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Decoding Patentable Subject Matter[1]

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(Codes for replication available at https://sites.google.com/view/colleenchien/)

Abstract: The Supreme Court's patentable subject matter jurisprudence from 2011 to 2014 has raised significant policy concerns within the patent community. Prominent groups within the IP community and academia, and commentators to the 2017 USPTO Patentable Subject Matter report have called for an overhaul of the Supreme Court's "two-step test." Based on an analysis of 4.4 million office actions mailed from 2008 through mid-July 2017 covering 2.2 million unique patent applications, this article uses a novel technology identification strategy and a differences-in-differences approach to document a spike in 101 rejections among select medical diagnostics and software/business method applications following the *Alice* and *Mayo* decisions. Within impacted classes of TC3600 ("36BM"), the 101 rejection rate grew from 25% to 81% in the month after *Alice*, and remained above 75% almost every month through the last month of available data (2/2017). Among abandoned applications, the prevalence of 101 rejection subject matter rejections in the last office action was around 85%. Among medical diagnostic ("MedDx") applications, the 101 rejection rate grew from 7% to 32% in the month after *Mayo* and continued to climb to a high of 64% and to 78% among final office actions just prior to abandonment. In the month of the last available data (from early 2017), the prevalence of subject matter 101 rejections among all office actions in applications in this field was 52% and among office actions before abandonment, was 62%. However outside of impacted areas, the footprint of 101 remained small, appearing in under 15% of all office actions. A subsequent piece will consider additional data

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This short paper incorporates and elaborates on, through code, ancillary views and methodological notes, the Patently-O blog post, *The Impact of 101 on Patent Prosecution*. That blog post is the first of a series of posts by Professor Chien about insights gleaned from open data releases by the USPTO dating back to 2012. The authors thank Jonah Probell, Jennifer Johnson, the USPTO Digital Services & Big Data (DSBD), USPTO Office of Chief Economist and Ian Wetherbee for comments and assistance with queries and data. All mistakes are Professor Chien's.

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and implications for policy. This article is the first in a series of pieces appearing in Patently-O based on insights gleaned from the release of the treasure trove of open patent data starting the USPTO from 2012.

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In November 2017, the USPTO Digital Services & Big Data (DSBD) portfolio within the USPTO in collaboration with the Office of the Chief Economist (OCE) quietly announced a first-of-its kind release of coded office action data, the USPTO "Office Action Database,"[4] the latest in a series of open patent data and tool releases since 2012 by the USPTO that have seeded well over a hundred of companies. For researchers and members of the public seeking to understand and improve the patent examination system, this represented a treasure trove of data. As OCE staffers Qiang Lu, Amand Myers and Scott Beliveau described in the paper that accompanied the release, Public PAIR is not available for bulk download nor is the text version of the database used internally at the PTO available to the public. This makes it impossible for all but the best resourced researchers to use the database to address public policy questions.[5] To make office action data much more accessible, the OCE used artificial intelligence methods to extract information from office actions and code each one based on the extent and type of rejection. The initial release of the dataset provided insight into 4.4 million office actions mailed from 2008 through mid-July 2017 for 2.2 million unique patent applications.

The resulting file was 1.31 GB, too large to be opened and processed by standard spreadsheet software, but through Google's BigQuery cloud software, it is now possible to access the dataset from a standard laptop. A number of the queries build on and are made vastly easier by the underlying Google public patents data ecosystem, curated by Ian Wetherbee of Google, which resides in BigQuery and includes tables contributed by IFI CLAIMS Patent Services, Google and other providers. The underlying open data however, has been provided by the USPTO, including through the "Patent Examination Data System" and "Patent Examination Research Dataset"[6] as detailed in Graham, S. Marco, A., and Miller, A. (2015). "*The USPTO Patent Examination Research Dataset: A Window on the Process of Patent Examination*." The combination of clean, coded detailed data about the US patent system and the tools to access it lay the foundation for an in-depth, comprehensive understanding of the US patent system.

Of great policy concern to the patent community has been Section 101. Prominent

[4] Qiang Lu et al., *USPTO Patent Prosecution Research Data: Unlocking Office Action Traits*, USPTO Economics Working Paper No. 2017-10 (Nov. 20, 2017), available at SSRN: https://ssrn.com/abstract=3024621(link is external).

