

# Informal Networking in the Public Sector: Mapping Local Government Debates in a Period of Austerity

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## Abstract

Studies in digital government research have not sufficiently considered the internal networking aspects of social media beyond interactions with the public. This article examines the function of social media as informal networks of professional practice within the public sector. The empirical study is based on a longitudinal analysis of the Twitter hashtag community #localgov used by British local government actors (dataset of 235,681 tweets posted within 2013-2015). In a period of significant budget reductions, Twitter conversations involved a wide range of responses about the impact of the cuts and future of services. #Localgov shows high level of cross-service exchanges in the institutional sharing of good practice while the dynamics of interaction reflect the traditional landscape of intergovernmental relationships in England. We argue about the importance and characteristics of hashtag communities like #localgov as spaces that bring together different actors with a public sector interest.

**Keywords:** social media; network analysis; budget cuts; local government; informal networks

## 1. Introduction

Social media have become an important frontline between many government organizations and their respective audiences. Platforms such as Facebook, Twitter and media sharing applications have become prominent in efforts to disseminate government information more widely and, to a varying extent, to build relationships with the public. Social media studies have focused on citizen-government interactions and adoption practices within government agencies (e.g. Criado,

Sandoval-Almazan, & Gil-Garcia, 2013; Mergel & Bretschneider, 2013). There is also considerable research on the use of social media in specific application domains like emergency management and risk communication (e.g. Kavanaugh et al., 2012; Panagiotopoulos, Barnett, Bigdeli, & Sams, 2016).

Beyond communications with the public, the role of social media for interactions related to professional practice within the public sector remains largely unexplored. It is evident that public sector professionals and other actors can use social media to share insight about their work and even collectively discuss policy issues. This phenomenon is taking place as networks of practice move on to new platforms with advanced networking and information sharing features. These digital networking interactions are different from citizen-government engagement and therefore can be of theoretical and practical interest. It is particularly important to map and understand informal networking interactions with respect to how they facilitate knowledge exchange and the institutional sharing of good practice (Crouch & Farrell, 2004; Lowndes, 2005).

While digital networks are a more recent phenomenon, the study of networks represents a significant area of research within public administration (Isett, Mergel, LeRoux, Mischen, & Rethemeyer, 2010; O'Toole, 2015). Alongside formal interorganizational networks, there is growing interest in networks that emerge in more informal settings to enable individuals to share expertise (Kapucu, Hu, & Khosa, 2014). Our knowledge of the formation and relational dynamics of such networks is limited to connections between professionals with similar work titles, also known as advice networks (Binz-Scharf, Lazer, & Mergel, 2011; Siciliano, 2015). Informal networks on social media represent a new important aspect of this stream of work, in terms of how such spaces facilitate ad hoc interactions, information sharing and open discourses within and across public organizations.

The article aims to gain a better understanding of the characteristics and function of these spaces as informal networks of professional practice within the public sector. We first discuss the relevant literature in the next section to frame our interest in informal and interpersonal networks, social media and hashtag communities. The empirical analysis is based on a longitudinal study of #localgov, which is a Twitter hashtag used by UK local government actors such as associations, officers, local representatives, media, consultants and other professionals. The dataset collected contains 235,681 messages that were posted by 37,592 users within the period 2013-2015. Using a variety of methods including timeline, textual, keyword and social networking analysis, we represent both the micro and macro properties of #localgov as a space of interaction.

The mapping of online interactions tagged with #localgov takes place within a period of prolonged institutional change and unprecedented local budgetary pressures exerted by the UK central government. There is wide variety of exchanges amongst local government actors mainly driven by the need to localize the centrally imposed agenda of budget reductions and institutional change while sharing expertise and experience in different service areas. These interactions offer topical insights in current local government discourses across geographical spaces. The paper discusses how spaces like #localgov can bring together communities in distributed discussions via

ad hoc networking and information sharing. Local government managers can share information and provide feedback towards central government and connect to other local government actors. Respectively, Twitter conversations can contain useful information for public managers in central government who are farther removed from the local level. These interactions are particularly relevant in intergovernmental systems such as the UK where central-local relations are characterized by a top-down approach.

## **2. Conceptual background**

### **2.1. Professional use of social media and hashtag communities**

Social media allow individuals to connect and interact on permanent (e.g. blogs, LinkedIn groups) or more ad hoc spaces (e.g. Twitter) that facilitate interpersonal networking outside organizational boundaries. When motivated professionals take part in social media conversations, there might be important benefits in terms of collaboration and organizational learning (Aramo-Immonen, Jussila, & Huhtamäki, 2015; S. Choi & Park, 2014). Equally, with the wide adoption of social media by many professional groups, individuals and organizations involved in the public sector, it can be expected that informal interactions and information sharing will be facilitated.

Despite the plethora of studies on social media and citizen-government interactions, these internal networking aspects of social media use have not been explored. While social media interactions with the general public are in many cases symbolic or transactional (Zavattaro & Sementelli, 2014), there might be more substantial outcomes from interpersonal networking amongst key individuals. A large survey of public servants in Mexico identified interorganizational collaborations and the transfer of good practice as one of the expected benefits of social media use (Picazo-Vela, Gutiérrez-Martínez, & Luna-Reyes, 2012). Later research by Bretschneider and Parker (2016) evidences that, as the formalization of social media within public agencies progresses, motivated individuals are more likely to feel empowered in their own personal use and engage about issues of professional practice.

The different functionalities and features of social media shape their potential relevance in a professional or personal context of use. In particular interest to this study are Twitter hashtags that form dynamically around popular events (e.g. elections, emergencies, television shows) (Bruns, 2012; Highfield, Harrington, & Bruns, 2013), support communities (Myrick, Holton, Himmelboim, & Love, 2016) or more generally as a means of decentralized engagement in politics (Abascal-Mena, Lema, & Sèdes, 2015; Rambukkana, 2015). Hashtags can also be established more permanently around professional topics of interest for Twitter users to share resources and engage in conversations with other professionals. In this context, hashtags help professional users to increase the visibility of their tweets to audiences through rapid information sharing and links to resources. These information spaces can host communities with significant levels of interaction like #hcsma, referring to Health Care Social Media Canada (Gilbert, 2016). They can also carry

relevance in a business communication context using broader keywords like #supplychain (Chae, 2015). We will refer to these spaces using *hashtag communities* as a term to describe dynamic information networks of professionals that emerge around Twitter hashtags.

## 2.2. Informal and digital networks

Networks in public administration vary in their structures and objectives but all entail interactions between or across government agencies and other organizational actors like interest groups, businesses, professional associations and non-profits (Berry et al., 2004; Isett et al., 2010). Many of these networks exist across cultural and national boundaries to enable international knowledge and information sharing when facing challenges such as capacity building, technical assistance, or harmonization of standards (Dawes, Gharawi, & Burke, 2012; Fedorowicz, Gogan, & Williams, 2007). Research on networks has largely focused on interorganizational interactions and institutional design issues (Kapucu et al., 2014; Klijn & Koppenjan, 2006; O'Toole, 2015) with such work being informed by a large variety of theoretical and methodological traditions (Berry et al., 2004).

The study of public sector networks has concentrated on formal networks that exist based on explicit arrangements between agencies and where membership is clearly defined (e.g. service delivery networks) (Isett et al., 2010). Isett et al. (2010, p. 165) outline informal networks as “*from task forces, to coalitions, to ad hoc committees, public and non-profit organisations participate in a wide range of interorganisational networks that do not bind its members together through formal means*”. They identify the need to understand the formation, purpose and relational dynamics of informal networks that emerge outside formal structures. A review by Kapucu et al. (2014) confirms that limited research has been conducted on the role of informal networks.

Informal networks of individuals or interpersonal networks have been studied by Binz-Scharf et al. (2011) and Siciliano (2015). Binz-Scharf et al. (2011) examine the strategies and conditions under which individuals seek answers via informal networking relationships. A case study with forensic scientists suggests that the sharing of expertise through informal ties occurs in ways unattainable within formal structures. Binz-Scharf et al. (2011) specifically make the case that informal interpersonal networks play an important role in sharing expertise within a highly decentralized system of governance like that of the USA. Siciliano's (2015) study of advice networks between school teachers similarly demonstrates that interpersonal networks are important for knowledge exchange but also shows that peer competition and reliance on existing relationships might limit the advice that employees seek. Both studies conclude that informal networks deserve attention because facilitating such relationships has largely positive effects in public organizations.

Research on digitally-mediated networks has also remained mostly within formal structures and interorganizational exchanges (e.g. Dawes, Cresswell, & Pardo, 2009; Janowski, Pardo, & Davies, 2012). Janowski et al. (2012) define Government Information Networks as a conceptual

framework that brings together different aspects of policy, collaborative and governance networks with a significant role of ICT to build, manage and sustain relationships between actors. This conceptualization integrates informal and interpersonal interactions that Janowski et al. (2012) recognize as an important aspect. Dawes et al. (2009) offer a more specific case of how international public sector knowledge-exchange networks rely heavily on informal interactions and information sharing between motivated individuals.

