New Methods for Technology Futures Analysis

[new approaches to technology foresight, forecasting & assessment]

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Outline

- An Initiative to advance technology foresight methods
- The FTA Seminar [Future-oriented Technology Analyses]
- One example new Technology Analysis Method

An FTA Chronology

2000: 7 of us conspire to improve tech "forecasting"

2001: "On the Future of Technological
Forecasting" article appears (in *TF&SC*);
Initiative percolates

2002: Vincent Marchau (TU Delft) collaborates;
we enlist 6 other Americans, 10 Europeans,
and 2 others to plan a sequence of actions

2003: IPTS (the Institute for Prospective Technological
Studies), backed by the EU Research Directorate,
agrees to host a special TF methods workshop

2004: 19-person co-authored paper appears:
Technology Futures Analysis:
Toward Integration of the Field and New Methods, by the
Technology Futures Analysis Methods Working Group
(in *TF&SC*)
May 13-14 – EU-US "FTA" Seminar on New Technology
Foresight, Forecasting & Assessment Methods

"TA"
Multiple Technology Analyses in support of Technology Management

- Technology monitoring (scanning)
- Competitive Technological Intelligence
- Tech Forecasting
- Technology Assessment
- Technology Foresight
- Technology Roadmapping

Why TA?

- Rapidly emerging technologies
- Greater availability of information on emerging technologies
- Opportunity to "look before we leap" re: impacts of new technologies

Why New Methods?

- Minimal research support for TA methodological development

- Increasing need for new tools due to:
  - more science-based innovation (e.g., bio, nano)
  - renewed attention to societal outcomes
  - needs & capabilities to address complexity in technological innovation systems

EU-US "FTA" Seminar
New Technology Foresight, Forecasting & Assessment Methods

- IPTS organized & hosted

- 13-14 May, 2004, Seville

- About 90 participants [way oversubscribed]

FTA Issues

- **Methodological Selection** – which methods to use for what?

- **Process Management** > good analyses

- **Models and Voices** – integration of empirical & expert opinion sources; quantitative & qualitative

- **What's the Use?** - how to increase the impact of FTA

- **Tales from the Frontier** – new methods in FTA

- **Importing Ideas** – new methods to borrow from other areas

An Illustrative New Method: Premises

- Rich S&T information resources: R&D publication & patent databases; the Internet; etc.
- Analytical tools with scripting capabilities
- Decision processes often outpace analytical processes
- Systematization of decision processes (e.g., stage-gate processes)

Core Components

- **Desktop Access to data** – capability to search & retrieve 1000's of abstract records covering an R&D domain in minutes
  - licensing arrangements for unlimited access
  - databases such as *Science Citation Index, INSPEC, EI Compendex, MEDLINE, Agricola*

- **Text Mining Software** – e.g., *VantagePoint* generates:
  - lists -- tabulations of leading topics ("what") and leading contributors ("who")
  - lists by lists (profiles of technologies or organizations)
  - maps of relationships based on term by document co-occurrences

Leading to: QTIP
Quick Technology Intelligence Process

- Quick

- R&D Domain Profiles

- Pinpointing of key sources

- Answer particular Technology Assessment Questions
  - generate "innovation indicators" [we have ~200] guided by understanding of tech innovation processes
  - compile empirical intelligence to address a given issue, in the way needed
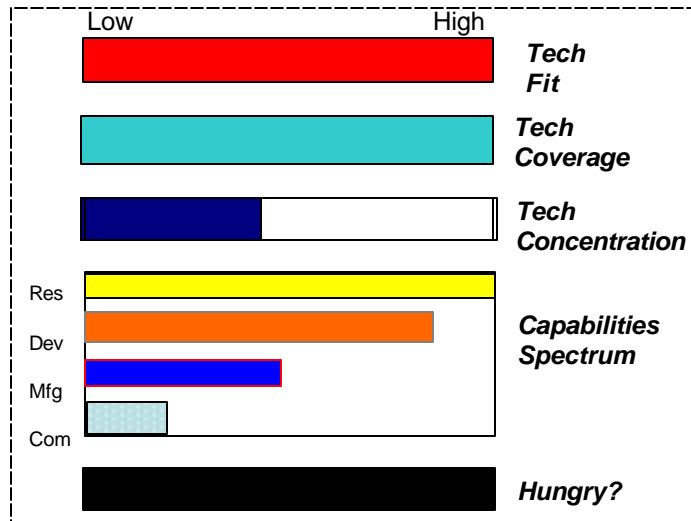
Storyline

- Our large company often assesses potential partner organizations re: joint technology development.

