

Development In Business Simulation & Experiential Exercises, Volume 21, 1994

THE INTELLECTUAL STRUCTURE OF ABSEL: A Bibliometric STUDY OF AUTHOR COCITATIONS OVER TIME

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ABSTRACT

Learned fields typically have groups of writers who share ideas apart from the general field. Analyzing prolific authors and their cocitation patterns reveals basic orientations. A total of 29 ABSEL authors over 20 years of Proceedings can be called "influential" based on the number and time span of their contributions. All have histories of long strings of ABSEL publications, or considerable time spans over which their writings have appeared. However, only in the last five years have intellectual groups crystallized along two orientation dimensions: (1) Design-Evaluation and (2) Issues-Applications of business simulations and games. The orientations and groups identified here may help ABSEL chart its future, and/or they may identify collaborative opportunities for ABSEL authors in general.

BIBLIOMETRICS AND INVISIBLE COLLEGES

Knowledge development and dissemination in academic fields often depends on the circulation of ideas and information in discipline publications. A worthwhile endeavor is to study the publications of a discipline. For instance, Garfield (1979) has coined the term, "bibliometrics" to refer to the study of bibliographic citations in a discipline's publications. Bibliometrics can reveal "invisible colleges" which have been defined by Lievrouw (1990) as "a set of informal communications relations among scholars or researchers who share a specific common interest or goal."

The concept of an invisible college deserves comment. It relies on the assumption that groups or communities of knowledge producers/communicators exist in a discipline, and that they are distinct to some degree from other communities in that discipline. Using the notion of scientific knowledge as consensus formation, an invisible college is a group of contributors who subscribe to a particular paradigm. In physical sciences knowledge development, the paradigm may be a certain school of thought, such as reductionism, while in the behavioral sciences, the paradigm may be a research tradition such as behaviorism. Multiple and possibly competing or complementary invisible colleges may be revealed in a general area by bibliometric research.

Of course, this type of research cannot resolve differences, but mapping and analyzing the invisible colleges apparent in a knowledge area is valuable for several reasons. First, it has historical significance as comparing knowledge generation/sharing maps over time affords insight into evolutionary shifts that have shaped a field. Second, it identifies specific contributors to knowledge as to their "community membership" and thus provides an understanding of their philosophical or topical predisposition's Third, revealing communities of knowledge producers leads to an understanding of the major issues or schools of thought in the area. Last, some assessment of the impact of specific writer's works on other authors can be judged by using bibliometric analysis.

ABSEL KNOWLEDGE AND COCITATION ANALYSIS

The totality of ABSEL knowledge rests in three places: (1) twenty years of published proceedings, (2) the *ABSEL Guide (1990)* and (3) various articles in issues of *Simulation and Games*¹. Of these three sources, the published proceedings (1974-1993) represent the vast majority of ABSEL

knowledge. Consequently, they were selected as the basis of knowledge for this study.

One method of identifying invisible colleges in a collection of writings is cocitation analysis. This approach was first developed by Rosengren (1968) who called it "co-mention analysis." The technique requires two steps. First, a set of influential authors is identified from all writers in an area. Then a matrix is created which enumerates the number of times each influential author is referenced by each other influential author. This cocitation matrix becomes raw data which is scrutinized for patterns through the application of multidimensional scaling, factor analysis or cluster analysis.

DETERMINING THE SET OF INFLUENTIAL AUTHORS

To examine the intellectual structure of ABSEL, the first order of business was to identify a "core" group of authors. This task began by identifying the most published authors across all ABSEL Proceedings. Examination of a typical proceedings reveals "full" papers, "condensed" papers, panel descriptions, symposia descriptions, and sundry other writings. It was decided that only writings which are relevant to cocitation would be eligible in determining the core group of authors. That is, panel descriptions and other writing which do not normally include references were not included. Thus, only full papers (1974-1993) and condensed papers (instituted in 1990) were used in this step.

This stage resulted in an authors-by-years matrix. For tractability, only authors who had 9 or more articles published over the twenty-year span were included. This cut-off rule resulted in 29 authors who accounted for a total of 389 articles. (Note: in cocitation analysis, co-authoring is counted the same as singly authoring, so there is overcounting of the number of articles to the extent that co-authoring exists.)

