



# Beyond the eye-catchers: A large-scale study of social movement organizations' involvement in online protests

new media &amp; society

1–22

© The Author(s) 2020

Article reuse guidelines:

[sagepub.com/journals-permissions](https://sagepub.com/journals-permissions)

DOI: 10.1177/1461444820943854

[journals.sagepub.com/home/nms](https://journals.sagepub.com/home/nms)**Lia Bozarth**  and **Ceren Budak**

University of Michigan, USA

## Abstract

Existing studies of social movement organizations (SMOs) commonly focus only on a small number of well-known SMOs or SMOs that belong to a single social movement industry (SMI). This is partially because current methods for identifying SMOs are labor-intensive. In contrast to these manual approaches, in our article, we use Twitter data pertaining to BlackLivesMatter and Women's movements and employ crowdsourcing and nested supervised learning methods to identify more than 50K SMOs. Our results reveal that the behavior and influence of SMOs vary significantly, with half having little influence and behaving in similar ways to an average individual. Furthermore, we show that collectively, small SMOs contributed to the sharing of more diverse information. However, on average, large SMOs were significantly more committed to movements and decidedly more successful at recruiting. Finally, we also observe that a large number of SMOs from an extensive set of SMIs, including Occupy Wall Street, participated in solidarity or even as leaders in BlackLivesMatter. In comparison, few SMIs participated in Women's movement.

## Keywords

Online social movements, social media, social movement industries, social movement organizations

---

## Corresponding author:

Lia Bozarth, University of Michigan, Ann arbor, MI, USA.

Email: [lbozarth@umich.edu](mailto:lbozarth@umich.edu)

## Introduction

The value of social movement organizations (SMOs)<sup>1</sup> for advancing pre-web era movements has been extensively documented in prior studies. Indeed, SMOs have sustained movements and kept their members' ideologies alive in times of public apathy or hostility (Taylor, 1989). SMOs also have served as education centers (Morris, 1981), and provided the structure and leadership needed to unite different communities of participants for swift offline actions (Gerhards and Rucht, 1992). In addition, SMOs have advanced the recruitment of participants in high-risk activism (Fernandez and McAdam, 1988). In sum, SMOs have been valuable to movements concerning *sustainment*, *knowledge sharing*, *community building*, and *recruitment*. Furthermore, scholars also note that individual SMO success is mediated by its location (i.e. its *structural significance*) within the network of movement communities. Importantly, given the difficulty of gathering data, most of these studies have only focused on high-profile SMOs from a specific social movement industry (SMI). An SMI is defined as a group of SMOs with comparable core objectives (Zald and McCarthy, 1979).<sup>2</sup>

Recent years have seen growing academic interest in Internet activism (Barberá et al., 2015; Budak and Watts, 2015; Freelon et al., 2016; Theocharis et al., 2015). A few studies examine the participation of SMOs (Fetner and King, 2016; Guo and Saxton, 2014; Lovejoy et al., 2012; Obar et al., 2012; Spiro and Monroy-Hernández, 2016), but—much like studies of SMOs during the pre-web era—they often focus on a biased subset of exceptionally successful or prestigious SMOs (i.e. eye-catchers) from the core SMI. In other words, (1) non-institutionalized and small-sized SMOs and (2) SMOs from peripheral SMIs are potentially overlooked in existing research. This limitation is likely because many current methods for identifying SMOs are biased and also require substantial manual labor. Despite these difficulties, we highlight a few exemplary papers (Andrews et al., 2016; Edwards and Foley, 2003; Kempton et al., 2001) that have carefully collected comprehensive lists of SMOs through considerable effort. They have exhaustively searched for available commercial and non-commercial directories, surveyed participants, and examined Internal Revenue Service (IRS) documentation. Still, applying such approaches to large movements unconstrained by a specific SMI (Edwards and Foley, 2003; Kempton et al., 2001) or geographical region (Andrews et al., 2016) is difficult.

Focusing on Twitter,<sup>3</sup> we provide the first automated, generalizable method to identify over 50K SMOs in two distinct progressive US-centric online movements—BlackLivesMatter and Women's movement. Informed by prior studies, we reassess the role of SMOs in the dimensions of *sustainment*, *knowledge sharing*, *community building*, *recruitment*, and *structural significance*. We use three distinct perspectives, comparing (1) SMOs to individuals, (2) large SMOs to small ones, and we distinguish (3) SMOs from core and peripheral SMIs. The first comparison is motivated by existing divergent findings concerning the relative significance of SMOs versus individuals in social movements (Earl and Kimport, 2011; Spiro and Monroy-Hernández, 2016). The second and third comparisons extend previous studies that examine the role of SMOs as a function of their size (Edwards and Foley, 2003) and industry (McCarthy and Zald, 1977).

Consistent with prior studies (Fetner and King, 2016; Spiro and Monroy-Hernández, 2016), we observe that eye-catcher SMOs are indeed more committed to sustaining

movements when compared to individuals. They also partake in more knowledge sharing and community building efforts, and attract a significant fraction of engagements. Interestingly, however, we also observe that half of all SMOs are very similar to individuals in all five dimensions. This suggests a more limited difference between SMOs and individuals in digital spaces (Earl and Kimport, 2011). In addition, we also show that, compared to small SMOs, large SMOs are more committed to movement sustainment, hold higher structural significance, and are remarkably more successful with recruitment. However, small SMOs on aggregate provide significantly more diverse information and are moderately important to recruitment. Finally, we demonstrate that SMOs from an extensive set of peripheral SMIs have protested in solidarity in BlackLivesMatter alongside the SMOs from the core *African American* SMI. In fact, despite having other primary objectives, some of the “peripheral” SMIs with established networks and resources have played a vital role in the development of BlackLivesMatter. At the same time, we also see a significantly lower level of solidarity for Women’s rights: only two other SMIs have protested alongside the core *Women* SMI. That is, the differences between large and small SMOs are consistent across both movements, but BlackLivesMatter has far broader and stronger support from “outsider” SMOs.

In sum, this study presents the first large-scale analysis of SMOs for US-centric progressive online movements. It exposes a long tail of SMOs, substantial in number, beyond the eye-catchers. We illustrate the characteristics of these SMOs, highlighting various important implications of this long tail on future studies of online social movements.

## Theoretical framework

We first discuss prior findings on the significance of SMOs during the pre-Internet era. We then describe existing literature of SMOs focused on the online environment, identify research gaps, and present our research questions.

### *The role and value of SMOs as observed in the movements of the pre-web era*

Before the era of social media, scholars have observed that SMOs are movement sustainers, educators (i.e. integral to knowledge sharing), coordinators (i.e. integral to community building), and recruiters. Furthermore, the success of any individual SMO is associated with its structural significance within the social movement network. Below, we discuss these findings in more detail.

**Sustainment.** Taylor (1989) found that SMOs provided space and resources for the core activists in the Women’s movement when public sentiment was unwelcoming. This observation was supported by Staggenborg (1998), who further showed that institutionalized and national-level SMOs were better able to sustain movements than non-institutionalized local SMOs. More specifically, small and radical women-centric SMOs dissolved when the Reagan administration reduced funding for gender-related issues.

Yet, the National Organization for Women (*NOW*) along with a few other prestigious SMOs were able to retain resources and provide its members with support and a sense of community, despite lacking substantive political power.

**Knowledge sharing.** Morris (1981) showed that activists frequently obtained movement-related information (e.g. location and time of a sit-in) from SMOs such as churches and Black student organizations during the Civil Rights movement. SMO leaders were heavily involved in training activists in non-violent actions through workshops. Furthermore, SMOs also consolidated more successful strategies and passed them on to each other (Minkoff, 1997). In fact, tactics useful in the Civil Rights movement were subsequently adopted by the Women's movement (Minkoff, 1997). In other words, SMOs were indispensable for movement-related *knowledge sharing*.