Digitally-enabled networks of individuals have always been a topic of great interest as ICTs allow the formation of networks of thousands of individuals who may have never met in person due to geographical or organizational distance (Vaast & Walsham, 2009). These digital networks of professional practice tend to exhibit the following characteristics (Wasko, Teigland, & Faraj, 2009): (1) they are self-organizing, voluntary and without formal controls, (2) participation is open to anyone who has the required technology, (3) individuals interact with others to exchange advice and ideas on common interests and (4) they are created and sustained primarily in public or semi-public spaces like forums, knowledge portals, intranets and social networking groups. Participants tend to make contributions when they think that it enhances their reputation or there is urgency to discuss collective issues related to professional practice (Wasko & Faraj, 2005). These features suggest that digital networks can facilitate the formation of relationships between individuals within but also across the boundaries of professional practice within the public sector (e.g. forensic scientists, school teachers).

### 2.3. Research questions

Joining current work on networks and networking research with social media studies provides the theoretical background to support our exploration of the new digital relationships that emerge in open information sharing environments. The characteristics and function of these spaces can be fundamentally different than offline spaces and existing interpersonal connections within the public sector. Public sector organizations traditionally have a tendency to restrict vertical information sharing due to their hierarchical structures (Blau & Scott, 1962). Arguably, open information spaces like hashtag communities have great potential to facilitate institutional sharing or the transfer of knowledge across institutions through networking relationships (Crouch & Farrell, 2004; Lowndes, 2005). Utilizing the capacity of social media may enlarge the information sharing capabilities of informal networks of professionals, and as such help to reduce institutional barriers and resulting knowledge silos (Mergel 2011). Lowndes (2005) notes that institutional sharing provides support to entrepreneurial actors who are seeking to adapt new practices locally. As Lowndes illustrates, ICT innovations and their use by computing professionals has traditionally been a strong area of knowledge sharing across professionals working in different local government authorities. An important example is the Knowledge Hub (2016), the UK's largest public service collaboration platform with over 1,500 different groups, many of which relate to local government services.

In theory, social media present considerable opportunities to act as spaces that reflect forthcoming public sector trends due to the institutional sharing of good practice. Mergel and Bretschneider (2013) discuss how the adoption of social media is often the result of informal exchanges across agencies to share experimentation results. Isett et al. (2010) further note that all informal networks rely on information sharing or were created for this sole purpose. It is therefore anticipated that social media spaces like hashtag communities might sustain important discourses and networking relationships between actors in the public sector domain.

Thus far, applications of networking research using social media data have been examined in topics such as: (1) mapping early warning, risk communication and emergency response networks (Chatfield, Scholl, & Brajawidagda, 2013; Jung & Park, 2014; Kyujin Jung & Park, 2016), (2) demonstrating the nature of political conversations on social media with emphasis on polarization (Choi & Park, 2014; Hong & Kim, 2016) or (3) uncovering connected action and other hybrid and alternative forms of interaction (Himmelboim, Smith, Rainie, Shneiderman, & Espina, 2017; Kim, Lee, & Park, 2016; Xu, Sang, Blasiola, & Park, 2014). We aim to examine social media interactions as forms of informal networking by addressing the following questions:

(RQ1) How do hashtag communities related to the public sector facilitate information sharing?

(RQ2) What are the dynamics of interaction between actors in hashtag communities related to the public sector?

The choice of #localgov relates both to the popularity of the hashtag and the nature of local government relationships in the UK over the period of the study. Local government in the UK involves different services and regional issues but at the same time is a tier of government large enough to sustain networks where actors share experiences and common professional interests. The next section introduces the details of the research approach including the relevant institutional background.

### **3. Research approach**

#Localgov is the most popular Twitter space used by professionals involved in different aspects of local government in the UK. Hence, it provides an interesting source of data for the study within the timeframe of 2013-2015. Budget events at the central level during the parliamentary year 2013-14 resulted in significant reactions from local government, particularly during the announcement of the Spending Review by the Chancellor of the Exchequer (Finance Minister) on the 23<sup>rd</sup> of June 2013. With the 2013 Spending Review announcement as the starting point of our data collection, the end is the Queen's speech on the 31<sup>st</sup> of May 2015, which set out the priorities for the newly elected government. It is important to reflect on the institutional context to which our Twitter dataset refers, focusing mostly on English local government.

### 3.1. Background: UK local government in a period of austerity

Local government in the UK employs 2.2 million people across 418 local authorities (Office for National Statistics, 2016). These authorities have responsibilities mainly related to transportation, planning, social care, housing and waste management. Relations between local and central level actors have traditionally been portrayed as tense and politicized (John, 2014; Jones & Stewart, 2002). One reason for this is the presence of single party governments at both the level of central and local government, which reduces party-political linkages among actors. Another reason is the more recent transformation of the UK civil service into a more managerially-oriented administration with growing disconnection between central civil servants and professionals at the local level (Laffin & Entwistle, 2000).

Across Europe, many local governments face spending pressures, with austerity having become the new 'normal'. The 2008 financial crisis and its consequences on the wider economy have put significant pressure on UK public finances. Local government expenditure experienced exceptional budget cuts over the period 2011-2015 at the levels of 26% (HM Treasury, 2010). Cuts have been implemented on social care spending, including services for children and older people, as well as parks, sport, and leisure facilities. Many councils also reduced their infrastructure spending, while the total local government workforce in England declined by 16.6% between 2010 and 2013 (NAO 2014).

English local authorities strongly rely on central government funding for around 70% of their income (OECD, 2012, p. 153). In dealing with the spending pressures, English local authorities have received limited support from central government, which emphasized the potential it saw to exist at the local level to improve efficiency and effectiveness. In 2012, the UK Department for Communities and Local Government (DCLG) published a document aimed at supporting local government in identifying fifty ways of 'sensible savings in local government' (DCLG, 2012). The representative body of English and Welsh local government, the Local Government Association (LGA), has provided some support to local authorities in their efforts to manage the cuts. The overall picture appearing is that most cuts have been implemented through an incremental (salami slicing) budget approach, rather than strategic cuts (Levine, 1978).

During the period of our analysis, devolution and decentralization have also affected local government in the UK. Devolution refers to the transition of legislative powers from the UK Parliament to Scotland, Wales and Northern Ireland. Decentralization denotes different initiatives implemented as part of the Conservative party's 'localism agenda', often in a rather ad-hoc way, including experiments with larger degrees of autonomy in a small number of authorities, especially large urban ones such as Manchester. In practice, the impact of the reforms has been limited, and central government decisions remain crucial for the financial position of local government.

### 3.2. Data collection and analysis

Posts tagged with #localgov were collected using Chorus Analytics, which is a set of applications designed to facilitate social science research using Twitter data (Brooker, Barnett, & Cribbin, 2016; Chorus, 2017). Chorus captures data from Twitter's application programming interface that is publicly available to developers. This type of access allows the retrospective retrieving of posts based on keywords like '#localgov' for up to a week (during the period of study, the dataset was updated at daily intervals). The dataset collected contained a total of 235,681 tweets posted by 37,592 unique accounts. This includes all original tweets and retweets that were posted in this period and included '#localgov' within their text.

Self-assigning a hashtag to a post is a choice that Twitter users make depending on the intended visibility of their tweets. Prior to the choice of #localgov for data collection, observations about the volume and source of posts suggested that the hashtag was the most recognized Twitter space for local government-related topics. The use of #localgov is not exclusive to local government in the UK and might contain contributions about international or regional issues in other parts of the world.<sup>1</sup> However, we can observe that: (a) most of the tweets were posted from accounts located in the UK (when this information is available), (b) most tweets were clearly related to UK-based events and (c) #localgov has been part of the official account description of the UK Department of Communities and Local Government (at the time of the study).

There are several guidelines about the mapping of digital communities enabled by Twitter hashtags with foundations both at the technical and the methodological level (Abascal-Mena et al., 2015; Borra & Rieder, 2014; Bruns, 2012; Bruns & Stieglitz, 2013). To address the research questions, the analysis was carried out in two main stages that distinguished between the macro and micro properties of #localgov as an interaction space. Different software tools were used in each stage with MS Excel employed to maintain databases of tweets and perform basic actions (filtering, sorting, ranking, pivot tables, diagrams). Figure 1 shows an overview of the main steps involved in the collection and analysis of data<sup>2</sup>.

*Macro analysis* was used to develop an overview of activity tagged with #localgov over the period of study, which included three steps:

- *Structural analysis* to identify patterns of communication within the tweets based on structural elements like mentions, retweets, hashtags other than #localgov, embedded links, and the location of the tweets when available.

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<sup>1</sup> Although an accurate estimation is not possible, approximately 80-90% of the tweets relate to local government in the UK, with most tweets related to England. Other locations of accounts using the hashtag include Australia, New Zealand, Ireland, USA and Canada. The conversations analyzed in sections in 4.2.1 and 4.2.2 are also in line with those levels.

<sup>2</sup> The 'filter and clean' check shown in the figure involved removing unnecessary fields in the dataset and validating that #localgov was present in the main text of the tweets. A few tweets were removed because #localgov was part of the account name or description but not the tweet text.



