

# A Scientometric and Social Network Analysis of Two Business Schools

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## Abstract

*In this paper, the ecologies of collaboration among the academics at two business schools, namely, the Nanyang Business School (NBS) and INSEAD are analysed by analysing the ten-year publication output of the two schools using techniques from both scientometrics and social network analysis. These two lenses provide two views that complement each other. When the two views are taken together, they make it possible for the ecology of collaboration at the two schools to be understood more holistically. The publications, retrieved from the Institute of Scientific Information's Web of Science database, were analysed on a sliding window basis over single-year time spans beginning with 1995 and ending with 2004. UCINET was then used to compute the social network parameters and to plot the sociograms. From the scientometric perspective, INSEAD had the larger publication output of 565 papers, compared with NBS's 234 papers. The levels of coauthorship at both schools were comparable, at 2.11 authors per paper in NBS and 2.21 papers per author at INSEAD. The low levels of coauthorship, the lack of an inflationary trend in coauthorship over the ten years, and the large percentage of papers that are coauthored by six or less authors (99.6%) indicate that the phenomenon of hyperauthorship was not at play in either school. However, major differences were found in the author productivity, citation profile, and the popular publication outlets. INSEAD's research papers received more citations compared with NBS's (29.1% of NBS's papers were uncited compared with 16.8% of INSEAD's), and 15 out of the 16 most heavily cited papers (those that received fifty citations or more) were from INSEAD. From the social network perspective, the author-to-author sociograms of both NBS and INSEAD were fragmentary, and comprised numerous small components averaging 2.3 to 4.2 nodes per component. The sociograms were symptomatic of the typical business school culture, which is low in both sociability and solidarity. The low density values also confirm the low level social capital in the networks of both schools.*

**Keywords:** Scientometrics; Authorship pattern; Social network analysis; Collaboration; Nanyang Business School; Institut Europeen d'Administration des Affaires

## 1. Introduction

The main currency for an academic is his reputation, just as that for the politician is the power he commands, and that for the businessperson is the wealth he has accumulated (Becher, 1989). How does an academic earn his reputation? Although the job of an academic consists of four components, namely, teaching and assessment, research and scholarship, administration, and community service (Butler, 2001), it is mainly on his research and scholarship that his reputation is built. Becher (1989) stresses that it is not the mere conduct of research and scholarship that earns an academic his reputation but the publication of the results of his research and scholarship that are important in securing his reputation and influence. He ranks the publication of an academic's research findings as far more important than his ability to teach, stating that "excellence in teaching counts for little towards recognition by established colleagues in the field" (p. 53).

In addition to its importance in the building of an academic's reputation, publishing is also important for his survival. The familiar but dreaded aphorism, publish or perish, has come to characterise the life at many universities (De Rond & Miller, 2005). It signifies

the principle on which an academic's recruitment, promotion, and tenure are primarily based. The emphasis on numbers has resulted in some unintended consequences. De Rond and Miller (2005) bemoan its impact on an academic's choice of research, stating that it has caused academics to shy away from research using interdisciplinary, ethnographic and longitudinal approaches, and from those with a philosophical orientation. They also state that it has led to the writing of articles that are seen to be lacking in substance, that restate the obvious, and that contribute only incrementally to scholarship. Innovation has also suffered, as academics shy away from bold, original or imaginative intellectual work, focusing instead on trivial and unimaginative research. Yimin (2006) reports that the culture of publish or perish has even resulted in a high level of stress among academics, and in an extreme case, driving an academic to take his own life.

However, scholarly publishing is still firmly established in academia as it still has useful roles to play. Hanson (1971) lists five reasons why a scholar should publish. Firstly, publications allow for the exchange of ideas, knowledge, perspectives, and experiences, and this stimulates thought and the creation of new knowledge. Secondly, publications promote an awareness of the developments in one's own special field, as well as in science and technology, in general. Thirdly, publications diminish the possibility of an academic reinventing the wheel, and in so doing, allow him to focus on novel research, saving time and effort. Fourthly, publications provide introductory and background information for research work in unfamiliar fields. Lastly, publications provide specific information and data needed for the research work at hand. Conway (1983) adds that publishing is a form of repayment to the community of scholars for the knowledge the author has obtained from the publications of other scholars.

