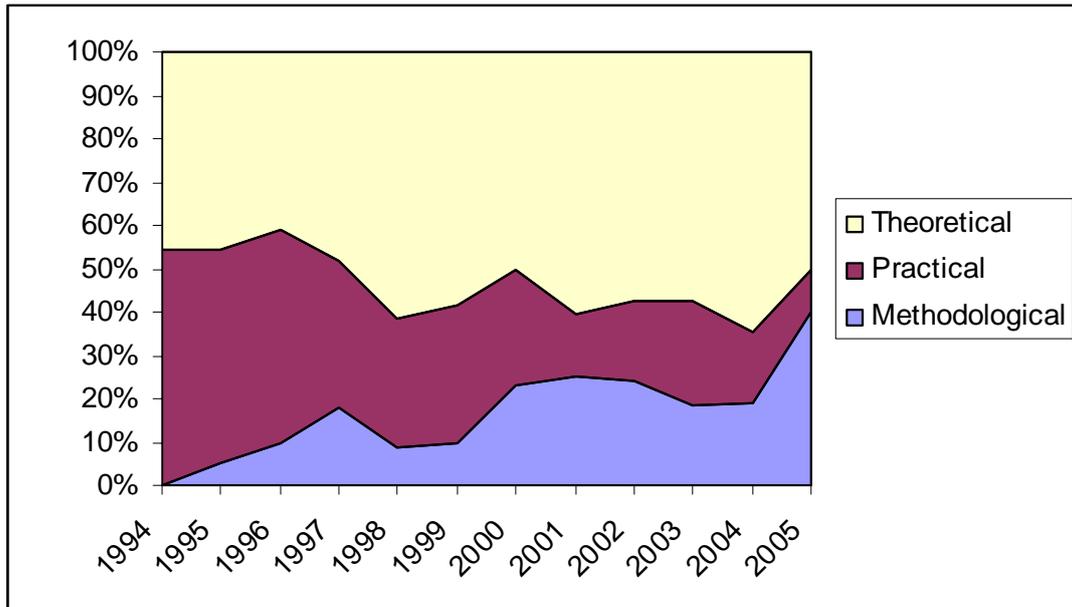


Figure 6: Shifting Patterns of Orientation

In terms of productivity specifically, the citation data set allows us to search for clusters of work with the theme of productivity. To do this we have extracted from the database the 63 articles that were published in IJOPM or JOM that mention productivity either in their title, keywords or abstract. Between them these 63 papers include 1,886 citations and 283 keywords, the most common being productivity [27 mentions], performance [13], performance measurement [11], data envelopment analysis [10], and manufacturing [8]. In this database [n=63] only three works are cited in more than 10% of papers (Charnes et al. 1978)XXXCharnes, 1994XXX(Anonymous1984). 91% of citations are made only once and 1% of citations are made 4 times or more. See Table 2 for a summary of these.

Reference	Citations
CHARNES A-EUROPEAN J OPERATION-1978	7
CHARNES A-DATA ENVELOPMENT ANA-1994	7

HAYES RH-RESTORING OUR COMPET-1984	7
BANKER RD-MANAGE SCI-1984	5
DIXON JR-NEW PERFORMANCE CHAL-1990	5
BANKER RD-OPER RES-1986	4
BROCKETT PL-MANAGE SCI-1996	4
FARRELL MJ-J ROYAL STATISTICA A-1957	4
KAPLAN RS-ACCOUNT REV-1983	4
SEIFORD LM-J PROD ANAL-1996	4
SKINNER W-HARVARD BUSINESS MAY-1969	4
SKINNER W-HARVARD BUS REV-1974	4
SWAMIDASS PM-MANAGE SCI-1987	4
WHEELWRIGHT SC-STRATEGIC MANAGE J-1984	4

Table 2: The Books and Papers Most Frequently

Cited By Those Works Concentrating on Productivity [n=63]

BIBLIOGRAPHIC AND CITATION DATA: INTERPRETIVE ANALYSIS

An important question to ask is what is the relationship between these works? A useful method for establishing this is Social Network Analysis, which seeks to identify the strength of ties between different actors in networks. Clearly when it comes to citation data different social networks can be explored. A classic approach is to review citation/co-citation patterns, but an equally valid method is to review keyword relatedness. Both forms of analysis were undertaken for the purposes of this paper.