- *Temporal metrics*: timeline analysis was used to map the volume of tweets over time. This step is important to provide an overview of activity within the whole dataset and understand how this activity corresponds to other events (e.g. high volume days).
- *User metrics* involves an overview and analysis of the accounts that contributed to #localgov during the period of data collection. This includes an identification of accounts that appear to be more central to the hashtag based on the volume of their contributions or the number of mentions/retweets received by other accounts.

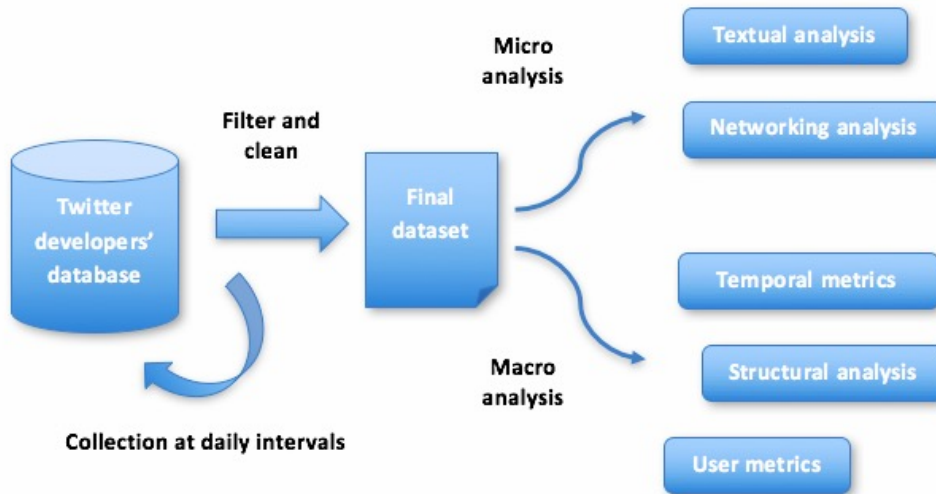


Figure 1 – overview of data collection and analysis

*Micro analysis* involved a deeper understanding of the specific themes of conversation tagged with #localgov as well as the nature of interactions between users in the context of these conversations. This analysis was carried out in two steps:

- *Textual analysis* was used to identify the main themes of conversation within #localgov. Although this type of content analysis does not include subjective evaluations of content (e.g. Krippendorff, 2013), it is essentially an extension of thematic and content analysis for very large textual datasets (Grimmer & Stewart, 2013). With the help of the qualitative analysis software NVivo 11, this step involved keyword frequency and text search queries. Keyword frequencies indicated the main themes of conversation that took place as well as their evolution over time by looking at different parts of the dataset. Textual analysis was used to select important conversations for networking analysis.
- *Social networking analysis* involved the extraction and visualization of networking relationships between user accounts within the dataset through mentions or retweets. This method of analysis is particularly suitable to explore and map large parallel conversations that take place over time (Abascal-Mena et al., 2015; Smith, Rainie, Shneiderman, & Himelboim, 2014). To demonstrate these dynamic interactions, we identified the formation of several community clusters around dominant themes of conversation. In the findings reported here,

we show two illustrative cases of such conversations filtered on combinations of popular keywords based on a selection of tweets. The open source platform Gephi was used to visualize and analyze networking relationships using network metrics.<sup>3</sup> The Textometrica software was used to generate files that show keyword frequency co-occurrences (Lindgren & Palm, 2011).

The findings first present the overview of activity within #localgov (macro analysis) and then focus on conversations and the dynamics of interaction (micro analysis).

## 4. Findings

### 4.1. Temporal, structural and user metrics (macro analysis)

Table 1 shows an overview of the activity of tweets tagged with #localgov. The 235,681 tweets correspond to approximately 331 tweets per day – a daily posting frequency that kept increasing slightly during the period of collection. There was also a steady increase in the number of accounts contributing each period accumulating to the total of 37,592 unique contributors. An increasing proportion of tweets over time, around 65%, contain links to resources that are usually in the form of commentaries, news websites, blogs or other sources. The accompanying tweets can be simply informational, ironical, critical or political. There is also a steady increase in the proportion of retweets during the time of study from about 41% to almost 50%. The proportion of direct mentions to other users fluctuated around 7% and slightly decreased mainly in the last period. This was expected because in the months before the UK elections of May 2015, tweets would become more politicized with a higher proportion of media sharing via embedded links and retweets.

Figure 2 visualizes the timeline of the whole dataset to show the overview of daily levels of posting. We can observe that the activity is sustained and distributed within the whole dataset with some fluctuations. This is mainly because the volume of tweets tagged with #localgov peaks during weekdays – at the levels of 400-500 tweets – while weekends generate much fewer tweets at the levels of 100. The two drops in activity that can be observed in the figure correspond to the days around the beginning of each calendar year in 2014 and 2015. These observations can be expected for a hashtag of professional nature that follows a working calendar.

In parallel to a steady level of activity, there are several noticeable spikes that correspond to major events that the community backchannels; significant daily peaks were related to the joint local government and European elections on 22 May 2014 (986 tweets), other political events, adverse weather conditions (e.g. floods), budgetary announcements (e.g. 760 tweets on the 2014 national budget announcement on 19 March 2014) and a Tweetathlon event organized by the Local

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<sup>3</sup> As a necessary interim step, the AWK scripting language was used to extract interactions between users within the tweets and create files that were then imported directly to Gephi (see Bruns, 2012). This is similar to the methodology documented by Abascal-Mena et al. (2015)

Government Association of England and Wales (near 1,550 tweets on 17 October 2013). Another important event generating a peak in activity was the Spending Review announcement by the Chancellor of the Exchequer on 26 June 2013 with 1,178 tweets. The cuts to local government budgets announced that day sparked a plethora of predictions, commentaries, official responses and other reactions by journalists and policy actors. The Tweetathlon is the only major event that generated an internal spike without an outside social or political stimulus.

Table 1 – overview of structural metrics

Period	Total tweets	Average daily activity (tweets)	Retweets	Direct Mentions	Tweets with links	Accounts
20/06/2013 – 31/12/2013	56,762	291	23,154 (40.8%)	4,067 (7.2%)	37,567 (66.1%)	11,142
01/01/2014 – 30/06/2014	58,085	321	24,722 (42.6%)	4,459 (7.7%)	42,062 (72.4%)	11,826
01/07/2014 – 31/12/2014	63,335	344	29,949 (47.3%)	4,235 (6.7%)	45,150 (71.3%)	13,731
01/01/2015 – 31/05/2015	57,499	381	28,558 (49.6%)	3,650 (6.3%)	42,617 (74.1%)	14,408
<b>Total</b>	<b>235,681</b>	<b>331</b>	<b>106,383 (45.1%)</b>	<b>16,411 (7%)</b>	<b>167,396 (71%)</b>	<b>37,592 (unique)</b>

Considering the 37,592 unique users that contributed to #localgov during the study, it is not surprising that a large proportion posted occasionally (fewer than 5 times) while a much smaller group made hundreds or even thousands of posts. Table 2 shows the distribution of posting activity per user. With an average of 6.3 posts and a high standard deviation (SD) of 71.7, there are 24,427 users (65% of the total) that made only a single contribution. A further 9,106 users or 24.2% posted between 2 and 5 times, while 3,464 users or 9.2% posted between 6 and 50 times. The remaining 595 users or 1.6% posted over 50 times and up to 7,445, with twenty-one forming the most active group with over one thousand posts each. This group predominantly includes influential individuals with large networks of followers like @aball\_localgov, @cllrharrington, @danslee, and @dominiccampbell, or accounts from media or local government organizations such as @localgoveditors, @Guardian\_local, and @LGANews, an account run by the Local Government Association. In total, there were 899 users with more than 10,000 followers and the average was 1,770 followers across all contributors.

