

Selfies as Social Movements: Influences on Participation and Perceived Impact on Stereotypes

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A new kind of online movement has emerged on social media: identity hashtag movements, through which individuals share "selfies" and personal stories to elucidate the experiences of marginalized social groups. These movements have the potential to counteract bias and enable social justice, but are enacted in a forum rife with identity and boundary management concerns. To understand this type of movement, we present a qualitative study of #ILookLikeAnEngineer, a hashtag created to challenge engineering stereotypes. We interviewed 32 people, including participants and non-participants of the movement, about their experiences with the hashtag. We found that personally identifiable participation promoted feelings of empowerment and strengthened connections within the marginalized community. At the same time, the personal and professional identity focus raised ambiguity about the boundaries of the collective and the movement's ability to change stereotypes. We discuss implications for online collective action and the use of social media for addressing stereotypes.

CCS Concepts: • **Human-centered computing** → **Empirical studies in HCI; Social media; Empirical studies in collaborative and social computing;**

Additional Key Words and Phrases: identity hashtag movements; online social movements; collective identity; engineering diversity; STEM; stereotypes

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1 INTRODUCTION

"Selfies," or photos of oneself, and stories have the potential to give a face to the social issues experienced by marginalized groups. In recent years, selfies with an accompanying hashtag have become a major form of participation in online social movements, where they are used to challenge stereotypes. These *identity hashtag movements* use personal identities to shape and reclaim the

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Fig. 1. Photos posted in the #ILookLikeAnEngineer identity hashtag movement.

broader public image of a marginalized group. For example, #ProfessionalLocs sought to counteract cultural stereotypes of wearing dreadlocks as a professional [11]. Using a selfie to show how they don the hairstyle at work, participants used their own identity to appeal to viewers who may have biases about dreadlocks. Many such movements have gained wide popularity and international attention, challenging stereotypes around topics such as race, gender, appearance, and professions (e.g., #YesAllWomen, #IfTheyGunnedMeDown, #ILookLikeAnEngineer).

Although identity hashtag movements are becoming increasingly prevalent, it is unclear what kind of effects they have on the experiences and perceptions of participants and viewers of the movement. First, what factors influence participation in the form of a selfie, or not posting at all? Selfies spotlight a user's personal identity, which public platforms like Twitter could rapidly spread to a large number of people. Identity issues known to appear even in offline movements, such as who can be considered part of the movement [45], could potentially be exacerbated by social media. Moreover, publicly expressing personal identity for potentially controversial social justice topics may be undesirable when presenting oneself to others online [40].

Second, what is the perceived impact of identity hashtag movements? Unlike offline movements, which employ actions like public protests to change laws or policies, identity hashtags rely on sharing stories or photos online as a less tangible means to achieve the goal of changing stereotypes. While these online actions may empower posters [14, 19] and work together with offline action [17], we lack understanding about their effects on viewers of the posts, including those who participate through other means (e.g., retweeting on Twitter or liking posts) or do not participate at all. Do *both* participants and non-participants experience tangible benefits from identity hashtag movements? To what extent can these movements influence attitude shifts about stereotypes?

Our research aims to better understand the connection between collective action, identity, social media, and its ability for counteracting stereotypes. We conducted a qualitative study on the perceptions of the #ILookLikeAnEngineer identity hashtag movement (Figure 1). To counteract engineering stereotypes, the movement called for engineers to post selfies with the hashtag on social media sites [56]. Engineering stereotypes are known to directly contribute to the marginalization and underrepresentation of certain groups, including women, Black, and Hispanic minority groups [4, 21, 25, 41, 57]. We chose to study this hashtag because of its focus on a specific stereotype, whereas many other identity hashtags (e.g., race- or gender-specific) tend to address communities that revolve around much broader issues. The professional nature of the hashtag also allowed us to

explore issues in intersecting professional identities with online social movements, where difficulties may arise in maintaining a professional online persona when posting about a controversial topic. Finally, understanding #ILookLikeAnEngineer has implications for using social media to improve STEM diversity.

