Do We Miscount Patent Citations?  
An Empirical Study on the Impact of Overlooking the Citations to a Patent's Pre-grant Publication  
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Patents, like academic papers, are often evaluated by its citation counts. Similarly, the more a patent is cited, the patent is considered as

- Having better quality
- More valuable
- More important
- Producing more impact/influence
Full-text image for US Patent No. 7,782,101
Screen capture of USPTO advanced search interface showing 240 patents citing US Patent No. 5,376,580
However, most analyses involving patent citations use ONLY issued patent

But, other than the issued patent, a utility patent application also has a pre-grant publication (PGPub)
A pre-grant publication (PGPub) is a public document of an utility patent application published 18 months after filing.
The PGPub and the subsequently issued patent are independently and individually cited.
Results of Search in US Patent Collection db for:
REF/7657849: 99 patents.
Hits 1 through 50 out of 99

Citations to patent US7,657,849

Results of Search in US Patent Collection db for:
Hits 1 through 50 out of 119

Citations to the corresponding PGPub 2007/0150842
30 subsequent patents citing both US 7,657,849 and its PGPub
The Question:
what is the impact of ignoring the citations to PGPubs?
• Empirical Data
  – Collect 137,964 utility patents issued in year 2007 from USPTO
    • Why 2007? We’d like to give the issued patents enough time to accumulate their citations
  – Count the citations to the 137,964 patents and their corresponding PGPubs
  – Calculate their PGPub Citation Shares:

  \[
  \text{PGPub Citation Share} = \frac{\text{PGPub Citations}}{\text{PGPub Citations U Patent Citation}}
  \]
• **PGPub Citation Share** reflects the degree of impact when citations to PGPub are ignored
  – PGPub Citation Share=0%
    • **No impact at all**
    • Special case: citation counts of PGPub and Patent are both 0, the PGPub Citation Share is considered as 0%
  – PGPub Citation Share=100%
    • The patent is **completely underestimated**.
  – PGPub Citation Share> 50%
    • More citation to the PGPub to the issued patent
• Overall statistics

<table>
<thead>
<tr>
<th></th>
<th>PGPubs</th>
<th>Patents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total citation count</td>
<td>705,714</td>
<td>696,405</td>
</tr>
<tr>
<td>Avg. citation count*</td>
<td>5.12</td>
<td>5.05</td>
</tr>
<tr>
<td>Max. citation count**</td>
<td>405</td>
<td>392</td>
</tr>
<tr>
<td>Max. difference</td>
<td>360</td>
<td>363</td>
</tr>
</tbody>
</table>

*The standard deviations are 11.92 and 10.72, respectively.
**Their corresponding patent and PGPub receive 45 and 29 citations only.
Distribution of PGPub Citation shares of all 137,964 patents
No. of patents

30% of the patents
PGPub Citation Share=0%

Implying that 70% of the patents are affected if citation to PGPub is ignored
36% of the patents PGPub Citation Share > 50%

These patents’ citations to PGPubs are GREATER than those to the patents
12% of the patents
PGPub Citation Share = 100%

These patents are completely underestimated
• Conclusion

  – An analyst should not ignore citations to the PGPubs easily without evaluating the impact first

  • About 70% of the patents are underestimated to various degrees

  • 36% of the patents are significantly underestimated

  • 12% of the patents are completely underestimated
• One may argue...
  – The content of a PGPub may be different from that of its corresponding patent, thereby justifying their citations are not counted together.
  – U.S. Patent Act (35 U.S.C.S. § 132(a)) specifies that “No amendment shall introduce new matter into the disclosure of the invention.”
  – The contents of the PGPub and the patent should both be bounded by what is disclosed at the time of filing.
• Extension of the Study
  – We speculate that citations to PGPubs should be even more significant for younger patents.
  – We have finished collecting utility patents issued in 2009 and 2011
• Analytical result to be reported in the future.
Thank You