STRUCTURE OF THE LEAN LITERATURE: JOURNAL QUALITY ANALYSIS

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1. INTRODUCTION

Over the last three decades, the topic of 'Lean' (Womack and Jones, 1996) has become firmly established within the field of logistics and supply chain research. This conference paper builds upon the work presented at ISL'16 (Francis *et al*., 2016), and represents the start of the second stage of a programme of bibliographic research into the topic of Lean. The first stage of the programme was a Citation Analysis (CA). This identified a dataset of the 241 most influential publications on the topic of lean, as measured by citation; the dominant academic approach for providing insight into the significance of individual publications (Peng and Zhou, 2006; Aguinis *et al*., 2014). This dataset is presented as a sample of the wider population of lean literature.

The second stage of the programme will provide a detailed evaluation of the structure of the lean literature, so that its characteristics and influence among academics and practitioners might be better understood. This paper represents the first of a number of deliverables from that second phase. Using both citation and publication counts as measures of influence, its specific objective is to analyse the journal papers that comprise over 78% of the dataset, and evaluate the relative quality of these. Such evaluation is established with reference to the *Academic Journal Quality Guide* produced by the *Association of Business Schools* (ABS, 2015).

2. METHODOLOGY

The first stage of the research design had three process steps. The first of these was to select the bibliographic database that was to host the source population of publications for subsequent descriptive analysis. Any such database needed to provide searchable citation statistics on an individual, un-aggregated

publication level. In addition, the substantial personal experience of the authors with the lean literature suggested that many of its most highly cited publications were likely to be books rather than journal papers. It was therefore important to select a database that encompassed the widest range of publication types. Google Scholar (GS) was subsequently selected as it is the most extensive academic indexing source. GS draws material from publishers, professional societies and university repositories in a broad range of academic disciplines. In addition to journal papers, conference papers, theses, dissertations, abstracts it also includes books, pre-prints and technical reports. GS therefore encompasses material associated with practitioners as well as academics; thereby partly addressing the concern raised by Aguinis et al. (2014) regarding the single (academic) stakeholder focus of the standard CA approach.

Having established the source database, the second step of the research process was to design the query search strategy to be used to identify relevant publications. Taken in conjunction with lay meanings of the word 'lean', the polymorphic nature of the lean concept highlighted by Samuel et al. (2015) poses particular challenges to constructing query search phrases that identify the population set of publications that are specific and most pertinent to the lean paradigm. The choice of search phrases will clearly influence the subsequent publications considered for analysis. However, researchers need to make informed choices in such circumstances to establish practical limits (Seuring and Gold, 2012). Based upon a consensus between the authors of this paper, ten lean synonym search phrases were subsequently agreed upon. These were: 'lean manufacturing', 'lean production', 'lean thinking', 'lean management', 'value stream', 'Toyota', 'world class manufacturing', 'Japanese manufacturing', 'just in time' and 'kaizen'. All employed an exact phrase match in the publication title, no date restrictions, and were for all publication types (excluding patents, case law and citations).

The third research process step was to implement this search strategy. The detailed results of each query were presented in highest to lowest number of citations per publication sequence, with some queries resulting in thousands of hits. The top 25 most relevant publications for each query were then identified, and the full reference details copied into an Excel worksheet. This entailed reading the abstracts of each publication in sequence to ensure it was relevant to the lean paradigm, until the 25 most highly cited relevant publications were identified. The net result was 250 individual publication reference details contained within ten worksheets. These were then merged and duplicate publication entries removed. This formed a merged dataset (MDS) of 241

unique publication reference details; representing an aggregated total of 98,829 citations. For each reference in the MDS, individual field details included the rank position (according to-); total citations; author/s; year of publication; publication title and relevant publication outlet data fields.

The second stage of the research design involved enhancing the MDS with the additional data fields necessary to enable the planned evaluation of the lean literature. The deliverable reported upon in this paper required journal/ quality coding. It was decided to use the 2015 edition of the Association of Business Schools' Academic Journal Quality Guide (ABS) as the vehicle to support this exercise. ABS is a guide to the relative quality of journals in which business and management academics publish their research; derived from peer review, editorial and expert judgements (ABS, 2015, p.5). ABS has become particularly prominent in the UK over recent years, and has a number of advocates (Hussain, 2011; Morris et al., 2011). However, it should be noted that both the objectivity of the guide itself and the managerial uses to which it has been applied have been criticised by some academics (see Willmott, 2011; Hoepner and Unerman, 2012).

