Measuring Knowledge Flows: Patent and Non-Patent Data

Expert Panel: Ajay Agrawal, Sharon Belenzon, Jeffrey Furman, Jasjit Singh
Discussant: Scott Stern
Co-Chairs: Riitta Katila & Kwanghui Lim

AoM PDW 2008

Brief background on using patent data — 15 minutes

- **Riitta Katila (co-chair)**

Expert Panel: Cutting edge uses of patent data from the knowledge and strategic perspectives — 15 minutes each

- **Sharon Belenzon**
- **Jeff Furman**
- **Ajay Agrawal**
- **Jasjit Singh**

Discussant Scott Stern — 20 minutes

Open Discussion & Conclusion — 45 minutes

- **Kwanghui Lim (co-chair)**

Patents 101

Riitta Katila

with Eric Giannella
Stanford Technology Ventures Program
MS&E dpt, Stanford University

Agenda

- Patents 101
  - Basic facts
- Common uses of patent data in orgs research
- SWOT analysis
- Resources

Patents: The Basic Facts

- What is patentable?

Optimist

"The Glass is Half Full"

Pessimist

"The Glass is Half Empty"

Patent Attorney

"Liquid H_2O bisects an open cylindrical vessel..."

Patents: The Basic Facts

- What is patentable?
  1. First to: invent (US) or file (Europe)
  2. Non-obvious
     - To someone in the field (US), or inventive (Europe)
  3. Novel
     - Beyond what is already known/invented
  4. Useful
     - To anyone (US), of industrial applicability (Europe)
  5. Patentable
     - Not: Laws of nature (gravity), natural phenomena (flora), abstract ideas (love)…

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Patents: The Basic Facts

- Patenting is a costly process, approx. $25,000 per patent (Lemley, 2000)

Source: IFI, 2007 top-ranked US patent winners (awarded U.S. patents)

Patents: The Basic Facts

- Patenting is a costly process, approx. $25,000 per patent (Lemley, 2000)

- Temporary monopoly: Right to **exclude** others
  - For 20 years from date of application
  - … should provide an incentive to innovate
  - … creates a market for innovation (through licensing)
  - … in exchange for disclosure
    - Both applications (since 2001) and granted patents publicly available

Title Keywords:
Tech Description

Inventor, Assignee:
Ownership

Patent Class:
Tech Classification

Patent Cites:
"Prior Art"

US005706601A

United States Patent [19]
Dail

[11] **Patent Number:** 5,706,601
[45] **Date of Patent:** Jan. 13, 1998

[54] **TRAP AND METHOD FOR TRAPPING A MOUSE OR OTHER RODENT**

[76] Inventor: **Robert P. Dail**, P.O. Box 7, 212 Riverview Ave., Camden, N.C. 27921

[21] Appl. No.: **447,755**

[22] Filed: **May 23, 1995**

[51] **Int. Cl.**[6] A01M 23/30
[52] **U.S. Cl.** 43/81
[58] **Field of Search** 43/8., 83, 81.5, 43/87, 83.5

[56] **References Cited**

U.S. PATENT DOCUMENTS

968,990	8/1910	Schuyler .	
1,709,199	4/1929	Hager	43/81
2,332,394	10/1943	Meeson	43/81
2,492,907	1/1950	Blair .	
3,041,384	7/1962	Graschow et al.	
3,992,803	11/1976	Kaiser .	
4,030,230	6/1977	Souza	
4,127,958	12/1978	Peters et al. .	
4,215,506	8/1980	Kaiser et al. .	
4,703,583	11/1987	Deutkovich et al	43/81
4,825,579	5/1989	Deutkovich et al	43/82
5,148,624	9/1992	Schmidt	

Primary Examiner—Scott A. Smith
Assistant Examiner—Jay A. Stelacone
Attorney, Agent, or Firm—Wigman, Cohen, Leitner & Myers, P.C.