**Community building.** Prior studies showed that SMOs contributed to movement expansion through "mesomobilization," a process referring to SMOs from different SMIs collaborating to consolidate overlapping identities and temporarily unite for a shared cause (Gerhards and Rucht, 1992; Staggenborg, 1998). Gerhards and Rucht (1992), as an example, demonstrated that SMOs from the *Peace*, *Human Rights*, *Women*, and *Environment* SMIs protested in solidarity against the World Bank and the International Monetary Fund (IMF). The authors posited that the prior connections built by these SMOs contributed to the successful coalition of distinct movement communities and resulted in impressive on-the-ground turnouts for the Anti-IMF movement. Indeed, SMOs had been essential in bridging different movement groups together, which led to larger, more diverse, and more robust movement communities (Gerhards and Rucht, 1992; Staggenborg, 1998; Staggenborg and Lecomte, 2009).

**Recruitment.** SMOs and their members also facilitated *recruitment* of new participants (Gerhards and Rucht, 1992; Klandermans and Oegema, 1987). More specifically, prior work (Powell, 2011) showed that individuals are more responsive to recruitment when movement narratives reflected their existing ideologies and values. Indeed, Gerhards and Rucht (1992) observed that SMOs from different SMIs framed the Anti-IMF movement differently to maximize participation. SMOs from the *Peace* SMI focused on the role of World Bank in weapon sales and its impact on world peace. In comparison, SMOs from *Environment* emphasized the World Bank's role in deforestation. In addition, while prior studies suggested that person-to-person connections (e.g. friendship) were important factors that influenced an individual's decision to join movements, they also showed a correlation between SMOs-to-person ties and individuals participating in high-cost activism (Klandermans and Oegema, 1987).

**Structural significance.** McCarthy and Zald (1977) and Jenkins (1983) theorized that SMOs may benefit directly from interorganizational ties, reasoning that an SMO with many connections to other SMOs have increased potential exposure to additional resources. Aveni (1978) further argued that SMOs with more extensive and stronger ties to other prestigious and diverse SMOs are more influential themselves. In other words, structural attributes of SMOs within protest networks are correlated with SMOs' resource

availability, prestige, and mobilization success (Aveni, 1978; Jenkins, 1983; McCarthy and Zald, 1977).

### *The role and value of SMOs in the era of Web 2.0*

The previous section clearly demonstrates SMOs' significance to social movements. Indeed, it comes as no surprise that, at the peak of their influence, prominent SMOs such as the American Federation of Labor held enough political sway to pressure Congress to pass the Fair Wage Act (Jilani, 2011). With the birth and expansion of the Web, however, the role of SMOs is being reconsidered. Thus far, researchers have examined SMOs' general social media presence (Guo and Saxton, 2014; Lovejoy et al., 2012), their role and significance compared to that of individuals (Spiro and Monroy-Hernández, 2016), and their importance within specific movement context (Davis et al., 2005). While these studies are valuable, there are several caveats. Most notably, some studies often only focus on larger and more established SMOs (Anduiza et al., 2014; Spiro and Monroy-Hernández, 2016); others only examine SMOs from the core SMI (Freelon et al., 2016; Kropczynski and Nah, 2011). As such, these SMOs are not representative. In the following sections, we describe existing literature in detail, identify gaps, and introduce core research questions.

*SMOs compared to individuals.* Prior studies comparing the significance of SMOs to individuals have reached incongruent results. Earl and Kimport (2011) observed that the majority of online petitions were initiated by individuals rather than SMOs. The authors postulated that low initiation, coordination and participation costs, and the decentralized structure of online activism may render SMOs non-essential (Earl and Kimport, 2011; Theocharis et al., 2015). Conversely, Spiro et al. (2016) examined the distinctions between zealots and SMOs in the "student uprising" in Mexico and "bus rebellion" in Brazil. They suggested that SMOs still play an important role in knowledge sharing and recruitment, especially as movements matured. This contrasts the behavior of individuals who, as shown by another study (Conover et al., 2011), were enthusiastic during the early stage but did not remain committed to sustaining movements. Spiro et al. (2016), however, had examined only a small set of SMOs most critical to the movements. Here, we incorporate long-tail SMOs and revisit the following research question to address incongruent observations:

**RQ1:** What is the role of SMOs (eye-catchers or otherwise) compared to individuals?

*Diversity of SMOs.* McCarthy and Zald (1977) noted that SMOs come in various shapes and forms. An SMO may have specific goals, little funding, and a small membership consisting primarily of volunteers. Conversely, an SMO may also have abstract, general objectives, substantial funding, and a large membership that includes professionalized political insiders. The size of an SMO has a direct association with its advocacy strategies. For instance, non-institutionalized, small SMOs are often applauded for their speedy communication and efficient grassroots efforts (Edwards and Foley, 2003; Lu,

2018). Yet, even with information and communication technologies (ICTs), coordinating large-scale offline actions often require substantial resources that are more readily available in large SMOs, as demonstrated by the Women's movement in Montreal (Staggenborg and Lecomte, 2009). Thus, we differentiate between large and small SMOs. We ask the following research question:

**RQ2:** What is the significance of large SMOs in contrast to small SMOs?

Similarly, SMOs are also differentiated by their SMIs. Davis et al. (2005) observed that hundreds of SMOs from tens of SMIs collaborated in the Anti-World Trade Organization (Anti-WTO) movement. The scale of this collaboration would not have been possible without new ICTs, including emails and websites. Indeed, compared to the Civil Rights movement of the past, which was associated with only five SMIs, a considerably larger number of SMIs participated in the Anti-WTO movement (Davis et al., 2005). Bennett et al. (2004) and Hall et al. (2020) argued that the Internet contributed to the emergence of supersized transnational movement communities: each loosely associated with hundreds or even thousands of SMOs from countless SMIs. A phenomenon that Wang et al. (2018, 2019) referred to as boundary spanning. In other words, social media has arguably reduced collaboration costs, thus allowing a greater number of SMOs to participate in movements outside of their primary objective. This can further lead to divergence in SMO behavior. For instance, we expect *NOW* to have a far greater role in Women's movement compared to the *NAACP*, despite both of them being large, institutionalized SMOs. That is, we hypothesize that the role of an SMO from a movement's core SMI should differ from another from a peripheral SMI. We formulate our research question accordingly.

**RQ3:** What are the differences in characteristics and behavior between SMOs from the core SMI and those from peripheral SMIs?

Insights gained through the presented research questions can provide a deeper understanding of the extent of SMOs' involvement in online movements, especially the subset of SMOs that are small-sized, peripheral, and regularly understudied.

## Method

Here, we first describe our raw Twitter data and then outline how we identify SMOs' accounts and their respective SMIs. Finally, we provide operationalized metrics for *sustainment*, *knowledge sharing*, *community building*, *recruitment*, and *structural significance*.

## Data

We start our analysis with a Twitter data archive corresponding to *all public tweets available at the time of data collection* in English from 1 February 2014, to 10 May 2015.<sup>4</sup> We aggregate 52 BlackLivesMatter and 38 Women's movement-related hashtags (the

complete list is in Supplementary Materials). BlackLivesMatter-related hashtags include #ferguson, #blacklivesmatter, and #policebrutality. Women's movement-related hashtags include #yesallwomen, #hobbylobby, and #everydaysexism and cover sexual violence, women empowerment, and wage equality issues. Next, we extract tweets that contain one of the aforementioned hashtags. In sum, we identify 36.6 million tweets and 4.3 million contributors for BlackLivesMatter, and 7.3 million tweets and 2.4 million users for Women's movement.

### *Data annotation: classify accounts into SMOs, other organizations, and individuals*

We use crowdsourcing and supervised learning to classify all users in our dataset into the following: SMOs, other organizations, and individuals. We define SMOs as “non-governmental organizations that purposely attempt to *change* individuals, established cultural norms, *status quo*, institutions and structures, and/or to redistribute wealth” (Zald and Ash, 1966). In comparison, service-based groups, for-profit businesses, established political parties, and public institutions are *other organizations* that are not SMOs. The remaining non-organizational accounts are individuals. Here, we only provide an overview for the following processes. Please see Supplementary Materials for detailed definitions, process descriptions, and results.