Frequently, in writing research papers, an academic does not work alone. He works as a member of a research network, which is an amorphous social grouping composed of smaller-scale social networks at various stages of formation, growth, and decline (Mulkey, 1977). This vast interpersonal network links the researchers, and any single researcher can be a member of one or several networks at any one time. It is with selected members of the research network that he writes his papers (Becher, 1989).

Given the importance of publishing in the life of an academic, it comes as no surprise that much research has been conducted to better understand this activity, mostly in the area of bibliometrics, scientometrics, and the sociology of science. The focus of this paper is on the publications of the academics at two business schools, namely, the Nanyang Business School (NBS) and INSEAD.

## 2. Introduction to the Two Schools

The NBS and INSEAD were chosen for this study as both schools are business schools that have received high ratings for their Masters of Business Administration programmes. NBS is a business school within a comprehensive university while INSEAD solely focuses on providing business programmes at the graduate level (both MBA<sup>1</sup> and PhD<sup>2</sup>). INSEAD was ranked second in the Business Education Commission's Top European Business Schools (2000) while NBS was ranked ninth position in Asiaweek's Asian MBA Ranking in 2004 (Financial Times, 2005). Both INSEAD and NBS were awarded both the European Quality Improvement System (EQUIS) and the Association to Advance Collegiate Schools of Business (AACSB) accreditation. These were given as a

<sup>1</sup> Although INSEAD was founded in 1957, the first students only were registered in 1959.

<sup>2</sup> INSEAD started its doctoral programme in 1989.

recognition of the high quality of business education that they have been providing (NBS, 2005; INSEAD, 2005).

### **(a) Nanyang Business School (NBS)**

NBS has a long history of business education in the Asia Pacific region, with a strong international faculty, innovative curricula and teaching methods. Its origins can be traced back to 1956 when the Department of Accountancy was established in the then Nanyang University and the Department of Commerce in Singapore Polytechnic. As the faculty expanded, the School of Accountancy and Business Administration, or SABA, was formed to provide more specialised courses like Actuarial Science, Banking, Insurance, Financial Analysis, Marketing, Industrial Management, and Human Resource Management. It was later renamed to School of Accountancy & Business in 1990, and finally as NBS in 1995 (NBS, 2005).

NBS has 193 resident faculty members within her six divisions of (i) Accounting; (ii) Banking and Finance; (iii) Business Law; (iv) Information Technology and Operations Management; (v) Strategy, Management and Organisation; and (vi) Marketing and International Business (NBS, 2005).

### **(b) Institut Européen d'Administration des Affaires (INSEAD)**

The *Institut Européen d'Administration des Affaires*, better known as INSEAD, was founded in 1957. It is currently one of the world's largest top-tier business schools. It is headquartered in Fontainebleau, France, but in 2000, it established a branch campus in Singapore to meet the increasing demand for MBA programmes globally. At present, there are 143 resident faculty members at INSEAD, offering the following academic areas (i) accounting and control; (ii) decision sciences; (iii) economics and political science; (iv) entrepreneurship and family enterprise; (v) finance; (vi) marketing; (vii) organisational behaviour, (viii) strategy; and (ix) technology and operations management. Its faculty research has made a considerable contribution to the study of international business and economics (INSEAD, 2005). INSEAD consistently retained its position among the top ten business schools according to the Financial Times MBA rankings from 2001 to 2004. INSEAD ranked fourth in the Financial Times's 2004.

