

Evolution of the Intellectual Structure of Operations Management: A Citation/Co-Citation Analysis

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Alan Pilkington: Research Areas

- Operations Management
- Innovation and Technology Management
- Bibliometrics – citation/co-citation analysis
 - Patent Analysis – key inventors, networks
 - OM discourses work
 - Alliances and joint ventures:
 - learning and operations practice transfer
 - Fuel cell innovation networks
- Enterprise Engineering
 - <http://personal.rhul.ac.uk/uhtml/001/homepage.html>

Introduction

- Overview of Bibliometric analysis
 - “field’s view of itself” (White and Griffith, 1980)
- Illustrative study: Exactly what is OM?
- Pilkington and Meredith, “The Evolution of the Intellectual Structure of Operations Management—1980-2006: A Citation/Co-Citation Analysis,” *JOM* (2009), 27 (3) pp.185-202.

Referencing Software

- To collect, manage and publish reference lists
- All software is very similar in function
 - EndNote – needs to be installed on PC
 - Refworks – on line via browser
 - JabRef – open source
 - Can import and export between these very easily
- Barrier was getting the information in...
- Now can import full information direct from databases:
 - SCOPUS
 - ZETOC
 - Other databases

Bibliometrics: definition

- Scientific study of data in literature
- Patent citation analysis
 - Provides map of how technology develops
 - Linkages between
 - Technology fields
 - Inventors
 - Firms
- Citation study of literature
 - Main contributors
 - Ranking of journals
 - Themes and how they emerge

Bibliometrics: data

- Data sources
 - ISI Web of Science Citations Index
 - Patent databases
 - Any other source
- Analyse the publications themselves
 - Authors/co-authors
 - Titles
 - Keywords
 - Abstract words
- Analyse Citations
 - Frequencies and patterns

ISI Raw Data to tagged format

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FN ISI Export Format
VR 1.0
PT Journal
AU Brown, S
BI Brown, S
TI Adapting manufacturing strategy and business-level competitive
strategy in new competitive environments: The case for
strategic reorientation
SO JOURNAL OF MANAGEMENT STUDIES
NR 189
CR 1996 IND WEEK 1207 V247 P23
YOUNGDT MA, 1996 ACAD MANAGE J V39 P836
ZALJAC EJ, 2000 STRATEGIC MANAGE J V21 P429
ZALJAC EJ, 1989 STRATEGIC MANAGE J V10 P413
EP 793
EP 815
PG 23
JT J Manage Stud
PT 2007
PD 120
VL 42
IS 4
GA 92973
PJ J MANAGE STUD-OXFORD
UT ISI:0002936900004
ER

PT Journal
AU Brown S, Richardson R
BI Brown S, Richardson R
TI Adapting manufacturing strategy and business-level competitive
strategy in new competitive environments: The case for strategic reorientation
SO JOURNAL OF MANAGEMENT STUDIES
NR 189
CR 1996 IND WEEK 1207 P23 V247 1996 IND WEEK 1207 P24 V247 ADLER PS, 1996
P15 CALIFORNIA MANAG ORG ANDERSON J, 1991 V1, P86 INT J PRODUCTION ORG ZALJAC
EJ, 2000 V21, P429 STRATEGIC MANAGE J ZALJAC EJ, 1989 V10, P413 STRATEGIC MANAGE
EP 793
EP 815
PG 23
JT J Manage Stud
PT 2007
PD 120
VL 42
IS 4
GA 92973
PJ J MANAGE STUD-OXFORD
UT ISI:0002936900004
ER

Tools to help: Bibexcel, SITKIS
Tutorial:
http://www4.rhnc.ac.uk/~uhtm001/bibexcel-primer.pdf

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Data Preparation - standardise

- Author names
 - How many initials?
- Journal/Book Title Variations
 - Many different ways need correcting
- Book editions
 - Hair et al, 1985, 1991, 1993, 1999...
- Use search and replace routines based on ranked frequency lists
- Construct database/excel files to analyse

Bibliometrics: measures

- Many different ways to examine data
 - Frequency tables and rankings
 - Groups in the data: Co-words, -authors, -citation frequency networks
 - Inter- and intra- discipline linkage
 - Concentrations of themes and their relations
 - Bibliometric coupling
 - How close are papers based on common citations
- Some Measures
 - Journal impact factor
 - No. citations relative to number of articles published
 - Compare size of waves made by journal compared to others
 - Immediacy index
 - Initial rate of citation
 - How quick are ideas spreading?
 - Citation half-life
 - How long does the impact last?