**Crowdsourcing.** We assign each Twitter account into a one of five strata based on (1) its follower count, (2) whether it has a website, and (3) whether its website is listed under the *News* or *Society* category in online directories Alexa and DMOZ. We then randomly sample accounts from each stratum resulting in a stratified sample of 2K+ Twitter accounts. Next, we employ paid high-quality (see Supplementary Materials for qualifications) workers through Amazon Mechanical Turk (MTurk), a crowdsourcing platform. We trained the workers to label each account into one of the three groups (SMOs, other organizations, individuals). Despite task complexity, we observe a .72 Krippendorff's alpha for inter-rater reliability, indicating substantial agreement (Schaer, 2012). In addition, using a pre-labeled subset, we also calculate Turkers' accuracy to be 82%. Both metrics suggest that label quality is sufficient.

**Supervised classification.** Supervised machine learning models are first trained using labeled data and then used to classify unlabeled data. We use a two-step procedure. First, we build a binary model to label accounts into individuals and organizations. Then, we apply a second model to further label organization accounts as SMOs or not. Such a nested approach has two benefits. First, it works well in the case of imbalanced classes (Budak et al., 2016)—our data are imbalanced given that individuals are far more common than organizations. Second, it allows us to identify the optimal combinations of feature sets, preprocessing steps, and classifier types (see details in the Supplementary Materials), which yield better results than a one-step multiclass method (e.g. using a single model to label x, y, or z). We assess classifier performance using area under the curve (AUC), which is a better metric than *accuracy* in evaluating classifiers built using imbalanced datasets (Ling et al., 2003). An AUC score  $\geq .8$  is considered good and  $\geq .9$

is excellent (Bradley, 1997). Here, we assess performance based on two testsets: (1) stratified sampling from all strata and (2) random accounts. Our best classifier for individual/organization labeling has above .9 AUC scores for both testsets, suggesting that our model has excellent performance distinguishing individuals and organizations. Separating SMOs from other organizations is more difficult: best AUC scores for stratified and random testset are .84 and .77, respectively (see sample SMOs from each stratum in Supplementary Materials).

Next, using the best performing classifiers, we categorize 312K accounts in our dataset as organizations, out of which 33.7K and 19.6K are SMOs that participated in BlackLivesMatter and Women's movement, respectively.<sup>5</sup> Indeed, comparing that to the Civil Rights movement of the past in which SMOs participated in the range of hundreds (Zunes and Laird, 2010), the scale of participation by SMOs in online social movements is unprecedented.

Finally, we conduct quality assessment and robustness checks (see Supplementary Materials) by (1) examining SMO accounts for bots and (2) removing the subset of countermovement-SMOs<sup>6</sup> that engaged in hashtag hijacking.

### *Data annotation: clustering SMOs into SMIs*

We next categorize SMOs into SMIs. Unlike related work that relies on cumbersome human labor (Guo and Saxton, 2014; Obar et al., 2012; Spiro and Monroy-Hernández, 2016), here we rely on noun-based k-means clustering (see Supplementary Materials). Using this method, we identify 12 distinct SMIs for BlackLivesMatter and 3 for Women's movement. All identified SMIs have a sample precision of 70% or above.

**BlackLivesMatter.** Alongside the SMOs of the core African American SMI, an extensive set of SMOs from Youth, Student, Christianity, Research Institutes, LGBTQ, Social Welfare, Non-African American Minorities, Occupy Wall Street (OWS), and non-mainstream, advocacy-based News SMIs participated in BlackLivesMatter. This highlights the strength of social media in enabling collaboration among SMOs with vastly different primary objectives. We first examine each SMI separately and select a representative subset of the SMIs for analysis: African American, News, OWS, Christianity, and LGBTQ. In addition, we aggregate all others into the Other category for brevity. Here, Christianity and LGBTQ are chosen randomly. SMIs aggregated into Other demonstrate comparable characteristics to each other and to Christianity and LGBTQ.

**Women.** Unlike the extensive collaborative effort shown for BlackLivesMatter, here, we only identify three distinct SMIs: the core *Women* SMI, peripheral SMIs *Christianity*,<sup>7</sup> and *LGBTQ*. Furthermore, we observe that SMOs within the *Women* SMI are divided into subgroups focused on distinct issues, including domestic abuse, leadership skills for young girls, and reproductive health. These subgroups behave similarly with respect to the five measurements of interest in this article. Thus, we present our findings for the combined group of all SMOs within the *Women* SMI for brevity.

## Metric operationalization

We first define large and small SMOs; we then provide measurements to assess *sustainment*, *knowledge sharing*, *community building*, *recruitment*, and *structural significance*.

**Large and small SMOs.** SMOs with more than 3K followers are defined as large (referred to as  $SMO_{3k+}$ ). The rest are classified as small ( $SMO_{<3k}$ ). We choose 3K as the threshold given it represents the 99th percentile in terms of follower counts on Twitter (Bruner, 2013). We note that 8.8% of SMOs in BlackLivesMatter and 13% of SMOs in Women's movement are in  $SMO_{3k+}$ .

**Sustainment.** Movement sustainment requires continued commitment. To measure each account's commitment, we calculate (1) number of movement-related tweets (i.e. tweets containing one or more relevant hashtags); (2) participation length, defined as the number of days between an account's first and last tweet for a movement; and (3) the number of unique days of participation. We then assess the commitment of each group of accounts (e.g. small SMOs) by deriving descriptive statistics, including the mean, median, and 95th-percentile values of the aforementioned measurements. For each group, we also calculate (4) the fraction of accounts that actively participated per day, averaged over time.

**Knowledge sharing.** Previous studies on SMO online strategies identify the use of URLs as a knowledge-sharing strategy (Guo and Saxton, 2014; Obar et al., 2012) that bypasses the 140-character limit imposed by Twitter at the time. Thus, we operationalize this concept by calculating (1) the total number of unique URLs and web domains shared by each group, and (2) the mean, median, and 95th-percentile value of the fraction of movement-related tweets that contained at least one URL by accounts of each group.

**Community building.** An online movement generally consists of many smaller communities focused on specific issues or incidents (e.g. abortion-focused vs rape-focused communities within Women's movement). These communities use unique hashtags for various agenda or framing purposes (e.g. #survivorprivilege to protest sexual assault). Existing work suggests that SMOs use hashtags strategically in their tweets to reach out to such communities and perform community building (Guo and Saxton, 2014, 2018; Ince et al., 2017). Here, similar to the approach used by Ince et al. (2017), for each movement, we first cluster similar hashtags into communities using the following process. We define similarity between hashtags  $\#h_i$  and  $\#h_j$  as the Jaccard similarity between  $T_i$  and  $T_j$  where  $T_i(T_j)$  is the set of tweets containing hashtags  $\#h_i(\#h_j)$ . We then build the co-occurrence graph where an edge exists between  $\#h_i$  and  $\#h_j$  if their Jaccard similarity is non-zero. Furthermore, edges are weighted by Jaccard scores. We then apply Louvain heuristics to compute subgraph partitions of highest modularity (Blondel et al., 2008). Here, each partition is its own community. Louvain algorithmically identifies a total of seven and five communities for BlackLivesMatter and Women's movement, respectively (see Supplementary Materials). We then measure an account's community

building effort by examining its hashtag usage and deriving the number of communities it participated in. Finally, we calculate the average number of communities for each group of accounts.

