

# open|laws

## **Deliverable 4.3.d1**

### **Big data user activity and metadata report**



Co-financed by the European Commission (DG Justice)  
under action grant JUST/2013/JCIV/AG  
(April 2014 – March 2016)

This publication has been produced with the financial support of the Civil Justice Programme of the European Union.  
The contents of this publication are the sole responsibility of implementing Beneficiary  
and can in no way be taken to reflect the views of the European Commission.



*JUST/2013/ACTION GRANTS*

*Grant Agreement Number 4562*

Project Start date: 01.04.2014  
Project End date: 31.03.2016

**Report No. D4.3.d1 – Big data user activity and metadata report**

Version: 1.0

Document prepared by: BY WASS GmbH (BYW), Clemens Wass,  
Salzburg University of Applied Sciences (SUAS),  
Thomas J. Lampoltshammer

Scope: policy-makers, academics, entrepreneurs

Deliverable due date: 31.3.2016

Deliverable actual date: 31.3.2016



co-funded by the Civil Justice Programme  
of the European Union

## Document History

Date	Revision	Comments
10.09.2015	0.1	Initial draft
13.11.2016	0.2	Update
29.2.2016	0.3	Update after IRIS conference
31.03.2016	1.0	Finalization

## Document Authors

Mag. Dr. Clemens Wass, MBL, MBA

Dipl.-Ing. (FH) Dr. Thomas J. Lampoltshammer, M.A. MSc

### *Disclaimer*

This publication has been produced with the financial support of the Civil Justice Programme of the European Union. The contents of this publication are the sole responsibility of BY WASS GmbH and the Salzburg University of Applied Sciences and can in no way be taken to reflect the views of the European Commission.

## Participant List

	<b>Short Name</b>	<b>Organisation Name</b>	<b>Country</b>
1	UVA	Universiteit van Amsterdam	NL
2	SUSS	University of Sussex	GB
3	LSE	London School of Economics and Political Science	GB
4	ALP	Alpenite srl	IT
5	SUAS	Fachhochschule Salzburg GmbH	AT
6	BYW	BY WASS GmbH	AT

### Disclaimer:

This publication has been produced with the financial support of the Civil Justice Programme of the European Union. The contents of this publication are the sole responsibility of BY WASS GmbH and can in no way be taken to reflect the views of the European Commission.”

This work is licensed under a Creative Commons Attribution Share-Alike 4.0 International License. (Attribution: openlaws.eu)

openlaws® is a registered Community Trade Mark (CTM)

## Table of Contents

1	Introduction.....	6
2	Strategies for Data Collection and Analyses.....	7
2.1	Website Analytics – User Traffic .....	7
2.2	Website Analytics – User Interaction Heat Map.....	7
2.3	Spatial Analysis of User Location Distribution .....	8
2.4	User-dependent Page Ranking of Legal Items.....	9
2.5	User-generated Community Highlights in Legal Items .....	10
2.6	Cluster Analysis of Legal Items .....	10
2.7	Time-based Analysis of Legal Items.....	12
3	openlaws.eu Statistics .....	12
3.1	Piwik .....	13
3.2	Kibana.....	15
3.3	openlaws back office.....	16
3.4	Apple iOS.....	16
3.5	Google Android.....	17
3.6	Social Media .....	17
4	References.....	24

## Figures

Figure 1: Web analytics dashboard.....	7
Figure 2: User website interaction heat map.....	8
Figure 3: Multi-layered geo-referenced data representation.....	9
Figure 4: Page ranking by categories and beyond .....	9
Figure 5: Community highlights with varying colour intensity.....	10
Figure 6: Graph visualisation of data items .....	11
Figure 7: Cluster visualisation of data items.....	11
Figure 8: Time line with graph items.....	12
Figure 9: openlaws web interface and openlaws RIS:App .....	13
Figure 10: PIWIK dashboard .....	13
Figure 11: openlaws RIS:App visits .....	14
Figure 12: openlaws RIS:App searches .....	14
Figure 13: openlaws folders.....	15
Figure 14: openlaws tags .....	15
Figure 15: openlaws back office key metrics .....	16
Figure 16: openlaws RIS:App iOS usage .....	16
Figure 17: openlaws RIS:App Android installations .....	17
Figure 18: openlaws on Twitter .....	18
Figure 19: openlaws on Facebook .....	18
Figure 20: openlaws followers around the world .....	19
Figure 21: openlaws followers in Europe .....	19
Figure 22: openlaws followers' interests and gender .....	20
Figure 23: openlaws tweet statistics .....	23

## 1 Introduction

An important part of the openlaws.eu project is to include user-generated content and to combine it with open data. For this purpose, the community needs to be engaged and awareness for the project has to be increased. Social media dissemination is a key element for this task.

This “Big data user activity and metadata report” provides a few selected key performance indicators and statistics for the openlaws platform. The data is provided by openlaws directly (in the enhanced production environment, further-developed and operated by the project spin-off openlaws gmbh), the openlaws RIS:App, and the social media channels used throughout the project. Usage of the services and data creation could be increased on all levels. The openlaws production system has over 1.4 million legal objects loaded in the graph database and the openlaws RIS:App has over 10 thousand visits per month.

The first part of this reports focuses on the theoretic background and strategies for data collection and analyses. The second part includes real-life data from openlaws.eu. Peaks could be observed during dissemination events, in particular the openlaws Final BOLD Conference, the openlaws hackathon during the IRIS 2016 legal informatics conference and during the European Data Forum (see Conferences Report for more details on dissemination activities).

## 2 Strategies for Data Collection and Analyses

### 2.1 Website Analytics – User Traffic

The general idea of website analytics relates to the collecting, the analysing, and the reporting of user interaction with a target web platform. Furthermore, monitoring becomes possible due to continuous analytical processes over time. These actions allow for a better understanding of how users interact with a given platform, how they arrived at it, and where they go when they leave again. The overall aim is to create an experience that binds customers to the platform and therefore fosters the establishment of a sustainable environment and end-user experience. Two suitable approaches can be identified to gather data. The first approach uses log files of web servers, while the second option employs client-side capabilities of web browsers (Hasan et al., 2009). An example for such an analytics environment can be seen in Fig. 1.

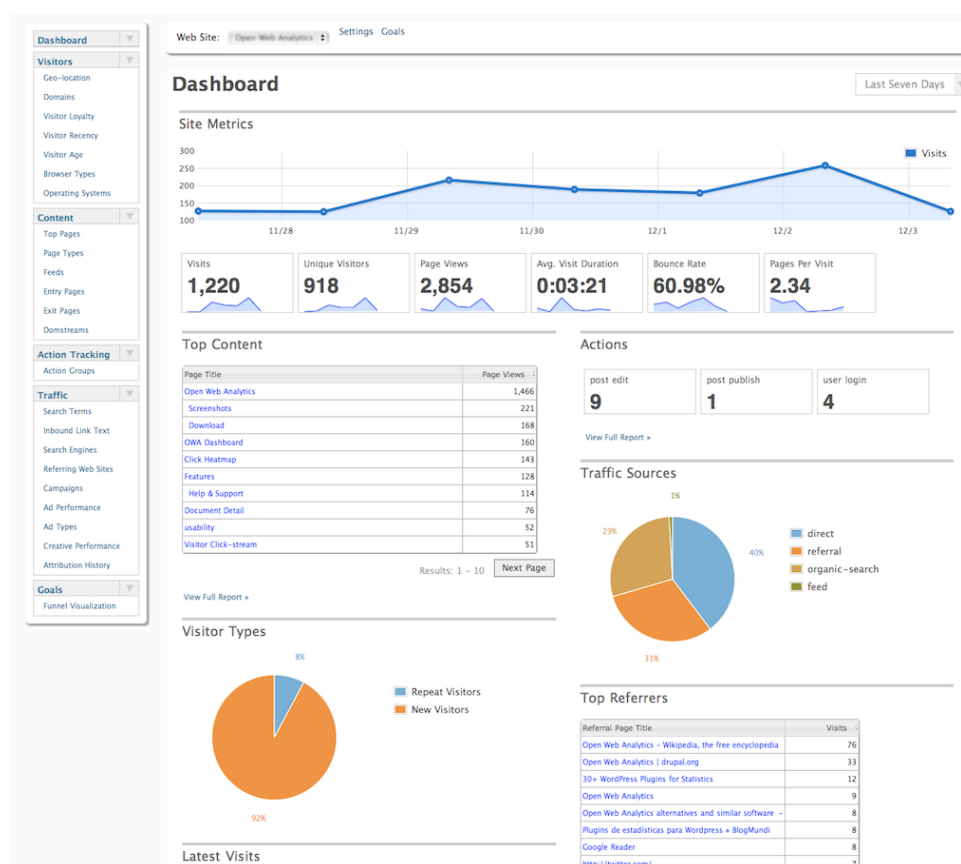


Figure 1: Web analytics dashboard<sup>1</sup>

The presented dashboard provides a comprehensive overview of all site-related activities, such as visitor statistics, traffic routes, and top content that is of high interest to the users of the platform.