## **3. Objectives**

The objective of the paper is to study the ecology of collaboration at the Nanyang Business Schools and INSEAD using techniques from scientometrics and social network analysis. Scientometrics techniques will be used to study the following:

- the annual publication counts
- the average number of authors per paper
- the average number of papers per author
- the most productive authors
- the citation patterns

## **4. Literature Review**

Scientometric studies are performed at different levels of aggregation. Broad studies have a wide scope, and typically cover a large geographical region, e.g., the European Union. Mela, Cimmino and Ugolini (1999) studied the 4,063 oncology papers published in the

European Union<sup>3</sup> in 1995. This figure was 36.5% of the total number of oncology papers published throughout the world, which numbered 11,117. For each paper, they noted the country of the corresponding author, which they regarded as the country of origin of that paper. In terms of the number of papers published, the top three countries were the United Kingdom (778 papers, 19.1% of the total), Italy (761, 18.7%) and Germany (580, 14.3%). Ugolini, Casilli and Mela went beyond the counts of publications by incorporating demographic and socioeconomic factors (specifically, the GDP of each country) into their analysis. With demographics included, Sweden, The Netherlands, Denmark and Norway took the top spots with 33, 27, 21, and 21 papers per million population respectively. With GDP in the equation, The Netherlands, Finland and Norway were the top countries with 1.33, 0.96 and 0.80 papers per billion US dollars respectively.

Lee (2003) investigated the research performance of the Institute of Molecular and Cell Biology (IMCB) in her first 10 years of establishments by examining her research publications, number of graduate students and patents filed. IMCB was established in 1987 at the National University of Singapore (NUS) and is funded by Singapore's National Science and Technology Board (NSTB). In 2000, IMCB was awarded the Nikkei Asia Prize for her precociousness in establishing herself as a world leader in life science research. In the study, it can be seen that the number of research scientists and engineers (RSEs) at IMCB and the number of publications over the investigated period had been increasing progressively. The number of RSEs at IMCB increased by 54.3% from 1991 to 1996 and the number of journal articles by 445% from 1987 to 1996. Lee took a step further by assessing the quality of IMCB's research output by looking at actual impact and visibility of the journal articles published. 95.6% of the articles were found published in ISI journals with an average of 25 to 30 citations per article. 4 particular articles were found to receive more than 200 citations; and 18 others received 100 to 200 citations. All these indicated IMCB's significant contribution to research in life science within her short span of existence.

## 5. Methodology

Two types of data were used in this study, namely, the list of publications for each of the two business schools, and the impact factor of the journals the articles were published in. The list of publications was obtained from the Web of Science<sup>®</sup>, and the journals impact factors, from the Journal Citation Reports<sup>®</sup>. A citation database, the Institute of Scientific Information's Web of Science<sup>®</sup>, was therefore used. It was selected because of its extensiveness, credibility and authority. It contains citations indexes of more than 8,700 journals from many disciplines with more than 850,000 fully indexed journal articles (Thomson, n.d.). The impact factors for different journals in which the academics have published were obtained from the Journal Citation Report<sup>®</sup> database. The small number of journals that are not listed in the Journal Citation Report<sup>®</sup> database were noted and assigned an impact factor of zero. The data were compiled and analysed using Microsoft Excel.

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<sup>3</sup> In their study, the European Union (EU) was defined as the 15 official member states plus Norway. This is because Norway is included in the European Economic Area, and in all calculations concerning the EU issued by Eurostat, the Statistical Office of the European Community (Ugolini, Casilli and Mela, 2002).

## 6. Results and Discussion

The annual publication counts are summarized in the Table 1 and Figure 1 below. Two observations can be made from Table 1. Firstly, INSEAD has 331 more publications than NBS over the ten years. This means that NBS has 141% more publications than NBS over the ten years. INSEAD's publication record is also more consistent. With the exception of 1997, INSEAD's annual publication numbers has been on the increase. NBS's publication record is more erratic, with years of plenty and years of few. It is important to note that as only English papers have been retrieved from the Web of Science, there is a possibility of undercounting the actual publications of INSEAD. This is because INSEAD is an international business school based in France, and may very well have a few papers published in French. This means that their being 141% ahead of NBS in publication count is a conservative figure. It is possible that this figure is greater if INSEAD has publications in languages other than English.

