New Method for Identifying Early-Stage Technologies via Patent Analysis

A two-year study sponsored by ATP-EAO developed a new method of patent analysis called "hot-spots." Hot spots are technologies that are sparking a concentration of inventive activity in the past few years. Hot spots can be analyzed for their geographic characteristics, particularly unexpected patterns of hot technological activity occurring off the beaten path, away from easy sources of venture capital, beyond known regions such as Silicon Valley, Route 128, Austin, and Salt Lake City. Borrowing from a method used in competitive intelligence studies to identify interesting technologies, the modified hot-spots approach allows for the identification of early-stage, high-risk technologies like those ATP funds.

Five Major Findings

1. **ATP patents are twice as likely to be found among the hot-spot related patents as in a similar sized sample of the general population of patents.** The hot-spots method identifies clusters of hot-spot patents (which may be quite old) as well as a current set of patents known as the next-generation patents. The next-generation patents are a well-defined subset of recent patents that is approximately 24% of the size of the general population of recent patents. This subset contains 47% of patents issued as a result of ATP sponsorship. This was carried out for two time periods, and for both periods the study found that roughly twice the number of ATP patents was found in the next generation set as would be expected. Moreover, this is a conservative estimate.

2&3. **ATP patents have characteristics that can be identified with real-time indicators, thus allowing a scoring method to identify other potential early-stage, high-risk technologies.** The vast majority of newly issued patents are of little value, and even those that do have value often are incremental improvements on existing products or technologies. The scoring method developed and validated in this study has the ability to identify interesting emerging technologies. All high-scoring clusters may not be early-stage, high-risk technologies as defined by ATP, but the majority would be described as being interesting or emerging technologies as opposed to incremental improvements, and a significant subset can be described as being early-stage, high-risk technologies.

Specifically, technologies that are likely to be early-stage, high-risk technologies can be identified by using parameters found in patents, such as high science linkage, and public sector participation, suggesting the hot-spot/next-generation methodology provides a means for identifying potentially early-stage technologies of interest to ATP, other Federal programs, and policymakers in a much more focused way than in mining recent patents in general.

The high-scoring clusters are in high-tech, interesting areas and were not just incremental improvement inventions, as the general population of U.S. patents tend to be. The top assignees producing the high-scoring clusters tend to be well known, well respected organizations such as the University of California, MIT, General Electric, IBM, etc. Universities provide much of the patents in the high-scoring clusters, and moreover they provide much of the foundation hot-spot patents which are then built upon by companies in industries such as Biotechnology, Pharmaceuticals, Semiconductors, and so on.

4. **From an evaluation perspective, the ATP related patents perform well above average in terms of the patent indicators.** This suggests that ATP-funded projects produce quality patents that are used by other technologies and companies beyond the ATP companies. In this way, the ATP related patents represent a public good, such that ATP-funded projects are likely to have a broad impact beyond the individual awardees.

5. **Current ATP outreach and ATP funding is by and large reaching the right metropolitan areas.** One of the original goals of the project was to determine metropolitan areas where ATP could do a better job of outreach, by determining the metropolitan areas with the most next-generation patents and comparing them with the metropolitan areas that produced ATP applications. The top 300 metropolitan areas were examined in both cases and we found that the top metropolitan areas in terms of high-tech patent production, with few exceptions, tend to be the same areas in which ATP receives a number of applications. This suggests that in the regions producing high-tech patents, companies are aware of the ATP program (see Table 1).