- We develop a standard organizational technology template to help in this assessment.

- We are initiating Australian operations requiring power in remote settings.

- Solid Oxide Fuel Cells (SOFC's) appear promising, but we require a customized solution.

- We thus seek an Aussie partner with SOFC capabilities.

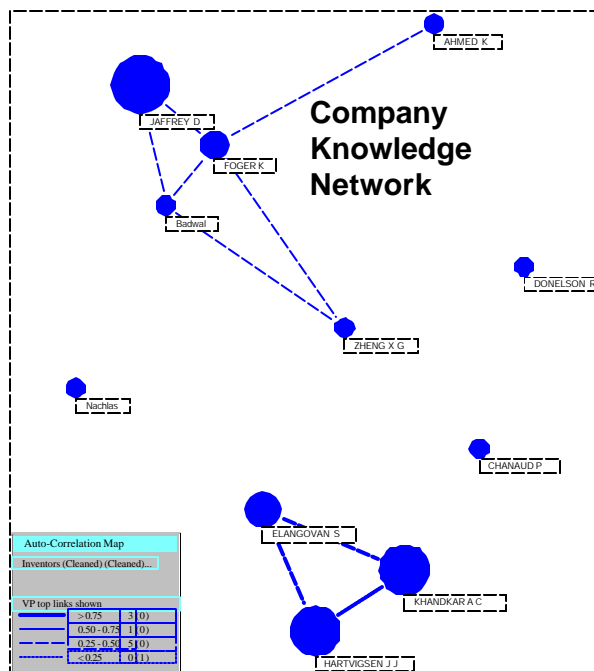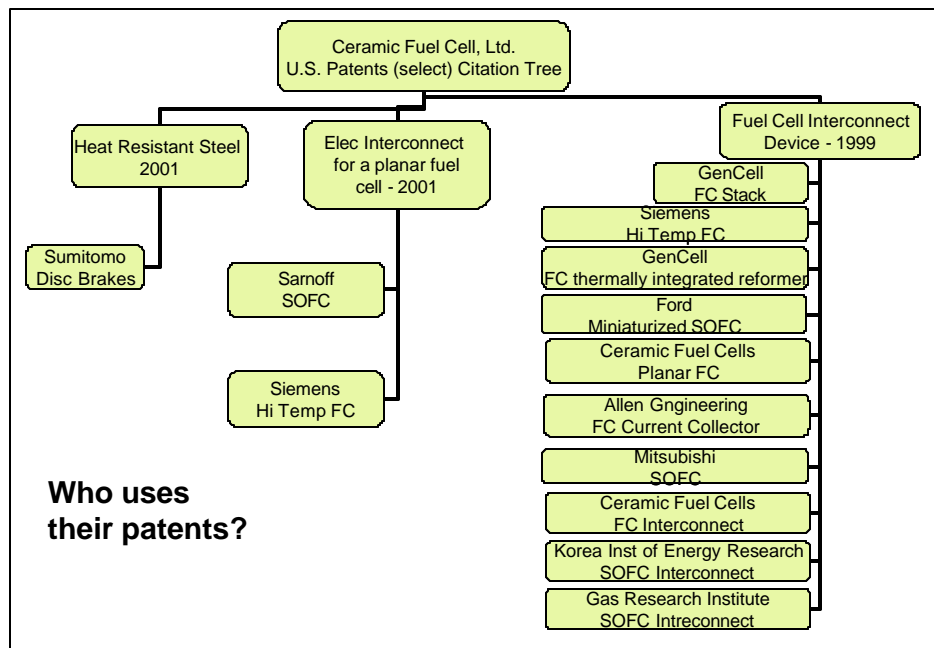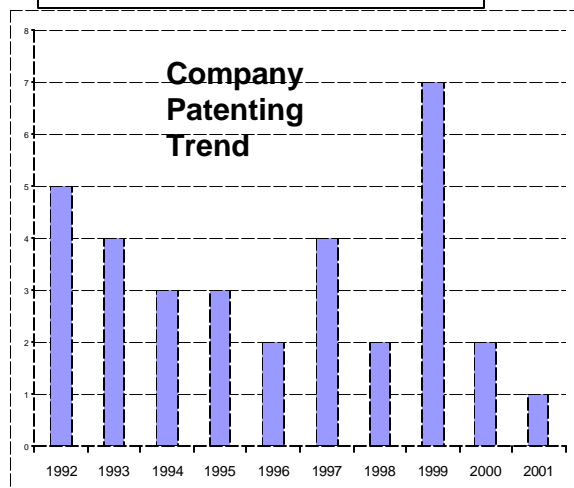- The "one-pager" spotlights a promising candidate.