Table 1: Annual Publication Output of NBS and INSEAD from 1995 to 2004

Year	NBS	INSEAD
1995	13	38
1996	16	46
1997	24	37
1998	16	49
1999	24	52
2000	21	60
2001	34	61
2002	34	69
2003	26	75
2004	26	78
	234	565

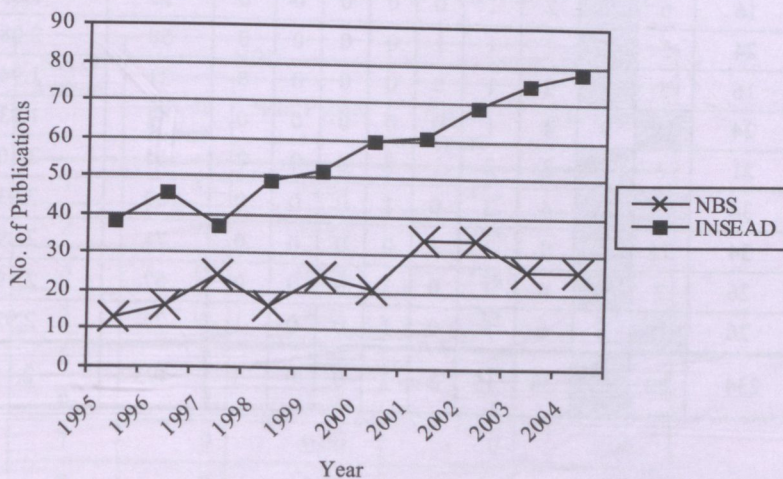


Figure 1: Annual Publication Output of NBS and INSEAD from 1995 to 2004

The levels of co-authorship are reported in Tables 2 and 3. The cells shaded grey indicate the modal coauthorship level for each year. It can be seen that INSEAD consistently has a

mode of two authors per paper over each of the ten years, and a mode of two authors overall. NBS has a mode of one author per paper for 1995, 1999, 2001, and 2004, and a mode of two authors per paper for the other years. NBS, too, has a mode of two authors per paper overall. This indicates a small collaboration size at the two business schools.

Both NBS and INSEAD had an overall mean of just over two authors per paper, with INSEAD having a slightly higher overall mean of 2.21 authors per paper. The most interesting feature of the table is NBS's mean authors per paper for 2004, which has a value of 2.92. What brought about this sudden increase from 2.19 in 2003? The reason for the sudden increase is a single paper coauthored by 15 people. The mean authors per paper for 2004, calculated without including this paper drops to 2.24.

In 1963, the father of scientometrics, Derek John de Solla Price predicted that "by 1980 the single-author paper will be extinct" (p. 79). He further predicted a steady movement towards "an infinity of authors per paper" (p. 79). Cronin (2001) reports that this situation of "an infinity of authors per paper" is already happening in biomedicine and high energy physics. He coined the term, *hyperauthorship*, defined as coauthorships involving 100 authors or more, to describe the massive levels of coauthorship in these fields. From the results of this study, it is clear that the single-author paper is not extinct. In fact, a significant number of single-author papers are still being written (214 papers, or 26.8% of the total of 799 papers). However, it is the double-author papers that form the majority (345 papers, or 43.2% of the total). It is also clear that the inflationary trend in authorship or "the practice of promiscuous coauthorship" (Cronin, 2001, p. 562), due in part to the widespread practice of guest, gift or surprise authorship<sup>4</sup>, has clearly not affected the publications of NBS and INSEAD to the extent that it has affected other fields. This can be seen from the fact that all but three of the 799 papers (99.6%) are coauthored by six or less academics (Tables 2 and 3).