**Recruitment.** Prior work similar to ours defines *recruitment* as “the moment a user started sending tweets [containing movement-hashtags] about it” (González-Bailón et al., 2011; Spiro and Monroy-Hernández, 2016). Here, we use a comparable definition as follows. We first identify the set of accounts  $A_{blm}$  that participated in BlackLivesMatter by using at least one relevant hashtag. Next, for each account  $a \in A_{blm}$ , we identify the first tweet  $t_a$  of  $a$  in that movement. We determine whether  $t_a$  mentions or retweets another account  $a'$ . If so, and if  $a'$  had already been participating in the movement (i.e.  $t_{a'}$  occurs before  $t_a$ ), we denote  $a'$  as the recruiter of  $a$  in BlackLivesMatter. If the first tweet by  $a$  contains multiple mentions and/or retweets, each account is considered a recruiter. Then, we aggregate the total number of accounts for which  $a'$  was the recruiter. We note that this measure also relates to the notion of social influence extensively studied in past work (Agrawal et al., 2011). Again, we assess the recruitment success of each group by deriving relevant statistics, including the average number of recruits per account (or per tweet) and the total number of recruits for each group. We repeat the same process for Women’s movement. In addition, compared to offline activism, participation in online movements is low cost (Bozarth and Budak, 2017). Thus, we further examine how successful each group is in recruiting slacktivists (e.g. accounts who only contributed a single tweet) versus non-slacktivists. We observe that for each group, its success is similar between slacktivists and non-slacktivists (see Supplementary Materials).

**Structural significance.** We use two metrics to assess SMOs’ structural significance: *kcore* and *in-degree*. First, *kcore* score measures an account’s embeddedness within a movement network, and its ability to recruit others and propagate a movement (González-Bailón et al., 2011). Agents—SMOs or otherwise—with higher *kcore* scores are considered to be more embedded and central to a community. Movements initiated by such agents are more likely to become successful. Second, *in-degree* captures the account’s reputation and popularity within a network (Casciaro, 1998). Here, we first define two directed graphs,  $G_{blm} = (N_{blm}, E_{blm})$  and  $G_{women} = (N_{women}, E_{women})$ . An account  $u \in N_{blm}$  if  $u$  participated in the BlackLivesMatter movement by using at least one of the related hashtags. An edge  $e_{u,v} \in E_{blm}$  from account  $u$  to  $v$  exists if  $u$  mentions or retweets  $v$  at least once while also using a related hashtag. We then compute *kcore* and *in-degree* values of each account in  $G_{blm}$  (and similarly in  $G_{women}$ ) using *SNAP*, a Stanford network analysis library (Leskovec and Sosis, 2016). Finally, we compute the average measurements for each group of accounts.

## Results

SMOs constitute to a very small fraction of total accounts: 33.7K (0.7%) accounts in BlackLivesMatter and 19.6K (0.8%) accounts in Women’s movement are SMOs. Nevertheless, SMOs posted a substantial fraction of tweets and received a considerable fraction of retweets and mentions. For BlackLivesMatter, as an example, SMOs

contributed 2.2 million (6.0%) tweets. They also received 1.4 million (14.6%) mentions and 4.2 million (15.4%) retweets. It is evident that SMOs were able to leverage Web affordances and continued to play a significant part in online social movements.

Here, we first compare SMOs as a group to individuals.<sup>8</sup> Then, focusing only on SMOs, we assess the differences between large and small SMOs, and SMOs belonging to core or peripheral SMIs.

### *RQ1: what is the role and function of SMOs (eye-catcher or otherwise) compared to individuals?*

On average (characterized by mean values), SMOs indeed “outperform” individuals. For instance, everyday, an average of 2.3% of all BlackLivesMatter SMOs posted movement-related tweets compared to 0.6% of all individuals. On average, BlackLivesMatter SMOs participated for 78 days—significantly longer than individuals (24 days). Both results suggest that SMOs are more central to *sustainment*. Focusing on *knowledge sharing*, BlackLivesMatter SMOs shared 14 links on average, while individuals shared a single link on average. Moreover, the average number of *recruits* via retweet by BlackLivesMatter SMOs is 11. In comparison, the average number for individuals is 0. Finally, we see that, on average, SMOs indeed had higher *structural significance*. For example, BlackLivesMatter SMOs had a *kcore* value of 32 on average, five times that of individuals. For *community building*, however, we observe that the majority of SMOs, much like individuals, participated in a single protest community. Similar results are obtained for Women’s movement (e.g. a Women’s SMO only focuses on abortion rights, but not girls’ leadership skills or sexism).

Surprisingly, SMOs characterized by median values appear comparable to individuals. For instance, the *median* (50th percentile) BlackLivesMatter SMO contributed only one or two tweets, does not actively reach out to different communities, had zero recruits, and was structurally insignificant. We observe that the difference between mean and median values is due to a small fraction of highly active or influential SMO accounts. In other words, measurements are positively skewed by outlier SMOs from the top quantile. As an example, a 95th-percentile SMO in BlackLivesMatter contributed 223 movement-related tweets (15 for a 95th-percentile individual), participated in five communities (3 for a 95th-percentile individual), and had a *kcore* value of 206 (14 for a 95th-percentile individual).

Finally, on aggregate, the contributions by individuals (due to their absolute number) were significantly higher than SMOs—individuals in BlackLivesMatter contributed 86.3% of total tweets. And, 71.1% of all recruitment was by individuals (similar for Women’s movement).

In sum, existing studies that only focus on eye-catching SMOs have missed the existence of a long tail of SMOs, which are revealed in this article through our automated account classification process. Furthermore, these long-tail SMOs are remarkably similar to individuals in their contribution and significance to online movements. That is, the roles of SMOs and individuals in social movements within specific digital spaces may well be more mixed and their distinctions more blurred (Earl and Kimport, 2011).

**Table 1.** A representative subset of metrics measuring large and small SMOs’ significance in *sustainment, community building, knowledge sharing, recruitment, and structural significance.*

| Dimension               | Metric                       | Metric type     | BLK small SMOs | BLK large SMOs | Women small SMOs | Women large SMOs |
|-------------------------|------------------------------|-----------------|----------------|----------------|------------------|------------------|
| Sustainment             | Movement-related tweet count | Mean            | 61.21          | 110.21         | 10.32            | 17.31            |
|                         |                              | Median          | 2.00           | 9.00           | 2.00             | 3.00             |
|                         |                              | Percentile (95) | 204.00         | 516.00         | 32.00            | 67.00            |
|                         | Protest length in days       | Mean            | 74.36          | 158.64         | 70.98            | 127.79           |
|                         |                              | Median          | 0.12           | 150.82         | 0.01             | 59.67            |
|                         |                              | Percentile (95) | 286.03         | 382.03         | 352.37           | 419.81           |
| Community building      | Community count              | Mean            | 1.80           | 2.45           | 1.23             | 1.42             |
|                         |                              | Median          | 1.00           | 2.00           | 1.00             | 1.00             |
|                         |                              | Percentile (95) | 5.00           | 6.00           | 2.00             | 3.00             |
| Knowledge sharing       | Fraction of tweets has URL   | Mean            | 0.31           | 0.52           | 0.44             | 0.53             |
|                         |                              | Median          | 0.17           | 0.50           | 0.33             | 0.50             |
|                         |                              | Percentile (95) | 1.00           | 1.00           | 1.00             | 1.00             |
|                         | Unique_domain                | Total           | 11.6K          | 5.07K          | 5.06K            | 2.3K             |
| Recruitment             | Recruit count by retweet     | Mean            | 2.67           | 49.07          | 1.30             | 20.53            |
|                         |                              | Median          | 0.00           | 0.00           | 0.00             | 0.00             |
|                         |                              | Percentile (95) | 2.00           | 79.45          | 1.00             | 41.00            |
|                         | Total recruits               | Total           | 173.36K        | 301.64K        | 82.51K           | 449.72K          |
| Structural significance | kcore                        | Mean            | 26.88          | 63.10          | 6.30             | 12.74            |
|                         |                              | Median          | 3.00           | 15.00          | 3.00             | 6.00             |
|                         |                              | Percentile (95) | 166.00         | 334.40         | 26.00            | 52.00            |