We present, to our knowledge, one of the first empirical studies on identity hashtag movements contrasting the perspectives of people from all levels of participation, including those who post, repost/like posts, or do not post at all. We identify factors that influence movement participation and success and provide insight on motivations and limitations to using identity on social media to counteract stereotypes. We found that participation through photo and text posts (as opposed to only text or links) led to the most retweets, suggesting that movement viewers may have favored explicit identity sharing. However, using these identities also inhibited participation, causing a context collapse [16] from intersecting multiple identities (personal, professional, online) as well as confusing who can participate. At the same, this form of participation was able to empower and reduce biases in both participants and non-participants we interviewed. However, these interviewees still questioned the reach and impact of the hashtag in changing stereotypes, beyond themselves and people who are well-aware of engineering diversity. Our research furthers understanding of the relationship between marginalized and professional identities in online social movements. We also identify important design factors that inform both hashtag organizers and designers building technology to support collective action.

2 BACKGROUND

2.1 Social Movements and Identity

Social movements involve the formation of collective identity, or sense of belongingness, among interacting individuals engaged in cultural or political conflict [18]. Identity can play a major role in the goals, strategies, recruitment of members, and formation of social movements.

2.1.1 Identity as a goal. The "new social movement theory" suggests that since the 1960s, social movements have shifted from a focus on economic differences between classes, to social changes in identity [29]. This is evidenced by major identity movements around marginalized groups, such as the civil rights movement, gay liberation movement, and feminism. Such movements have worked to achieve changes in not only human rights and lifestyle, but also in stigmatized perceptions of the groups [5, 6].

2.1.2 Identity as a strategy. In order to achieve identity goals, social movements have used identity as a strategy. For example, members of the New York City LGBTQ rights movement in the 1970s publicly expressed their identity by dressing in alternative fashion and holding "kiss-ins" at straight bars. Berstein describes this as *identity deployment*, where identity is expressed "such that the terrain of conflict becomes the individual person so that the values, categories, and practices of individuals become subject to debate" [5]. Identity can be deployed either for *critique*, to challenge the values of dominant culture, or for *education*, to challenge dominant perceptions of a minority.

2.1.3 Identity as an incentive. Identity can also be an incentive for joining a social movement. People manage the way they present themselves to others in order to give positive impressions of themselves [26]. Social identity theory, which focuses on the association of individuals' identities with social groups [31], suggests that positive impressions can be supported by participating in social movements. Those who belong to a group that is associated with a negative social identity can join a movement that is working to achieve a more positive identity for that group. Moreover, participants can develop an "activist" or politicized identity as part of engaging in the movement, which helps them connect to the struggles of the collective [45, 61].

2.1.4 Identity in formation of the movement. Researchers have described the need for movements to form a collective identity in order to mobilize individuals to take collective action [5, 18, 58]. Taylor and Whittier describe three components of collective identity: boundaries, consciousness, and negotiation [58]. Members of the collective must define the boundaries of people who belong in the movement, develop a collective consciousness in evaluating their structural position and interests, and negotiate views and actions of the collective in both public and private settings. Having a well-defined collective identity is crucial for the success of social movements. Without a clear collective identity, people may feel the movement does not properly represent them and choose not to participate, and the public may view the movement as confusing [24, 45].

#ILookLikeAnEngineer had an identity goal of changing dominant perceptions about engineers. The movement pursued this goal by deploying identity through the selfies of participating engineers. However, it is unclear whether the movement was able to achieve its identity goal using this strategy online, or if it experienced issues in forming a collective identity or incentivizing participation. In particular, the movement may have experienced unique issues as a result of taking place in an online environment.

2.2 Identity Hashtag Movements

Though several researchers have investigated identity movements, less is known about identity movements that take place online. With the advent of the Internet, online platforms have become widely used for social movements due to their ease of access, broad reach, mobilization support, and spread of information [35, 46, 50, 53, 60]. One popular form that these movements have taken is social media posts that are labeled with hashtags.

Many hashtags spawn in order to discuss issues about politics or social justice, especially involving marginalized groups. Research has shown that such hashtags are important for building communities for these groups. For instance, the "hashtag feminism" and "Black Twitter" communities have utilized hashtags as a virtual safe-space for expressing feminist [20] and racial identities [7, 10, 51], respectively, connecting users with shared identities and demonstrating the ongoing discussions of the issues they face [49]. Hashtags about these groups can evolve into or function as part of online movements, such as in the case of #WhyIStayed and #BlackLivesMatter. In these hashtags, individuals have formed a collective for changing beliefs about domestic violence and racial discrimination, deploying their identities in shared personal stories. These *identity hashtag movements* can empower members by helping them take control of how their experiences and identities are framed [14, 17].