Table 2: Breakdown of the Coauthorship Levels at NBS

Year	No. of Articles	No. of Authors									Author Totals	Authors/Paper	Papers/Author
		1	2	3	4	5	6	7	8	15			
1995	13	8	3	1	1	0	0	0	0	0	21	1.62	0.65
1996	16	6	7	2	1	0	0	0	0	0	30	1.88	0.55
1997	24	5	15	2	1	1	0	0	0	0	50	2.08	0.53
1998	16	5	8	2	1	0	0	0	0	0	31	1.94	0.57
1999	24	10	9	4	1	0	0	0	0	0	44	1.83	0.67
2000	21	7	9	2	2	1	0	0	0	0	44	2.10	0.50
2001	34	13	13	4	3	0	1	0	0	0	69	2.03	0.58
2002	34	11	12	9	1	1	0	0	0	0	71	2.09	0.57
2003	26	7	11	6	1	0	1	0	0	0	57	2.19	0.49
2004	26	10	5	6	3	0	1	0	0	1	76	2.92	0.38
	234	82	92	38	15	3	3	0	0	1	493	2.11	0.78

<sup>4</sup> Anderson (1992) provides two explanations for gift authorships. Firstly, they can be attributed to the autocratic senior scientist who insists on appending his name on every paper that is published from research work performed at his research centre. Secondly, they can be attributed to the junior researcher who appends the name of more distinguished and well-established colleagues to increase the odds of the paper being accepted for publication.

Table 3: Breakdown of Coauthorship Levels at INSEAD

Year	No. of Articles	No. of Authors									Author Totals	Authors/Paper	Papers/Author
		1	2	3	4	5	6	7	8	20			
1995	38	9	16	11	1	1	0	0	0	0	83	2.18	0.52
1996	46	16	19	9	2	0	0	0	0	0	89	1.93	0.68
1997	37	9	17	9	0	2	0	0	0	0	80	2.16	0.61
1998	49	10	24	11	3	0	1	0	0	0	109	2.22	0.54
1999	52	17	21	11	3	0	0	0	0	0	104	2.00	0.65
2000	60	15	26	17	2	0	0	0	0	0	126	2.10	0.58
2001	61	14	29	14	4	0	0	0	0	0	130	2.13	0.54
2002	69	15	30	16	6	1	1	0	0	0	158	2.29	0.56
2003	75	14	34	17	8	1	0	0	1	0	178	2.37	0.51
2004	78	13	37	23	4	0	0	0	0	1	192	2.46	0.47
	565	132	253	138	33	5	2	0	1	1	1249	2.21	0.90

Examining Table 4, both NBS's and INSEAD's highest number of papers are papers coauthored by two people (39.3% and 44.8%, respectively). In the case of NBS, although the most common coauthorship is two, it is only slightly ahead of singly-authored papers (35.0%) with difference of a mere ten additional papers (or 4.3%). INSEAD's percentage of papers with two coauthors (44.8% of the total), on the other hand, exceeds single-author papers (23.4% of the total) by more than 21.4%.

Seen from a different angle, 76.6% of INSEAD's articles have more than one author compared to NBS's 65.0%. This indicates that the extent of collaboration, as indicated by the extent of coauthorship, is greater in INSEAD than in NBS. This might be due to INSEAD's ethos of having "no dominant culture", resulting in its closely knitted networks faculty members, students, alumni and practitioners (Barsoux, 2000).