[57] **ABSTRACT**

A trap and method for trapping a mouse or other rodent. The present invention is directed to an animal trap, particularly to a mouse trap or the like in combination with an enclosure in the form of a plastic bag inside a cover. The enclosure is contoured so as to fit within the cover and has an open rear end to admit an entry therein of the rodent. When the rodent enters the enclosure and touches a pad end of the trigger member, the spring-loaded striker is released from a catch position and kills the rodent within the enclosure by entering the lower portion of the cover through two vertical slots without penetrating the enclosure. The enclosure is then pulled from the cover by the user and disposed of. The bag can be of the colored plastic type, so the user will not even see the mouse inside of it.

5 Claims, 3 Drawing Sheets

Issue date

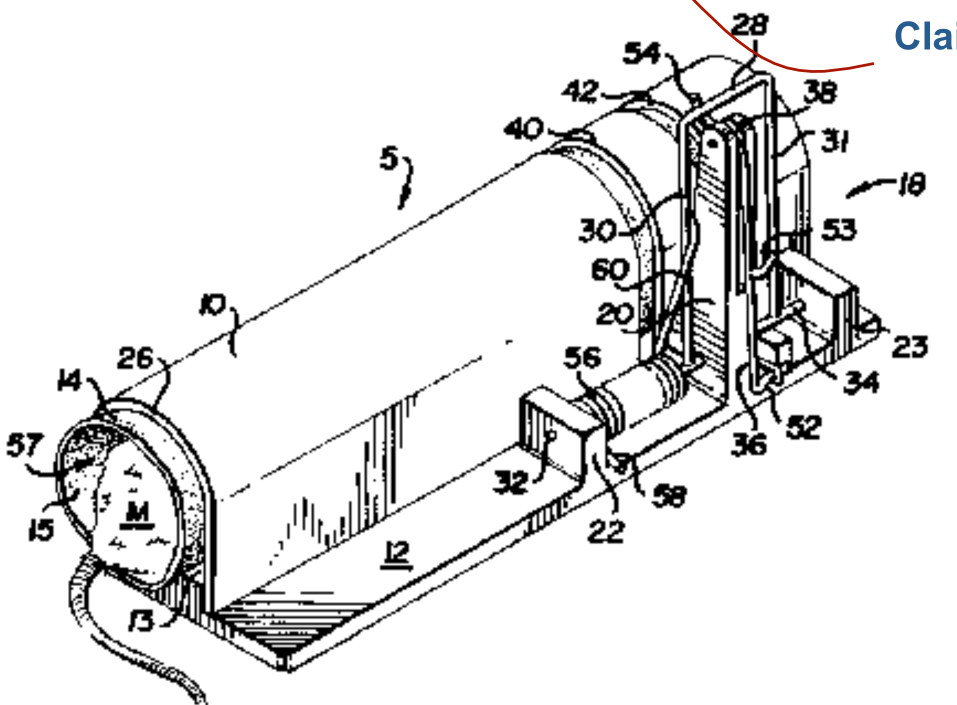
Filing date

Other Cites:
Science/Knowledge
Characteristics

Examiner & Attorney /
Law Firm

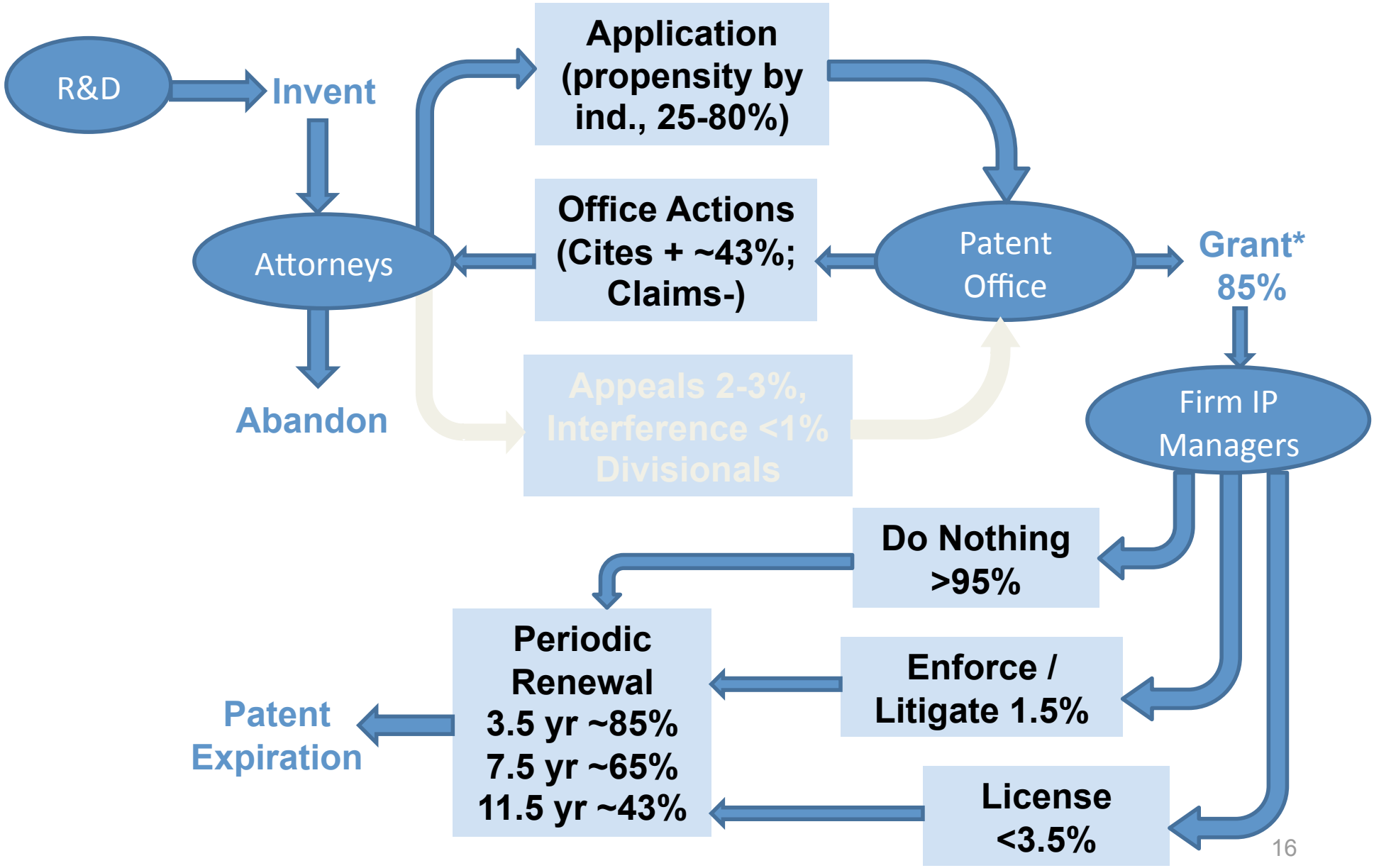
Abstract:
Tech Description

Claims: Coverage of patent



A BETTER MOUSE TRAP

Life History of a Patent



* According to the USPTO, grant rates have steadily declined from 71% in 2000 to 53% in 2006, but legal scholars place the figure much higher.