Factsheet 1.C7 (March 2005 by Connie Chang)

Table 1 - Rank and Percentage for Five Parameters by MSA (Sorted by the Top Scoring Next-Gen Cluster Patent Rank)

Metropolitan Area	ATP Applications	ATP Awards	Hot-Spot Patents	Next-Gen (NG) Patents	Top S coring 100 NG Cluster Patents
San Francisco-Oakland-San Jose, CA CMSA	1 (9.7%)	1 (10.7%)	1 (17.6%)	1 (17.5%)	1 (14.9%)
Boston-Worcester-Lawrence-Lowell-Brockton, MA-NH NE CMA	2 (7.2%)	2 (7.9%)	3 (5.5%)	3 (4.8%)	2 (8.6%)
New York-Northern New Jersey-Long Island, NY-NJ -CT-PA CMSA	4 (6.2%)	3 (6.0%)	2 (9.5%)	2 (7.8%)	3 (7.4%)
Los Angeles -Riverside-Orange County, CA CMSA	5 (5.0%)	6 (3.5%)	4 (4.2%)	4 (4.2%)	4 (5.0%)
San Diego, CA MSA	7 (3.1%)	10 (2.5%)	6 (2.8%)	9 (2.5%)	5 (4.4%)
Washington-Baltimore, DC -MD-VA-WV CMSA	3 (6.3%)	5 (4.4%)	7 (2.7%)	12 (2.1%)	6 (3.9%)
Houston-Galveston-Brazoria, TX CMSA	17 (1.5%)	19 (1.2%)	15 (1.7%)	15 (1.7%)	7 (3.3%)
Seattle-Tacoma-Bremerton, WA CMSA	19 (1.3%)	22 (1.0%)	14 (1.9%)	13 (2.1%)	8 (3.0%)
Minneapolis-St. Paul, MN-WI MSA	12 (1.9%)	9 (2.6%)	8 (2.6%)	6 (2.8%)	9 (2.7%)
Philadelphia-Wilmington-Atlantic City, PA-NJ -DE -MD CMSA	8 (2.8%))	11 (2.5%)	13 (2.1%)	14 (1.9%)	10 (2.6%
Raleigh-Durham-Chapel Hill, NC MSA	22 (1.1%)	23 (0.9%)	21 (1.2%)	17 (1.6%)	11 (2.2%)
Chicago-Gary-Kenosha, IL-IN-WI CMSA	9 (2.8%)	8 (2.6%)	5 (2.9%)	7 (2.7%)	12 (1.9%)
Detroit-Ann Arbor-Flint, MI CMSA	6 (3.7%)	4 (5.1%)	12 (2.1%)	11 (2.2%)	13 (1.9%)
Dallas-Fort Worth, TX CMSA	18 (1.4%)	16 (1.9%)	11 (2.2%)	10 (2.4%)	14 (1.7%)
Denver-Boulder-Greeley, CO CMSA	11 (2.0%)	14 (2.3%)	19 (1.3%)	22 (1.2%)	15 (1.4%)
Austin-San Marcos, TX MSA	21 (1.1%)	18 (1.3%)	9 (2.4%)	8 (2.7%)	16 (1.2%)
Cincinnati-Hamilton, OH-KY-IN CMSA	28 (0.7%)	29 (0.8%)	25 (0.7%)	24 (0.9%)	17 (1.2%)
Phoenix-Mesa, AZ MSA	27 (0.7%)	38 (0.5%)	22 (1.1%)	21 (1.2%)	18 (1.1%)
New Haven-Bridgeport-Stamford-Waterbury-Danbury, CT-NE CMA	20 (1.2%)	17 (1.9%)	16 (1.6%)	18 (1.5%)	19 (1.0%)
Rural NY	33 (0.6%)	39 (0.5%)	31 (0.5%)	26 (0.7%)	20 (1.0%)
Atlanta, GA MSA	13 (1.7%)	21 (1.1%)	20 (1.2%)	20 (1.3%)	21 (0.9%)
San Antonio, TX MSA	64 (0.2%)	91 (0.2%)	63 (0.2%)	57 (0.3%)	22 (0.9%)
Iowa City, IA MSA	177 (0.0%)	999 (0.0%)	134 (0.1%)	118 (0.1%)	23 (0.8%)
Boise City, ID MSA	114 (0.1%)	999 (0.0%)	10 (2.4%)	5 (3.5%)	24 (0.8%)