With this research limitation in mind, a publication-type code was added for each of the 241 MDS publications to signify whether it was a book, book chapter, conference paper, journal paper or report. In addition, a unique journal code was produced for every individual journal title represented within the dataset (eg 'IJPR'). For all publications identified as a journal paper, the appropriate journal code was appended at this point to signify its source journal title. A master list of the MDS journal titles was then built. With reference to the ABS (2015) document, three fields were subsequently added to each journal title entry to facilitate sorting and evaluation: is the title listed ('yes' or 'no'), what is the journal's quality rating ('1'-'4*'), and to what subject area does the title belong?

3. DISCUSSION

The MDS composition by publication type is summarised in Table 1. As with all of the tables contained within this section, details are provided of the influence of each table entry, where such influence is expressed in terms of both total number of publications and total number of citations within the MDS. This table highlights that 97.5% of the MDS publications are books and journal papers. Indeed, the (189) academic journal papers that form the focus for the remainder of this article comprise 78.4% of the total MDS publications; a surprisingly high proportion for a topic that is considered atheoretical by many commentators. The other

important finding contained within Table 1 is that the 19.1% of the MDS comprised of books represent 40.3% of its total aggregated citations. Reference to the final column of the table reveals that the average number of citations per book is over two and a half times that per journal paper.

Table 1. Influence by publication type (all publications)

Publication Type	Publications		Citations		
	#	%	#	%	Avg./ Pub
Book	46	19.1	39,785	40.3	865
Book Chapter	2	0.8	214	0.2	107
Conference Paper	2	0.8	176	0.2	88
Journal Paper	189	78.4	58,365	59.1	309
Report	2	0.8	289	0.3	145
TOTAL	**241**		**98,829**		

For the remainder of this article we focus on evaluating only the characteristics of the journal papers within the above. Table 2 summarises the ABS (2015) listing details of the journal papers contained in the dataset. Nearly 78% of these MDS papers are found in listed journals, and these account for nearly 88% of the total journal paper citations. In fact, the average number of citations per publication of listed journal papers is twice that of the non-listed figure.

Table 2. Journal paper breakdown: ABS listed?

ABS Listed?	Publications		Citations		
	#	%	#	%	Avg./ Pub
NO	42	22.2	7,159	12.3	170
YES	147	77.8	51,206	87.7	348
TOTAL	**189**		**58,365**		

We now turn our attention to the 147 journal papers that are found in ABS (2015) listed journals; starting with an evaluation of the relative academic quality of the journal titles that these publications are found in. Table 3 details the official ABS (2015) definition for each of its five quality ratings. ABS uses these to classify and rank 1,401 business and management journal titles within 22 subject areas.

Table 3. Definition of ABS journal quality ratings

ABS Rating	Meaning
4*	Journals of Distinction. Within the business and management field including economics, there are a small number of grade 4 journals that are recognised world-wide as exemplars of excellence. Their high status is acknowledged by their inclusion in a number of well-regarded international journal quality lists. The Guide normally rates a journal 4* if they are rated in the highest category by at least three out of the five non-university based listings – Financial Times 45, Dallas List, VHB, Australian Deans' List, CNRS. In addition, journals from core social sciences disciplines that do not appear in those listings may also be rated 4* on the grounds that they are clearly of the finest quality and of undisputed relevance to business and management. In the Guide of 2015, this applies to three journals from the fields of sociology and psychology.
4	All journals rated 4, whether included in the Journal of Distinction category or not, publish the most original and best-executed research. As top journals in their field, these journals typically have high submission and low acceptance rates. Papers are heavily refereed. Top journals generally have the highest citation impact factors within their field.
3	3 rated journals publish original and well executed research papers and are highly regarded. These journals typically have good submission rates and are very selective in what they publish. Papers are heavily refereed. Highly regarded journals generally have good to excellent journal metrics relative to others in their field, although at present not all journals in this category carry a citation impact factor.
2	Journals in this category publish original research of an acceptable standard. A well regarded journal in its field, papers are fully refereed according to accepted standards and conventions. Citation impact factors are somewhat more modest in certain cases. Many excellent practitioner-oriented articles are published in 2-rated journals.
1	These journals, in general, publish research of a recognised, but more modest standard in their field. Papers are in many instances refereed relatively lightly according to accepted conventions. Few journals in this category carry a citation impact factor.