Analysis tools

- Frequencies
 - Tables and rankings
- Network Data (co-citations, coupling, etc)
 - SPSS/SAS etc
 - Principal components
 - MDS
 - Clustering routines
 - UCINET/Netdraw/Pajek/Gephi
 - Network measures and graphs

OM Study: Method and Data

- Citation/co-citation analysis
- Full contents (1980 to 2006) of:
 - JOM and IJOPM and POM (started 1990)
- Sources:
 - Social Science Citations Index – not complete
 - Own generated – html, pdf's, import and convert
- Source articles: 2,978
- Giving 80,917 citations
- Data standardisation – missing data, spellings, book editions, author initials

Citation/co-citation values (weighted)

Publication	Citation Frequency	Maximum Co-citation Value	Publication Most Cited With
HAYES.RESTOR_COMP.1984	21.4	15.3	HILL.MANUF_STRAT.1985
HILL.MANUF_STRAT.1985	25.3	15.3	HAYES.RESTOR_COMP.1984
SCHONBERGER.JAP_MANUF_TECH.1982	19.4	3.6	SCHONBERGER.WORLD_CLASS_MAN.1986
SKINNER.HBR.1989	18.4	12.2	HAYES.RESTOR_COMP.1984
NUNNALLY.PSY_THY.1978	16.1	7.1	HAR.MULT_DATA_ANAL.1992
ORLICKY.MRP.1975	15.0	2.2	CRONBACH.PSYCHOMETRIKA.1951
PORTER.COMP_STDY.1980	15.0	8.1	HAYES.RESTOR_COMP.1984
SWAMI.DAS.MAN_SCI.1987	14.0	9.5	HAYES.RESTOR_COMP.1984
WOMACK.MACH_CHNG_WLD.1980	13.7	6.0	HAYES.RESTOR_COMP.1984
SCHONBERGER.WORLD_CLASS_MANUF.1986	13.7	5.4	HAYES.RESTOR_COMP.1984
SKINNER.HBR.1974	12.8	7.5	HAYES.RESTOR_COMP.1984
FLYNN.JOM.1990	12.1	4.6	NUNNALLY.PSY_THY.1978
DEMING.OUT_CRISIS.1986	11.8	6.0	CROSSBY.QUAL_FREE.1979
HAYES.HBR.1979	11.4	5.3	HAYES.RESTOR_COMP.1984
HAYES.DYN_MAN.1988	11.1	5.9	HAYES.RESTOR_COMP.1984
FERDOW.S.JOM.1990	10.8	6.9	HAYES.RESTOR_COMP.1984
HAR.MULT_DATA_ANAL.1992	10.7	7.1	NUNNALLY.PSY_THY.1978
MONDLEN.TOVOTA_PSYS.1983	10.3	3.5	SCHONBERGER.JAP_MANUF_TECH.1982
YIN.CASE_STUDY.RES.1984	10.3	5.4	REINHARDT.AJR.1989
MILLER.MAN_SCI.1984	9.7	6.7	HAYES.RESTOR_COMP.1984
VOLLMANN.MANUF_PLANN.1988	9.6	1.5	HILL.MANUF_STRAT.1985
FLYNN.JOM.1994	9.2	4.9	NUNNALLY.PSY_THY.1978
REINHARDT.AJR.1989	8.8	5.4	YIN.CASE_STUDY.RES.1984
BAKER.INT_SED_SCHED.1974	8.6	1.1	BAKER.JOM.1981
WADNER.MAN_SCI.1958	8.5	2.1	DEAR.KELLY.JOM.1988
HALL.ZERO_INV.1983	8.4	2.1	SCHONBERGER.JAP_MANUF_TECH.1982
CROSSBY.QUAL_FREE.1979	8.3	6.0	DEMING.OUT_CRISIS.1986
ANDERSON.JOM.1989	8.2	5.2	HAYES.RESTOR_COMP.1984
THOMPSON.ORG_ACTION.1967	8.2	2.5	HAYES.RESTOR_COMP.1984
ADAMI.MANAGE.1989	8.0	4.8	HAYES.RESTOR_COMP.1984
CONWAY.THEO_SCHED.1967	8.0	1.9	SKINNER.HBR.1989
PORTER.COMP_ADV_CREA.1985	7.9	2.7	HAYES.RESTOR_COMP.1984
GERWIN.MAN_SCI.1993	7.9	5.3	SWAMI.DAS.MAN_SCI.1987
SKINNER.MANUF_CORP_STRAT.1978	7.8	3.5	HAYES.RESTOR_COMP.1984