Portland-Salem, OR -WA CMSA	26 (0.7%)	20 (1.2%)	18 (1.4%)	16 (1.6%)	25 (0.8%)
Cleveland-Akron, OH CMSA	15 (1.6%)	15 (2.0%)	24 (0.9%)	25 (0.8%)	26 (0.8%)
Knoxville, TN MSA	36 (0.5%)	55 (0.3%)	58 (0.2%)	84 (0.1%)	27 (0.8%)
Columbus, OH MSA	25 (0.7%)	25 (0.9%)	39 (0.4%)	47 (0.3%)	28 (0.7%)
Rochester, NY MSA	29 (0.7%)	26 (0.9%)	17 (1.5%)	19 (1.5%)	29 (0.6%)
Madison, WI MSA	38 (0.5%)	30 (0.8%)	53 (0.3%)	52 (0.3%)	30 (0.6%)
Pittsburgh, PA MSA	14 (1.7%)	13 (2.3%)	23 (0.9%)	30 (0.5%)	31 (0.6%)
Milwaukee-Racine, WI CMSA	37 (0.5%)	44 (0.5%)	41 (0.4%)	36 (0.5%)	32 (0.6%)
Burlington, VT-NE CMA	176 (0.0%)	999 (0.0%)	35 (0.5%)	23 (0.9%)	33 (0.5%)
Hartford, CT-NE CMA	34 (0.6%)	27 (0.9%)	26 (0.6%)	28 (0.6%)	34 (0.5%)
Miami-Fort Lauderdale, FL CMSA	63 (0.2%)	53 (0.4%)	28 (0.6%)	32 (0.5%)	35 (0.5%)
Johnson City-Kingsport-Bristol, TN-VA MSA	207 (0.0%)	94 (0.2%)	121 (0.1%)	94 (0.1%)	36 (0.5%)
Orlando, FL MSA	39 (0.5%)	34 (0.6%)	74 (0.2%)	44 (0.4%)	37 (0.5%)
Lexington, KY MSA	126 (0.1%)	91 (0.2%)	108 (0.1%)	59 (0.2%)	38 (0.5%)
Melbourne-Titusville-Palm Bay, FL MSA	125 (0.1%)	113 (0.1%)	71 (0.2%)	68 (0.2%)	39 (0.5%)
Omaha, NE-IA MSA	106 (0.1%)	87 (0.2%)	146 (0.1%)	136 (0.1%)	40 (0.5%)
Jacksonville, FL MSA	100 (0.1%)	999 (0.0%)	151 (0.0%)	147 (0.1%)	41 (0.5%)
Salt Lake City-Ogden, UT MSA	23 (0.9%)	28 (0.8%)	32 (0.5%)	29 (0.5%)	42 (0.4%)
Providence-Warwick-Pawtucket, RI-NE CMA	47 (0.4%)	41 (0.5%)	55 (0.3%)	50 (0.3%)	43 (0.4%)
Albuquerque, NM MSA	32 (0.6%)	33 (0.6%)	43 (0.3%)	58 (0.2%)	44 (0.4%)
Oklahoma City, OK MSA	124 (0.1%)	999 (0.0%)	93 (0.1%)	91 (0.1%)	45 (0.4%)
Nashville, TN MSA	95 (0.2%)	999 (0.0%)	64 (0.2%)	106 (0.1%)	46 (0.4%)
Charleston, WV MSA	175 (0.0%)	133 (0.1%)	163 (0.0%)	142 (0.1%)	47 (0.4%)
Fort Myers-Cape Coral, FL MSA	999 (0.0%)	999 (0.0%)	172 (0.0%)	194 (0.0%)	48 (0.4%)
West Palm Beach-Boca Raton, FL MSA	79 (0.2%)	70 (0.2%)	34 (0.5%)	45 (0.4%)	49 (0.3%)
Santa Barbara-Santa Maria-Lompoc, CA MSA	31 (0.6%)	43 (0.5%)	56 (0.3%)	62 (0.2%)	50 (0.3%)