Table 4: Coauthorship Pattern at NBS and INSEAD

No. of Authors	NBS		INSEAD	
	No. of Papers	% of Papers	No. of Papers	% of Papers
1	82	35.04	132	23.36
2	92	39.32	253	44.78
3	38	16.24	138	24.42
4	15	6.41	33	5.84
5	3	1.28	5	0.88
6	3	1.28	2	0.35
7	0	0.00	0	0.00
8	0	0.00	1	0.18
> 12 <sup>†</sup>	1 <sup>†</sup>	0.43	1 <sup>‡</sup>	0.18
Total	234	100.00%	565	100.00%

Note: <sup>†</sup> 1 article written by 15 authors, <sup>‡</sup> 1 article written by 20 authors

**(a) Prolific Authors**

The most productive authors at both the NBS and INSEAD were identified. Becher (1989) explains in his book *Academic Tribes and Territories*, that the quest for recognition of the value of one’s work by others in the field is single most important motivating factor for academics and scientists to publish. The quantity of publication output serves as a formal and explicit criterion for recognition and is widely employed as a yardstick in determining the value of an academic. Table 5 lists top ten prolific authors that published the most articles in the respective schools over the studied period.

It is clear that the most prolific authors at INSEAD are more prolific than the most prolific authors at NBS. This can be seen from the fact that the average number of publications by the top 10 prolific authors over the ten years is 15.3 for INSEAD but only 7.7 for NBS. “Viswanathan S” and “Van Wassenhove LN” are the most prolific authors at NBS and INSEAD respectively. Examining the publication list of Viswanathan and Van Wassenhove, it is interesting to note their individual authorship patterns. Out of Viswanathan’s eleven articles, five are single-author papers, five are double-author papers with Viswanathan as the first author, and Viswanathan’s last paper is a double-author paper with him as the second author. Viswanathan has not published papers with more than two authors. The authorship pattern of Van Wassenhove is very different. He appears mostly as the last author (28 out of 34 papers), never as the first author, and has published no single-author papers. Van Wassenhove prefers multiple authorships. He has published five double-author papers, 23 triple-author papers, six papers with more than three authors.

Table 5: Lists of Top Ten Prolific Authors in Publication Outputs from 1995 to 2004 for NBS and INSEAD

Rank	NBS		INSEAD	
	Author	No. of Papers	Author	No. of Papers
1	Viswanathan S	13	VanWassenhove LN	34
2	Tung LL	10	Ayres RU	23
3	Huang WH	8	Loch CH	18
4	Wang QN	8	Yucesan E	13
5	Walker J	7	Kim WC	12
6	Wang PM	7	Anderson E	11
7	Ang S	6	Mintzberg H	11
8	Chiang RHL	6	Parker PM	11
9	Li MZF	6	Fatas A	10
10	Tsang EWK	6	Mauborgne R	10
	NBS Average	15.3	INSEAD Average	7.7

Table 6 summarises the citation profile of the papers from NBS and INSEAD. According to Diamond (1986), the main function of most citations is to refer the reader to important work relevant to the paper and to credit important predecessors for their contribution to the current work. Such citations present evidence that the person cited has done work that is viewed as relevant to the current research that will be useful to those attempting to further the research area. For NBS, 29.1% of their papers remain uncited, while for



INSEAD, the figure is 16.8%. Also, for NBS, 90.2% of their papers attracted 0 to 9 citations, while for INSEAD, it is 70.6%. From these figures, it is clear that INSEAD's papers have created greater impact among business researchers. INSEAD also has a larger percentage of papers (2.7%) in the highly cited category, i.e., papers that attract more than 50 citations, compared to NBS (0.4%).

Table 6: Citation Profile for NBS and INSEAD from 1995 to 2004

No. of Cites	NBS	NBS (%)	INSEAD	INSEAD (%)
0 (uncited)	68	29.1	95	16.8
1	52	22.2	86	15.2
2 ≤ TC ≤ 9	91	38.9	218	38.6
10 ≤ TC ≤ 19	15	6.4	93	16.5
20 ≤ TC ≤ 49	7	3.0	58	10.3
50 ≤ TC ≤ 99	1	0.4	13	2.3
100 ≤ TC ≤ 149	0	0.0	1	0.2
150 ≤ TC ≤ 200	0	0.0	0	0.0
TC > 200	0	0.0	1	0.2
Total	234	100.0	565	100.1