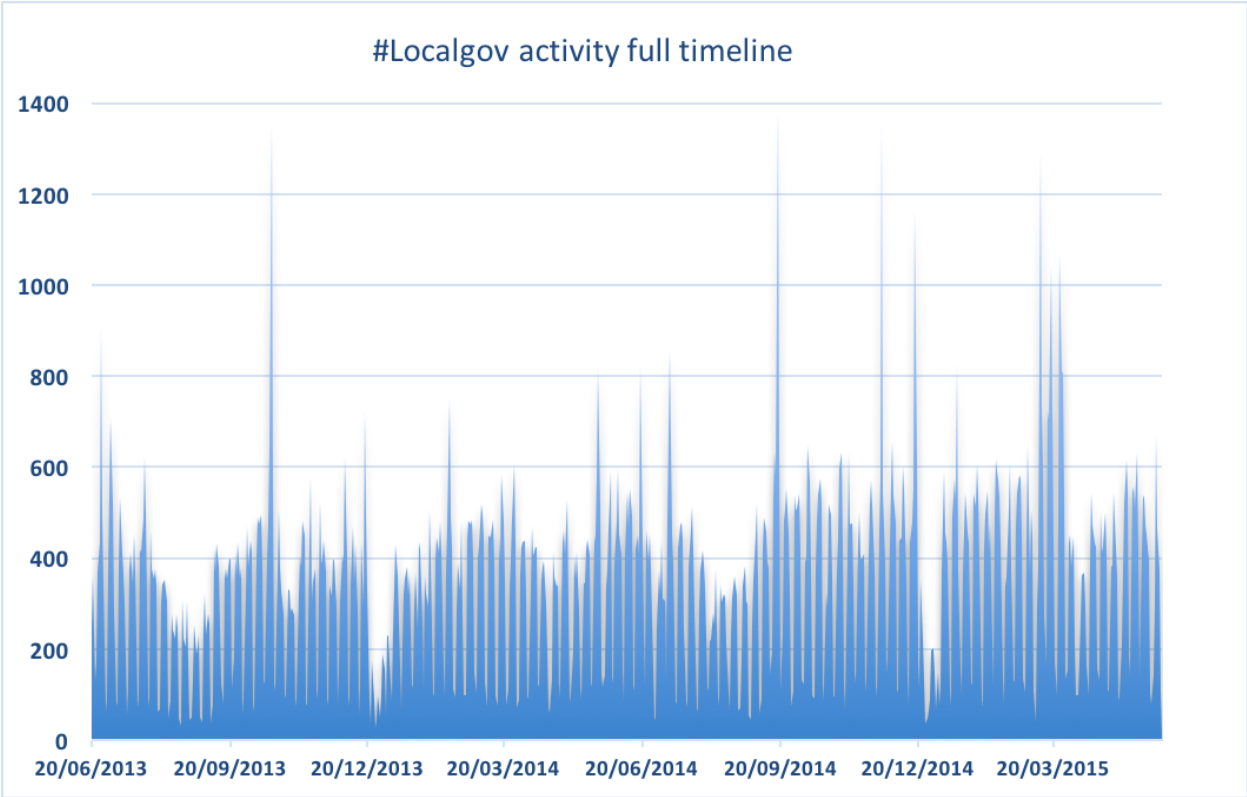


Figure 2 – timeline of #localgov activity showing the number of tweets posted per day

Table 2 – distribution of posts per user (average 6.3, standard deviation 71.7)

Number of posts	Number of users	Cumulative percentage
1	24,427	64.98%
2 - 5	9,106	89.20%
6 - 50	3,464	98.42%
51 - 100	288	99.18%
101 - 500	264	99.89%
501 - 1,000	22	99.94%
Over 1,000	21	100.00%

#### 4.2. Conversations and networking relationships (micro analysis)

In an open community as wide as local government and covering a period of over two years, it is expected that there is no single dominant theme of conversation. Many different conversations take place over #localgov where information sharing evolves around engagement with popular media and other accounts related to news and events in the sector. Many of the posts are purely informational (e.g. retweeting the news), but we also find a large number of direct interactions and exchange of opinions. It is important to explore the relational dynamics of actors depending on the specific conversations in which they are participating as well as with regard to the network as a whole.

To provide an overview of the diversity of conversations, table 3 shows the most frequent keywords that appeared within original tweets and retweets. The most popular words refer to local and contemporary themes about developments in the sector like “council”, “local”, “city”, “county”, “latest”, “today”, “jobs”, “news” or “people”. This is an anticipated form of everyday common talk amongst professionals in local government. Tweets containing these keywords might refer to the sector as a whole (national issues) or only to regional and local developments. Topical variations also take place because certain local authority accounts use the hashtag intensively to disseminate their updates. Slightly more specialized thematic talk can be observed in keywords such as “care”, “digital”, “social”, “#socialcare”, “services”, “cuts” or “funding”. Words that do not appear in table 3 but were found near or over 1,000 times include “spending review”, “devolution”, “budget” and “finance” and “cost”.

Table 3 – most frequent keywords within original tweets and retweets

	Original tweets	Retweets
Over 5,000 mentions	Council, local, #bcclive, new, government, councils	Local, new, council, councils
Between 3,000 and 5,000 mentions	City, services, public, today, committee, live, social, meeting	@guardian, cuts, @localgoveditors, government, @icma, services, @lgacomms, today
Between 2,000 and 3,000 mentions	Now, work, people, great, report, see, good, need, help, get, news, cuts, district, like, service, day, care	Public, @lganews, report, @thecpbb, great, lga, people, read, social, @themjcouk, @elgl50, work
Between 1,000 and 1,500 mentions	#localgovwebcast, future, next, funding, community, county, digital, #localgovjobs, time, chief, one, health, blog, use, sector, just, todays, #socialcare, jobs, make, data, year, read, role, week, media, latest	@gdnlocalleaders, need, future, funding, now, get, help, good, digital, city

Content that attracted more attention in terms of retweets is driven both by the popularity of high profile accounts, such as local government organizations, media, think tanks, or influential individuals (e.g. @Guardian, @LocalgovEditors, @LGAcomms, @JRF\_UK, the Guardian editor @PatrickJButler) and specific keywords like ‘cuts’, ‘services’, ‘funding’, ‘future’ and ‘digital’. The following tweets are the ones that received the most retweets within the dataset:

- @JRF\_UK: *Read our new report: The cost of the cuts: the impact on #localgov and poorer communities [http://\\*\\*\\*](http://***) [200 RTs]*
- @BBCNews: *1bn from fuel duty should go to fix potholes and roads in England and Wales #localgov [http://\\*\\*\\*](http://***) [170 RTs]*
- @HelReynolds: *A quick guide to answering people who use social media to talk to your organisation: [http://\\*\\*\\*](http://***) #localgov [155 RTs]*
- @PatrickJButler: *Here's the no more cuts letter to Osborne from 375 council leaders [http://\\*\\*\\*](http://***) #localgov [131 RTs]*
- @JRF\_UK: *Our research highlights the cost of the cuts to #publicservices in the UK since 2010 #localgov [http://\\*\\*\\*](http://***) [130 RTs]*

Therefore, conversations within #localgov are stimulated by both endogenous factors related to developments in local authorities (e.g. sectoral updates or news from service departments), and exogenous factors, mostly related to central government’s actions and other important national conversations. This is consistent with what we can observe in figure 1 where the spikes of activity within the dataset were triggered by political or financial/budgetary events while a steady flow of activity across the whole dataset relates to discussions about developments in the sector. Table 1 indicates that such activity increased within the dataset over time.

#### 4.2.1. Network selection and overview of metrics

For the purpose of network analysis and visualization, we selected and filtered two illustrative examples based on a sub-set of keywords. We refer to these as *bunches* of conversation and were chosen as: (1) tweets containing “cuts” or “austerity” for a total of 12,196 and (2) tweets containing “services” or “reform” for a total of 12,035. The distinction of these conversations facilitates an analysis of the micro-dynamics of interaction between different accounts in a more coherent and manageable subset of all #localgov tweets. Selecting words in related pairs assures that each conversation is based on a coherent theme that is not a sole keyword. The specific pairs of popular keywords had a sustained and relatively stable presence over the whole dataset while tweets about “cuts” or “austerity” experienced spikes during the budgetary events of June 2013 and March 2014. With other possible selections like ‘decentralization’ or ‘localism’, activity was more concentrated in parts of the dataset and faded over time. This selection further reflects the diversity of themes around local government finance and the future of services with regard to institutional changes in local government.

Networking relationships between users taking part in the conversations have been constructed in the form of mentions, which cover both direct mentions (using ‘@’ within the text of the tweets) and retweets (tweets containing ‘RT @’). Table 4 presents an overview of the network metrics for the two bunches of conversation and the whole dataset as a point of reference.<sup>4</sup> The large number of clusters detected in the whole dataset (318) is expected for open Twitter discussions over a long period of time (Abascal-Mena et al., 2015), especially given that the whole dataset includes 38,509 mentions made by 15,014 users. The cuts-austerity network has 10,634 mentions by 5,895 users and the service-reform network 9,816 mentions by 5,195 users. The average clustering co-efficient is comparable for the three networks between 0.175 and 0.208. In proportion, each of the two bunches represent about 5% of the total dataset while corresponding to about 25-26% of the interaction between users. This suggests that interactions between users are more likely to be clustered around specific topics or events than spread symmetrically across the whole range of activity within #localgov.

Table 4 – network metrics for the two bunches of conversation and the full network

	Cuts - austerity	Services - reform	Full network
Total tweets	12,196	12,035	235,681
% retweets	56%	47%	45%
Average daily activity (tweets)	17	17	331
Tweets per user	2.1	2.3	15.7
Users (nodes)	5,895	5,195	15,014
Mentions (edges)	10,634	9,816	38,509
Average in-degree centrality (standard deviation)	1.8 (17)	1.9 (9.7)	2.6 (18.2)
Users with zero in-degree centrality (% of total users)	4,117 (69.8%)	3,152 (60.6%)	7,801 (52%)
Users with 10 or higher in-degree centrality (% of total users)	158 (2.7%)	174 (3.3%)	620 (4.1%)
Number of different communities detected (clusters)	143	193	318
Average clustering co-efficient	0.175	0.187	0.208

<sup>4</sup> Clusters and modularity indices were calculated by the Gephi software using the default algorithm by Blonde et al. (2008).