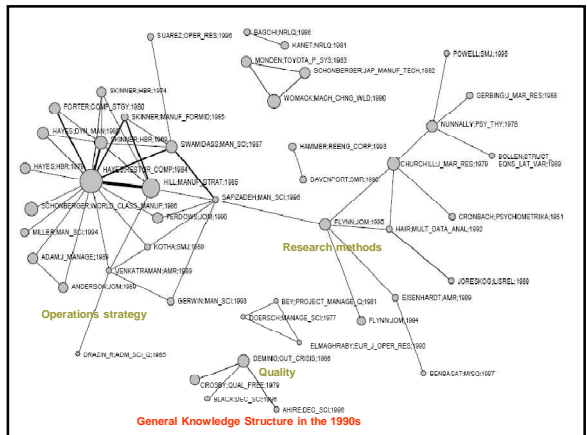
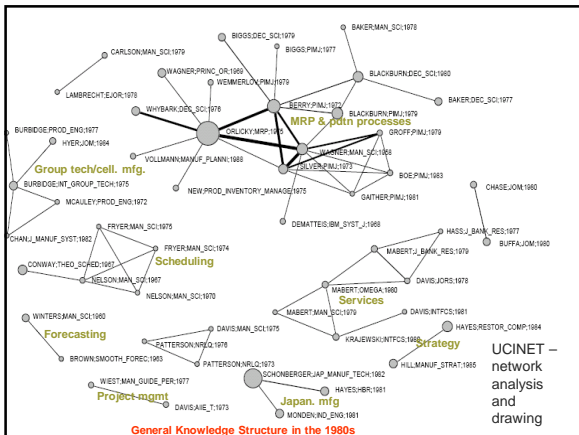
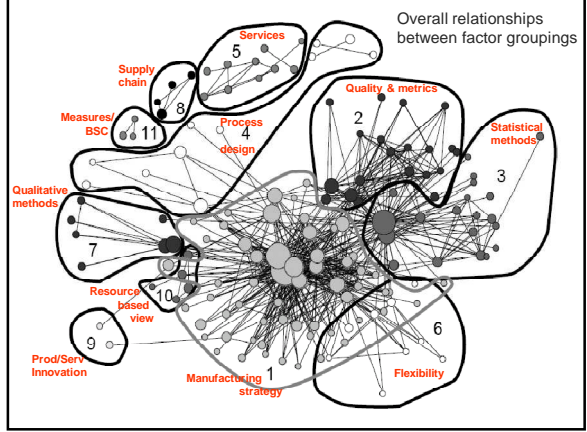
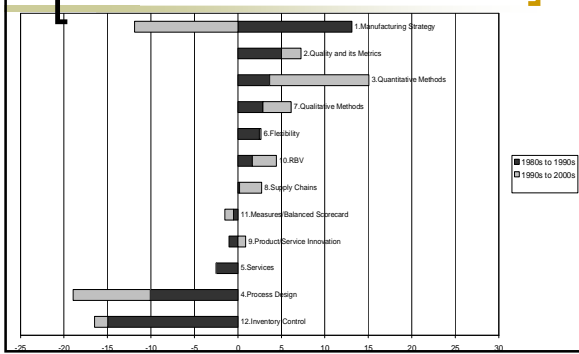
Factor Analysis of Co-citation Matrix