### 2.2 Website Analytics – User Interaction Heat Map

While the before-described analytical processes mainly capture traffic to and from a website, another important aspect should be acknowledged as well, which is in-page analytics. The focus here is to track and analyse the actual interaction of users with

<sup>1</sup> [http://www.openwebanalytics.com/?attachment\\_id=43](http://www.openwebanalytics.com/?attachment_id=43)



the front-end and the included content and structure. One way to achieve this task is to use “person-on-site” testing with actual users performing selected tasks on the website. To be able to analyse the main orientation and viewpoints of users, eye-tracking methods can be employed. These techniques make it possible, to actually see hotspots of interests that users tend to focus their attention and therefore their eyes on (Owens & Shrestha, 2008).

However, the above-described eye-tracking approach requires on-site lab setups as well as volunteers to participate within the analytical process. This kind of setting is not applicable for our project. As an alternative, in-page analytics were selected. These analytics introduces a kind of an overlay onto the existing portal website. When users are browsing the page, their clicks are recorded on this overlay, forming an interaction heat map that can then be analysed (Farney, 2011). Figure 2 displays an example of such a heat map.



Figure 2: User website interaction heat map<sup>2</sup>

From this example heat map, several hot spots of interests can be identified, such as the main navigation menu, the “back home” functionality behind the logo on the top, as well as the download link behind the box icon.

## 2.3 Spatial Analysis of User Location Distribution

As the user profiles of the openlaws platform will foresee a home location attribution, this information can be used to analyse the spatial distribution of the users as such. The geo-referenced information (geolocation) of the user community can be formulated as an additional layer above other existing information, enriching the overall data at hand (see Fig. 3).

<sup>2</sup> [http://www.openwebanalytics.com/?attachment\\_id=61](http://www.openwebanalytics.com/?attachment_id=61)

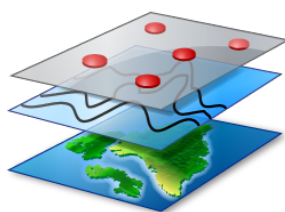


Figure 3: Multi-layered geo-referenced data representation<sup>3</sup>

A suitable technology to store, integrate, process, and visualize these geo-referenced data comes already with our employed database Neo4j. There exists an extension called neo4j spatial<sup>4</sup> that provides all required spatial capabilities to our database. These capabilities include, but are not limited to, map generation, filters on locations and bounding boxes, or geometrical functions (intersect, include, radius). Combined with technologies such as Leaflet<sup>5</sup> for interactive web-based maps, a basic spatial data infrastructure for our legal content and associated information can be created.

## 2.4 User-dependent Page Ranking of Legal Items

To provide effective search results, it is necessary to internally rank all legal items within the system. By doing so, the most relevant items per search category can be identified and then presented to the users (see Fig. 4).

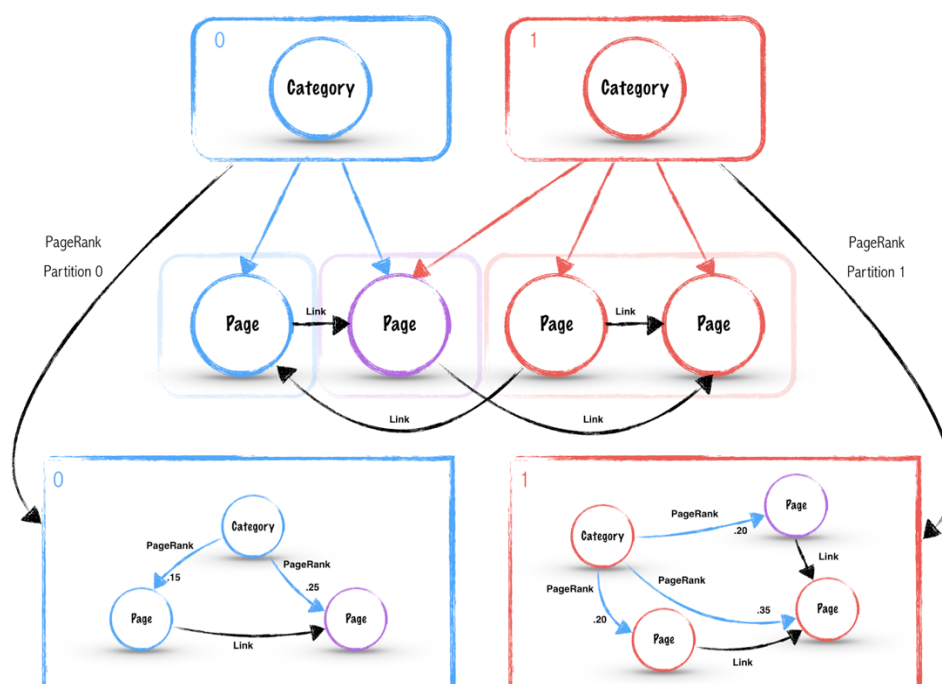


Figure 4: Page ranking by categories and beyond<sup>6</sup>

The ranking value is calculated by weights attached to links between legal items. By summing these weights up, paired with a proper normalization, a ranking score can be

<sup>3</sup> <http://wp.me/p26jdv-An>

<sup>4</sup> <https://github.com/neo4j-contrib/spatial>

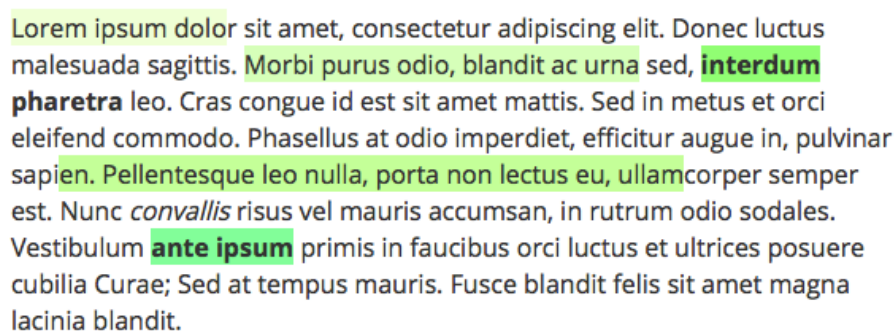
<sup>5</sup> <http://leafletjs.com/>

<sup>6</sup> <http://neo4j.com/blog/categorical-pagerank-using-neo4j-apache-spark/>

calculated. While this is interesting for search results, it can also provide interesting insights into the evolving database over time. As users are searching for items, enrich them with highlights and/or annotations, and upload legal items themselves, the overall ranking adapts towards inclusion of these new items. Therefore, this ranking also provides insights towards most important legal items of the current user community. The employed neo4j database already provides the necessary functionality to model weighted edges between nodes. In addition, the underlying search engine elastic-search and available extensions such as GraphAware Neo4j NodeRank<sup>7</sup> or the combination with the clustering engine Apache Spark<sup>8</sup> can provide rock-solid ranking results that can be used for deeper community analysis.

## 2.5 User-generated Community Highlights in Legal Items

Users on the openlaws platform can highlight aspects and text parts within legal items in their folders that they deem important. While these highlights have little impact towards the community, they can be used to express textual interpretation of the community as a whole. By aggregation of all highlights associated to a legal item in openlaws, normalized by their total number, community highlights can be generated, which are publicly available for all users (see Fig. 4).



Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec luctus  
 malesuada sagittis. Morbi purus odio, blandit ac urna sed, **interdum**  
**pharetra** leo. Cras congue id est sit amet mattis. Sed in metus et orci  
 eleifend commodo. Phasellus at odio imperdiet, efficitur augue in, pulvinar  
 sapien. Pellentesque leo nulla, porta non lectus eu, ullamcorper semper  
 est. Nunc convallis risus vel mauris accumsan, in rutrum odio sodales.  
 Vestibulum ante ipsum primis in faucibus orci luctus et ultrices posuere  
 cubilia Curae; Sed at tempus mauris. Fusce blandit felis sit amet magna  
 lacinia blandit.