[5] *Id*.

[6] Used under CC BY 4.0.

groups within the IP community,[7] a number of academics,[8] and the majority of commentators to the 2017 USPTO Patentable Subject Matter report[9] have called for an overhaul of the Supreme Court's Section 101 jurisprudence and "two-step test" or its application.

Since the release of office action data, we have looked for evidence that the two-step test had transformed patent prosecution as the headlines would suggest.[10] We did not find it, because, as the PTO report notes, a relatively small share of office actions - 11% - actually contain 101 rejections.[11] However, using art tech center and art unit codes we further disaggregated the data into classes and subclasses and created a grouping of the TC3600 art units responsible for examining software and business methods (art units 362X, 3661, 3664, 368X, 369X), which we dub "36BM." (see definition in Table 1) We put the remainder of TC 3600 art units into the category "TC36 Other" however because many months contained insufficient data (of less than 50 office actions), we did not include "TC36 Other" views in the Figures. We also borrowed a CPC-based identification strategy for Medical Diagnostic ("MedDx") technologies, developed by Chien and Rai for their forthcoming work on the impact of 101 on Medical Diagnostics.[12]

[7] The AIPLA has proposed a "clean break from the existing judicial exceptions to eligibility by creating a new framework with clearly defined statutory exceptions." The IPO has suggested replacing the Supreme Court's prohibition on the patenting of abstract ideas, physical phenomena, and laws of nature with a new statutory clause, 101(b), to be entitled "Sole Exception to Subject Matter Patentability." See Dennis Crouch, *AIPLA on Board with Statutory Reform of 101*, PATENTLY-O (May 16, 2017), https://patentlyo.com/patent/2017/05/aipla-statutory-reform.html; Josh Landau, *AIPLA Signs on to IPO's Misguided Proposal on § 101*, PAT. PROGRESS (May 17, 2017), https://www.patentprogress.org/2017/05/17/aipla-signs-ipos-misguided-proposal.

[8] Jeffrey A. Lefstin, Peter S. Menell, and David O. Taylor, *The Need for Legislative Reform: The Berkeley Section 101 Workshop*, Patently-O (October 10, 2017), https://patentlyo.com/patent/2017/10/legislative-berkeley-workshop.html.

[9] *Patent Eligible Subject Matter: Report on Views and Recommendations From the Public*, USPTO (Jul. 2017), https://www.uspto.gov/sites/default/files/documents/101-Report_FINAL.pdf.

[10] In doing so, we built on earlier work by Bernard Chao suggesting a sharp increase in 101 rejections in Art Unit 1634, Bernard Chao and Amy Mapes, *An Early Look at Mayo's Impact on Personalized Medicine*, 2016 Patently-O Patent Law Journal 10, at 13. https://patentlyo.com/media/2016/04/Chao.2016.PersonalizedMedicine.pdf

[11] Office Action Dataset at 2 (also mentioning that "101 rejections" include subject matter eligibility, statutory double patenting, utility, and inventorship rejections).

[12] Colleen Chien and Arti Rai, *An Empirical Analysis of Diagnostic Patenting Post-Mayo*, forthcoming (defining medical diagnostic inventions by use of any of the following CPC codes: C12Q1/6883; C12Q1/6886; G01N33/569; G01N33/571; G01N33/574; C12Q2600/106).