Average closeness centrality (standard deviation)	3.5 (2.2)	3 (2.3)	2.9 (2.3)
Average betweenness centrality (standard deviation)	3,007 (35,590)	2,278 (20,832)	12,815 (169,540)

All three networks have similar levels of in-degree centrality that represent the average mentions received per user. As expected by the distribution of posts in table 2, there is a large number of users that have not been mentioned by others within the dataset while a core of users in each conversation receives 10 or more mentions (93 users received 50 or more mentions in the whole dataset). This proportion is higher for the services-reform bunch (3.3% compared to 2.7%) which also has a smaller proportion of users that were not mentioned by others (60.6% compared to 69.8%). The latter represents the occasional contributors in both bunches that draw on resources from popular media accounts as well as important individuals.

The centrality measures can be informative about the structure of the networks. The closeness centrality measures for the whole dataset (mean 2.9, SD 2.3) shows that even the most influential accounts in the network do not really dominate the whole discussion. The betweenness centrality measure (mean 12,815, SD 169,540) shows that the most influential accounts receive mentions from all parallel conversations with the network, which is expected for national media and other high-profile accounts. While closeness centrality is distributed across the whole range of actors-users (median 4.23), betweenness centrality is asymmetrically driven by 13,045 accounts that have a score of 0 because they receive zero or very few mentions. The same observation applies to the two bunches of conversation where closeness centrality is distributed while betweenness centrality remains asymmetrical and proportional to the size of the whole network.

For each of the two bunches, we outline the composition of the most prevalent clusters or groups of users and visualize each bunch in figures 3 and 4.<sup>5</sup> The appendix provides illustrative examples of tweets related to each bunch.

#### 4.2.2. *Conversations about cuts and austerity*

Cuts and austerity represent a bunch of conversation with wide relevance to civil society at the time of study, hence the significant number of 5,895 users-nodes involved in such discussions over #localgov. This conversation is driven to a large extent by the sharing of media and other resources (high proportion of retweets at 56%), triggered by events that are exogenous to the #localgov community (national budget announcements). The average activity of 17 tweets per day (SD 27) ranges from 1 to 346. Every account in this network receives an average of 1.8 mentions (SD 17),

<sup>5</sup> The visualizations shown in figures 3 and 4 are based on force-directed graph drawing, using the Fruchterman and Reingold (1991) algorithm.



with 158 accounts receiving 10 or more (up to 990). Several major political or government accounts receive mentions without reciprocating (e.g. Erik Pickles, George Osborne or HM Treasury).

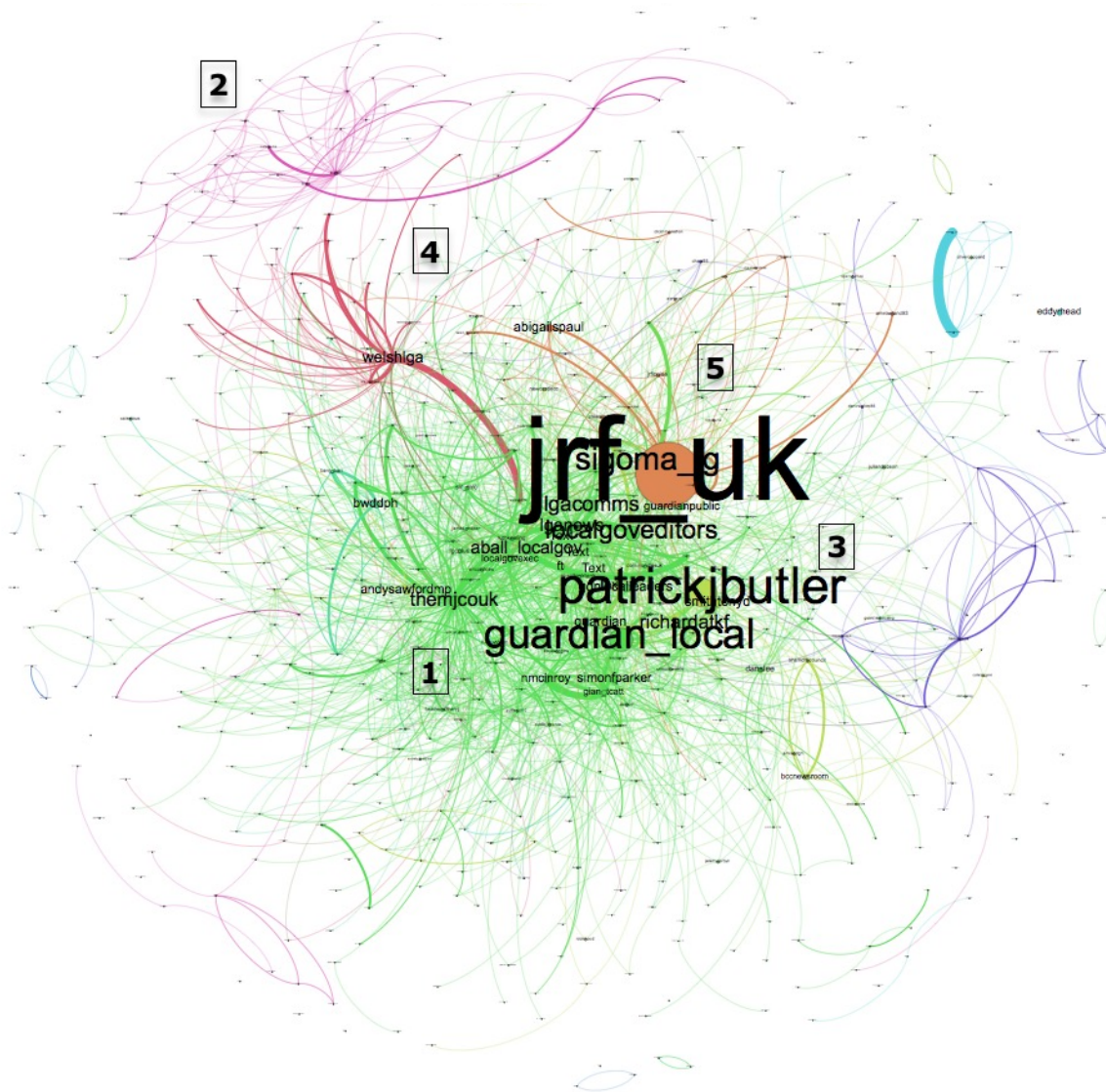


Figure 3 – network of mentions within the cuts-austerity bunch, only accounts mentioned 3 or more times shown.

Figure 3 shows the network of interactions between accounts that received at least three mentions<sup>6</sup>. The graph shows 886 users-nodes (15% of the total visible) and 2,630 mentions-edges (24.7% of the total visible). Out of the 143 different communities detected, there are five visible clusters of conversation that occupy near or more than 5% of the whole network:

<sup>6</sup> Removing more occasional contributors from these visualizations is a necessary step in order to be able to distinguish the main network clusters in figures 3 and 4.

Cluster (1) (53.7%): general news sharing driven by the Guardian accounts (@Guardian\_Local) and accounts held by the Local Government Association (@Localgoveditors, @LGAnews or @LGAcomms).

Cluster (2) (8.8%): international information sharing that appears disconnected from UK-related discussions. The main accounts are @ICMA and @Careersingov.

Cluster (3) (7.65%): driven by 425 mentions to @PatrickJButler, a Guardian journalist and social policy editor.

Cluster (4) (5.5%): interactions centered around accounts from important actors in Wales like @WelshGovernment or @WelshLGA.

Cluster (5) (4%): interactions around the tweets of @JRF\_UK (the Joseph Rowntree Foundation), the most mentioned account in this network (990 mentions) due to the related reports commissioned by the JRF, mainly Hastings et al. (2012).

Interactions in this bunch exhibit some characteristics of a protest movement with fast diffusion of information around influential accounts; a formation that Smith et. al (2014) refer to as a broadcast network. Many local level actors were particularly involved to demonstrate the controversial nature of the spending reductions, criticize the central government's decisions and/or openly protest. As shown in the appendix, tweets containing 'cuts' or 'austerity' include many negative reactions about the impacts of the cuts in local communities, such as the termination or reduction of local services. On a more positive note, we can find within the tweets commentaries about how local authorities have managed to maintain good levels of service and identified ways to cope with the cuts. Figure 5 in the appendix shows keyword associations between the most common words in this bunch of discussion. The network shows that tweets from the different clusters of actors mostly discuss the issue in a similar way in terms of keyword co-occurrence (large cluster in red).

#### *4.2.3. Conversations about services and reform*

Services and reform are an equally popular and sizeable bunch with 5,195 users-nodes involved. The proportion of retweets (47%) is closer to the average for the whole of #localgov (45%), which suggests that there is a good proportion of original comments and opinions exchanged. The average daily posting frequency is 17 tweets per day (SD 17), ranging from 1 to 169. Accounts in this network receive on average 1.8 mentions (SD 9.6). There are 174 accounts with 10 or more mentions, up to 273. Similar to the cuts-austerity network, certain major political accounts receive many mentions that do not necessarily reciprocate, e.g. Erik Pickles, the former Secretary of State for Communities and Local Government, receives 50 mentions only in this bunch.