Though identity hashtag movements have been shown to have positive benefits for participants, less is known about their success in achieving identity goals. Online social movements are often criticized as "slacktivism," a combination of "slacker" and "activism" describing actions that people take to support a cause that make them "feel good" about themselves but produce little to no impact. These actions are considered low-cost and low-risk, including posting or liking posts on social media [43]. Research suggests that while online activism can have positive effects of raising awareness or motivating donations [12, 13, 33, 38], these changes might only come about when one is already well-aligned with the values of the cause [36]. Still, stories or pictures of counter-stereotypical exemplars can be effective in overcoming stereotypes [23, 47, 48]. Hashtags like #ILookLikeAnEngineer, which deploy counter-stereotypical identities of users through selfies, may reduce biases at a wide scale about the collective identity of engineers. Our work addresses this possibility by investigating the perceived impact of #ILooklikeAnEngineer.

Unique issues for participation in identity movements may also emerge when they take place online. Though participation can be motivated by a desire to achieve a positive identity for one's

Table 1. Overview of #ILookLikeAnEngineer tweets collected from Aug 3-Sept 13, 2015.

(b) Breakdown of unique tweets by type.

(a) Overall counts.		(b) Breakdown of unique tweets by type.				
	Count	Tweet Type	Count	Percent Retweeted	Avg User Followers	Avg User Following
Total tweets	156499	Photo-only	1116	1.4%	1302	423
Unique tweets	47055	Link-only	605	0.2%	1384	674
Retweets	109444	Text-only	8282	6.2%	2081	716
Unique users	86700	Photo + Text	10863	52.8%	3811	593
		Photo + Link	42	0.1%	4024	1306
		Text + Link	22168	20.9%	8641	1420
		Photo + Text + Link	3979	18.3%	43107	2057

social group, it may also be inhibited by the highly public and self-defining nature of deploying one's identity online—especially when the topic is considered controversial. Marwick and boyd suggests that users tend to censor potential controversial topics on social media sites like Twitter in order to uphold their personal online brand to imagined audiences [40]. Generally, online environments may lack of a certain "level of participation, commitment, and trust" required for mobilizing individuals to deploy their identities [62]. Moreover, Conover and colleagues suggest that hashtag participation may be limited to those who are already connected and interested in the hashtag topic [15]. We study #ILookLikeAnEngineer to not only understand perceptions of impact, but also motivations and barriers to participation in identity hashtag movements.

3 METHOD

We conducted a qualitative study with #ILookLikeAnEngineer participants to obtain a deep understanding of engagement in and perceptions of identity hashtag movements.

3.1 Research Setting: #ILookLikeAnEngineer

We interviewed Isis Anchalee, the creator of the #ILookLikeAnEngineer, to learn the background of the hashtag. The #ILookLikeAnEngineer hashtag was created at the start of August 2015 by Anchalee, who was a platform engineer at the time. In response to negative comments about her physical appearance in an engineering recruitment advertisement, Anchalee wrote a blog post on Medium [1] about her personal experiences with biases in engineering. At the end of the post, she included a picture of herself with the hashtag, inviting those interested in tech diversity and those who do not fit the "cookie-cutter mold" of the engineering look to spread the word and help redefine "what an engineer should look like" using the hashtag. Hundreds of thousands of Twitter users tweeted and retweeted the hashtag with pictures of engineers, the trending hashtag eventually spreading to other platforms such as Facebook, Instagram, and major news sites. The movement also spawned spin-off hashtags [32] and research about biases within STEM [3].

To understand the characteristics of the #ILookLikeAnEngineer movement on Twitter, we collected 156,499 tweets that contained the hashtag over its first 40 days. These tweets range from August 3, 2015, the first day Anchalee used the hashtag, to September 13, 2015. We describe these tweets and breakdown the different types of unique tweets in Table 1.