Using the CINET software the networks of keywords and most common citations for the 63 articles that focus on productivity were analysed (Anonymous1999). Figure 7 shows the pattern of keywords for the most commonly cited articles [those with a

weaker ties [see line thicknesses] suggesting that coherent bodies of work may not have yet emerged for these topics.

An alternative way of exploring networks is citation/co-citation analysis. Figure 8 shows the network that results if data inclusion criteria are: [i] a minimum of two citations to the reference and [ii] a minimum of six citations to the cited article in the dataset. These data inclusion criteria ensure that only articles that are deemed to have had reasonably widespread impact are included in the network analysis. The data shown in figure 8 suggests that the articles that focus on productivity fall into three broad categories. By far the most densely bundled set of co-citations centre on the core performance measurement literature [shown to the right of the figure]. The second [and somewhat outlying] literature is that discussing Data Envelopment Analysis, a specific productivity measurement methodology, favoured by a significant number of productivity researchers. The third bundle of co-citations, shown towards the top of figure 8, relate to the manufacturing strategy and general research methodology literature, suggesting that productivity researchers who publish in P/OM journals tend to seek to position their research in the arena of manufacturing strategy.

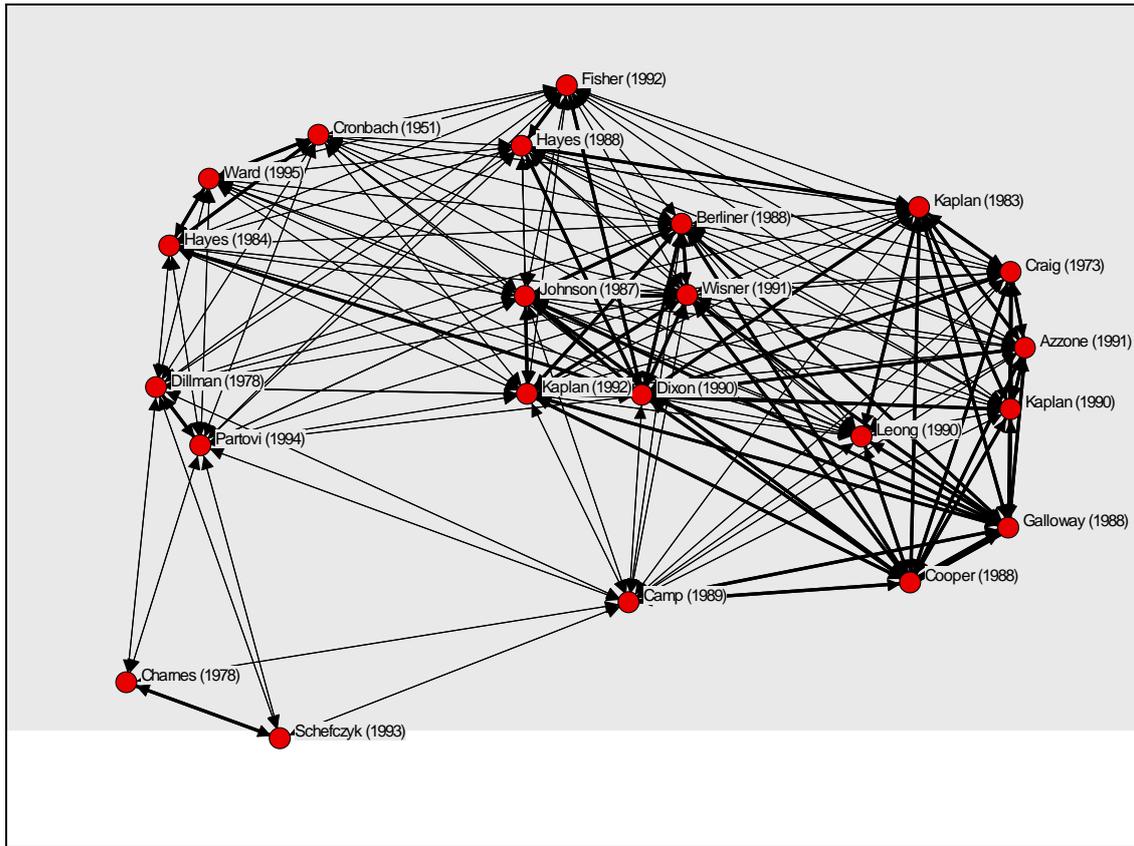


Figure 8: Co-Citation Network for Productivity Articles

THE POLICY CONTEXT: DESCRIPTIVE ANALYSIS

It is clear from numerous publications that policy makers are concerned with issues of productivity. The US, for example, published a report in January 2004 – Manufacturing in America. The introduction to the report reads:

The United States is the world's leading producer of manufactured goods. Standing alone, the U.S. manufacturing sector would represent the fifth-largest economy in the world—larger than China's economy as a whole. The U.S. manufacturing sector also leads in innovation, accounting for more than 90 percent of all U.S. patents registered annually. Investments in technology create new industries and careers in manufacturing as U.S. firms

introduce products and cutting-edge manufacturing techniques. Perhaps *most importantly*, productivity in manufacturing has continued to rise significantly [italics added]”(US Department of Commerce, 2004).

While Ben Bernanke, Chairman of President Bush’s Council of Economic advisors, speaking in September 2005 said:

“Turning to the topic of this meeting, I will review some recent developments, as well as the prospects, for the U.S. economy. Those of us whose job it is to monitor the economy follow literally hundreds of economic data series, but *four are particularly crucial*: (1) the gross domestic product, the basic measure of aggregate economic activity; (2) the unemployment rate, which (together with key employment statistics such as payroll employment) measures the utilization of our labor resources; (3) *productivity growth, a fundamental determinant of how fast the economy and living standards can grow*; and (4) inflation, a basic indicator of monetary and financial stability [italics added]”¹.

Similar statement can be found in policy papers and speeches made by politicians across Europe. One of the UK Treasury’s key policy areas is productivity: “Productivity growth, alongside high and stable levels of employment, is central to long-term economic performance and rising living standards. Increasing the productivity of the Economy is a key objective for the Treasury”². In a series of five influential papers, published between November 2000 and March 2004, the British

¹ Ben Bernanke, Chairman of the Council of Economic Advisors speaking at the Macroeconomic Advisers Washington Policy Conference on September 8th 2005.

² See http://www.hm-treasury.gov.uk/documents/enterprise_and_productivity/ent_index.cfm

Government outlined its views on productivity in the UK (HM Treasury, 2000; HM Treasury, 2001a; HM Treasury, 2001b; HM Treasury, 2003; HM Treasury, 2004a). Similar publications have been produced at a European level – most notably the recent Lisbon Strategy (Denis et al. 2005). The damning opening paragraph of this report reads:

“The structural nature of the EU’s productivity downturn is confirmed by the analysis in this paper, with the bulk of the deterioration emanating from an outdated and inflexible industrial structure which has been slow to adapt to the intensifying pressures of globalisation and rapid technological change. The EU’s productivity problems are driven by the combined effect of an excessive focus on low and medium-technology industries (with declining productivity growth rates and a globalisation-induced contraction in investment levels); an inability to seriously challenge the US’s dominance in large areas of the ICT industry, as reflected in the relatively small size of its ICT production sector; and finally, its apparent slowness in reaping the productivity enhancing benefits of ICT in a range of ICT-using industries, although measurement issues severely complicate an assessment of the gains from ICT production and diffusion” (Denis et al. 2005).

Consistently these and other similar reports talk about the importance of manufacturing [particularly high value manufacturing], the need for innovation - both within the firm in terms of products/services, processes and organizational form and outside the organization in terms of facilitating the creation of new markets - and the potential contribution organizational practices can play in enhancing firm

performance (Department of Trade and Industry, 2003; US Department of Commerce, 2004; Denis et al. 2005). Clearly each of these issues is of interest to the P/OM community. Indeed given the data presented already in this paper it is clear that the P/OM community has sought to address issues of productivity and performance in their research. The question then, is how influential has this research been? To what extent does it feature in and influence the major policy publications of the day?

To address these questions we reviewed in detail four policy publications – the US Manufacturing Strategy, the UK’s Innovation Strategy, the UK’s Manufacturing Strategies and the EU’s Lisbon Strategy³. These publications were chosen on the grounds that they are arguably the most significant [and relevant] policy publications to have been produced on topics relating to productivity and performance in recent years. The analysis – which was essentially qualitative in nature – involved an in-depth review of each publication using a content analysis methodology. We constructed a dictionary which included the names of all authors listed in tables 1 and 2 [i.e. the authors of both the most cited books and papers in P/OM and the authors of the most cited P/OM works that relate to productivity]. Table 3 contains a summary of the findings of this analysis.