Company at a Glance:
Ceramic Fuel Cells Ltd.

http://www.cfcl.com.au/

SCORECARD

Low High	
	Tech Fit
	Tech Coverage
	Tech Concentration
Res	
Dev	*Capabilities Spectrum*
Mfg	
Com	
	Hungry?

**Investors in the Company:
12 Organizations, including
Australian manufacturing, power,
gas, investment & government.**

Company Patenting Trend

Year	
1992	5
1993	4
1994	3
1995	3
1996	2
1997	4
1998	2
1999	7
2000	2
2001	1

Ceramic Fuel Cell, Ltd. U.S. Patents (select) Citation Tree

- Heat Resistant Steel 2001
  - Sumitomo Disc Brakes
- Elec Interconnect for a planar fuel cell - 2001
  - Sarnoff SOFC
  - Siemens Hi Temp FC
- Fuel Cell Interconnect Device - 1999
  - GenCell FC Stack
  - Siemens Hi Temp FC
  - GenCell FC thermally integrated reformer
  - Ford Miniaturized SOFC
  - Ceramic Fuel Cells Planar FC
  - Allen Gngineering FC Current Collector
  - Mitsubishi SOFC
  - Ceramic Fuel Cells FC Interconnect
  - Korea Inst of Energy Research SOFC Interconnect
  - Gas Research Institute SOFC Intreconnect

Who uses their patents?

Company Knowledge Network

AHMED K
JAFFREY D
FOGER K
Badwal
ZHENG X G
DONELSON R
Nachlas
CHANAUD P
ELANGOVAN S
KHANDKAR A C
HARTVIGSEN J J

Auto-Correlation Map

Inventors (Cleaned) (Cleaned)...

VP top links shown

> 0.75	3	(0)
0.50 - 0.75	1	(0)
0.25 - 0.5	5	(0)
< 0.25	0	(1)

Top Inventors	Top Authors
Jarrey [8]	**Badwal [22]**
Foger [4]	Jiang [22]
Badwal [2]	**Foger [16]**
	Zhang [9]
	Ciacchi [8]
	Love [6]

Next Step:
Initiate contact with
Foger or Badwal?

"One-Pager" Components

- **Scorecard** – key dimensions to allow quick comparison to screen candidates
- **Company Information** – from the www
- **R&D Trends** – currently active?
- **Patent Impact** – who cites their patents?
- **Inventor Teams** – knowledge networks
- **Leading Inventors** – core players?
- **Action Recommendations** – so what? next step?

QTIP

1. Patent and Publication R&D Domain searches offer a rich resource to inform Technology Intelligence, Foresight & Assessment
2. Models of Technological Innovation Processes suggest success factors, pointing toward empirical "innovation indicators"
3. Select suitable indicators to address your TA questions
4. Script and standardize technology analyses
5. One-pager in one day
6. "Tech Mining" can lead to better informed decisions!

Resources

- Example outputs of our "Technology Opportunities Analysis" and "HotTech" profiling at: http://tpac.gatech.edu

- Information on the text mining software used here, *VantagePoint*, at: http://www.theVantagePoint.com;

- *Tech Mining* book by Alan Porter and Scott Cunningham, due in 2004 from Wiley