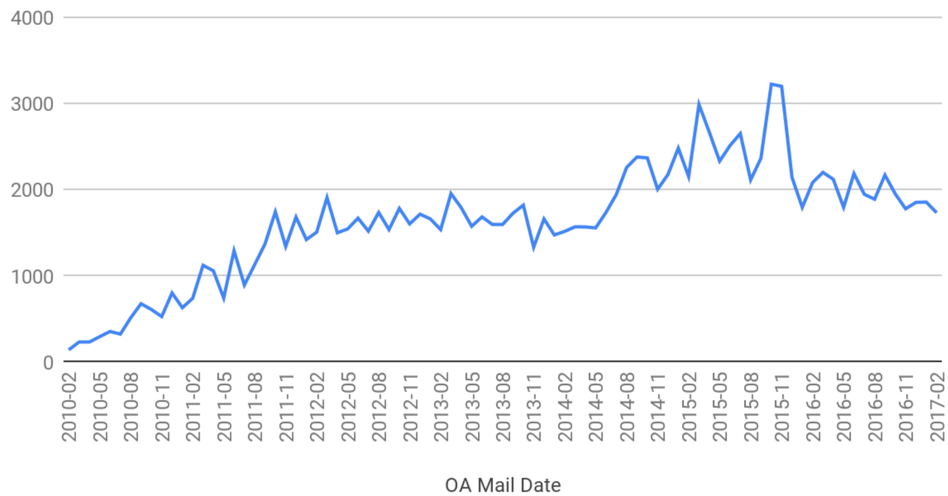
Table 1: PTO Technology Grouping Definitions[13]

Grouping Abbreviation	Definition	Description
TC36BM	Business method	Technology Center 362X, 368X, 369X, 3661, 3664
MedDx	Medical diagnostic	CPC = C12Q1/6883; C12Q1/6886; G01N33/569; G01N33/571; G01N33/574; C12Q2600/106. Definition developed by Arti Rai for Chien and Rai, forthcoming.
TC2100	Computer Architecture	Technology Center 21XX
TC2400	Computer Network	Technology Center 24XX
TC2600	Communication	Technology Center 26XX
TC36Others	Others	Technology Center 361X, 363X, 364X, 365X, 3662-63, 3665-69X, 367X
TC2800	Semiconductor	Technology Center 28XX
TC1700	Chemical and Materials Engineering	Technology Center 17XX
TC3700 MechE	Mechanical Engineering	Technology Center 37XX
"Grand Total"	All TCs	All TCs

A number of prosecutors we talked to talked about how they worked draft their claims to avoid the "dreaded TC3600" technology centers, perceived to have a high rate of rejections as a matter of course. To explore the impact of such gaming on our analysis, we looked at all TC36BM office actions over the studied period as shown in Fig A. While we found that indeed, 36BM office actions were down from their peaks, overall, the number of office actions in "36BM" remained over 2000 in most months. Still, as described below, we regenerated the graphs of interest by CPC-delineated technology sector, which is harder to game than art unit.

[13] We used 2-3 digit-group art unit queries for ease and completeness of search.

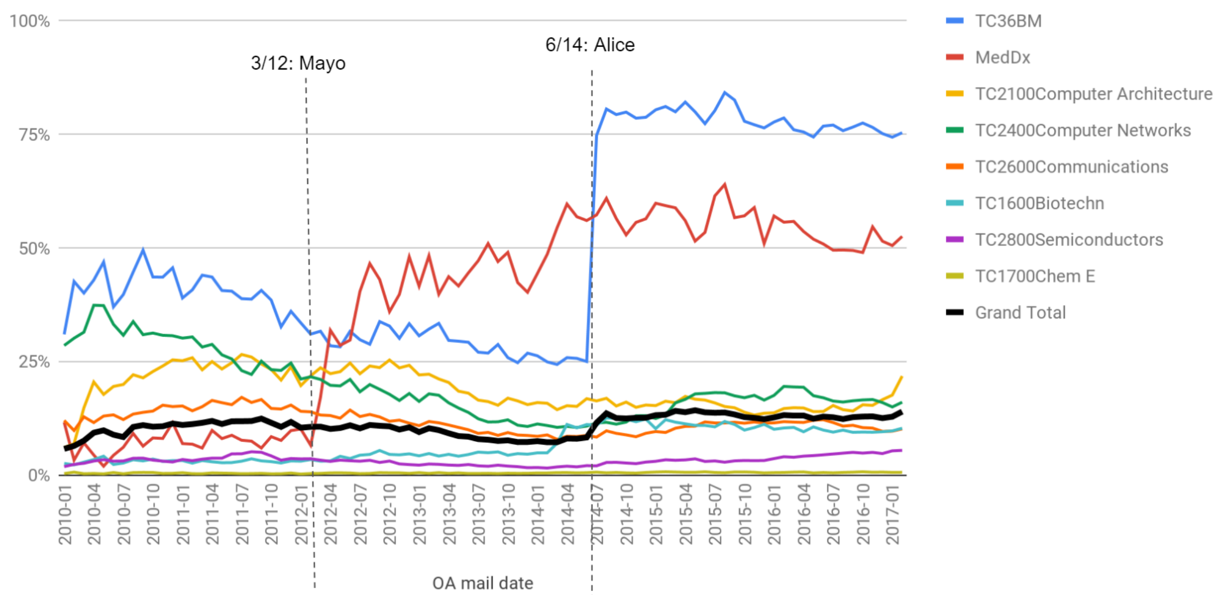
Fig A: Office Actions By Month in 36BM Art Units