Table 3: Results of Policy Document Content Analysis

Policy Paper	Total number of words in paper	Number of unique words	Number of references to the	Total Number of references in the
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³ The full references to these four policy reports are:

- Dti “Innovation Report - Competing in the Global Economy: The Innovation Challenge”, December, 2003.
- Dti “Manufacturing Strategy: The Government’s Response to the Third Report of the House of Commons Trade and Industry Select Committee: Session 2001-02”, July, 2002.
- European Union, “European Competitiveness Report”, November, 2003.
- US Department of Commerce “Manufacturing in America”, January, 2004.

			works of the most frequently cited P/OM academics	document
US Manufacturing Strategy	38,930	4,906	No references to any of the works of the most frequently cited P/OM academics	63
UK Manufacturing Strategy	22,204	2,776	No references to any of the works of the most frequently cited P/OM academics	32
UK Innovation Review	52,823	4,509	No references to any of the works of the most frequently cited P/OM academics	92
The Lisbon Strategy	25,451	2,492	No references to any of the works of the most frequently cited P/OM academics	60

POLICY IMPACT: THE OMA MODEL

It is clear from the data presented in table 3 that there is a disconnect between the P/OM and policy communities, not in terms of their interests in productivity and performance, but instead in terms of their awareness and/or reliance on one another's work. To explore this apparent disconnect a theoretical framework developed over the last 15 years by social psychologists and consumer researchers will be deployed (Batra and M.L. Ray, 1986; Andrews, 1998; MacInnis et al. 1991). The model is based on findings suggesting that there are two principal challenges to be overcome prior to effective communication. The first is that the content of the communication must match an audience's level of processing. When an audience is unlikely to process information, it becomes more important to sprinkle messages with cues that will attract audiences and cause them to like a message. However, once an audience is engaged, this marketing is much less important than the strength and/or quality of

arguments. In other words, it is crucial to encourage deeper processing as this evokes more enduring memory and attitudinal change. More specifically, the OMA framework proposes that three factors act as antecedents to information processing: *Opportunity, Motivation and Ability*.

- ***Opportunity***. This relates to those exogenous characteristics of a message, such as exposure time, message length, the number of arguments, and the absence of distractions.
- ***Motivation***. Motivation is the preparedness of an audience to focus on and process particular information.
- ***Ability***. This dimension relates to the skills necessary to interpret a message. High-ability audiences are proficient at message processing because they are experts, that is, they are knowledgeable about a topic.

In other words, if P/OM researchers wish to be more involved in policy debates they must be concerned with assuring that their potential audience possesses sufficient motivation, ability, and opportunity to engage with their research findings. The lack of interchange between P/OM and policy suggests that both parties currently exhibit low motivation. From a mainstream P/OM perspective this lack of motivation can be explained in part by the field's primary focus on a different audience entirely: practicing managers. As evidence of the primacy of this audience, it is possible to point to regular expressions of concern over level of impact on practice (Buffa, 1980; Wilson, 1995; Hayes, 2000). Whilst this concern with relevance is entirely laudable, it

may have rendered the discipline somewhat blind to its own potential contribution to other important areas of debate, such as public policy. What techniques can be used to enhance motivation? One of the most important involves the creation of an *attractive* and *interesting* message that will create positive affect. (n.b. what consumer researchers have labelled the *attitude toward the ad* or *Aad*). The extensive *Aad* literature suggests that messages that strike affective responses generate more attention, greater interest, more cognitive responses, higher message recognition, and greater topic recall. P/OM, at least implicitly, understands the need to market its work – after all, its quintessential study is the International Motor Vehicle Program (IMVP) report into the performance of the global motor industry (Anonymous 1990). This study ‘revealed’ the existence of a 2:1 difference in productivity between car assembly plants in Japan and those in the West. The performance differential was ascribed to Lean Production practices that improved productivity through reduced lead times, material and staff costs, increased quality etc. Given the creation of such strong levels of motivation, it is no surprise that these findings led to a great deal of automotive industry ‘soul searching’ and Lean Production practices aroused such intense and enduring interest. Interestingly, although most P/OM authors suggest normative explanations for the impact of the ‘lean production’ research and corresponding model (Voss, 1995), it is possible to highlight alternative explanations using the OMA model. For instance:

- *The content and style of the book.* For instance, the three named authors (Womack, Jones and Roos) actually collaborated with a fourth (Donna Carpenter, named only on the inside copyright sheet) who, as a professional writer, helped to improve the readability of the text.