*Figure 5: Community highlights with varying colour intensity*

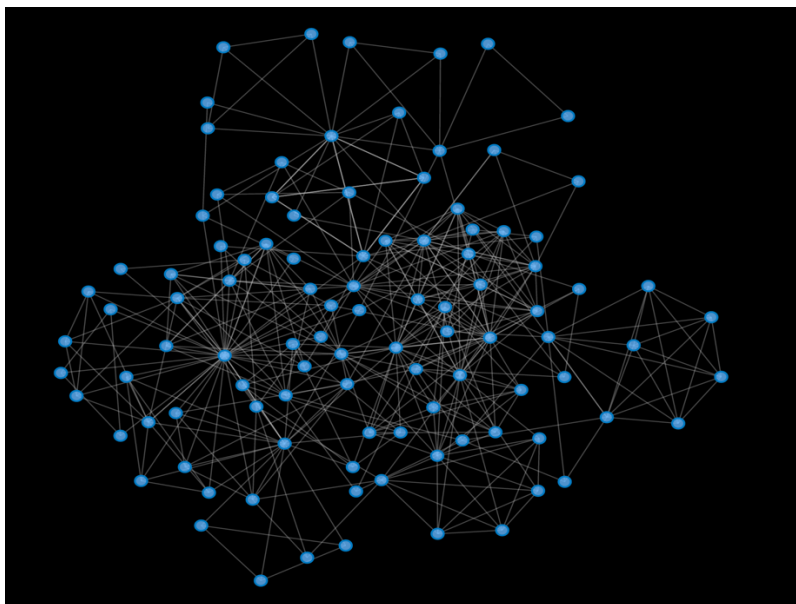
The newly generated community highlights manifest in highlighted text parts with a varying colour intensity. The level of intensity represents the number of users that have highlighted the same text parts within this particular legal item – the stronger the colour the more people deemed this part important. By analysing these community interpretations, important aspects within legal texts can be found quickly.

## 2.6 Cluster Analysis of Legal Items

One of the major benefits employing graph databases for storing legal data are their inherent capability to express connectivity between data entities right away (see Fig. 5). These interconnections can be used to analyse the network established by legal items, modified, mutated, and evolved by users interacting with these items. The analysis of these networks can hold valuable information, not only regarding the legal items, but also regarding the network between users.

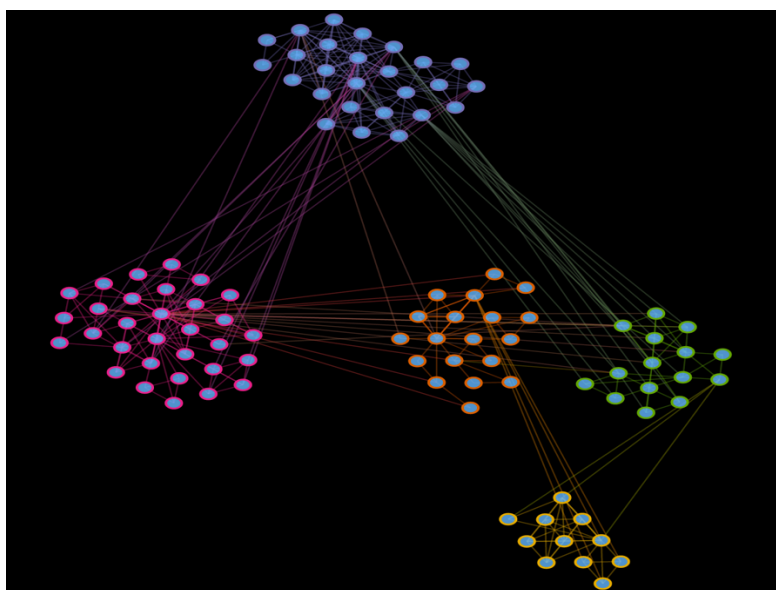
<sup>7</sup> <https://github.com/graphaware/neo4j-noderank>

<sup>8</sup> <http://spark.apache.org/>



*Figure 6: Graph visualisation of data items<sup>9</sup>*

One possible way to perform this network analysis is represented by cluster analysis. The mathematical output of such an analysis can then be visually displayed to provide a convenient way to identify potential clusters of high interest (see Fig. 6)



*Figure 7: Cluster visualisation of data items<sup>10</sup>*

There do exist multiple cluster analyses, however, one solid starting point is represented by the *Girvan-Newman edge betweenness clustering algorithm* (Girvan & Newman, 2002). It utilizes information about edge betweenness to identify gravity points of interest, pointing towards community peripheries. The results can be used within openlaws mainly for two aspects: i) to provide insights in the community structure of openlaws, and ii) to detect legal items, i.e., legislation that have a high impact on the community and other legal items.

<sup>9</sup> <http://nicolewhite.github.io/2014/07/24/visualize-subset-neo4j-alchemy.html>

<sup>10</sup> <http://nicolewhite.github.io/2014/07/24/visualize-subset-neo4j-alchemy.html>

## 2.7 Time-based Analysis of Legal Items

Another interesting aspect to investigate is the evolvement of legal items over time. This can be achieved by a time-based extension for our underlying database neo4j (Cattuto et al., 2013), (see Fig. 8). This time extension enables digging deeper into the changes of legal items over time with regard to the external legal sources, but also reflecting the changes within the openlaws community.

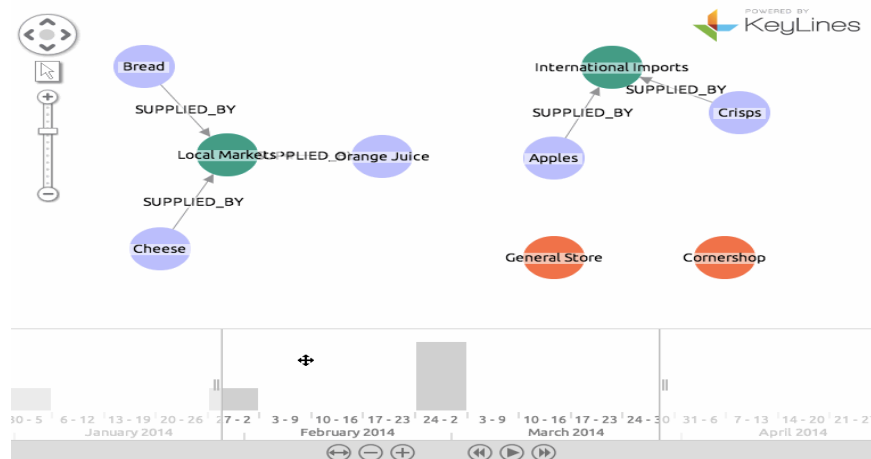


Figure 8: Time line with graph items<sup>11</sup>

Thus, it becomes possible to see how annotations and highlight to legal texts evolve over time. Another interesting aspect comes in the form of watching the network grow. The establishing of links between items, but also emerging sub-groups of users related to certain legal topics can hold interesting insights.

## 3 openlaws.eu Statistics

In this section we provide a few actual statistics from the project. The data includes information from social media activities (mainly Twitter, which was our preferred communication channel throughout the project), usage reports of the underlying RIS:App (which has become part of the openlaws.eu project as already indicated in the project proposal) and the newly developed openlaws.eu platform (which allows for the creation of community content). In the next months, the user base will be merged to one comprehensive system by the project spin-off openlaws gmbh.