We also chose and developed metrics to track the footprint of 101 subject matter rejections. To estimate the prevalence of 101 rejections overall, we looked at the share of office actions sent in a given month with a 101 subject matter rejection (as distinct from statutory double patenting, utility, and inventorship rejections) (Figure 1). But to understand whether or not the impact of *Alice* and *Mayo* persisted through, and perhaps even caused abandonments, we looked in particular at applications that ended up going abandoned, and the prevalence of 101 rejections in the final office action prior to abandonment (Figure 2). It is worth noting that we were not able to track the incidence or outcome of appeals in the data, and that many factors other than rejections can lead someone to abandon. However, by looking at this metric across time, we could discern whether or not any potential impact following introduction of the two-step test overall could be detected based on looking at trends in rejections overall and prior to abandonment. One data point that would bridge these two views, of grant rate, was not available because of truncation effects, with Alice taking place in June 2014 and office action data only available through early 2017.

Mayo v. Prometheus, decided in March 2012, and *Alice v. CLS Bank*, decided in June 2014, elicited the strongest reactions. The data suggest that an uptick in 101 subject matter rejections following these cases was acute and discernible among impacted art units as measured by two metrics: overall rejection rate and "the pre-abandonment rate" rate - among abandoned applications, the prevalence of 101 subject matter rejections within the last office action prior to abandonment.

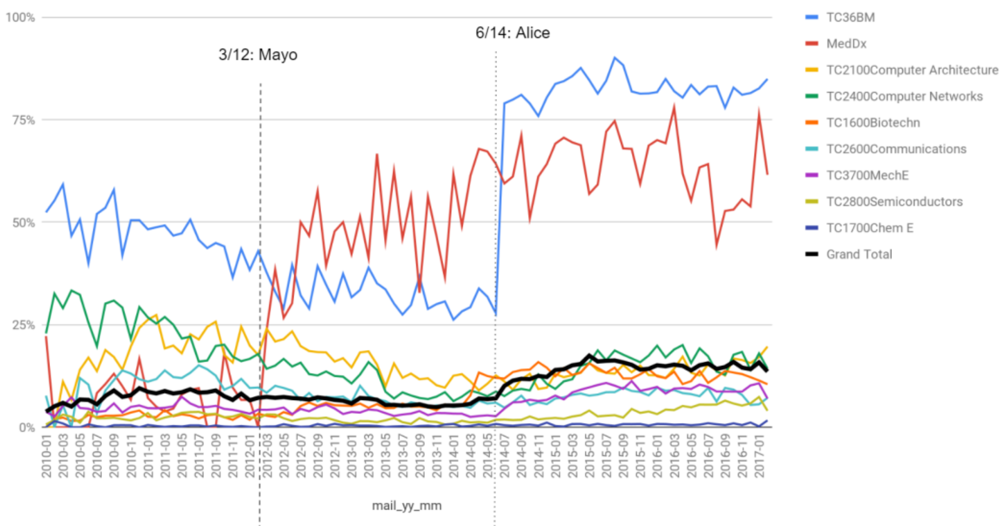
Figure 1: Share of Office Actions Including a 101 Subject Matter Rejection



Within impacted classes of TC3600 ("36BM"), represented by the top blue line, the 101 rejection rate grew from 25% to 81% in the month after the Alice decision, and has remained above 75% almost every month since then. (Fig 1) In the month of the last available data, among abandoned applications, the prevalence of 101 rejection subject matter rejections in the last office action was around 85%. (Fig 2)