Agenda

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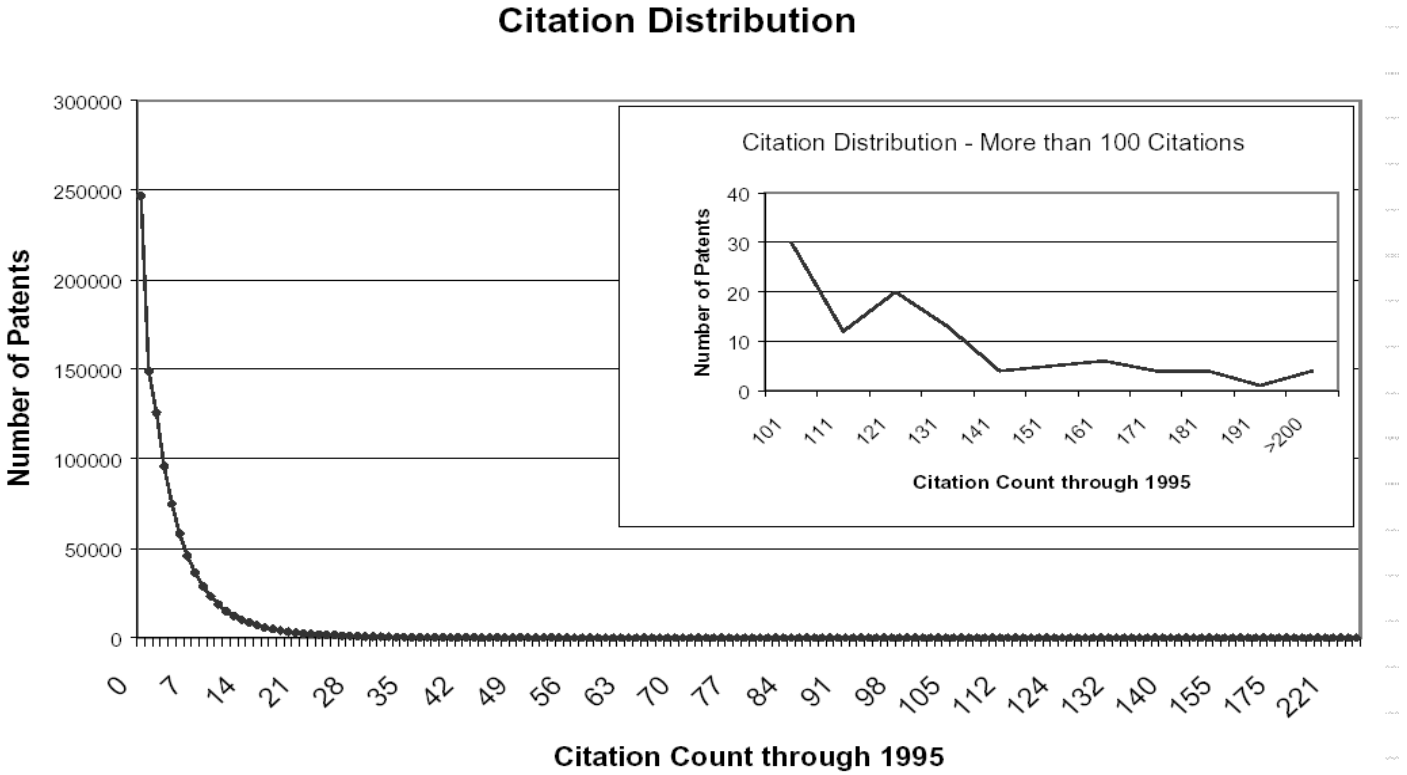
  - Basic facts
- Common uses of patent data in orgs research
- SWOT analysis
- Resources

Common uses of patent data by orgs researchers

- Patents as "working papers"
  - Measure of inventive effort (not success)
  - …not unlike academic working papers, the value of patents is highly skewed

Value of patents is highly skewed



- 25% of patents receive no citations
- 0.01% of patents receive more than 100 citations
  - <10% have commercial value (Basalla, 1988)

Source: B. Hall's website; Katila, 2001, 2007 (Business performance measurement – Theory and practice)

Common uses of patent data

- Patents as "working papers"
  - Measure of inventive effort (R&D effort)

- Patents as " indicators of knowledge flows"
  - Reflect R&D dynamics at firm-level
    - Temporal: Age of cited patents (Nerkar, 2002 MS)
    - Spatial: Assignees of cited patents (self-cites, intra, extra-industry; Katila, 2002 AMJ)
    - Sequential: First/late-mover re patents granted to other firms (Katila & Chen, 2009 ASQ)

Common uses of patent data

- Patents as "working papers"
  - Measure of inventive effort (R&D effort)

- Patents as " indicators of knowledge flows"
  - Reflect R&D dynamics at firm-level
  - Reflect R&D dynamics at industry-level
    - Technology trends in an industry?

