

CT 3.1.3

Co-Institution Collaboration Network on U.S. University Patents 1974-2004

M. M. Clements¹ and B. W. Herr, II²

¹Doctoral Candidate, Education Policy Studies and Higher Education Administration, School of Education, Indiana University, Bloomington, IN 47405

²Senior Software Developer, Cyber Infrastructure for Network Science Center, SLIS, Indiana University, Bloomington, IN 47405

Introduction

The 1980 Bayh-Dole Act was passed into legislation to encourage technology transfer from the university laboratory into the marketplace. Prior to 1980, universities were allowed to patent technology developed with public funds on an exceptional basis. This legislation, along with institutional reforms that allowed most academic inventors to share in the proceeds of their innovations, has resulted in the growth of university participation in the marketplace activities. Whereas university patents accounted for less than one-half of 1 percent of all U.S. patents prior to 1980, university patents currently comprise 5 percent of all U.S. patents (NSB, 2006). Furthermore, both federal funding and patents have been concentrated at a few universities for many years (Leaf, 2005; Morgan and Strickland 2001; National Science Foundation, 2005). Given this growing participation of U.S. universities in the marketplace, more should be known about the actual relationships that result in patents granted to universities. This study explores co-institutional collaboration on patents issued to U.S. universities between 1975 and 2004. By depicting the inter-connectivity between academic institutions, commercial, governmental and international institutions, we explore the relationships between patents assigned to universities, collaborative diversity and collaborative strength of institutions participating on patents, and the importance of the patent as determined by citation strength.

Related Work

There has been wide-ranging and important research on co-authorship networks arising from scholarly publications, (Barabási, 2003; Barabási et al., 2002; Börner, Maru, & Goldstone, 2004; Börner, Sanyal, & Vespignani, 2007; Boyack, Klavans, & Börner, 2005; Newman, 2001a, 2001b, 2001c, 2001d). Likewise, research has focused on the patent classification system and disciplinary diffusion of information (Boyack et al., 2005; Boyack, Wylie, Davidson, & Johnson, 2000; Tijssen, 2001).

Dataset

This network analysis is performed on the U.S. Patent and Trademark Office's [USPTO] PATSIC, CONAME and INVENTOR data files, the Scholarly Database files containing citation information on patents that were granted to U.S. universities between 1975 and 2004. Ultimately, 1048 institutions are present in the network, produced 44,394 patents involving 47,556 unique inventors.

Results

The undirected co-institution networks of university patenting have evolved into scale-free, non random networks of affiliation adhering to the models of preferential attachment (Barabási, 2003; Barabási, Ravasz, & Vicsek, 2001; Colizza, Flammini,

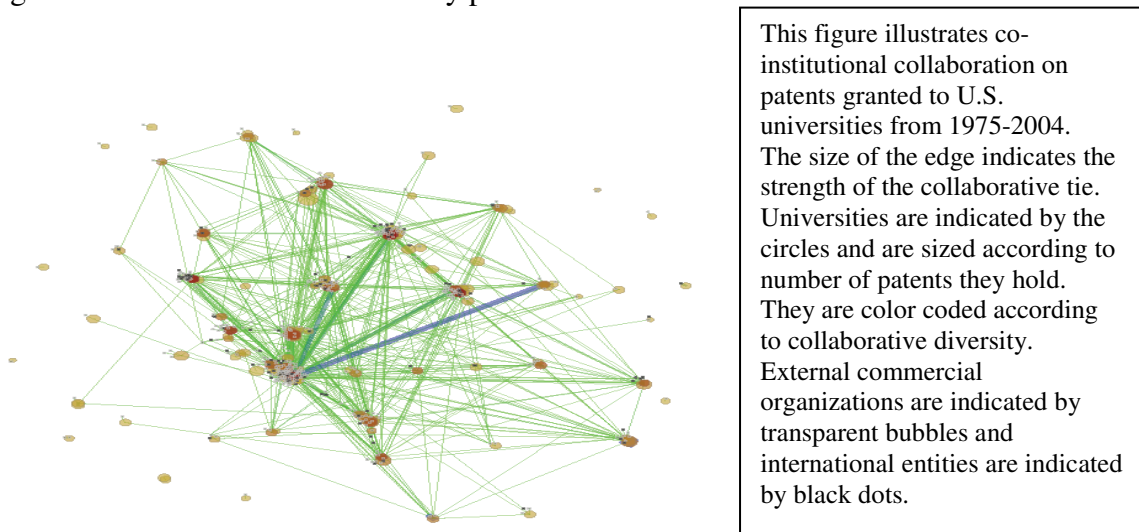
Serrano, & Vespignani, 2006). These networks appear to be self-selective and governed by affinity. It is interesting to note that as more institutions enter the network, a correlation between collaboration and diffusion (as measured through citation strength) arises. While the overall number of collaborations is increasing, collaborative diversity is also growing. Furthermore, there is growing international participation on patents awarded to U.S. universities.

Table 1: Fundamental statistics for institutional collaboration networks

	75-79	80-84	85-89	90-94	95-99	00-94	75-04
Type	Tree	Tree	Scale-Free	Scale-Free	Scale-Free	Scale-Free	Scale-Free
Nodes	154	178	238	330	553	686	1048
Isolates	142	150	152	113	97	91	140
Edges	7	15	61	216	667	917	1581
$\langle k \rangle$.091	.169	.513	1.31	2.412	2.644	3.017
ASP	1.300	1.118	1.821	5.644	4.106	3.953	3.724
Diameter	2	2	5	12	10	10	9
Density	.0006	.0010	.0022	.0040	.004	.004	.003
WattsStrogatz Clustering	0	0	0.173	0.249	0.374	0.400	0.424
Connected Components	147	163	179	140	112	113	161
Largest Component	4	3	8	152	423	547	863

$\langle k \rangle$ = average degree, ASP is Average shortest path

Figure 1: Structure of U.S. university patent collaborations from 1975-2004



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