SMOs: social movement organizations. BLK: BlackLivesMatter

*RQ2: what is the significance of large SMOs compared to small SMOs?*

A representative subset of metrics comparing large and small SMOs’ significance is shown in Table 1. For BlackLivesMatter, on average,  $SMO_{3K+}$  contributed 110 tweets and remained in the movement for 158.6 days compared to  $SMO_{<3K}$  which contributed 61 tweets and had an active period of 74.4 days on average. Both metrics suggest that large SMOs were more committed to *sustaining* online movements. Furthermore, results also demonstrate that large SMOs had considerably higher structural significance, were more successful with recruitment (20 times more, in fact), and were more involved in knowledge sharing. Interestingly,  $SMO_{3K+}$  and  $SMO_{<3K}$  had comparable results for community building: SMOs in both groups largely chose to be involved with one or two protest communities (Table 1). In addition, we also observe similar patterns, except for recruitment, when using median values of  $SMO_{3K+}$  and  $SMO_{<3K}$ . For instance, the median number of movement-related tweets by  $SMO_{3K+}$  is 9 (4.5 times that of  $SMO_{<3K}$ ), and the median kcore score for  $SMO_{3K+}$  is 15 (5 times that of  $SMO_{<3K}$ ). That is, both mean and median values suggest that large SMOs were more significant in online movements. Next, focusing on the outliers in each group, we observe that a 95th-percentile  $SMO_{3K+}$  in BlackLivesMatter demonstrated a comparable behavior in community building and knowledge sharing

**Table 2.** Regression results assessing large and small SMOs’ role in BlackLivesMatter.

|                          | Dependent variable   |                       |                            |                          |                      |
|--------------------------|----------------------|-----------------------|----------------------------|--------------------------|----------------------|
|                          | Unique days          | Community count       | Fraction of tweets has URL | Recruit count by retweet | kcore                |
| tweet_count              | 0.019***<br>(0.0002) | 0.001***<br>(0.00001) | 0.045***<br>(0.001)        | −0.00000<br>(0.00000)    | 0.057***<br>(0.003)  |
| participation_start_date | −0.080***<br>(0.001) | −0.004***<br>(0.0001) | −0.219***<br>(0.003)       | 0.0005***<br>(0.00002)   | −0.076***<br>(0.020) |
| followers_pct            | 0.147***<br>(0.004)  | 0.014***<br>(0.0002)  | 0.544***<br>(0.010)        | 0.005***<br>(0.0001)     | 0.390***<br>(0.061)  |
| Observations             | 35,595               | 35,595                | 35,595                     | 35,595                   | 35,595               |
| R <sup>2</sup>           | .343                 | .305                  | .134                       | .012                     | .321                 |

SMOs: social movement organizations.  
The values in parentheses refer to the standard deviation.  
Here, a representative subset of metrics that measure *sustainment*, *community building*, *knowledge sharing*, *recruitment*, and *structural significance* are presented (omitted metrics showed comparable results); an SMO’s size approximated using follower count percentile (*followers\_pct*) is the independent variable of interest. We also control for an SMO’s total number of movement-related tweets (*tweet\_count*) as well as the timestamp of its initial participation in the movement (*participation\_start\_date*).  
\*\*\*p < .01.

compared to a 95th-percentile  $SMO_{<3K}$ . However, a 95th-percentile  $SMO_{3K+}$  contributed 516 movement-related tweets (204 for a 95%  $SMO_{<3K}$ ), recruited 79 users (only 2 for a 95th-percentile  $SMO_{<3K}$ ), and had a kcore score of 334.4 (166 for a 95th-percentile  $SMO_{<3K}$ ). This suggests that top-performing  $SMO_{3K+}$  were considerably more committed to sustaining a movement, were the driving force behind recruitment, and were structurally more significant.

Next, to ensure these observations are not simply by-products of large SMOs tweeting more in general, we also run the following regression analysis. For a given SMO  $i$  in BlackLivesMatter, we denote the number of unique days  $i$  participated as  $y_i$ , the total number of BlackLivesMatter tweets by  $i$  as  $tweet\_count_i$ , the time of  $i$ ’s first tweet as  $participation\_start\_date_i$ , and  $i$ ’s percentile in terms of follower count as  $follower\_pct_i$ . We then regress the equation

$$Y = \alpha + \beta_1 \times tweet\_count + \beta_2 \times participation\_start\_date + \beta_3 \times follower\_pct + \varepsilon \tag{1}$$

We repeat the same process to assess the metrics for *community building*, *knowledge sharing*, *recruitment*, and *structural significance*. A representative subset of the results is summarized in Table 2. As shown, a 10% increase in *follower\_pct* is associated with spending 1.5 more unique days participating in the movement, 5.4% more in the fraction of tweets containing an URL, and an increase of 3.9 in kcore value. That is, even when we control for total tweet contributions, larger SMOs in BlackLivesMatter are still associated with higher commitment to movements, more knowledge-sharing efforts, better recruitment success, and larger structural significance. One possible explanation is that large SMOs are financially better equipped to strategically manage their social media presence and also augment their influence.

Finally, we also note that, on aggregate,  $SMO_{<3K}$  posted a total of 227.2K unique URLs, 3.4 times more than the contributions by  $SMO_{3K+}$ . The domains that  $SMO_{<3K}$  shared news from were also more varied: 11.6K unique domains, twice that of  $SMO_{3K+}$ . In addition,  $SMO_{<3K}$  also recruited a total of 173.8K users, which is 57% of  $SMO_{3K+}$ 's total recruitment. These results suggest that small SMOs due to their sheer number (much like individuals) contributed more varied information to online movements and played a moderate role in recruitment.

### *RQ3: what are the differences in characteristics and behavior between SMOs from the core SMI and those from peripheral SMIs?*

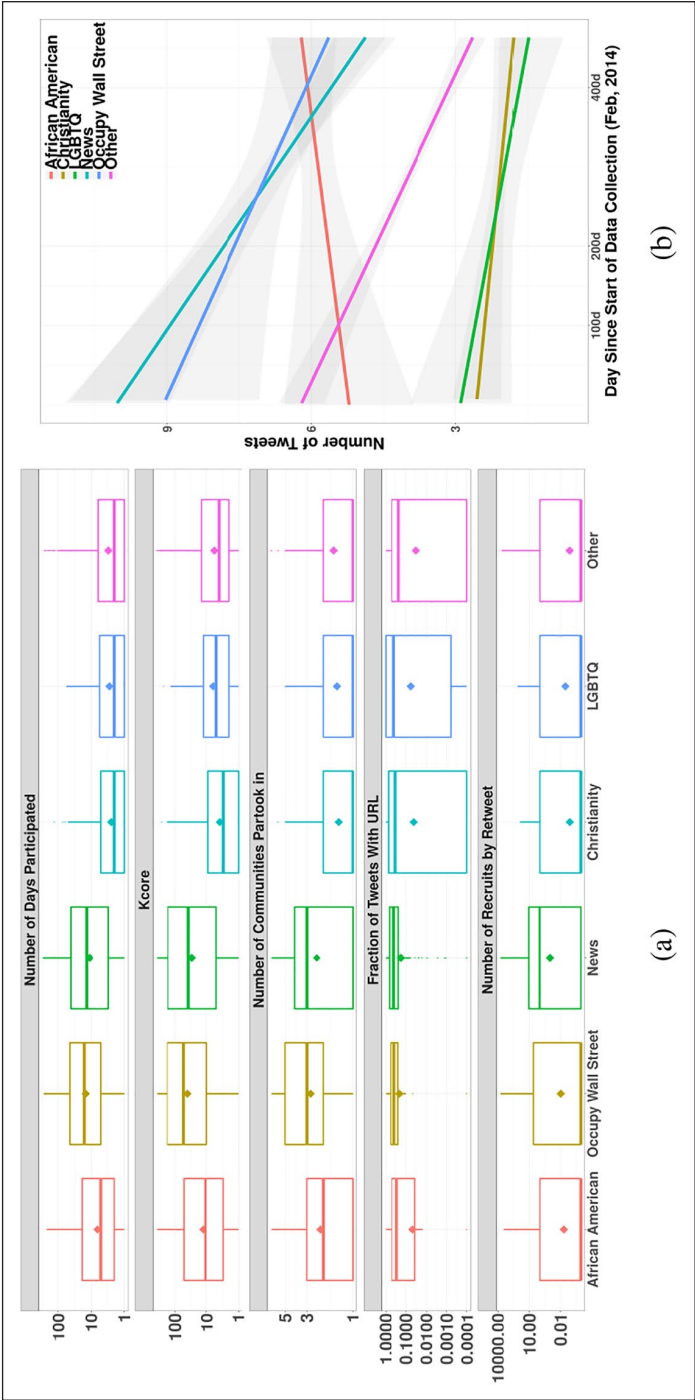
Thus far, results are comparable for BlackLivesMatter and Women's movement, suggesting robustness in our observations centered on the role of SMOs compared to individuals, as well as on the difference between large and small SMOs. In this section, however, we demonstrate that BlackLivesMatter had far more extensive and energetic participation from SMOs in peripheral SMIs compared to Women's movement which can be characterized as dormant.