<sup>11</sup> <http://keylines.com/network-visualization/visualize-neo4j-time-graph>

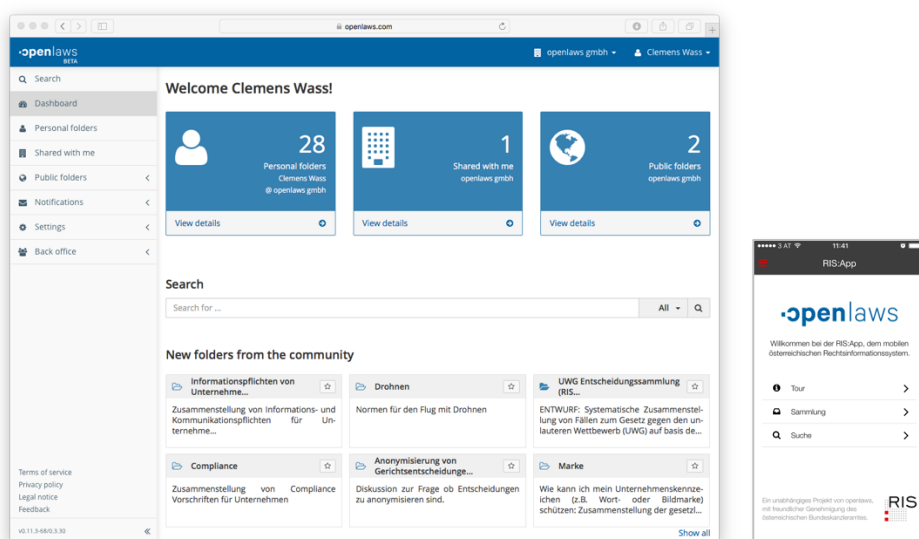


Figure 9: openlaws web interface and openlaws RIS:App

### 3.1 Piwik

Piwik is a free and open source web analytics application written by a team of international developers that runs on a PHP/MySQL webserver.<sup>12</sup> It is self-hosted and tracks online visits to one or more websites and displays reports on these visits for analysis. We have used PIWIK for analyses of the usage of the openlaws RIS:App. PIWIK was preferred over Google Analytics for privacy reasons.

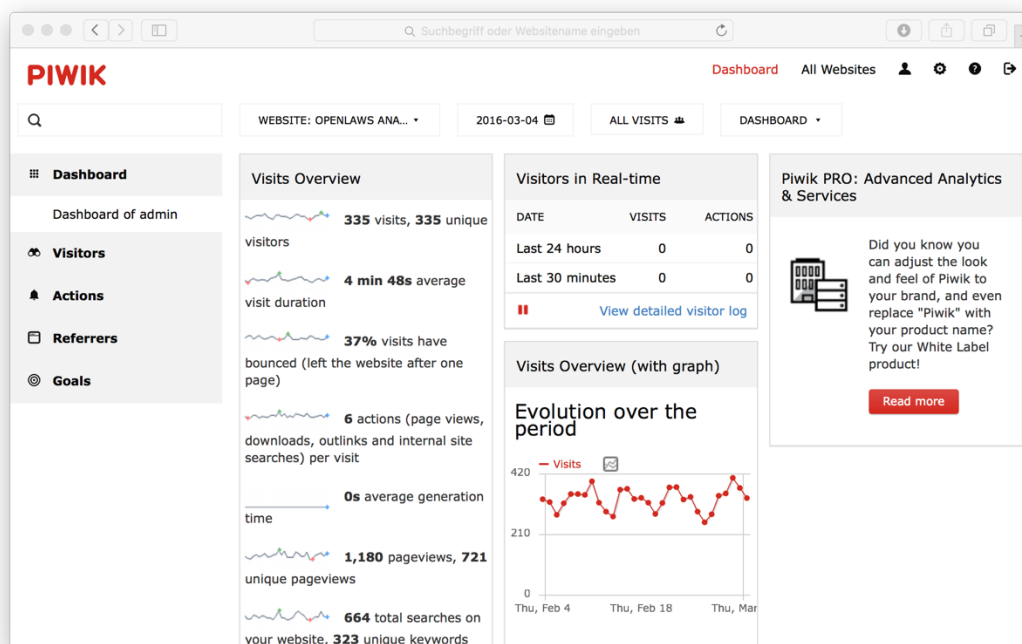


Figure 10: PIWIK dashboard

<sup>12</sup> <https://piwik.org>



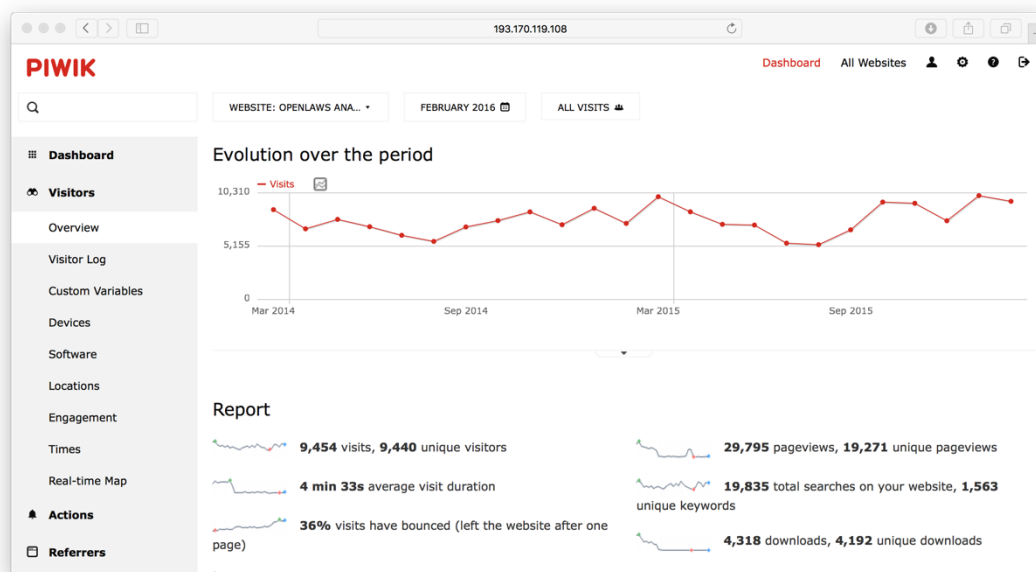


Figure 11: openlaws RIS:App visits

In January 2016 we have reached for the first time over 10,000 visits per month, with an average visit duration of 4:33 minutes.