Compared to cuts-austerity, the clustering also reveals more distributed conversations (193 compared to 143) based on a similar number of tweets. Figure 4 shows the network of interactions between accounts that received at least three mentions. There are 1,077 users-nodes (20.7% of the total visible) and 3,101 mentions-edges (31.6% visible). The main clusters in figure 4 that occupy 5% or more of the network are:

- Cluster (1) (31.6%): conversations involving important policy actors and think tanks such as @EricPickles, @communitiesUK and the account of @ServiceReform (Public Service Transformation Academy) that specializes in knowledge sharing in public services.
- Cluster (2) (14.3%): discussions involving @LGAnews or @LGacomms, the two main accounts of the Local Government Association. This cluster also includes the account of the @KnolwedgeHub.
- Cluster (3) (12.4%): a cohesive cluster driven by accounts specializing in digital transformation and communications in local government (e.g. @futuregov, @dominiccampbell, @danslee).
- Cluster (4) (9.3%) interactions around the tweets of @Guardian\_Local and editor @PatrickJButler.
- Cluster (5) (7.6%) international information sharing driven again by @ICMA and popular accounts covering global local government news.
- Cluster (6) (6%) conversations about Wales involving the @WelshGovernment or @WelshLGA.

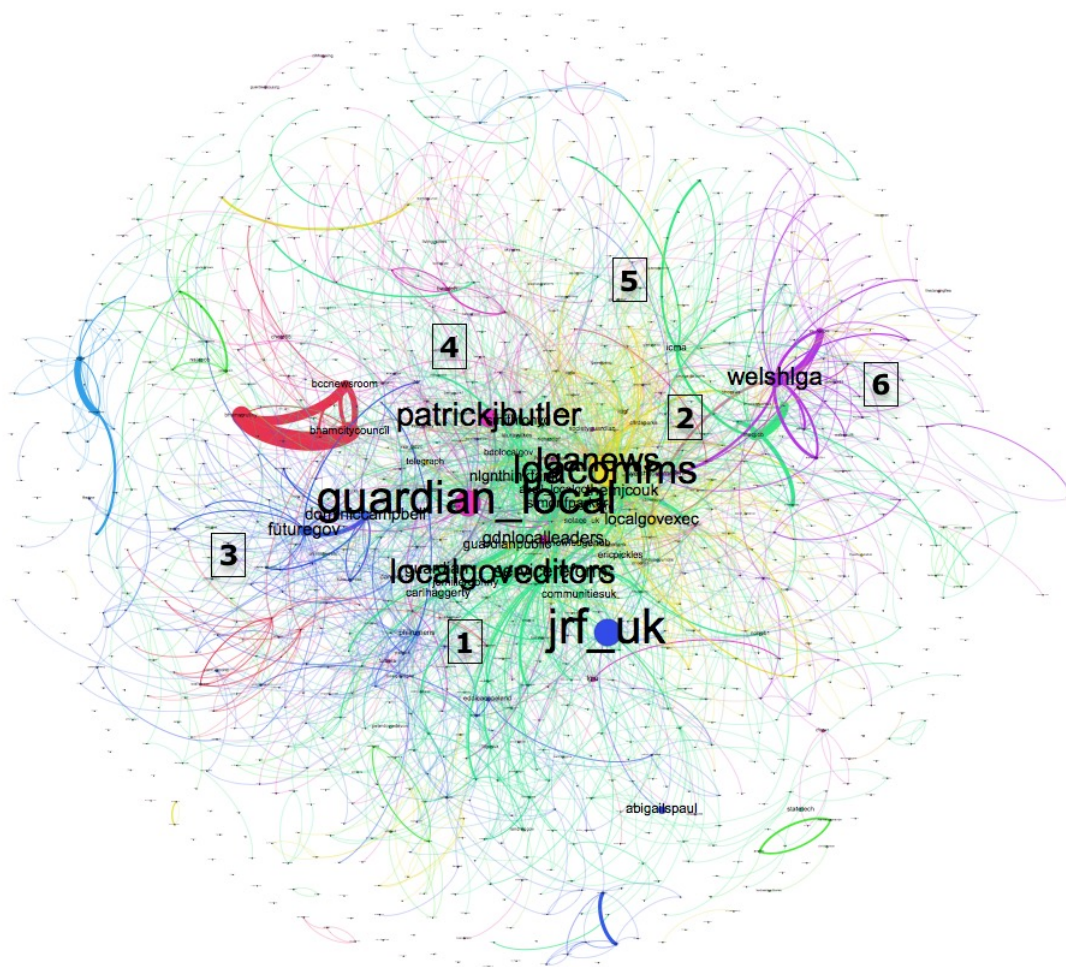


Figure 4 – network of mentions within the services-reform bunch, only accounts mentioned 3 or more times shown.

Conversations about services-reform form a theme more endogenous to the #localgov community with clear relevance to knowledge exchange, as also evidenced by the presence of the Knowledge Hub (2016) account in the network. In contrast to austerity-cuts, the bunch on services-reform is more strongly driven by knowledge exchange within a network of practitioners across local government service departments. The examples of tweets shown in the appendix contain news about major developments in each service department with children and care services being heavily mentioned (other examples not shown in the appendix relate to democratic or financial services). Frontline and digital services also receive a lot of attention especially in the context of service reform or financial pressures. There are further tweets about what service reform means and how it impacts different groups of the public. There is also a group of tweets on shared services and developments within councils.

Figure 6 in the appendix shows keyword associations between the most common words in this bunch, similar to figure 5 for the cuts-austerity bunch. Here we can observe more diversity in the most frequent associations between keywords as the clusters are more balanced and represent the different aspects of the conversation.

## **5. Discussion and implications**

### **5.1. Localgov as a space of information sharing and networking**

The analysis of #localgov conversations during the period 2013-2015 reflects the emerging role of digital forums in relation to professional practice in the public sector. In response to RQ1, information sharing over #localgov is in line with the characteristics of professional networking, such as decreased activity over weekends and high percentage of embedded sources. Strong rises occur in Twitter activity during major political and budget events while an increasing level of activity has been sustained over time. Different conversations take place in parallel where information sharing evolves around engagement with popular media and other accounts related to events and developments in the sector. Many contributions are simply informational (e.g. retweeting the news) while we also find a large number of direct interactions and exchange of opinions.

The two bunches of conversation analyzed in depth show the plurality of discourses that co-exist over #localgov. In the cuts-austerity bunch, local level actors were particularly involved to demonstrate the controversial nature of the spending reductions, criticize the central government or simply protest. In contrast, discourses on services-reform were motivated by knowledge exchange within a network of practitioners across local government service departments. Activity in this bunch is the closest we can observe to a network of practice within local government that backchannels events and important developments in the sector. This form of interaction differs from the more focused groups that exist in communities like the Knowledge Hub. We can rather observe that #localgov facilitates exchanges across these more specialized communities.

The plurality of conversations does not translate into balanced engagement of participants as shown in table 2, reflected by the centrality measures and visualized in figures 3 to 4. Taking into account that users contributing to online communities always have diverse professional motivations (Gilbert, 2016; Wasko & Faraj, 2005), such assessments over #localgov become even more complicated because: (1) the nature of participation or contribution is completely open, (2) Twitter's function as an information network (retweets, mentions, visibility of hashtags) allows contributions to reach beyond active participants in ways that cannot be fully captured, (3) activity on #localgov is publicly accessible even to those without a Twitter account. Such uneven, layered and distributed audiences can be expected in hashtag communities (Choi & Park, 2014; Highfield et al., 2013; Marwick & Boyd, 2011) where the sporadic involvement of a large number of participants might imply a much larger audience 'listening to' these conversations.

In terms of the dynamics of interaction (RQ2), the extent to which contributors experience #localgov as a community fluctuates depending on the topic and users' individual motivations. Existing local government networks and organizations, civil society actors, and media accounts act as hubs in most conversations. Geographical proximity also influences how users take part in some conversations (e.g. announcements by local authorities, conversations related to Wales) but does not seem to be a primary factor, at least in topics of national or international interest. Reliance on existing relationships is rather minimal although it is likely that conversations tagged with #localgov are also loosely determined by "following" relationships or result in new connections. The distribution of centrality measures shows that the hashtag has distinctive users with stable contributions but no central organization or actors that dominate the flow of information (Abascal-Mena et al., 2015).

Despite the open information sharing features and flexible formation of ties between individuals, interactions over #localgov still exhibit some boundaries. The network analysis suggests that there is ample communication and exchange of ideas between local government actors, across services, but much less across the tiers of government. Important actors such as central government departments and political actors are mentioned intensively in some conversations but do not usually engage with other users. Despite the limited active presence of central level actors in our study, the existence of these actors in the network is implied, and many tweets are aimed at actors at the center, such as the Department of Communities and Local Government (DCLG). This reflects, at least during the period of the study, the constant need in local government to understand the financial implications of central government's decisions and to use this information to work out tactics for local service reform. Information on local level responses is subsequently fed back to the center. Central government's continuing authority and local government's dependence strongly mirrors the established setting of intergovernmental relationships in the UK (John, 2014; Jones & Stewart, 2002). The analysis of #localgov further establishes that while central government controls most of the revenue of local authorities, it also shapes discourses amongst local government actors.

