

## Pace/SkillPROOF IT Job Index Methodology.

In order to handle data generated in different geographical locations efficiently, a database system needs an index mechanism that will help it retrieve data items quickly according to their overall positions and assimilate them into a meaningful format. Information Technology job postings by corporations and institutions especially need such a mechanism. In this paper, we describe a dynamic index structure which gives an algorithm for searching and updating Information Technology (IT) job postings in two New York State regions, New York (Manhattan) County of the City of New York, and Westchester County. Although there are no background data to test the validity of the process, we believe the algorithm has a potential self testing ability, and that the structure performs well.

The Pace/SkillPROOF IT Job Index (PSII) is a composite index calculated as the weighted composition of variables representing the number of job postings in eleven U.S. Bureau of Labor Statistics (BLS) IT job categories. The following is a brief methodology for calculating the index.

### Variables

Variables used in the index are standard job categories in the Information Technology market. There are various approaches to defining job categories. We have adopted the IT job categories of the U.S. Bureau of Labor Statistics. The 11 categories are standard and encompass most of the job titles in this market:

- Computer and Information Systems Managers
- Computer and Information Scientists, Research
- Computer Programmers
- Computer Software Engineers, Applications
- Computer Software Engineers, Systems Software
- Computer Support Specialists
- Computer Systems Analysts
- Database Administrators
- Network and Computer Systems Administrators
- Network Systems and Data Communications Analysts
- Computer Specialists, All Other

### Data

The index uses data obtained by SkillPROOF <http://www.skillproof.com/home/SkillProof.asp>, a company founded in 2002. Every 24 hours the company's specialized Web crawler randomly scans the posted Manhattan and Westchester job listings of companies in the sample. SkillPROOF maps the openings into the eleven major IT job categories used by the U.S. Department of Labor, ranging from programmers to network and computer administrators.

## The Index

The PSII then assigns a mathematical weight to each category according to its relative share of the number of job openings in the baseline years of 2004 and 2005, the first two-year period for which SkillPROOF started to collect information. The baseline will be updated every two or three years depending on the structure of IT industries. At present, the weights are as follows:

### Westchester Weight Structure\*

<b>BLS Category</b>	<b>Job Counts 2004</b>	<b>Job Counts 2005</b>	<b>Sums</b>	<b>Weights</b>
Computer & Information Systems Managers	56	59	115	0.0891
Scientists, Research	273	211	484	0.3752
Programmers	86	139	225	0.1744
Software Engineers, Applications	64	72	136	0.1054
Software Engineers, Systems Software	34	41	75	0.0581
Support Specialists	11	30	41	0.0318
Systems Analysts	45	66	111	0.0860
Database Administrators	1	8	9	0.0070
Network and Systems Administrators	5	4	9	0.0070
Network Systems Analysts	39	30	69	0.0535
Specialists, All Other	2	14	16	0.0124
<b>2-Year Total</b>			<b>1290</b>	<b>1.0000</b>

\* For simplicity the word "Computer" is dropped from the BLS categories

And for Manhattan, the weight structure is as follows.

### Manhattan Weight Structure

<b>BLS Category</b>	<b>Job Counts 2004</b>	<b>Job Counts 2005</b>	<b>Sum</b>	<b>Weights</b>
Computer & Information Systems Managers	1103	1378	2481	<b>0.1891</b>
Scientist	24	16	40	<b>0.0030</b>
Programmers	1196	1528	2724	<b>0.2076</b>
Software Engineers, Applications	1454	1728	3182	<b>0.2425</b>
Software Engineers, Systems Software	735	1047	1782	<b>0.1358</b>
Support Specialists	345	659	1004	<b>0.076</b>
Systems Analysts	339	427	766	<b>0.0583</b>
Database Administrators	83	92	175	<b>0.0133</b>
Network and Systems Administrators	132	213	345	<b>0.0262</b>
Network Systems Analysts	142	239	381	<b>0.0290</b>
Specialists, All Other	90	149	239	<b>0.0182</b>
<b>2-Year Total</b>			<b>13119</b>	<b>1.0000</b>

The ratio of the total number of jobs in a category for the two-year period to the total of all jobs is taken as the weight of that IT job category. For example, the weight of 0.1891 for Computer and Information Systems Managers is the ratio of 2,481, the total postings

in 2004 and 2005 in that category, and 13,119, the total number of job postings in all categories.

The weighting prevents a surge in any single category from having a disproportionate, and, hence, misleading, influence on the Index's overall snapshot of the market.

To calculate the Index, we used the following procedures:

- The 91-day moving average of the daily postings is calculated using Excel software.
- The 91-day moving average on the first of the month is taken as a representative of the job postings of the previous quarter before, e.g., the value related to July 1<sup>st</sup> is taken as a representative of the job postings in the 2<sup>nd</sup> quarter.

The composite index is calculated by the weighted composition of the number of categories, as a percentage of the same in the base years.

$$WA_n = \alpha_1 C_1 + \alpha_2 C_2 + \alpha_3 C_3 + \dots + \alpha_{11} C_{11}$$
$$PSII_n = WA_n / WA_{Base}$$

Where, WA is the Weighted Average of all eleven categories  
n is the period (month) of the Index  
 $\alpha$  is the weight of the variable  
C is the job category

Job postings are monitored and recorded daily, but an actual job opening may not be filled immediately. So the actual number of job listings and daily job listings differ by the number of days a job continues to be posted. To prevent this phenomenon from inflating the data, SkillPROOF does not count duplicate jobs.

## Diffusion Index

As a separate piece of information on how widely changes in various job postings are spread across the job categories, year-to-year and month-to-month "diffusion indexes" are calculated. The yearly diffusion index shows the number of categories with increased postings over the same month a year earlier. For example, if in July 2006 seven categories had higher postings than in July 2005, the yearly diffusion index would be  $7/11 = 0.64$  or 64 (expressed as a percent). The monthly diffusion index shows the number of categories with increased postings over the month before.

These comparisons can be helpful to policy makers, as they indicate the need for certain skills and professional training.

To determine the impact of each job category in the total IT market, we use the following procedures

- The 30 day moving average is estimated for each job category.
- The average number of monthly job postings for each category is calculated.
- For the diffusion index, the base is 2004, the first year data became available.
- The ratio of each category to its corresponding base-year value is taken as the representative of that category.
- The corresponding monthly and yearly diffusion indexes are then calculated as described above.

## Preliminary Results

Comparing calendar year 2005 with the previous year, the PSII or weighted average of the number of overall IT jobs increased 22 percent. The annual diffusion index increased from 30 to 50 percent of the 11 categories, an increase of more than 60 percent in the number of categories showing growth.

## Schedule

The PSII is announced by the 15<sup>th</sup> of the month of each new business quarter on the Pace University Web site at [www.pace.edu/PSII](http://www.pace.edu/PSII).