Table 1 summarizes the contribution histories of the 29 core ABSEL authors. Visual inspection of Table 1 reveals some interesting patterns. First, the Table identifies when each author came on board." and in some cases it reveals if and when the author "jumped ship." Second, the table suggests the amount of contributions of the various authors. For example, Gentry is the most prolific contributor with 32 articles, Biggs, Burns, and Faria each account for 20+, and many authors have 12 or more articles. The Table also indicates the contribution level of each core author over his or her current "period" as an ABSEL author. Perhaps the most significant observation to be made is that most of the 29 core authors are still active publishers. A total of 18 presented papers in 1993, and 6 of the others presented one in 1992. In other words, 62% had a paper the 1993 Proceedings, and 83% had papers in either the 1993 or the 1992 Proceedings. (In the spirit of completeness, Table 2 identifies what might be termed an "honorable mention" ABSEL authors group.)

¹ Some may recall the *Journal of Experiential Learning and Simulation*, which is defunct.

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TABLE 1
AUTHORS MOST PUBLISHED
IN ABSEL PROCEEDINGS (1974-1993)

Author	Total Articles	Ave/ Yr	First Year	Last Year
J. Gentry	32	1.6	1974	1993
A. Burns	24	1.3	1975	1993
D. Brenenstuhl	20	1.4	1975	1988
A. Faria	20	1.0	1974	1993
J. Gosenpud	19	1.3	1979	1993
D. Fritzsche	18	0.9	1974	1992
J. Schreier	17	1.1	1975	1989
W. Wheatley	17	2.1	1986	1993
J. Wolfe	16	0.9	1976	1998
L. Graf	15	1.1	1980	1993
T. Pray	15	1.0	1978	1992
B. Barton	14	0.8	1974	1990
W. Biggs	14	0.7	1975	1993
R. Catalanello	12	0.8	1976	1991
R. Frazier	12	1.0	1975	1986
W. House	12	0.8	1977	1992
P. Thavikulwat	12	1.1	1982	1993
S. Gold	11	0.9	1981	1993
P. Markulis	11	1.0	1983	1993
D. Teach	11	1.1	1984	1993
H. Cannon	10	1.4	1987	1993
N. Cheisel	10	0.8	1980	1992
R. Hornaday	10	1.4	1986	1992
P. Sanders	10	0.9	1982	1993
D. Strang	10	0.6	1977	1993
P. Anderson	9	0.9	1984	1993
K. Goosen	9	0.5	1977	1993
B. Keys	9	0.5	1974	1993
L. Lawton	9	1.1	1986	1993

Inclusive only of range of publication years (First-to-Last)

Cluster analysis was used to gain a more clear picture of the patterns in the core ABSEL authors-over-time data. Four author clusters were identified with the use of Ward's method. Each cluster is given a descriptive label and is described below. Authors belonging to each cluster are listed alphabetically.

"Keeps on Ticking"

Biggs, Burns, Brenenstuhl, Catalanello, Faria, Frazier, Fritzsche, Gentry, and Schreier define a group of authors that spans ABSEL's existence and who have been consistent, for the most part, in appearing in the Proceedings over their respective spans. All but one first appeared in 1974 or 1975 and that one (Catalanello) appeared in 1976. A "Where Are They Now?" subgroup is apparent with Brenenstuhl, Schreier and Frazier who were major contributors in ABSEL's early existence, but they have not appeared in the Proceedings since the late 1980's. Nonetheless, this group's influence spans 1974 through 1993.

The Mainstream Group

Eight authors constitute what might be called the current mainstream of ABSEL. They are: Barton, Cheisel, Gosenpud, Gold, Graf, House, Keys, and Wolfe. While two of them (Barton and Keys) figured into ABSEL's inception, the bulk of this group's writings appears in the 1980's Proceedings, and extends into the 1990's. All but one had an article in 1992 and/or 1993. Thus, this group's influence is concentrated from 1980 through 1993.