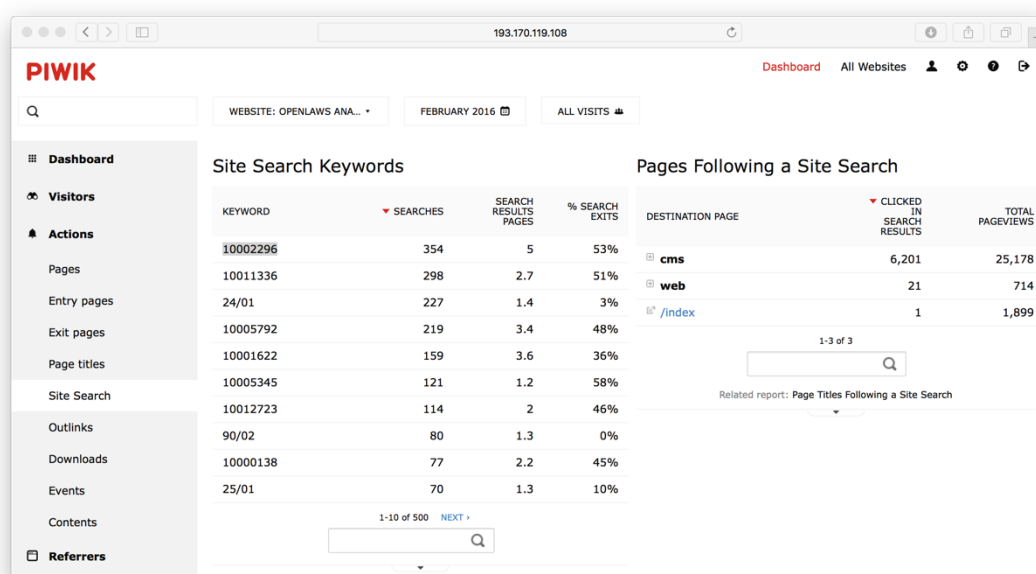


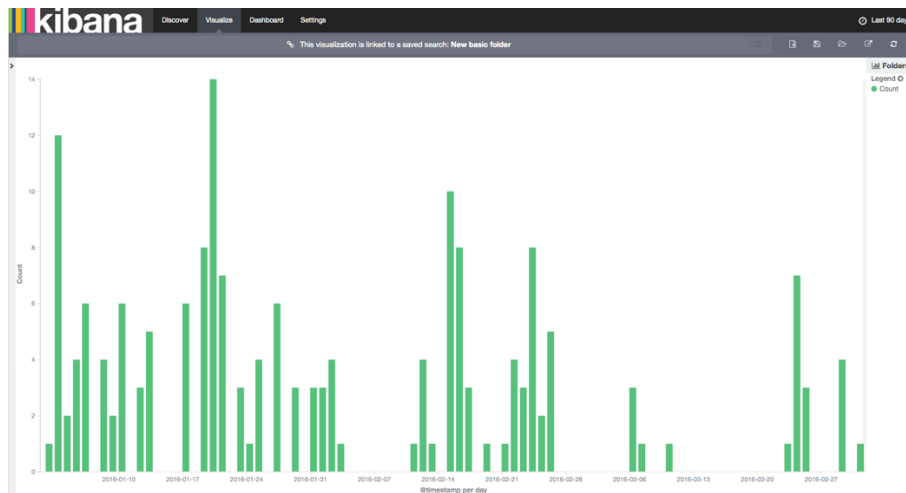
Figure 12: openlaws RIS:App searches

The most popular search terms (February 2016) within the mobile RIS:App are the Austrian Criminal Code (Strafgesetzbuch), the Traffic Regulation Act (Strassenverkehrsordnung), Security Police Act (Sicherheitspolizeigesetz), the Civil Code (Allgemeines Bürgerliches Gesetzbuch), the Weapons Usage Act (Waffengebrauchsgesetz), the Driver's License Act (Führerscheingesetz) and the Federal Constitution (Bundesverfassungsgesetz). This order shows clearly that usage on the mobile device is different compared to desktop usage. On mobile devices police-related/triggered searches are predominant, while traditional usage at the desktop is broader with a trend towards widely used legislation like the Civil Code. These results

are also in line with our user feedback, where we have learnt that the mobile application is heavily used by the police.

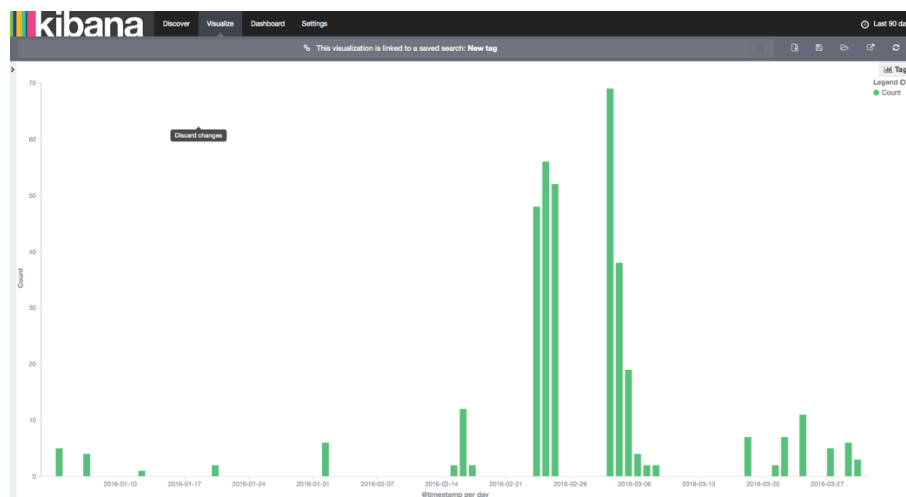
### 3.2 Kibana

Kibana is an open source data visualization plugin for Elastic search.<sup>13</sup> It provides visualization capabilities on top of the content indexed on an Elastic search cluster. Users can create bar, line and scatter plots, or pie charts and maps on top of large volumes of data. At openlaws Kibana is used to visualize the contents in the Neo4J graph database.



*Figure 13: openlaws folders*

Figure 13 above shows the number of user-created folders within openlaws over the past 90 days. The period around the IRIS conference 2016 (see conferences report) show a high activity.



*Figure 14: openlaws tags*

The number of tags added within openlaws during the IRIS conference 2016 peaked even stronger compared to the user-created folders. A reason for this can be that it is easier to create simple tags, compared to the more complex creation of a topic-

<sup>13</sup> <https://www.elastic.co/products/kibana>



specific folder.

### 3.3 openlaws back office

In addition to Kibana and Piwik, a few key metrics are displayed in the openlaws back office. As of the date of this report, 1,470,244 legal objects are loaded in the production system (the Neo4J graph database). Users have created 547 tags, 338 short titles (for case law) and 332 folders.

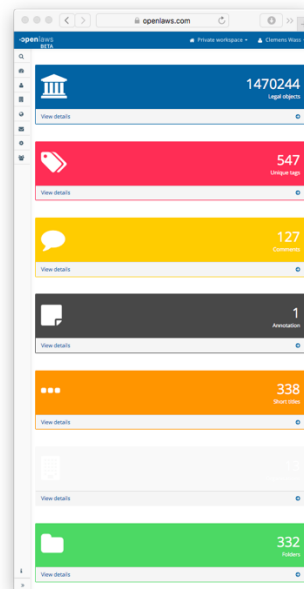


Figure 15: openlaws back office key metrics

### 3.4 Apple iOS

Apple provides its own statistics for Apps that are available in the iTunes Store. We see a strong increase of usage per day since September 2015:

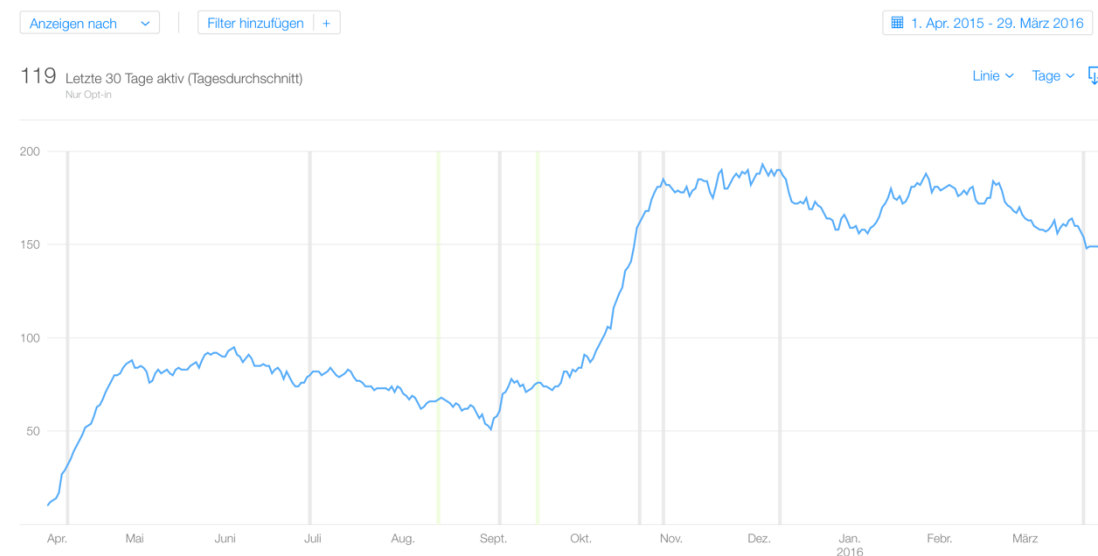


Figure 16: openlaws RIS:App iOS usage

### 3.5 Google Android

Google's Play Developer Console provides extensive statistics on installations of the openlaws RIS:App on Android devices. As of the date of this report, the App is installed on 13,614 Android devices.

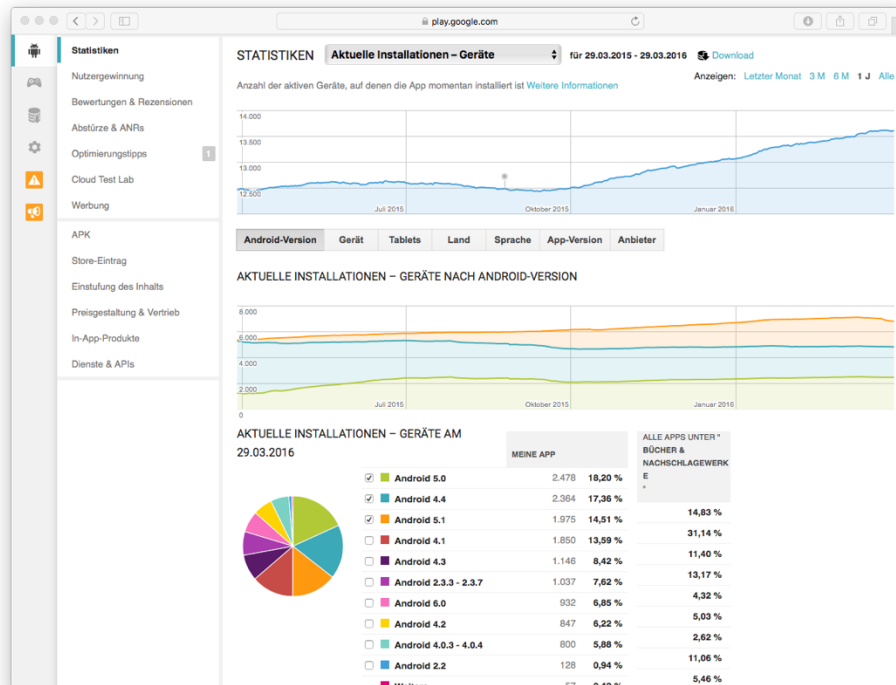


Figure 17: openlaws RIS:App Android installations

### 3.6 Social Media

Social media plays a major role when building an online community. In a professional international setting, Twitter is one of the most popular tools to spread news. For the project we have therefore focused on Twitter (<https://twitter.com/openlaws>) and replicated the Twitter feeds to Facebook (<https://www.facebook.com/openlaws.eu/>) and our own project website ([www.openlaws.eu](http://www.openlaws.eu)).