**BlackLivesMatter.** As shown in Figure 1(a), SMO accounts belonging to the *African American* SMI, denoted as  $A_{aa}$ , were more central to BlackLivesMatter than the subset of SMOs that participated in solidarity such as  $A_{christianity}$  and  $A_{lgbtq}$ . The median tweet contribution by  $A_{aa}$  is 8, and 2 for both  $A_{christianity}$  and  $A_{lgbtq}$ . In addition,  $A_{aa}$  was also more active in community building with 22% of all  $A_{aa}$  engaged with three or more communities. In comparison, less than 10% of  $A_{lgbtq}$  depicted a similar effort. Similar patterns are also observed in knowledge sharing, recruitment, and structural significance.

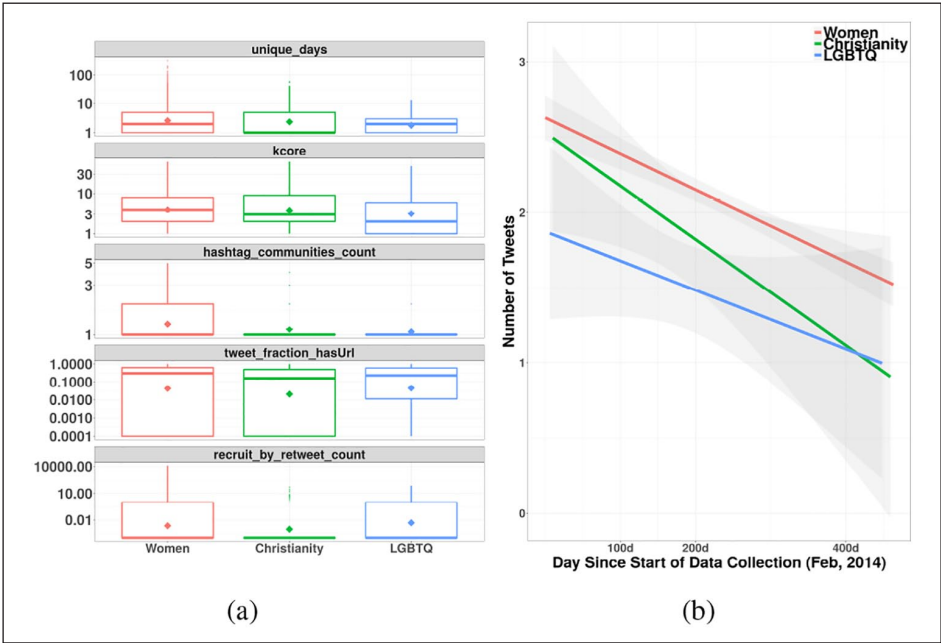
Interestingly, both  $A_{news}$  and  $A_{ows}$  exceeded  $A_{aa}$  in all five dimensions. For instance, the median tweet contribution by  $A_{news}$  is 32, four times that of  $A_{aa}$ . Furthermore,  $A_{news}$  was also the most successful at recruiting new users. The recruitment rate for  $A_{news}$  is .83 per tweet, approximately four times that of the second highest group  $A_{ows}$ . In addition, the median number of URLs contributed by  $A_{news}$  is 7 compared to  $A_{aa}$ 's single URL. Results suggest that  $A_{news}$  is much better at employing social media mechanisms, perhaps due to the nature of its industry. The critical role of progressive, advocacy-centric news organizations in BlackLivesMatter can be explained by their need to engage and educate others.

More surprisingly,  $A_{ows}$  surpassed both  $A_{news}$  and  $A_{aa}$  in their commitment to BlackLivesMatter.<sup>9</sup> The median tweet contribution by  $A_{ows}$  is 54, the highest among all groups. In fact, as depicted in Figure 1(a),  $A_{ows}$  is the most dedicated among all SMIs as measured by the number of days of participation and number of communities engaged. Furthermore,  $A_{ows}$  also possessed the most favorable network positions. The median kcore value for  $A_{ows}$  is 55 compared to  $A_{news}$ 's 41 and  $A_{aa}$ 's 11.

What accounts for this surprising finding? Further analysis reveals a plausible explanation—our dataset captured the early stages of the BlackLivesMatter movement where movement-specific SMOs were yet to fully mature. Within the scope of our dataset, for instance, *@blklivesmatter*, the official Twitter account for the movement, leapt from 1.6K



**Figure 1.** BlackLivesMatter: (a) differences in role fulfillment between SMOs from distinct SMIs, including commitment, structural significance, knowledge sharing, community building, and recruitment, and (b) their change in participation intensity as movements continue.



**Figure 2.** Women’s movement: (a) differences in role fulfillment between SMOs from distinct SMIs, including *commitment*, *structural significance*, *knowledge sharing*, *community building*, and *recruitment*, and (b) their change in participation intensity as movements continue.

to 34.5K followers—the same account had 249K followers in September 2019. Indeed, over 35% of all  $A_{aa}$  accounts on Twitter were created after February 2014, a time when the BlackLivesMatter movement started to gain national recognition. This number is only 2% for  $A_{ows}$ . The Occupy movement, which started in 2011, was well developed with a mature and stable social media presence by 2014.

As the BlackLivesMatter movement progressed, the activity level, measured by tweet count, waned for  $A_{ows}$  and rose for  $A_{aa}$ . In fact, as shown in Figure 1(b),  $A_{aa}$  was the only SMI with an increase in average participation level over time. This is consistent with prior studies (McCarthy and Zald, 1977; Minkoff, 1997), which suggest that resources of prior social movements contribute to the success of later movements (e.g. the Civil Rights movement advancing the Women’s movement in the 1970s). As a movement grows and gains capital, professional movement-specific SMOs will eventually emerge.

**Women’s rights.** Unlike the BlackLivesMatter movement where behavior varied significantly across SMIs, the median tweet contribution by all three SMIs is 2, implying that more than half of the SMOs from the core *Women* SMI behaved just like the ones from the peripheral SMIs. Nevertheless, there are more outliers in  $A_{women}$ , some of which contributed more than 1000 tweets in a year while none from the other SMIs did. In addition, as shown in Figure 2(a), there is a modest community building effort by  $A_{women}$ :

over 7.5% of  $A_{women}$  engaged with two or more communities, while less than 2% of  $A_{christianity}$  and almost none of  $A_{lgbtq}$  did the same. In addition, the recruitment rate for  $A_{women}$  is 5.40 per tweet, approximately 2 and 25 times that of  $A_{lgbtq}$  and  $A_{christianity}$ , respectively. Finally, as shown in Figure 2(b), we observe a downward trend in the average participation intensity of all three SMIs.

As a whole, the commitment by  $A_{women}$  was comparable to  $A_{christianity}$  and  $A_{lgbtq}$  with some outliers being more committed to sustaining the movement. Furthermore,  $A_{women}$  was more invested in building communities and was also more successful with recruitment. The differences are moderate in comparison to BlackLivesMatter, however. What explains this difference? Multiple high-profile and polarizing events (e.g. the Ferguson March) had occurred in BlackLivesMatter during the timespan of our dataset. Women's movement had fewer external shocks and remained in relative abeyance. Indeed, the total number of Women's movement-related tweets is only 19.9% that of BlackLivesMatter's. More recent gender-centric events (e.g. Women's March, #metoo) may have reinvigorated Women's movement with new opportunities.

