Measuring Generic Technology via Co-technology Analysis & SNA

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Introduction

Measuring generic technology can be of great significance in selecting & managing generic technology for new industries. Few studies on measuring generic technology have been found. The existing studies on measuring generic technology either focus on measuring or identifying a certain kind of generic technology according to qualitative analysis, or focus on measuring or identifying generic technology by using Delphi method during the process of technology foresight activities. When it comes to the indicator measuring generic technology, correlation is usually used, but this correlation is often the analytic results according to the opinions of Delphi experts, which lacks objectivity in some degree.

Data collection and research methodology

This study is based on bibliographic patent data retrieved from DII. We choose a new industry "electric vehicle" as the sample, for it is of great significant measuring generic technology in new industries. The data was retrieved on September 28, 2010, and we downloaded the latest 5000 patent data in 2009 as the sample. Technology fields co-occurrence analysis is used in this study. DMC, i. e.: Derwent Manual Code, is chosen as technology field classification.

Analyzing & Results

Close connection of technology fields analysis

Among the 2 323 different kinds of technology fields, top 79 technology fields with frequency higher than 70 times form 2 033 co-occurring pairs, and 11 pairs with more than 300 frequency among these pairs are as Table 1. Technologies with high frequency of co-occurring pairs mean there is a strong tie and close connection between the two technology fields.

Matrix among top 79 technology fields

Still analyzing by the software of Bibexcel, we got the co-occurrence matrix of the top 79 technology fields. We get the co-occurrence technology partners of each technology field according to the formula of Countif (B2:B80,">0"), and listed top 30 of all as Table 2 by their order from high to low.

Table 1. Top 11 technology co-occurring pairs.

Technology co-occurrence pairs		Fre.
X21-A01D	X22-P04A	817
X21-A01D	X21-A01F	639
X21-A01J	X21-B01A	487
L03-H05	X21-B01A	470
X21-A01D1	X22-P04A	414
X21-A02A	X22-P04A	413
T01-J07D1	X21-A01F	389
X21-A01D	X21-B01A	388
X21-A01D1	X21-A02A	375
X21-A01F	X21-B01A	345
T01-J07D1	X21-A01D	330

Table 2. Top 10 co-occurrence partners .

No.	partners	ID (DMC)
1	56	T01-J07D1
2	44	L03-H05
3	38	X16-B01
4	36	A12-T04C
5	36	X22-F
6	34	U24-H07

7	33	X21-B01B
8	32	X11-U02
9	32	X22-F04
10	32	X22-F01A

Network of top 79 technology fields

Using Ucinet-Netdraw, we drew Figure 1: network of top 79 technology fields. Figure 1 shows that the right upper part is more density than other parts; the node of T01-J07D1 is the biggest node in the graph.

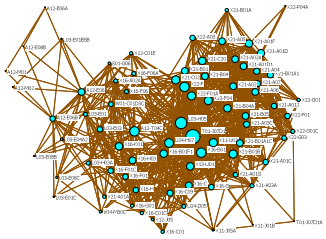

Figure 1. Network of top 79 technology fields.

Network indicator of generic technology measuring

We chose Ucinet-centrality-multiple measures-degree (abbr. M-Deg.), and found that the order of M-Deg. is coincide with that of the partners. So M-Deg. is considered to be a proper indicator in measuring generic technology (Table 3).

Table 3. Orders both of M-Deg. and partners.

No.	M-Deg.↓	ID(DMC)	partners↓
1	71.795	T01-J07D1	56
2	56.41	L03-H05	44
3	48.718	X16-B01	38
4	46.154	A12-T04C	36
5	46.154	X22-F	36
6	43.59	U24-H07	34
7	42.308	X21-B01B	33
8	41.026	X11-U02	32
9	41.026	X22-F04	32
10	41.026	X22-F01A	32

Conclusions & discussions

Co-technology analysis, i. e.: technology field co-occurrence analysis, can be used to measure generic technology. Having more technology co-occurrence partners for a given technology field means it is more likely to be a generic technology field. •Analyzing results also show that, generic technology is not necessary hot technology with high frequency. The weight of co-technology should be taken into consideration in the further studies. Measuring generic technology can be visualized by using Netdraw tool of Ucinet. It is concluded that multiple-degree centrality is a proper indicator in measuring generic technology after analyzing and comparing degree, betweenness, closeness, and eigenvector centrality.

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References

Balconi, M. and A. Laboranti (2006). "University-industry interactions in applied research: The case of microelectronics." *Research Policy,* 35(10): 1616-1630.

Belanger, B. C., G. A. Uriano, et al. (1991). "the advanced technology program - a new role for nist in accelerating the development of commercially important technologies." *Journal of Research of the National Institute of Standards and Technology,* 96 (5): 605-611.

Bhattacharya, S. and P. K. Basu (1998). "Mapping a research area at the micro level using co-word analysis." *Scientometrics*, 43 (3): 359-372.

Breschi, S., L. Cassi, et al. (2009). "Networked research: European policy intervention in ICTs." *Technology Analysis & Strategic Management*, 21(7): 833-857.

Breschi, S. and F. Lissoni (2009). "Mobility of skilled workers and co-invention networks: an anatomy of localized knowledge flows." *Journal of Economic Geography*, 9(4): 439-468.

Chiang, J. T. (1998). "High-technology targeting: its modes' strategies and paradigms." *Technology in Society,* 20 (1): 1-23.

Green, K., R. Hull, et al. (1999). "The construction of the techno-economic: networks vs. paradigms." *Research Policy*, 28 (7): 777-792.

Keenan, M. (2003). "Identifying emerging generic technologies at the national level: the UK experience." *Journal of Forecasting*, 22 (2-3): 129-160.
Kuwahara, T. (1999). "Technology forecasting activities in Japan." *Technological Forecasting and Social Change*, 60 (1): 5-14.
Lee, B. and Y. I. Jeong (2008). "Mapping Korea's national R&D domain of robot technology by using the co-word analysis." *Scientometrics*, 77 (1): 3-19.
Lee, S., H. Seol, et al. (2008). "Using patent information for designing new product and technology: keyword based technology roadmapping." *R & D Management*, 38 (2): 169-188.
"Commercializing generic technology: The case of advanced materials ventures." *Research Policy*, 35 (3): 375-393.
Okamura, K. and N. S. Vonortas (2006). "European alliance and knowledge networks." *Technology Analysis & Strategic Management*, 18(5): 535-560.
Olle Persson, I. (2010). "Bibexcel ", from http://www8.umu.se/inforsk/Bibexcel/.
Reddy, P. (1997). "New trends in globalization of corporate R & D and implications for innovation capability in host countries: A survey from India." *World Development*, 25 (11): 1821-1837.
Small, H. (1993). "macrolevel changes in the structure of cocitation clusters - 1983-1989." *Scientometrics*, 26 (1): 5-20.
Small, H. and E. Sweeney (1985). "CLUSTERING THE SCIENCE CITATION INDEX USING CO-CITATIONS .1. A COMPARISON OF METHODS." Scientometrics 7 (3-6): 391-409.
Small, H., E. Sweeney, et al. (1985). "clustering the science citation index using co-citations mapping science." *Scientometrics*, 8 (5-6): 321-340.
Su, F. P., K. K. Lai, et al. (2009). "Patent Priority Network: Linking Patent Portfolio to Strategic Goals." *Journal of the American Society for Information Science and Technology*, 60(11): 2353-2361.
Wooding, S., K. Wilcox-Jay, et al. (2005). "Co-author inclusion: A novel recursive algorithmic method for dealing with homonyms in bibliometric analysis." *Scientometrics*, 66 (1): 11-21.