- *The timing of the book.* It emerged towards the end of a period of sustained interest in operations management related issues that had initially been triggered by Japanese industrial expansion. It is worth remembering that during the 1980's, successive US administrations commissioned large-scale investigations into the relative decline of US industry and power of Japan.
- *The research methodology employed.* The data was collected using collaborative research involving lots of academics in multiple locations, this in turn meant that key academic (and consulting) players were on-board before publication.
- *The promotional activity associated with it.* Unlike most P/OM texts, a series of seminars and events coincided with its launch and have continued in various guises ever since. Since the original IMVP report, high-profile journal articles, books and annual 'Global Lean Summits' have continued the portrayal of Lean Production as a more or less universal set of production management principles.

More specifically, perhaps the P/OM challenge is to relate information to other experiences that might be relevant to a policy audience. Consider the dominant research methods within P/OM for instance. The field's engineering and OR/MS heritage has lead it, in the US in particular, towards methodologies that emphasise sub-firm (i.e. machine or function) level quantitative models and statistical analysis.

“Research in operations ...[is]...[h]eavy on the artificial and rational ends of the scales and light on the object reality and existential/interpretative ends,

[it] has typically exhibited high reliability and internal validity but almost no external validity.....It is time to expand our limited set of worn-out paradigms and consider new research methods from paradigms used in our sister fields.”(Meredith et al. 1989)

IMPLICATIONS AND CONCLUSIONS

POM researchers who wish to focus their attention on issues and target audiences that lie beyond the traditional boundaries of the discipline face a number of challenges. With respect to the productivity debate, the apparent lack of interchange between P/OM and policy makers suggests the need to adopt a more structured approach to designing and communicating future studies. This paper argues that the OMA model offers a potentially useful framework for conceptualizing and unifying otherwise seemingly disjointed interests, messages and audiences.

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Figure 1: The Structure of the Bibliographic and Citation Data Sets

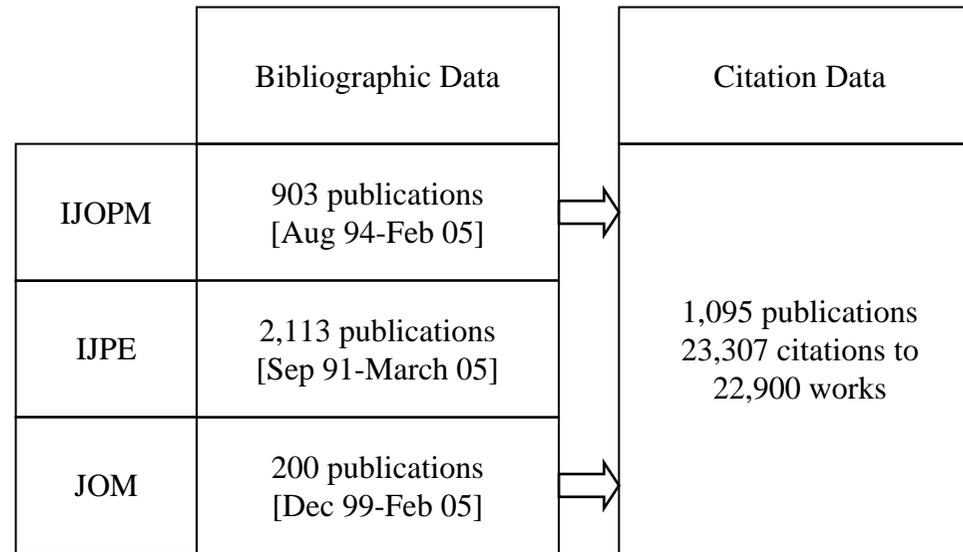


Figure 2: Summary of Methodology Employed

Research Question:	Question 1: To what extent have P/OM scholars undertaken and published research relevant to policy debates on productivity?	Question 2: To what extent have policy makers taken account of this research?	Question 3: What are the potential reasons for the observed answers to these questions?
Data Sources and Methodologies:	Bibliographic and citation data.	Document archive analysis and participant observation.	Findings from research questions 1 and 2.
Analysis Phases:	<ul style="list-style-type: none"> •Descriptive •Analytic •Interpretative 	<ul style="list-style-type: none"> •Descriptive •Analytic •Interpretative 	Findings viewed through the lens provided by the theory of opportunity, motivation and ability.