## Discussion and limitations

In this article, we provided the first automated method for classifying SMOs at scale on Twitter. Using this method, we identified over 50K SMOs participating in two significant online movements: BlackLivesMatter and Women's movement. Focusing on the dimensions of *commitment*, *knowledge sharing*, *community building*, *recruitment*, and *structural significance*, we showed that an average SMO was rather similar to an average individual both in terms of behavior and significance. Furthermore, compared to small SMOs, large SMOs on average (1) were more committed to movements, (2) made more knowledge-sharing efforts, (3) were much more successful with recruitment, and (4) had higher structural significance. Although, in aggregate, small SMOs contributed significantly to the sharing of more diverse information and recruitment. Finally, we also observed that a large number of SMOs from varied SMIs participated in solidarity, lending their Twitter network to assist a social movement not of their immediate domain, as exemplified by the surprisingly assertive role of OWS SMOs in BlackLivesMatter.

There are several limitations and future directions worth noting. First, we chose to focus on US-centric, high-profile, progressive movements; future work should also explore the respective countermovements (e.g. AllLivesMatter is a countermovement of BlackLivesMatter) as well as movements that are transnational, conservative, or less successful. Second, our analyses rely on Twitter data: we identified relevant content using a limited number of hashtags and excluded all tweets with no hashtags. Furthermore, we do not address SMOs' characteristics and role outside of the Twitter platform. The role and behavior of SMOs on other online platforms (e.g. Facebook) may well be different. This limitation is primarily due to a lack of research data shared by platforms such as Facebook and Instagram. Third, future work should also account for hashtag hijacking behaviors on Twitter to separate supporters from non-supporters. Next, our method of clustering SMOs into SMIs is unable to assign a fraction of SMOs into coherent SMIs. Similarly, future work should also explore better classification methods. In addition, while an *average* individual pales in comparison to an SMO in significance, some

individuals—possibly members of SMOs—also hold strong positions in movements and show high commitment. Future work should distinguish individuals who are members of SMOs from non-members to further explore SMOs' induced impact on social media activism. Moreover, we examine knowledge sharing through number of domains and URLs, yet content quality likely differs from domain to domain. Thus, future work should examine the actual content shared. Finally, some critics have argued that online movement participants are slacktivists who provide little substantive value (Bozarth and Budak, 2017), whereas opponents have argued that online movements are significant in both bringing awareness to a broad audience and inducing online participants to also engage in offline activism (Freelon et al., 2016; Steinert-Threlkeld et al., 2015). As such, future work should connect SMOs' online and offline functions (e.g. recruitment) and significance.

Despite these limitations, our work highlights various important implications. First, collectively, individuals posted the most tweets, and thus played a critical role in *knowledge sharing* and *recruitment*. In fact, an average individual and an average SMO behave rather similarly. These observations are consistent with prior research, which demonstrates that ICTs are allowing individuals to be involved in online movements at an unprecedented scale due to low costs. Second, the observation that small SMOs shared more diverse information and were moderately significant in recruitment suggests that their role should not be discounted. Future work can build on our findings and examine the differences between content shared by large and small SMOs as well as the characteristics of users recruited by these two groups. Third, considering the extensive involvement of SMOs from peripheral SMIs in BlackLivesMatter, we posit that social media affordances are carving out new pathways for SMOs to engage and cooperate with each other on an unprecedented scale, allowing them to easily and cheaply pool in certain types of social capital to sustain and expand online social movements. It will be crucial for future work to unpack these new dynamics by comparing behavioral differences, cooperation, or even competition among the different groups, across varied movements, times, and locations. Finally, it is also worthwhile to note the relevant challenges addressed in this article. That is, traditional efforts in identifying SMOs rely on experts for coding and are often biased toward large institutionalized SMOs. Here, we went through numerous iterations to create a crowdsourcing task with high inter-rater reliability. We also developed reliable automated methods for identifying SMOs and assigning them into SMIs. The methods and labeled data provide a great opportunity for future large-scale research in collective action.

## Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research was supported by the National Science Foundation (Grants IIS-1815875 and GCR-1934494).

## ORCID iD

Lia Bozarth  <https://orcid.org/0000-0002-0879-4234>

## Supplemental material

Supplemental material for this article is available online.

## Notes

1. In this work, advocacy-based non-profit organizations, interest and lobby groups, unions and employee associations, non-established political groups, and proselytistic (conversion-seeking) religious entities are categorized as social movement organizations (SMOs; Zald and Ash, 1966). See Supplementary Materials for a precise definition and examples of SMOs.
2. For instance, *Pride Radio* and *National Center for Transgender Equality* both belong to the *LGBTQ* social movement industry (SMI) because they share the same primary goal of advocating for LGBTQ-related issues. Furthermore, the *LGBTQ* SMI is the core SMI for the LGBTQ movement but is considered a peripheral SMI for other movements such as BlackLivesMatter—the SMI and the movement have different primary goals. See Supplementary Materials for all terminologies, definitions, and examples.
3. We focus on Twitter given its data accessibility and close resemblance to a broadcasting network (Kwak et al., 2010), which makes it ideal for information cascading. In fact, Twitter was crucial to recent movements such as the “Arab Spring” and Brazil’s “bus rebellion” (Spiro, Monroy-, and Hernández, 2016; Theocharis et al., 2015).
4. These data were gathered by one of the co-authors who at the time was a researcher at a large software company. Complete data were transferred from Twitter to the said company on a daily basis due to their data agreement. The data collection was performed on 15 May 2015. As such, our dataset does not include (1) tweets that were originally posted but deleted by 15 May 2015 and (2) tweets from accounts deleted/suspended by 15 May 2015.
5. While these may seem like very high numbers, our affiliated university alone has 1.5K student organizations, 600+ of which are labeled as advocacy-related groups.
6. Countermovements are an important part of social movement studies. However, given our data collection excluded countermovement hashtags (e.g. #AllLivesMatter), this article cannot adequately address the countermovements and their SMOs.
7. We ensure that SMOs under this SMI are in fact supportive of Women’s movement by manually sampling and inspecting 100 accounts. We find that over 90% of them self-identify as progressive religious groups.
8. Here, the group of individuals included both actual supporters and others who may be hashtag hijackers.
9. To ensure validity of this surprising finding, we manually review all 77 SMOs in this SMI and remove false positives.

## References

- Agrawal D, Budak C and El Abbadi A (2011) Information diffusion in social networks: observing and affecting what society cares about. In: *Proceedings of the 20th ACM international conference on information and knowledge management*, Glasgow, 22–26 October, pp. 2609–2610. New York: ACM.
- Andrews KT, Edwards B, Al-Turk A, et al. (2016) Sampling social movement organizations. *Mobilization: An International Quarterly* 21(2): 231–246.
- Anduiza E, Cristancho C and Sabucedo JM (2014) Mobilization through online social networks: the political protest of the Indignados in Spain. *Information, Communication & Society* 17(6): 750–764.