This finding contrasts previous studies like Hong and Nadler (2016: 91) who find that *'political voices are more concentrated when a voice is measured by the online network using social media*

*than when measured using traditional indicators, such as the number of lobbyists*'. Instead, the analysis of #localgov shows that the prominence of political voices in the offline world is not necessarily resembled in online networks. A major difference to note here is the professional nature of discussions over #localgov compared to open social media discussions about national politics.

## 5.2. Implications for networks and networking research

The analysis of #localgov provides an illustrative case that contributes to our understanding of the formation, purpose and importance of informal networks. Regarding the formation, Janowski et al. (2012) refer to informal networks as emergent ties that will tend to formalize over time and seek legitimacy. Online communities like #localgov have no such explicit purpose and might change the scope of their activity depending on the engagement channels that enable them. Notwithstanding the strong self-organizing element involved in a hashtag community, the data collected over two years support the status of #localgov as a sustainable space where more occasional participation by users might spill over to other topics of professional interest. Therefore, rather than being a 'network' in the strict sense, hashtag communities and digital spaces like #localgov facilitate the practice of 'networking' as an organizing concept (Isett et al., 2010).

In terms of its purpose, informal networking over #localgov is much different from advice networks that exist between public sector professionals with similar job titles. Advice networks are semi-private and to a large extent instrumental (problem solving) while also involving internal competition and other barriers to knowledge dissemination (Binz-Scharf et al., 2011; Siciliano, 2015). The open, dynamic and emergent discussions over hashtag communities have diverse tones – from the official to the informal – and occupy several functions that are altogether informational (e.g. sharing or commenting on the news), expressive/emotional (e.g. protesting against the cuts) or aimed at knowledge sharing / policy transfer (e.g. interactions with other professionals in similar service areas). Such interactions can be seen to exist in parallel to the more focused and private function of advice networks and with much different effects, without depending on mutual or permanent relationships between individuals. Similarly, debates over #localgov are complementary to the ones occurring in formal networks and offline forums, such as discussions within central-local government working groups about service reforms or committee conversations within local authorities. Twitter discussions backchannel such debates and provide a multi-expressive function for professionals in the sector that is different from formal channels and direct interpersonal connections.

The above lead to an important realization about the proposition and importance of spaces like #localgov: they provide an open platform to spread real-time information from a wide array of professional backgrounds, political perspectives, and geographical places, across the government system. This function of informal networking offers an accelerated form of institutional sharing of good practice and innovative ideas through rapid information exchange (Lowndes 2005; Crouch and Farrell 2004). Both Siciliano (2015) and Binz-Scharf et al. (2011) underline the importance of informal networks for overcoming barriers to knowledge exchange in systems of decentralized

governance. The findings from #localgov demonstrate that the knowledge exchange role of informal networks can be likewise significant in centralized environments such as the UK intergovernmental system. With limited institutional sharing occurring vertically in centralized systems, informal networking interactions have potential to omit intergovernmental knowledge gaps. This was evident in particular in conversations about how local authorities deal with budget cuts and attempt to reform services within their new local realities. The generally one-party composition of UK cabinets often translates in polarized interactions with local government actors who do not resemble cabinet's political orientation. As a result, local actors from different parties might have substantially less access to central government. For these actors, #localgov fulfills an important expressive function enabling them to cross professional and organizational hierarchies that impede communication in offline discussions. As such, it can be argued that #localgov differs from offline networks at least within the institutional setting of the UK intergovernmental system.

Finally, there are noteworthy methodological implications with the study of #localgov being the first analysis of informal networking using social media data in this context. Social networking analysis methodologies are gaining popularity in public administration research (Kapucu et al., 2014) and are seen as particularly suitable for understanding social media conversations beyond content engagement analytics (Mergel, 2017). The scope of the analysis over #localgov contributes to this array of methodological choices. In emergency and risk communication networks, analysis is dynamic and event-based, usually aiming to show how fast diffusion of crisis information is shaped by important actors (Chatfield et al., 2013; Jung & Park, 2014; Jung & Park, 2016). In large political conversations, rapid diffusion is not as critical and other methods can be applied to show how influence spreads over political networks and how it echoes discourses in other parts of the public sphere (Hong & Kim, 2016; Hsu & Park, 2012).

In large professional networking conversations like #localgov, the aim is to uncover both the shape (i.e. who engages and how) and the state of the community (multiple parallel discourses). Widely applicable methods like qualitative or quantitative sentiment analysis (e.g. Gaspar, Pedro, Panagiotopoulos, & Seibt, 2016) are mostly uninformative for such a dataset due to the very large variety of content and expected lack of sentiment fluctuations in a professional environment<sup>7</sup>. Instead, it is important to consider both the macro and micro properties of such communities with multiple methods such as user metrics, timeline mapping and keyword analysis applied selectively. In line with the findings of Abascal-Mena et al. (2015), we identified that a small proportion of the activity over #localgov occupies a much larger proportion of the interactions between users. Therefore, to conceptualize the main information flows in such large datasets, semantic sampling criteria can be applied based on a community's interests. Network visualizations and metrics over a smaller sample can be indicative of the key actors of a much larger network.

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<sup>7</sup> Sentiment analysis using SentiStrength (2017) was applied to the whole dataset and showed mostly neutral sentiment and insignificant daily fluctuations with very limited exceptions.

### 5.3. Policy implications

Networking in spaces like #localgov might not be receiving sufficient attention compared to citizen-government interactions and several policy implications emerge. First, digital networks in local government help to identify where service or funding pressures can build up, and what solutions to consider for alleviating them. This information can be valuable information for local level actors facing similar challenges and will release innovative knowledge from geographically and functionally dispersed silos (Noveck, 2009). Specifically, with institutional changes taking place in the UK in recent years, information sharing can provide much needed feedback for national policy makers regarding the local impact of central government policies. As continuing budget pressures render it unlikely that the central government will significantly increase its monitoring capacity of such developments, digital networks offer a new feedback mechanism to acquire insight about local trends. Capturing and evaluating datasets of online discussions such as #localgov can contribute to policy makers' efforts of building evidence from social media data (Mergel, 2017).

For public managers, it is important to realize the dual knowledge sharing and expressive function of digital networking relationships across organizations and tiers of government. For example, conversations about cuts and austerity allowed local government actors to voice their disappointment with the central government's suggestions about how to deal with the funding cuts. In addition, as UK local governments are responsible for providing many different services, such as infrastructure, rubbish collection, and environmental health, they naturally apply a stronger integrated public service approach which can help to alleviate central government knowledge silos. Although knowledge sharing in digital networks of local government generates relevant information for central policymakers, their expressive function arguably diminishes their potential as channels for knowledge mediation. This particularly applies when political polarization occurs and digital exchanges become captured by dissonances across ideological lines; generally expected of online political discussions (e.g. Choi & Park, 2014; Hong & Kim, 2016). Such risks are important in First Past the Post political systems, such as the UK, the US, and Canada, where the tradition of single party executives at the central and local level heighten political polarization. The reputation of digital networks as a reliable source of information exchange will benefit from less ideological exchanges. It is encouraging that the network metrics from different parts of our dataset reveal relatively low centralization of discussions compared to studies that show higher concentration of online activity by large and powerful organizations (e.g. Hong & Nadler, 2016).

Building stronger connections between digital networks in local government and traditional policy forums that have acquired a strong reputation for providing non-partisan information, such as the Local Government Association, might enhance the position of #localgov for innovative and expertise-based knowledge exchange. More active participation by central government could also enhance the position of #localgov by facilitating engagement towards more meaningful innovation discussions, which would be particularly relevant for central government departments with strong service links to local government. This suggestion opens new territory for the official social media



guidance for civil servants who are generally more restricted in publicly expressing their views. So far, guidelines have emphasized the use of social media as an instrument to receive feedback from the public rather than a way to actively interact with stakeholders (Cabinet Office, 2014).

## **6. Conclusion**

Understanding the evolution of open discussions in digital networks is challenging due to the novelty of the phenomena and the exploratory nature of the analysis. There are limitations in such studies where interpretations are attempted between online and offline activity. Information flows in a popular hashtag community like #localgov are determined by a large number of events that might be difficult to understand using summary measures like keyword analysis and network visualization. The choice of #localgov, motivated by intense discourses over local government finances during our time period, increases the complexity of analysis compared to more contained hashtags. As a self-assigned method, we cannot know what motivated each user to tag #localgov to their tweets and the extent to which they monitor other discussions within #localgov.

Another consideration is that our filtered micro-analysis of conversations within #localgov does not capture the full range of exchanges that took place over a period of nearly two years. For example, discussions about digital innovation in service areas and major political developments (localism, decentralization) were further topics of interest in the full dataset. Further, it needs to be noted that local government is a rather distributed area of professional practice in the public sector and, as such, more likely to benefit from open discussions across geographical boundaries. The needs of other communities involved professionally with the public sector might be different in either direction, hence making informal networking less relevant.

There are important future research needs regarding the role of informal and digital networks in the public sector. More work can be done to map and understand interactions in digital networking spaces, predominantly how they resemble or shape dynamics outside these spaces. For example, a further analysis step to learn more about users contributing to #localgov is either by looking at their structural positions within networks (connections), sampling their content outside the hashtag itself or mapping the available metadata.