US patent milestones

Patent #	Yr of issue	Yrs since prior milestone	Invention
1	1790	-	Process of producing potash for **fertilizer**
1M	1911	121	Tubeless vehicle tire
2M	1935	24	Process of improving pneumatic **tires**
3M	1961	26	Automatic conversion to data processing code (GE)
4M	1976	15	Process of recycling asphalt aggregate compositions
5M	1991	15	Process of efficiently producing fuel ethanol
6M	1999	8	**Palm Computing** Hotsynch (3Com)
7M	2006	6	Process of producing **polysaccharide fibers** (DuPont)

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Patent data: Strengths and Weaknesses

- **Strengths**
  - Observability
    - at multiple levels of analysis (inventor, team, firm, industries)
    - of invention details (technical class, claims, etc.)
    - over a significant time period
  - Institutional & legal structure (e.g., renewals) aids interpretation

Patent data: Strengths and Weaknesses

- **Strengths**
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    - at multiple levels of analysis
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  - Institutional structure aids interpretation

- **Weaknesses**
  - Interpretation and heterogeneity
    - Use of patenting and citations varies across industries, firms
    - Mapping onto firms' products (i.e., innovation) difficult

Deep understanding of firms' motivations for pursuing patents, and the application and enforcement processes aids study design

Patent data: Opportunities

- Novel
  - …interpretation of basic concepts
  - …measures
  - …links to outside data
  - …triangulation

Opportunity 1: Novel Interpretation of Basic Concepts

- **Opportunities to develop theory**

- Patent as an indicator of firm's search (i.e., problem-solving) activities ala Nelson & Winter (Katila, 2002)
  - Each patent describes a technological problem and a solution to that problem (Walker, 1995)

- Scientific vs. non-scientific citations (Ahuja & Katila, 2004; Fleming & Sorenson, 2004 SMJ)
  - Invention conceptualized as a combinatorial search process
  - Science as a guide to search

- Patent renewal conceptualized as options

Opportunity 2: Novel measures

- **New measures to capture novel concepts, often utilizing increased computing power**

- Organizational and technological boundary spanning (Rosenkopf & Nerkar, 2001 SMJ)

- First v. late mover advantage (Katila & Chen, 2009 ASQ)

Opportunity 3: Novel links to outside data

- **Opportunities to identify fruitful intersections with other domains**

- Match with data on
  - new products (Katila, 2002)
  - venture capital (Kortum & Lerner; Hsu & Ziedonis)
  - acquisitions (Ahuja & Katila, 2001; Kapoor & Lim)
  - commercialization of university inventions (Henderson et al.,1998; Katila & Shane, 2005)
  - technology licensing agreements (Gans, Hsu & Stern)
  - firm performance (Heeley & Jacobson, 2008)

Opportunity 4: Novel triangulation

- **Opportunities to test and challenge underlying assumptions in patent literature**

- Do citations really reflect knowledge flows?
  - Jaffe, Trajtenberg & Fogarty (2000)
    - About ½ correspond to some kind of knowledge flow, about ¼ correspond to a significant flow; remainder of citations added by others (non-inventor)
  - Alcacer & Gittelman (2006)
    - Examiner and inventor citations more alike than expected

- Do all kinds (age, size) of firms patent equally?
  - Katila, Rosenberger, Eisenhardt (2008) ASQ
    - Startups use trade secrets rather than patent

Patent data: Challenges

- Bar on novelty is relatively high
  - Entry costs lowered on raw data (80's, 90's, 00's)
  - Theory v. crunching the numbers
- Data hygiene
  - Patent assignees (family trees)
  - Temporal clarity (file v. grant dates, causality)
  - Single v. multi-industry studies

- *But – help is on its way: You know someone who uses patent data!*

Summary

- Patent data are attractive
  - A key tool in the empirical innovation researcher's toolkit
- There are still several novel approaches to using patent data
  - Each has its challenges and opportunities
- Patent data can aid in measurement
  - But cannot substitute for novel research questions or for appropriate study design

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Resources

- USPTO – starting point, small N, free
- NBER - some data limitations, corporate family trees, matched with compustat data, free
- Delphion - easy to use, aggregates several other db's, $249 a month
- Derwent - intl. patent families; MicroPatent, large N, $$$

Resources

- http://patentpdw.kwanghui.net - 2008 PDW's patent reading list

- www.nber.org/patents - data and scholars
- www.piug.org – practitioners
- www.patentlyo.com/ - legal

Personal websites:

- Bronwyn Hall
- Josh Lerner
- Many others