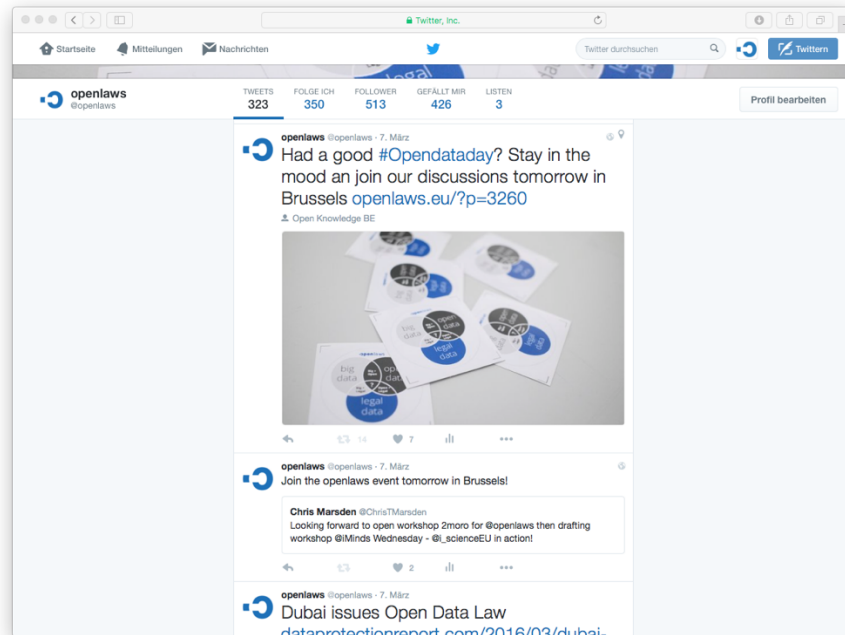


Figure 18: openlaws on Twitter

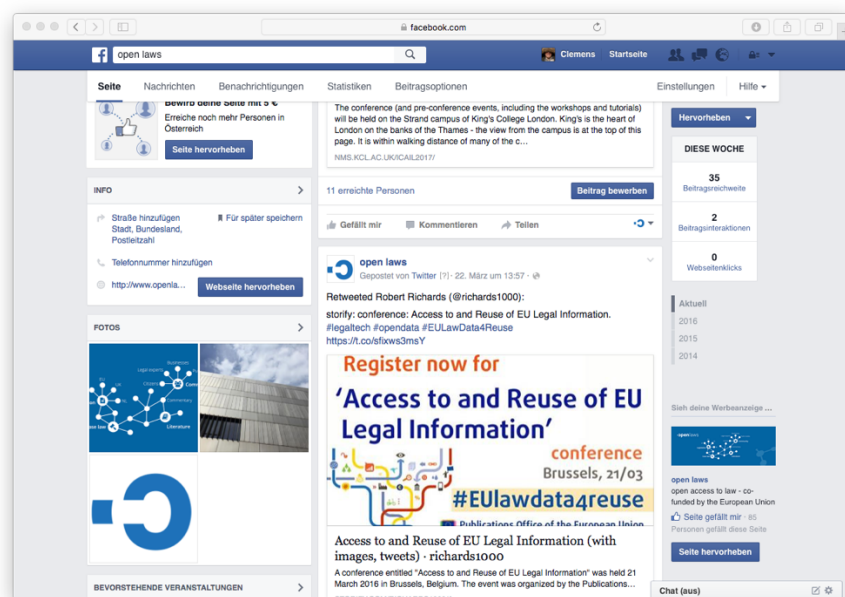


Figure 19: openlaws on Facebook

Social media platforms have their own analytics tools, but there are also third-party services that make user activity even more visible. As of March 2016, openlaws has 516 followers on Twitter. The geographic spread is visualized by the service tweepmap:

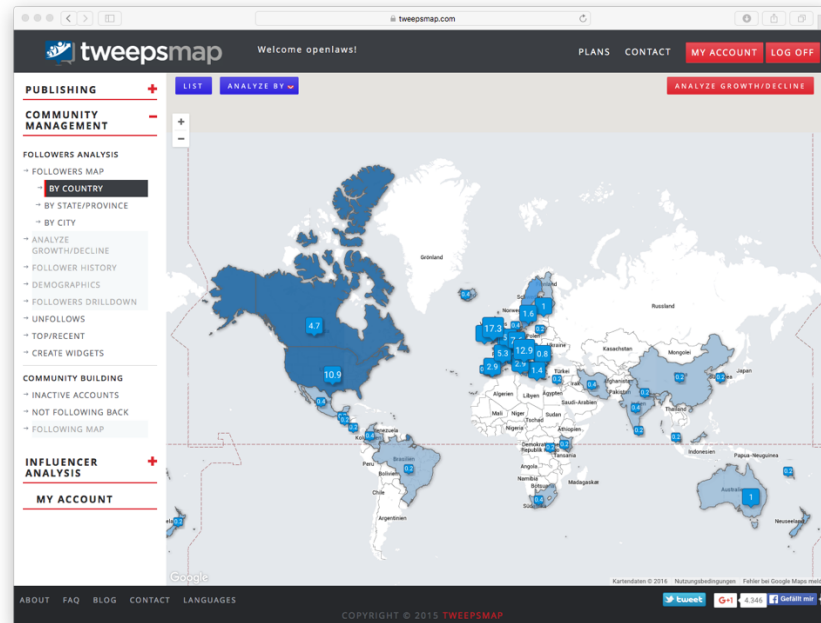


Figure 20: openlaws followers around the world

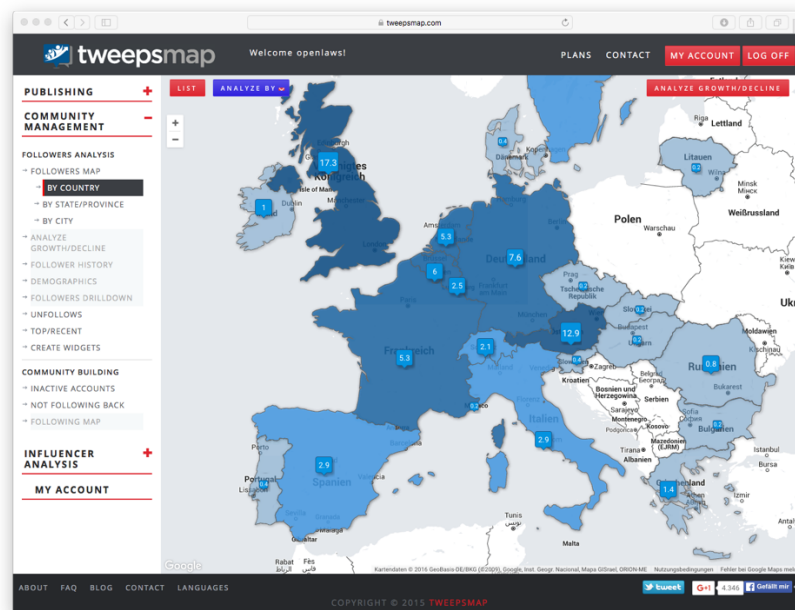
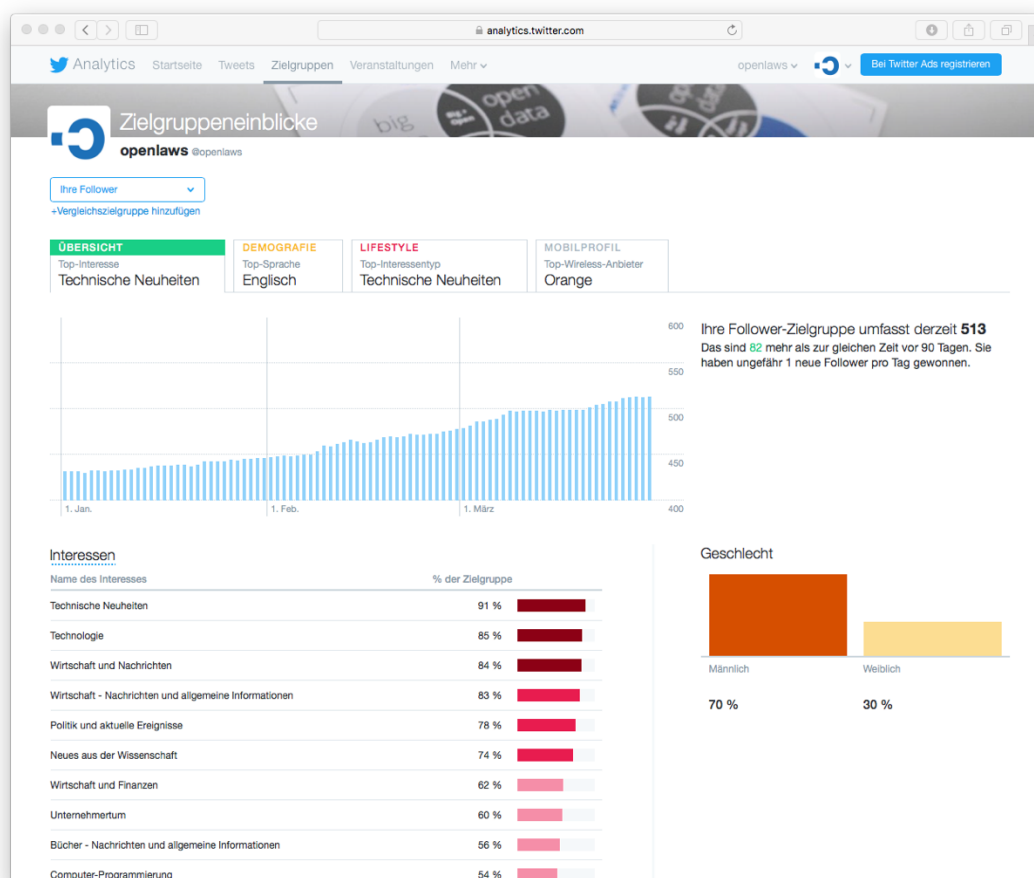


Figure 21: openlaws followers in Europe

openlaws receives international attention. The visualization on the global map shows that more than 15% of openlaws followers are located in the USA and Canada. Within Europe, openlaws was able to create the highest awareness in the UK (17.3%), Austria (12.9%) and Germany (7.6%). The high percentage of followers in the UK and Austria is the result of the dissemination activities of the participants and the ODI (Open Data Institute) start-up status of the project spin-off (openlaws gmbh). The Netherlands are active as well (5.3%), just like France (5.3%), where an independent open law movement is emerging.



*Figure 22: openlaws followers' interests and gender*

openlaws followers on Twitter are typically interested in technology and innovation, economy and news, politics, science, finance, business, books and coding. 70% of our followers are male, 30% female.

Tweet-impressions have increased during the project duration. The peak was reached in March 2016 with 18,1000 impressions and 35 mentions. This peak is in direct connection with our dissemination activities for the final BOLD Conference in Brussels. The highest number of profile visits was achieved in November 2015 as a result of our presentation at the European Data Forum in Luxembourg.

The following figures show the numbers of followers and impressions as well as the most popular tweets since September 2015:

März 2016 • 30 Tage bisher...

## TWEET-HIGHLIGHTS

## Top-Tweet 2.940 Impressionen bekommen

Had a good #Opendataday? Stay in the mood an join our discussions tomorrow in Brussels [openlaws.eu/?p=3260](http://openlaws.eu/?p=3260)  
[pic.twitter.com/ekPuBb06IB](http://pic.twitter.com/ekPuBb06IB)



14 7

Alle Tweet-Aktivitäten anzeigen

Twitter Aktivitäten anzeigen

## Top-Erwähnung 51 Interaktionen bekommen



Toon Vanagt

@Toon · 8. März

Inspiring how @openlaws is openly sharing their best-of-breed open source platform including: @Elasticsearch @neo4j  
[pic.twitter.com/OTAxUTPz8](http://pic.twitter.com/OTAxUTPz8)



1 3 3

Tweet anzeigen

## WERBEN AUF TWITTER

## Erreichen Sie mehr Nutzer mit Ihren Tweets

Mit gesponserten Tweets und Inhalten erreichen Sie mehr Nutzer auf Twitter.

Jetzt loslegen



## MÄRZ 2016 ÜBERSICHT

Tweets	11	Tweet-Impressionen	18,1 Tsd.
Profilbesuche	660	Erwähnungen	35
Neue Follower	35		

Februar 2016 • 29 Tage

## TWEET-HIGHLIGHTS

## Top-Tweet 6.671 Impressionen bekommen

FREE and OPEN: Big Open Legal Data conference in Brussels, March 8 2016  
[openlaws.eu/?p=3260](http://openlaws.eu/?p=3260) #legaltech  
 #opendata [pic.twitter.com/gLWZuiQYm](http://pic.twitter.com/gLWZuiQYm)



1 20 20

## Top-Erwähnung 57 Interaktionen bekommen



Open Data Institute

@ODIHQ · 11. Feb.

Interested in open data law? Check out this Open Legal Data conference (Brussels):  
[buff.ly/1LSxl4](http://buff.ly/1LSxl4) @openlaws #legaltech  
 #opendata

18 8

Tweet anzeigen

## FEBRUAR 2016 ÜBERSICHT

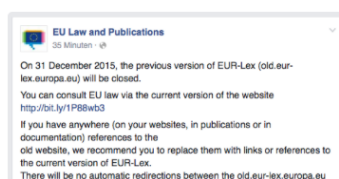
Tweets	16	Tweet-Impressionen	14,1 Tsd.
Profilbesuche	759	Erwähnungen	33
Neue Follower	32		

Januar 2016 • 31 Tage

## TWEET-HIGHLIGHTS

## Top-Tweet 987 Impressionen bekommen

All: update your links. The old EUR-Lex [old.eur-lex.europa.eu](http://old.eur-lex.europa.eu) will be taken offline on 31/12/2015. @EUPublications  
[pic.twitter.com/eRLHnWdJzN](http://pic.twitter.com/eRLHnWdJzN)



9 4

Alle Tweet-Aktivitäten anzeigen

## Top-Erwähnung 31 Interaktionen bekommen



EC Open Data Policy

@EC\_opendata · 22. Jan.

.@SpendNetwork, @openlaws + @InSymbio are all reusing EU open data? And you? [pic.twitter.com/d3brdAcSyl](http://pic.twitter.com/d3brdAcSyl)



8 7

## JANUAR 2016 ÜBERSICHT

Tweets	7	Tweet-Impressionen	6.552
Profilbesuche	398	Erwähnungen	11
Neue Follower	15		

Dezember 2015 • 31 Tage

## TWEET-HIGHLIGHTS

## Top-Tweet 2.450 Impressionen bekommen

Our [@neo4j](#) DB attracts quite many students who want to jump-start their career. At [@fhSalzburg](#), growing the team [pic.twitter.com/2q71ZzBas5](http://pic.twitter.com/2q71ZzBas5)



🔗 5 ❤️ 4

[Alle Tweet-Aktivitäten anzeigen](#)

Twitter Aktivitäten anzeigen

## Top-Erwähnung 20 Interaktionen bekommen



**Radboud Winkels**

@Radboud · 1. Dez.

Prel. Programme [@openlaws](#) Open Legal Data and NAiL 2015 workshop during [#jurix2015](#) online. [@jurixfoundation](#) [leibnizcenter.org/~winkels/OpenL...](http://leibnizcenter.org/~winkels/OpenL...)