"The Second Decade People"

Six authors joined ABSEL late in its first decade, and they have remained active through the present. They are: Anderson, Markulis, Teach, Thavikulwat, Sanders, and Strang. As a group, they came on board in the 1980's, and they tend to have long strings of consecutive single ABSEL proceedings papers. A number of them, however, shows a drop in 1991 or 1992. Only one-half published an article in the 1991 and/or 1992 Proceedings, but all did so in 1993. The influence span of this group is 1984 through 1993.

"The Next Generation"

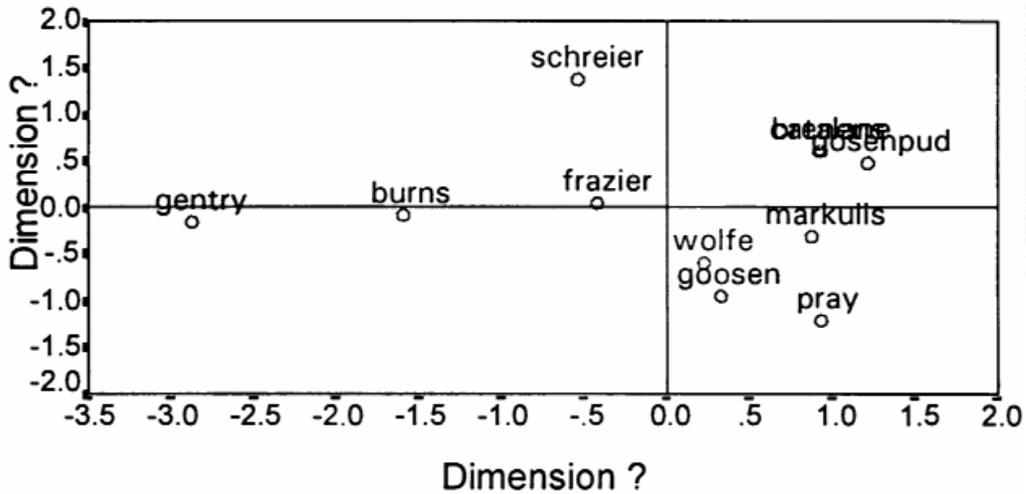
The last group of 5 authors includes Cannon, Goosen, Hornaday, Lawton, and Wheatley. Interestingly, this group collectively joined ABSEL in the mid-1980's. (Goosen is the only exception, joining in the 1970's), and these authors have either been quite consistent in annual appearances in the Proceedings *and/or* characterized by two or more articles in any one Proceeding through 1993. Collectively, their profile is somewhat similar to the early publication profile of the "Keeps On Ticking..." group. The "next generation" group's publication span is 1986 through 1993.

To summarize, the cluster analysis results have identified four ABSEL author groupings based on temporal aspects of their contributions. Interestingly, each group has remained influential in ABSEL; although, the beginnings of the respective influence streams vary greatly. However, this analysis does not address shared influence in the form of invisible colleges.

TABLE 2
ABSEL "HONORABLE MENTION" AUTHORS LIST

Number of Articles	Authors
8	M. Chanin, E. Maddox, R. Oppenheimer
7	E. Gomolka, H. Hemmasi, G. Jackson, A. Patz, W. Ward
6	R. Decker, D. Lambert, R. Robert, J. Washbush, T. Whiteley, O. Whitney