Among medical diagnostic ("MedDx") applications, represented by the top red line, the 101 rejection rate grew from 7% to 32% in the month after the Mayo decision and continued to climb to a high of 64% (Fig 1) and to 78% among final office actions just prior to abandonment (Figure 2). In the month of the last available data (from early 2017), the prevalence of subject matter 101 rejections among all office actions in applications in this field was 52% and among office actions before abandonment, was 62%. (Fig 2)

Figure 2: Share of Abandoned Applications with a 101 SM rejection in the last office action pre- Abandonment



However, outside of these groupings and other impacted art units (see paper for longer list) the impact of 101 caselaw has been more muted. 101 rejections overall (depicted by the thick black line) have grown - rising from 8% in Feb 2012 to 15% in early 2017 (Fig.1) - but remain exceptional.

When patents are grouped by WIPO CPC code,[14] rather than PTO AU code, a sustained increase in 101 rejections following *Alice* can be discerned in four out of the five major technology sectors (except mechanical engineering) but in no month or any sector does the prevalence of 101 rise above 20%.

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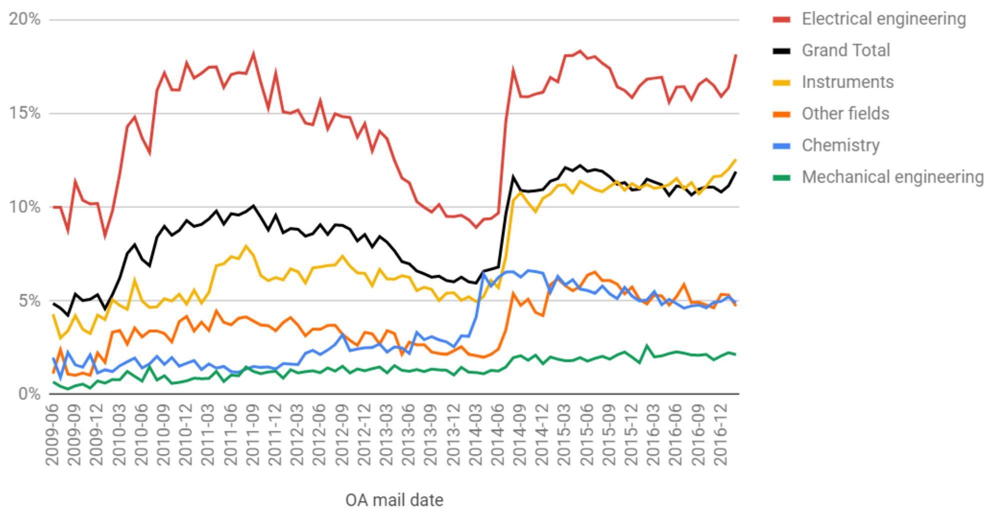
[14] Following the methodology laid out in ULRICH SCHMOCH, CONCEPT OF A TECHNOLOGY CLASSIFICATION FOR COUNTRY COMPARISONS 9–10 tbl.2 (2008), http://www.wipo.int/edocs/mdocs/classifications/en/ipc_ce_41/ipc_ce_41_5-annex1.pdf.

Figure B : Share of Office Actions that Included an 101 rejection by WIPO Tech Sector (by mail date)



On balance, the data confirm that 101 is playing an increasingly important role in the examination of software and medical diagnostics patents. More than four years after the Alice decision, the role of subject matter does not appear to be receding, remaining an issue in a large share of cases not only at their outset but among applications that go abandoned through the last office action. That patentees cannot tell before they file whether or not their invention will be considered patent-eligible, and perceive that much depends not on the merits of the case but in what art unit the application is placed also presents a challenge to the goal of predictability in the patent system.

It is also the case that the vast majority of inventions examined by the office are not significantly impacted by 101. Even when an office action does address subject matter, rejections and amendments on 101 subject matter on the record are often cursory, in contrast with, for example, novelty and nonobviousness discussions.

What does the data teach us and what directions for policy might it suggest? I save this topic, as well as the impact of USPTO guidance on prosecution and some data issues left unexplored here, for a future post on Patently-O, as data gathering continues.