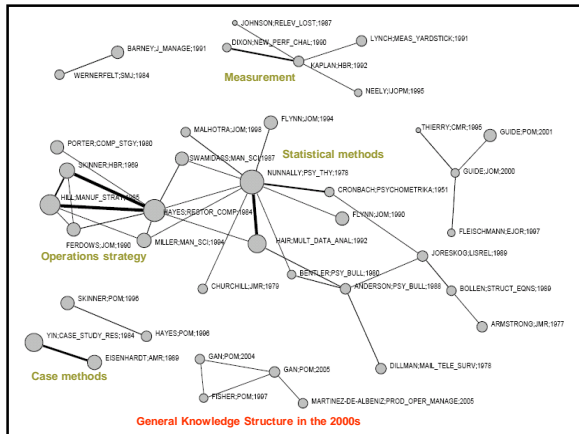
Factor Name (cum var exp. %)	Overall	Loading of Citations onto Factor Groupings (% and rank order)													
		Total	1980-89	1990-89	2000-96	LCM	JOM	PCM	LCM	JOM	PCM	LCM	JOM	PCM	
1. Manufacturing Strategy (25)	44.2%	1.381	1.522	1.403	1.463	1.416	1.437	4.24	5.23	1.418	1.343	1.519	1.381	1.519	1.381
2. Quality and its Metrics (35)	11.0%	3.47	4.97	3.19	3.84	3.37	3.63	4.0	7.6	3.92	5.7	15.2	13.6	10.0	8.51
3. Quantitative Methods (43)	11.2%	2.84	4.1	4.55	2.65	4.19	2.77	4.07	2.4	7.10	2.0	8.8	22.5	2.37	7.98
4. Process Design (49)	9.5%	2.50	2.49	2.1	5.13	2.47	4.73	27.2	19.4	2.84	4.21	2.6	5.1	11.6	2.49
5. Services (54)	3.8%	6.63	3.8	3.7	2.6	10.9	6.1	7.9	2.8	5.21	3.8	4.1	6.39	7.4	4.4
6. Flexibility (59)	3.3%	8.68	3.3	3.5	3.2	3.4	7.34	1.3	2.8	6.58	10.12	4.1	3.4	7.39	5.1
7. Quality Method (62)	4.9%	5.0	11.29	8.1	4.56	5.46	5.32	8.0	10.24	8.3	5.0	10.56	4.5	4.07	11.45
8. Supply Chains (65)	3.0%	9.12	1.4	1.11	3.9	7.30	2.4	6.45	1.3	1.9	9.40	1.0	8.05	12.30	6.5
9. Product/Service Innovation (67)	1.9%	10.23	1.3	1.2	2.2	10.14	2.3	10.28	10.2	1.2	12.15	1.1	2.9	1.7	8.25
10. RBV (70)	3.4%	7.0	13.17	10.4	4.4	6.43	2.6	8.22	11.0	1.8	10.65	0.0	1.3	9.30	8.19
11. Measures/Balanced Scorecard (71)	2.4%	10.35	3.0	7.0	2.0	11.40	7.0	1.12	10.12	3.9	4.2	7.86	4.1	1.0	0.3
12. Inventory Control (73)	1.3%	12.16	8.3	1.9	0.3	12.12	10.11	2.9	13.2	3.13	11.02	21.9	3.0	11.02	5.8

Chi-square=1668.5; sig. at 0.000 sbs s30 s17P s17P s11 ns280 s1790 s1700 ns180 ns190 s1700 s1700 s1700 s1700

Factor Table: KMO measure of sampling adequacy = 0.202; Bartlett's test of sphericity: approx. chi-square = 27292, df = 9730, sig. = 0.000

Percentage Change in Factor Groups





Tips for getting cited

- No substitute for publishing in the top journals
 - If looking at 2nd tier (i.e. none FT-40 list), ensure journal is indexed full text in one of the big databases
- Review type articles are easily cited as they justify many arguments
- Tell everyone about the article, including personal web pages, citeulike, etc.

Conclusions

- Citation/co-citation provides field's view of itself
- Intellectual structure of OM
 - 12 areas identified
 - Shift away from Inventory and process design
 - Focus towards robust research methods and integrated ideas (SCM)
 - Manufacturing strategy lost importance recently
- OM journals have different focus
- Future work: location of OM within the journal space – where is OM cited outside OM?