### (b) Social Network Analysis

Table 7 summarises the parameters that characterise the NBS and INSEAD author-to-author sociograms. For both the sociograms, the number of nodes and components increased over the ten-year period. For NBS, the increase is 240% (from 20 to 68), and for INSEAD, 127% (from 73 to 166). This indicates an increase in the number of academics involved in publishing papers over the ten years. Isolates are nodes that are not connected to any other nodes. INSEAD has a smaller percentage of isolates compared to NBS. INSEAD's isolates never exceeds 12% of the total number of nodes, while at NBS, the isolates reached a high of 35% of the total number of nodes. The relative persistence in the absolute number of isolates for both schools might give the impression that a same group of loners that consistently choose to work alone exist. An examination of the sociograms in Appendixes F and G indicates that this is not true. Though a few authors might appear as isolates repeatedly over the ten years, e.g., "Viswanathan S" and "Tsang EWK" from NBS, and "Niselesen T" and "Ayres RU" from INSEAD, all the other academics did collaborate with others at various times over the ten-year period. In general, the percentage of isolates fell over the ten-year period for both NBS and INSEAD.

Goffee and Jones (1996) proposed a two-dimensional model of organisational culture. The first dimension is *sociability*, the degree of friendliness among organisational members, and *solidarity*, the extent to which organisational members are able to pursue shared objectives. From these two dimensions, they created a matrix of four types of organisational cultures, namely, networked, communal, fragmented, and mercenary (Figure 2). The low inclusivity values and the large number of small components in both NBS and INSEAD are symptomatic of a fragmented organisational culture. This finding agrees with Barsoux's (2000) observation of the culture of business schools:

*Business schools are organisational oddities, in that they can function perfectly well while being weak on both sociability and solidarity. [...] Typically, there is a low level of interaction among faculty; and there is no particular affinity for the institution, which employs them.*

(Barsoux, 2000, p. 116)

Table 7: Citation Profile for NBS and INSEAD from 1995 to 2004

Year	NBS		INSEAD	
	No. of Nodes	No. of Components	No. of Nodes	No. of Components
1995	20	5	73	22
1996	29	10	68	20
1997	45	16	61	18
1998	28	10	90	30
1999	36	18	80	24
2000	42	13	104	34
2001	59	17	113	36
2002	60	18	123	36
2003	53	17	146	43
2004	68	14	166	49

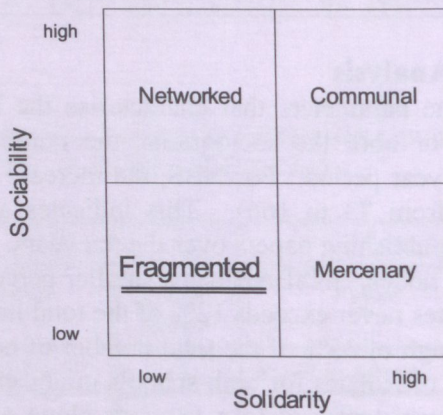


Figure 2: Goffee and Jones's (1996) Model of Organisational Culture

Fragmentary is, in fact, the most appropriate description of the author-to-author sociograms of both NBS and INSEAD, due to the numerous components and the lack of an obvious main component.

### 7. Conclusion

In this paper, the ecologies of collaboration between academics at two business schools, namely, the Nanyang Business School (NBS) and INSEAD, were studied by analysing their research publications over ten years using techniques from scientometrics and social network analysis. The two complementary lenses of scientometrics and social network analysis were used in order to gain a more holistic picture of the ecology of collaboration at each school. The lists of publications were retrieved from the Institute of Scientific Information's Web of Science® database, using the address and date fields as filters. The data were then analysed on a sliding window basis over single-year time spans beginning with 1995 and ending with 2004. Microsoft Excel and UCINET were used for the analysis.

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