FIGURE 1
 ABSEL 1979-1983 COCITATION MAP



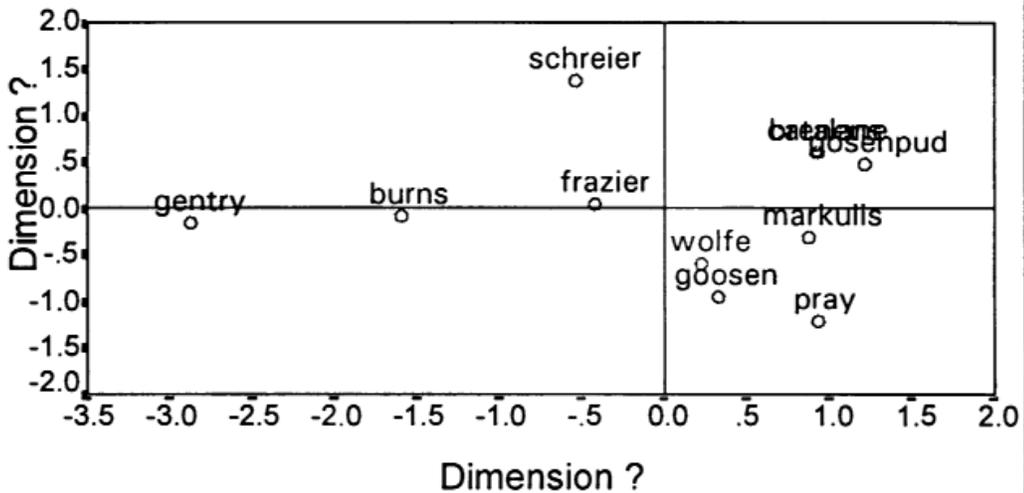
11, 1994

Multidimensional scaling
 method. Stress was low to
 moderate, .86, .56, and .59,

DEVELOPMENT

These are snapshots, so to
 speak, of college development
 over the periods 1979-1984,
 since constraints permit only
 snapshots. Figure 1 shows a
 snapshot of only Brenenstuhl,
 Gosenpud defining a
 relatively little cociting
 dimensions is tenuous.
 structure, and cociting is

FIGURE 1
 ABSEL 1979-1983 COCITATION MAP



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Figure 2 illustrates the initial formation of coherent colleges and identification of the underlying dimensionality. The horizontal axis appears to be a Design-Evaluation distinction, with Gold, Pray, Strang, and Keys tending to write about simulation game formulation, composition, and operation concerns, while Wolfe and Gosenpud typify authors concerned with evaluations and comparisons of the effects of simulations and experientials. The vertical axis is less well defined;

although it appears to separate the authors as to Issues versus Applications with writers falling above tending to be concerned with simulation and gaming issues while those below the zero point of the vertical axis being somewhat more inclined to write about specific applications, including research studies, using simulations and games. Still, the intellectual communities are not well defined even during the first half of ABSEL's second decade, and identifying invisible colleges remains dubious.