Source: ABS (2015, p.7).

Using the above journal quality ratings, Table 4 details the MDS journal papers by each quality rating level. In terms of publication count, this table reveals a distinct skew towards higher rated journals, with over 75% of all listed papers being found in journals rated '3-4*'. Indeed, the largest proportion can be found in '3' rated journals (33.3%), whilst the two smallest categories are '2' and '1' rated respectively. In terms of citations, the skew is even more pronounced with the '3-4*' rated journals yielding nearly 92% of the aggregated citations. In fact, there is an extremely high correlation ($r=0.957$) between journal quality rating and the average number of citations per publication for the MDS papers categorised for that rating.

Table 4. Journal paper influence by ABS quality rating

Quality Rating	Publications		Citations		
	#	%	#	%	Avg./ Pub
4*	27	18.4	16,760	32.7	621
4	36	24.5	13,706	26.8	381
3	49	33.3	16,414	32.1	335
2	16	10.9	2,015	3.9	126
1	19	12.9	2,311	4.5	122
TOTAL	147		51,206		348

The 147 ABS listed journal papers contained within the MDS are drawn from 70 different journal titles. Importantly, these titles are dispersed across 19 of the 22 ABS subject areas. Of course, this distribution is far from even among either the journal titles or ABS subject areas. Table 5 details the latter. In terms of publication count, the top three categories account for over 72% of the listed papers. *Operations & Technology Management* is unsurprisingly the largest category; accounting for 51% of the papers. Perhaps more surprisingly, this is followed by *General Management, Ethics & Social Responsibility* which accounts for an additional 13.6% of the listed papers. *Economics, Econometrics & Statistics* accounts for a further 7.5%.

Table 5. Journal paper influence by ABS subject area

Subject Area	Publications		Citations		
	#	%	#	%	Avg./ Pub
Accounting	4	2.7	492	1.0	123
Business History & Economic History	1	0.7	124	0.2	124
Economics, Econometrics & Statistics	11	7.5	4,439	8.7	404
Entrepreneurship & Small Business Management	1	0.7	346	0.7	346
Finance	1	0.7	785	1.5	785
General Management, Ethics & Social Responsibility	20	13.6	7,750	15.1	388
HRM & Employment Studies	5	3.4	967	1.9	193
Information Management	2	1.4	229	0.4	115
Innovation	1	0.7	96	0.2	96
International Business & Area Studies	2	1.4	162	0.3	81
Management Development & Education	1	0.7	54	0.1	54
Marketing	2	1.4	906	1.8	453
Operations & Technology Management	75	51.0	23,487	45.9	313
Operations Research & Management Science	7	4.8	2,806	5.5	401
Organisation Studies	2	1.4	1,369	2.7	685
Psychology (Organisational)	3	2.0	877	1.7	292
Sector Studies	2	1.4	187	0.4	94
Social Sciences	3	2.0	1,378	2.7	459
Strategy	4	2.7	4,752	9.3	1,188
TOTAL	**147**		**51,206**		**348**

If we turn to citation analysis, then the top three categories again account for over 70%, although the actual subject areas are slightly different. *Operations & Technology Management* is again the leading category, with 45.9% of total ABS listed citations. *General Management, Ethics and Social Responsibility* is again second, with

15.1%. However, the third highest subject area category by citation is *Strategy*, yielding 9.3% of the citations.

4. CONCLUSIONS

This paper represents the first deliverable of a programme of research that aims to detail the wider structure of the lean literature. The discussion in the previous section yields three important conclusions. First, the high prevalence of journal papers (78%+) in the MDS throws into question the claim that lean is an atheoretical topic. Second, a very significant skew in terms of publication and citation count was noted towards the highest ABS journal quality ratings. This was reinforced by a very high correlation between quality rating level and the average number of citations per publication for that category. This suggests that ABS journal quality rating is a reliable proxy for degree of citation; certainly for the lean literature. If such ratings are indeed an indication of the underlying academic quality of the journal outlet, then this further reinforces the first conclusion. Lastly, the discussion revealed that the MDS journal publications were drawn from 19 of the 22 ABS subject areas, underlining the extent of diffusion of the lean paradigm within the business and management literature more widely.

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