🔗 3 ❤️ 3

[Tweet anzeigen](#)

## Top-Medien-Tweet 722 Impressionen bekommen

[@MonicaPalmirani](#) presenting at [#jurix15](#) in the [@openlaws](#) workshop [#linkeddata](#) [#opendata](#) [#legaltech](#) [pic.twitter.com/G4vuKHJuGU](http://pic.twitter.com/G4vuKHJuGU)



🔗 1 ❤️ 1

## DEZEMBER 2015 ÜBERSICHT

Tweets	7	Tweet-Impressionen	7.120
Profilbesuche	389	Erwähnungen	8
Neue Follower	1		

November 2015 • 30 Tage

## TWEET-HIGHLIGHTS

## Top-Tweet 1.242 Impressionen bekommen

Too much of the same old copyright discussion over and over again. How can we actually change it? Suggestions? [#opencon](#) [#OpenInnovation](#)

🔗 3 🔄 3 ❤️ 3

[Alle Tweet-Aktivitäten anzeigen](#)

Twitter Aktivitäten anzeigen

## Top-Follower hat 27 Tsd. Follower



**figshare**

@figshare FOLGT IHNEN

Securely store and manage your research outputs in the cloud, or make them openly available and citable (with a DOI) for free. [#research](#) [#data](#) [#management](#)

[Profil anzeigen](#)

[Follower-Dashboard anzeigen](#)

## Top-Erwähnung 41 Interaktionen bekommen



**Open Data Incubator**

@ODIncubator · 16. Nov.

our [#EDF2015](#) panel w/ Clemens [@openlaws](#) [@kalte2707](#) [@esimperl](#) [@ianmaggill](#) [@vicgrss](#) of [@commoprices](#) Stefano [@insymbio](#) [pic.twitter.com/GoZJlEXlUC](http://pic.twitter.com/GoZJlEXlUC)



🔗 3 ❤️ 5

[Tweet anzeigen](#)

## Top-Medien-Tweet 837 Impressionen bekommen

Do citizens trust in governments? At the open government conference in Linz [#opendata](#) [#opengov](#) [pic.twitter.com/BqWgPJEmu](http://pic.twitter.com/BqWgPJEmu)

## NOVEMBER 2015 ÜBERSICHT

Tweets	20	Tweet-Impressionen	8.180
Profilbesuche	820	Erwähnungen	38
Neue Follower	33		



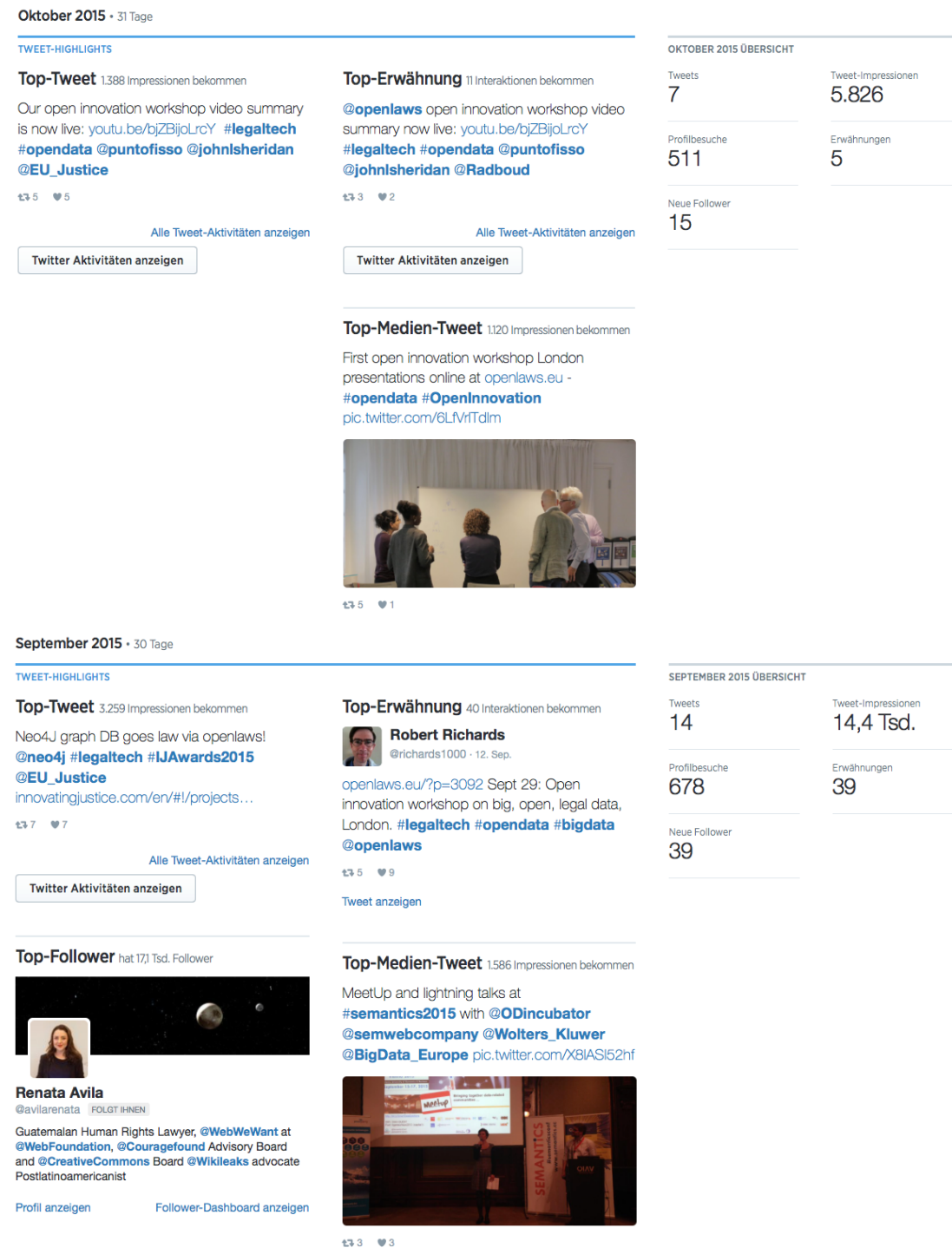


Figure 23: openlaws tweet statistics



## 4 References

- Boyd, D., & Crawford, K. (2012). Critical questions for big data: Provocations for a cultural, technological, and scholarly phenomenon. *Information, communication & society*, 15(5), 662-679.
- Bryant, R., Katz, R. H., & Lazowska, E. D. (2008). Big-data computing: Creating revolutionary breakthroughs in commerce, science and society.
- Cattuto, C., Quaggiotto, M., Panisson, A., & Averbuch, A. (2013, June). Time-varying social networks in a graph database: a Neo4j use case. In *First International Workshop on Graph Data Management Experiences and Systems* (p. 11). ACM.
- Chen, M., Mao, S., & Liu, Y. (2014). Big data: A survey. *Mobile Networks and Applications*, 19(2), 171-209.
- de Souza Baptista, C., Pires, C. E. S., Leite, D. F. B., & de Oliveiraa, M. G. (2014). NoSQL geographic databases: an overview. In: Pourabbas, E. (ed.). *Geographical Information Systems: Trends and Technologies*, 73.
- Fan, J., Han, F., & Liu, H. (2014). Challenges of big data analysis. *National science review*, 1(2), 293-314.
- Farney, T. A. (2011). Click analytics: Visualizing website use data. *Information Technology and Libraries*, 30(3).
- Girvan, M., & Newman, M. E. (2002). Community structure in social and biological networks. *Proceedings of the national academy of sciences*, 99(12), 7821-7826.
- Hasan, L., Morris, A., & Proberts, S. (2009). Using Google Analytics to evaluate the usability of e-commerce sites. In: Kurosu, M. (ed.). *Human Centered Design, HCI I 2009, Lecture Notes in Computer Science*, 5619, pp. 697-7006.
- Labrinidis, A., & Jagadish, H. V. (2012). Challenges and opportunities with big data. *Proceedings of the VLDB Endowment*, 5(12), 2032-2033.
- Owens, J. W., & Shrestha, S. (2008). How do users browse a portal website? An examination of user eye movements. *Usability News*, 10(2).
- Sagiroglu, S., & Sinanc, D. (2013, May). Big data: A review. In *Collaboration Technologies and Systems (CTS), 2013 International Conference on* (pp. 42-47). IEEE.
- Zhang, Y., Chen, M., Mao, S., Hu, L., & Leung, V. (2014). Cap: Community activity prediction based on big data analysis. *Network, IEEE*, 28(4), 52-57.