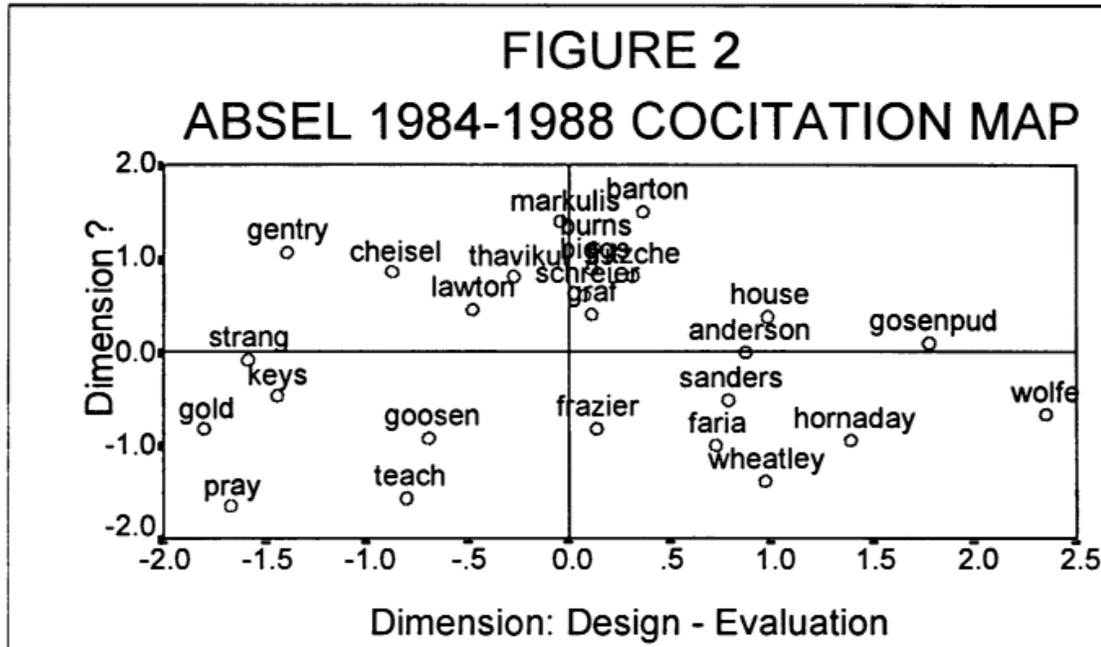


Figure 3 pertains to ABSEL's most recent five years, and it strongly suggests that intellectual communities have crystallized. The horizontal Design-Evaluation dimension appears to be intact, with a dear collegial group (Frazier, Gold, Goosen, Pray, and Thavikulwat) primarily concerned with design of simulations. The Evaluation end has Wolfe as its anchor point, with Anderson, Lawton, and Gosenpud as an apparent "school" largely concerned with evaluation of simulations and games. The horizontal axis is more apparent in Figure 3; although, it is flipped 180 degrees from that in Figure 2 (perfectly acceptable). Now, Faria and Keys are seen as co-concerned with applications of experientials and simulations, including research on their effects. Burns and Gentry appear to be oriented toward evaluation issues, while Barton, Fritzsche, Markulis, Strang, and Wheatley are more oriented toward design issues.

To support our thinking as to the dimensions of ABSEL's current intellectual structure, we offer Figure 4. This figure is a set of representative article titles taken for the 1993 and 1992 ABSEL proceedings. We have selected authors occupying the extreme positions of each of the four orientations, and we have identified the articles, which might be called "exemplars" of each orientation. In all cases, the titles are highly suggestive of the respective orientations.