In the meantime, the USPTO appears to be moving forward on examiner guidance. As it does, it may want to decide which metrics matter - overall prevalence of 101, 101 in pre-abandonment phases, or others - and the direction in which it hopes the guidance will move each metric. The USPTO should also continue the important work it has started by making up-to-date data available -- right now, high quality data stops around February 2017[15] without any plans to update it that I'm aware of

[15] The later months of 2017 have insufficient counts for research purposes.

(my subsequent FOIA request for updates was denied). That leaves a gap in our ability to monitor and understand the impact of various interventions as they change over time - certainly not a unique phenomena in the policy world - but one that is remediable by the USPTO with adequate resources. In the meantime, it is thanks to the USPTO's data release that any comprehensive look into the impact of the two-step test is even possible.

<u>Appendix</u>

Table 2: Tech Centers with over 50% rejection rates.[16]

Tech Center	AU2	AU2 name	app _101 rej	app_tot	rej_rate
3683	36	Electronic Commerce & Transportation	253	256	98.83%
3626	36	Electronic Commerce & Transportation	340	345	98.55%
3629	36	Electronic Commerce & Transportation	170	174	97.70%
3624	36	Electronic Commerce & Transportation	357	366	97.54%
3628	36	Electronic Commerce & Transportation	212	220	96.36%
3686	36	Electronic Commerce & Transportation	566	589	96.10%
3623	36	Electronic Commerce & Transportation	473	494	95.75%
3693	36	Electronic Commerce & Transportation	293	307	95.44%
3695	36	Electronic Commerce & Transportation	309	325	95.08%
3625	36	Electronic Commerce & Transportation	396	417	94.96%
3682	36	Electronic Commerce & Transportation	178	189	94.18%
3691	36	Electronic Commerce & Transportation	390	422	92.42%
3688	36	Electronic Commerce & Transportation	379	411	92.21%
3684	36	Electronic Commerce & Transportation	201	218	92.20%
3694	36	Electronic Commerce & Transportation	254	277	91.70%
1631	16	Biotechnology	325	357	91.04%
3696	36	Electronic Commerce & Transportation	284	315	90.16%
3685	36	Electronic Commerce & Transportation	228	257	88.72%
3621	36	Electronic Commerce & Transportation	142	161	88.20%
3689	36	Electronic Commerce & Transportation	233	266	87.59%
3692	36	Electronic Commerce & Transportation	249	293	84.98%
2862	28	Semiconductors	158	189	83.60%
3681	36	Electronic Commerce & Transportation	166	203	81.77%
3627	36	Electronic Commerce & Transportation	230	287	80.14%
3622	36	Electronic Commerce & Transportation	298	376	79.26%

[16] For complete list of tech centers, visit https://sites.google.com/view/colleenchien/data-and-code.

2864	28	Semiconductors	187	246	76.02%
2865	28	Semiconductors	111	149	74.50%
2449	24	Computer Networks	225	328	68.60%
2659	26	Communications	217	327	66.36%
3687	36	Electronic Commerce & Transportation	298	451	66.08%
2438	24	Computer Networks	358	544	65.81%
3716	37	Mechanical Engineering	474	722	65.65%
3715	37	Mechanical Engineering	485	750	64.67%
2128	21	Computer Architecture	143	222	64.41%
3714	37	Mechanical Engineering	379	605	62.64%
2123	21	Computer Architecture	91	149	61.07%
2863	28	Semiconductors	70	117	59.83%
2498	24	Computer Networks	176	298	59.06%
2658	26	Communications	211	359	58.77%
2857	28	Semiconductors	123	212	58.02%
3717	37	Mechanical Engineering	292	512	57.03%
1634	16	Biotechnology	270	495	54.55%
2442	24	Computer Networks	93	171	54.39%
2124	21	Computer Architecture	100	191	52.36%
2122	21	Computer Architecture	143	279	51.25%
2459	24	Computer Networks	68	133	51.13%
2152	21	Computer Architecture	74	145	51.03%
2444	24	Computer Networks	125	246	50.81%
2162	21	Computer Architecture	256	504	50.79%
2158	21	Computer Architecture	120	239	50.21%
3718	37	Mechanical Engineering	2	4	50.00%
2615	26	Communications	1	2	50.00%