Finally, although our knowledge of what constitutes or generates institutional change has increased substantially, relatively little is known about the role of informal institutions during reform processes (Helmke & Levitsky, 2004). Resembling many features of informal institutions, digital networking spaces offer a unique opportunity to investigate reform processes in the context of local service delivery. Hence, more can be done not only to map digital interactions and audiences but also to draw on these data to enhance our understanding of the working of governance institutions and processes. Such a relationship will vary based on the context of discussions with the current study focusing only on the nature of information sharing and networking.

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## Appendix – keyword associations and illustrative examples of tweets

<b>Cuts - austerity</b>	
Strong sentiment against	<p><i>Great #mjawards13 this evening but cloud of further damaging cuts could have dampened proceedings but didnt. #localgov is under Govt attack</i></p> <p><i>Protest rally against proposed Doncaster council cuts #localgov <a href="#">http://***</a></i></p> <p><i>The Devil is in the detail. The prospect of a further 10 cut to #LocalGov budgets is a devastating prospect even including pooled budgets.</i></p> <p><i>The tragedy of these cuts captured brilliantly by @***: In Newcastle libraries and pools shut <a href="#">http://***</a></i></p>
Impact of the cuts on services and individuals	<p><i>Public sector austerity measures hitting women hardest <a href="#">http://***</a> 2 times more women than men have lost #localgov jobs</i></p> <p><i>CCTV cameras are being cut back by local councils saving money - watchdog warns <a href="#">http://***</a> #localgov</i></p> <p><i>County consults on 500k cuts to bus subsidies <a href="#">http://***</a> #transport #localgov</i></p> <p><i>From budget cuts to council tax freezes we draw together the main points on #localgov from the #SpendingReview <a href="#">http://...</a></i></p>
Activities happening despite cuts and austerity	<p><i>#localgov has gone a long way in transforming itself in the face of austerity <a href="#">http://***</a> Transformation is an ongoing process</i></p> <p><i>#localgov is finding ways to maintain F2F customer contact despite austerity-driven budget cuts <a href="#">http://***</a> via @***</i></p>
Ways forward for local government	<p><i>Can #localgov innovate its way out of the cuts <a href="#">http://***</a> new @*** report</i></p> <p><i>Is sharing costs among the community the way to cope with cuts <a href="#">http://***</a> #localgov</i></p> <p><i>Another round of austerity ahead LGC #SR13 <a href="#">http://***</a> How #localgov can absorb #cuts without impacting #frontline services</i></p>

<b>Services - reform</b>	
Frontline and public services	<p><i>Osborne confirms that #localgov will receive another slash in funding of 10. How much more can frontline services take #SR13</i></p> <p><i>LGA launches Annual Conference today with a ten-point plan to improve public services #lgaconf13 #localgov <a href="#">http://***</a></i></p>
Children's services	<p><i>Medway pledges to improve inadequate childrens services following @Ofstednews report <a href="#">http://***</a> #localgov</i></p> <p><i>Worked in #localgov 3yrs but in 3wks of working in Childrens Services theyve blown my mind. Massive respect for the social workers.</i></p> <p><i>Local authority chiefs warn #Ofsted over simplistic childrens services framework #localgov <a href="#">http://***</a></i></p>
Service/welfare reform	<p><i>People will remember welfare reform as the state punishing the poor <a href="#">http://***</a> #LocalGov</i></p> <p><i>reform primary care with social care outside #localgov argues @*** <a href="#">http://***</a> - 90of ASC services already outsourced</i></p> <p><i>Council-led commission launched to examine public service reform &amp; #localgov funding changes in Scotland: <a href="#">http://***</a> #sp4 @***</i></p> <p><i>.@reform correlation between cuts and innovation in #publicservices most protected tend to be less innovative. #localgov innovative</i></p>
Care services	<p><i>#nurses in #socialcare should have CPD covered by #NHS or #localgov same way that nurses working in Health services do #Joinedupthinking</i></p> <p><i>If only we could use philanthropy or other means to rebuild care services from a truly client perspective. Current model broken #localgov</i></p> <p><i>How are social enterprises developing services &amp; products to cope with dementia #socialcare #localgov @GdnSocialCare <a href="#">http://***</a></i></p>
Digital services	<p><i>Cabinet Office accept that #localgov needs to know what funding is available to support people who cant access their digital services</i></p> <p><i>#localgov report on councillors attitudes to using digital to improve local services <a href="#">https://***</a></i></p> <p><i>40 of local authorities have still not made any savings through the digitalisation of public services <a href="#">http://***</a> #localgov</i></p>
Shared or sharing services	<p><i>As councils learn #localgov budgets to be cut by 2.9 @*** on the opportunities #sharedservices offer <a href="#">http://***</a></i></p> <p><i>#lgaconf14 @EricPickles re #localgov focus should be on sharing services but wouldnt rule out reorganisation down the line</i></p> <p><i>At least 96 of councils across the country sharing services with other councils #LGAProductivity #LGA #localgov <a href="#">http://***</a></i></p>





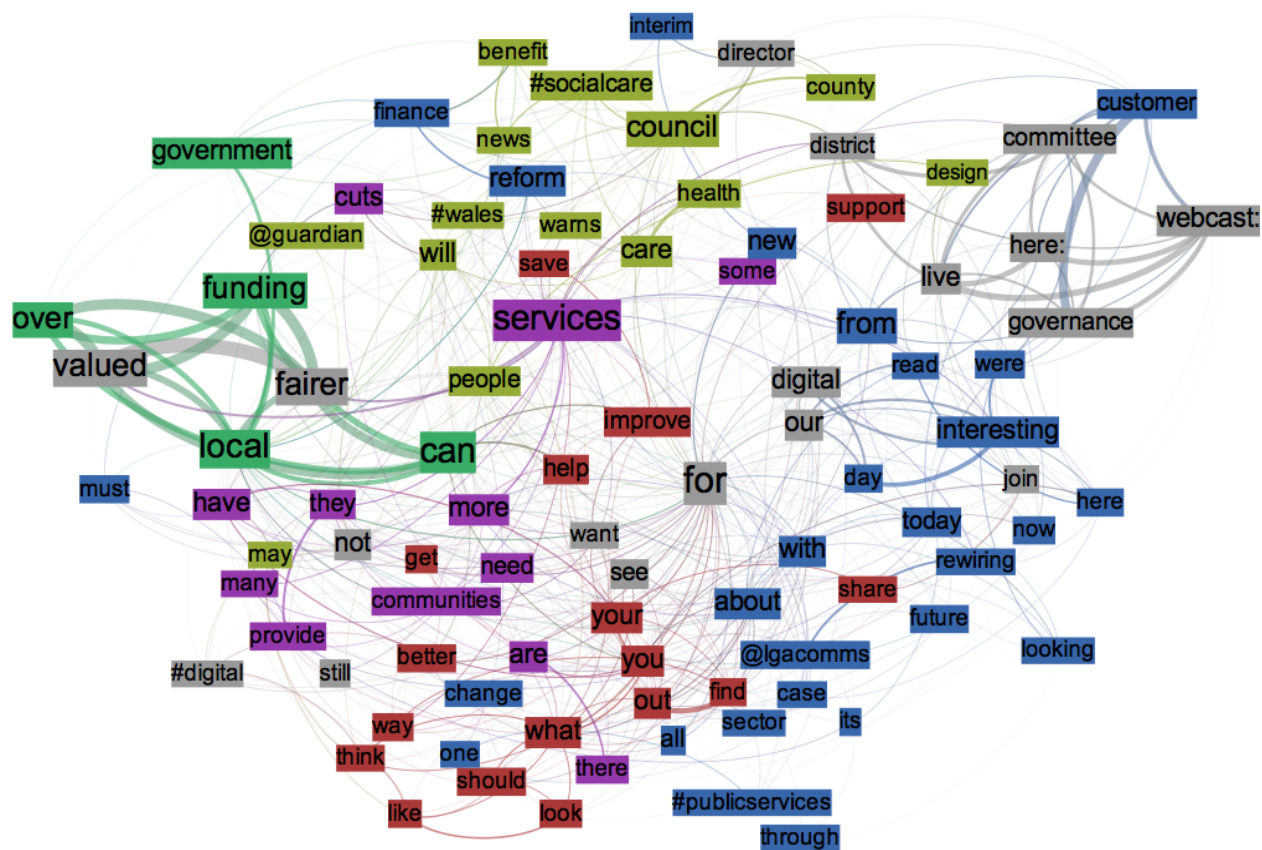


Figure 6— network of keyword associations in the service-reform bunch. Filtered from an initial selection of keywords mentioned at least 50 times in the service-reform tweets (only original). Shows 94 nodes (46% of total) and 723 edges (7.1% of total); selection made only for reasons of visibility. The five main clusters shown in different colors occupy 12.7% – 29.8% of the discussion each. ‘Localgov’ and keywords of fewer than three characters excluded; several nodes merged based on semantic similarities. Thickness of edges proportional to keyword frequency co-occurrence.