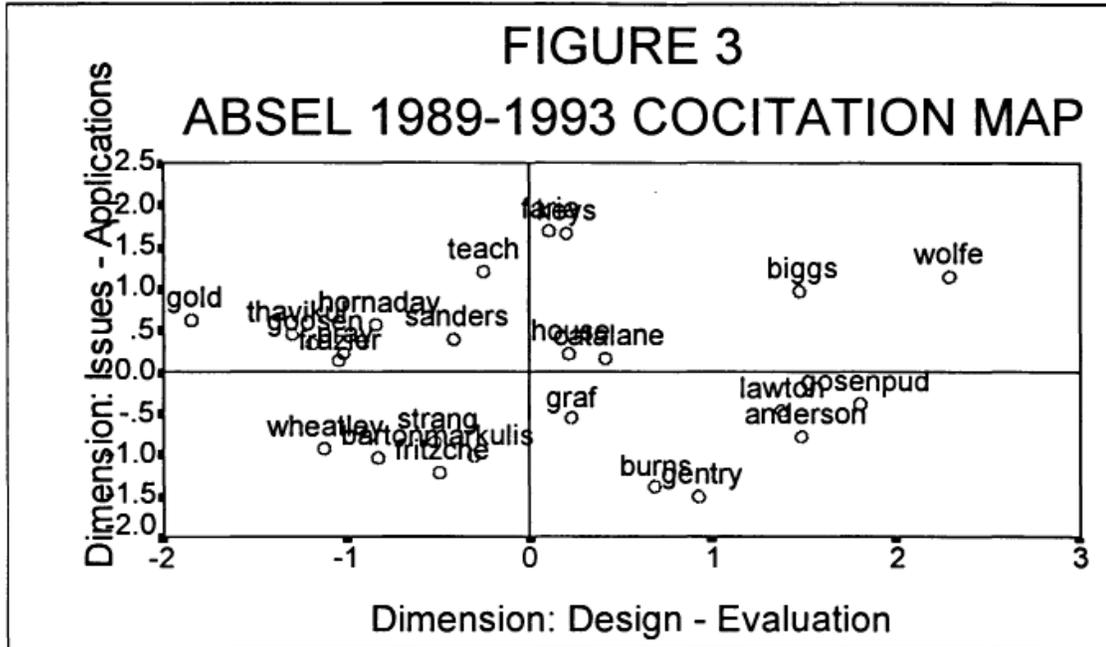


FIGURE 4
RECENT "EXEMPLARS" OF THE FOUR ORIENTATIONS

Applications
<i>Sales Manager: A Simulation</i> (J. Dickinson and A. Faria 1993)
<i>The Distribution Channel Game</i> (R. Teach 1993)
<i>Lessons Learned from a Customized Management Development Simulation</i> (M. McDonald and B. Keys 1993)
<i>Using Lotus 1-2-3 to Complete a Triple Play in a Simulated Competition</i> (R. Nulsen, D. Roussos, A. Faria 1993)
Issues
<i>A Systematic Approach to the Development and Evaluation of Experiential Exercises Performance</i> (G. Macintosh, J. Gentry and J. Stoltman 1993)
<i>A Framework for the Identification of Moderated and Mediated Performance Consequences of Pedagogical Alternatives</i> (A. Burns 1992)
<i>How Should We Measure Experiential Learning?</i> (J. Gentry, J. Stoltman, C. Mehlhoff 1992)
<i>Can Ethics be Taught: A Simulation Tests a Traditional Ethics Pedagogy</i> (P. Ricci and P. Markulis 1992)

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Design		
Reducing the complexity of Interactive Variable Modeling in Business Simulations Through Interpolation (K. Goosen 1993)		
Modeling Interactive Effects in Mathematical Functions for Business Simulations: A Critique of Goosen's Interpolation Program (S. Gold 1993)		
Multiple Industries in Computerized Business Gaming-Simulations (P. Thavikulwat 1993)		
Modeling Total Quality Elements into a Strategy-Oriented Simulation (E. Mergen and T-Pray 1992)		
Evaluation		
An Instrument for Investigating the Effectiveness of Teaching Methods in the Business Policy and Strategy Formation Course (B. Biggs, W. Miles, J. Schubert 1993)		
Peer Group Indicators of External Validity of Business Games: A Five Year Longitudinal Study (J. Wolfe and C. Roberts 1992)		
Comparing the Simulation with the case Approach: Again! (J. Gosenpud and J. Wabush 1993)		
Dominant Personality Types and Total Enterprise Simulation Performance: A Follow-Up Study (P. Anderson And L.Lawton 1993)		

CONCLUSIONS

We must point out that a major weakness of our work is its reliance on published articles. ABSEL knowledge certainly flows informally as well as in discipline-specific publications. Also, the roles of ABSEL workshops, demonstrations, special panels, officerships, and Fellows are not accommodated by this analysis. Clearly, these types of ABS EL influence sources are greatly understated by looking only at published articles. All conclusions must be tempered by this fact.

The introduction to this paper noted that a benefit of bibliometric study of an area is to map out the various orientations co-existing within the intelligentsia of a discipline. Perhaps this is the primary value of the cocitation analysis of ABSEL's influential authors, for they appear to have evolved into collegial groups sharing ideas but with definite orientations. A Design-Evaluation orientation differentiation is readily apparent, and it clearly distinguishes the predispositions of ABSEL's invisible colleges. At the same time, an Issues-Applications orientation is in place, and while it is not as differentiating as the Design-Evaluation dimension, the two work together well in characterizing the topics favored by the half-dozen or so intellectual groups which have evolved to date.

It is noteworthy to recall that most of the influential ABSEL authors whose works were used to identify these orientations and the various invisible collages have writings spanning the past decade, and a good many have writings that span most of the 20 years of ABSEL's existence. Interestingly, it is only in the last five years that formal sharing (i.e., cocitas) of ideas has been sufficient to discern clear-cut orientations and to place cohesive groups of writers in a two-dimensional orientations map. In a very real sense, this crystallization of orientations signals opportunity for collaborated efforts and corroboration of findings and/or thinking. While not all influential authors are doggedly fixed as to orientation, each one's general affinity is apparent. Hopefully, this bibliometric analysis will prove useful to ABSEL as it charts its future and to the general membership as it seeks to understand what ABSEL is all about.

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