- Aveni AF (1978) Organizational linkages and resource mobilization: the significance of linkage strength and breadth. *The Sociological Quarterly* 19(2): 185–202.
- Barberá P, Wang N, Bonneau R, et al. (2015) The critical periphery in the growth of social protests. *PLoS ONE* 10(11): e0143611.
- Bennett WL, Della Porta D, Diani M, et al. (2004) *Transnational Protest and Global Activism*. Lanham, MD: Rowman & Littlefield.
- Blondel VD, Guillaume JL, Lambiotte R, et al. (2008) Fast unfolding of communities in large networks. *Journal of Statistical Mechanics: Theory and Experiment* 2008(10): P10008.
- Bozarth L and Budak C (2017) Is slacktivism underrated? measuring the value of slacktivists for online social movements. In: *Proceedings of the ICWSM 2017*, Montreal, QC, Canada, pp. 484–487. Menlo Park, CA: AAAI.
- Bradley AP (1997) The use of the area under the roc curve in the evaluation of machine learning algorithms. *Pattern Recognition* 30(7): 1145–1159.
- Bruner J (2013) Tweets loud and quiet. *O'Reilly Radar*, 6 October. Available at: <https://www.oreilly.com/content/tweets-loud-and-quiet/>
- Budak C and Watts DJ (2015) Dissecting the spirit of Gezi: influence vs. selection in the occupy Gezi movement. *Sociological Science* 2: 370–397.
- Budak C, Goel S and Rao JM (2016) Fair and balanced? Quantifying media bias through crowd-sourced content analysis. *Public Opinion Quarterly* 80(S1): 250–271.
- Casciaro T (1998) Seeing things clearly: social structure, personality, and accuracy in social network perception. *Social Networks* 20(4): 331–351.
- Conover M, Ratkiewicz J, Francisco MR, et al. (2011) Political polarization on Twitter. *ICWSM* 133: 89–96.
- Davis GF, McAdam D, Scott WR, et al. (2005) *Social Movements and Organization Theory*. Cambridge: Cambridge University Press.
- Earl J and Kimport K (2011) *Digitally Enabled Social Change: Activism in the Internet Age*. Cambridge, MA: MIT Press.
- Edwards B and Foley M (2003) Social movement organizations beyond the beltway: understanding the diversity of one social movement industry. *Mobilization: An International Quarterly* 8: 87–107.
- Fernandez RM and McAdam D (1988) Social networks and social movements: multiorganizational fields and recruitment to Mississippi freedom summer. *Sociological Forum* 3(3): 357–382.
- Fetner T and King BG (2016) Three-layer movements, resources, and the tea party. In: Fetner T and King BG (eds) *Understanding the Tea Party Movement*. Farnham: Ashgate, pp. 35–54.
- Freelon D, McIlwain CD and Clark MD (2016) Beyond the hashtags: #ferguson, #blacklivesmatter, and the online struggle for offline justice. Available at: <https://cmsimpact.org/resource/beyond-hashtags-ferguson-blacklivesmatter-online-struggle-offline-justice/>
- Gerhards J and Rucht D (1992) Mesomobilization: organizing and framing in two protest campaigns in west Germany. *American Journal of Sociology* 98(3): 555–596.
- González-Bailón S, Borge-Holthoefer J, Rivero A, et al. (2011) The dynamics of protest recruitment through an online network. *Scientific Reports* 1: 197.
- Guo C and Saxton GD (2014) Tweeting social change: how social media are changing nonprofit advocacy. *Nonprofit and Voluntary Sector Quarterly* 43: 57–79.
- Guo C and Saxton GD (2018) Speaking and being heard: how nonprofit advocacy organizations gain attention on social media. *Nonprofit and Voluntary Sector Quarterly* 47: 5–26.
- Hall N, Schmitz HP and Dedmon JM (2020) Transnational advocacy and NGOs in the digital era: new forms of networked power. *International Studies Quarterly* 64: 159–167.
- Ince J, Rojas F and Davis CA (2017) The social media response to black lives matter: how Twitter users interact with black lives matter through hashtag use. *Ethnic and Racial Studies* 40(11): 1814–1830.

- Jenkins J (1983) Resource mobilization theory and the study of social movements. *Annual Review of Sociology* 9: 527–553.
- Jilani Z (2011) Report: five things unions have done for all Americans. Available at: <https://think-progress.org>
- Kempton W, Holland DC, Bunting-Howarth K, et al. (2001) Local environmental groups: a systematic enumeration in two geographical areas. *Rural Sociology* 66(4): 557–578.
- Klandermans B and Oegema D (1987) Potentials, networks, motivations, and barriers. *American Sociological Review* 52(4): 519–531.
- Kroczynski J and Nah S (2011) Virtually networked housing movement: hyperlink network structure of housing social movement organizations. *New Media & Society* 13(5): 689–703.
- Kwak H, Lee C, Park H, et al. (2010) What is Twitter, a social network or a news media? In: *Proceedings of the WWW 2010*, 26–30 April, pp. 591–600. New York: ACM.
- Leskovec J and Sosc R (2016) Snap: a general-purpose network analysis and graph-mining library. *TIST*. Available at: <https://arxiv.org/abs/1606.07550>
- Ling CX, Huang J and Zhang H (2003) AUC: a better measure than accuracy in comparing learning algorithms. In: Xiang Y and Chaib-draa B (eds) *Advances in Artificial Intelligence*. Berlin/Heidelberg: Springer, pp. 329–341.
- Lovejoy K, Waters RD and Saxton GD (2012) Engaging stakeholders through Twitter: how non-profit organizations are getting more out of 140 characters or less. *Public Relations Review* 38(2): 313–318.
- Lu J (2018) Organizational antecedents of nonprofit engagement in policy advocacy: a meta-analytical review. *Nonprofit and Voluntary Sector Quarterly* 47: 177S–203S.
- McCarthy JD and Zald MN (1977) The trend of social movements in America: professionalization and resource mobilization. Available at: <https://deepblue.lib.umich.edu/bitstream/handle/2027.42/50939/164.pdf?sequence=1&isAllowed=y>
- Minkoff DC (1997) The sequencing of social movements. *American Sociological Review* 62: 779–799.
- Morris A (1981) Black southern student sit-in movement: an analysis of internal organization. *American Sociological Review* 48: 744–767.
- Obar JA, Zube P and Lampe C (2012) Advocacy 2.0. *Journal of Information Policy* 2: 1–25.
- Powell R (2011) Frames and narratives as tools for recruiting and sustaining group members. *Sociological Inquiry* 81: 454–476.
- Schaer P (2012) Better than their reputation? On the reliability of relevance assessments with students. In: Catarci T, Forner P, Hiemstra D, et al. (eds) *Information Access Evaluation. Multilinguality, Multimodality, and Visual Analytics*. Berlin/Heidelberg: Springer, pp. 124–135.
- Spiro ES and Monroy-Hernández A (2016) Shifting stakes: understanding the dynamic roles of individuals and organizations in social media protests. *PLoS ONE* 11: e0165387.
- Staggenborg S (1998) Social movement communities and cycles of protest: the emergence and maintenance of a local Women’s movement. *Social Problems* 45(2): 180–204.
- Staggenborg S and Lecomte J (2009) Social movement campaigns: mobilization and outcomes in the Montreal Women’s movement community. *Mobilization: An International Quarterly* 14(2): 163–180.
- Steinert-Threlkeld ZC, Mocanu D, Vespignani A, et al. (2015) Online social networks and offline protest. *EPJ Data Science* 4: 19.
- Taylor V (1989) Social movement continuity: Women’s movement in abeyance. *American Sociological Review* 54: 761–775.
- Theocharis Y, Lowe W, van Deth JW, et al. (2015) Using Twitter to mobilize protest action: online mobilization patterns and action repertoires in the Occupy Wall Street, Indignados, and Aganaktismenoi movements. *Information, Communication & Society* 18: 202–220.

- Wang D, Piazza A and Soule SA (2018) Boundary-spanning in social movements: antecedents and outcomes. *Annual Review of Sociology* 44: 167–187.
- Wang DJ, Rao H and Soule SA (2019) Crossing categorical boundaries: a study of diversification by social movement organizations. *American Sociological Review* 84: 420–458.
- Zald MN and Ash R (1966) Social movement organizations: growth, decay and change. *Social Forces* 44: 327–341.
- Zald MN and McCarthy JD (1979) Social movement industries: competition and cooperation among movement organizations. Available at: <https://deepblue.lib.umich.edu/handle/2027.42/50975>
- Zunes S and Laird J (2010) The US Civil Rights movement (1942-1968). Available at: <https://www.nonviolent-conflict.org/the-us-civil-rights-movement-1942-1968/>

### Author biographies

**Lia Bozarth** is a PhD student at the University of Michigan School of Information. Her research focuses on applying computational methods to study and address pitfalls and safeguards in online political communications.

**Ceren Budak** is an assistant professor at the University of Michigan School of Information. Her research interests lie in the area of computational social science, and she's particularly interested in applying large scale data analysis techniques to study problems with social, political, and policy implications.