Given that the movement's call-to-action was to post a selfie, we expected a high count for unique tweets that included photos. However, there were also about twice as many tweets authored with links and text descriptions (47% of unique tweets) as tweets authored with photos and text (23% of unique tweets). We found that many of these text + link tweets were tweets that shared news articles (example headlines in Table 5). Interestingly, the opposite was the case for the types

of tweets that were most retweeted. Previous work suggests that photos with faces generally engage users on social media the most [2], thus these retweet counts may have resulted from the prominence of selfies in the movement. Moreover, work by Suh and colleagues suggests that while urls and hashtags are the most predictive of retweets, commonly retweeted urls are often media-related (e.g., from Twitpic, YouTube, Flickr) [55].

Table 2. Participant Engagement Levels

Category	Description	Participants
Poster	Posted a picture with the hashtag	P1,P3,P4,P5,P8,P9,P10,P11,P12,P13,P15,P17
Retweeter	Retweeted a tweet with the hashtag	R2,R6,R7,R14,R23,R24,R32
Commenter	Commented on Anchalee’s blog post	C28,C29,C30,C31
Observer	Did not engage with the hashtag online	O16,O18,O19,O20,O21,O22,O25,O26,O27

3.2 Participants

To gain insight on movement participants and non-participants, we interviewed 32 people who varied in their level of engagement in the movement: 12 *posters*, who authored a tweet with a picture accompanied by the #ILookLikeAnEngineer hashtag, and 20 *non-posters*, including 7 *retweeters*, 4 *commenters*, and 9 *observers*, who did not author a tweet with the hashtag (Table 2). We distinguished between posters and non-posters in this manner in order to understand differences between those who deployed their identity with a selfie and those who did not. Our sampling allowed us to contrast experiences across different participation levels. In order to recruit participants, we contacted authors of tweets, retweets, and replies with the hashtag during its originally active period (August 2015) by email. Participants contacted from Twitter had a varied number of followers. We also emailed individuals who commented on the original Medium post that had started the movement. For observers, we used convenience sampling, recruiting from our universities and our own network, which included students and industry professionals. We targeted individuals who were either from engineering departments or had engineering job titles in order to glean perspectives from those in the engineering community. We decided to sample from engineers for observers in order to understand why they chose to not join the movement despite being engineers, as well as understand how they perceived inclusivity or were directly impacted as part of the community. Our criteria for recruitment were simply that they had heard of the hashtag.

Interviewees’ ages ranged from 18 to 64. Some interviewees had only just started their respective professions, while others had 20+ years of experience. Half of the interviewees (posters and retweeters-only) had either previously engaged with another diversity-related hashtag movement on Twitter, or had attended a diversity-related event such as a meetup. We had 19 female and 13 male interviewees. Fifteen of our interviewees identified as White/Caucasian, while the rest identified as a different ethnicity, including White Jewish, African-American, East Asian, South Asian, Middle Eastern, and Hispanic, or respectfully declined to disclose their ethnicity.

3.3 Protocol

We conducted 30-60 minute semi-structured interviews over Google Hangouts and in-person from October 2015 to January 2016 and transcribed the audio recordings. Interviews covered participant work experience and profession, how much they use social media and Twitter, their experience with other Twitter hashtag movements, and their thoughts and experiences with #ILookLikeAnEngineer.

Questions about #ILookLikeAnEngineer included how they learned about the hashtag, their initial reactions to it, how and why they participated or did not participate, and their perceptions of its impact on themselves and the engineering community. Since the hashtag was created in August and the interviews were conducted a few months later, we asked interviewees about their online activity during the time the hashtag was the most active, as well as their activity at the time of the interview, in order to account for any changes.

3.4 Analysis

We analyzed interviewees' perceptions of the hashtag using a grounded theory approach [54] with the NVivo qualitative analysis software. First, we segmented the transcripts into high level topics such that similar sections of interviews could be analyzed together; for example, we collected all comments about motivations not to post to the hashtag under the *Why Not Post* topic. Then we performed open coding on each topic for a subset of the transcripts, looking for similarity across the interviewees' opinions, behavior, and experiences (e.g., *not an engineer* under the *Why Not Post* topic), and developed codes describing categories that emerged within each topic. These codes were then applied to the rest of the transcript data. Coding was performed independently by two coders who met frequently to discuss codes in order to ensure high inter-rater reliability. We achieved Cohen's Kappa above 0.8. Next, we performed axial coding, grouping similar codes and analyzing them to identify higher-level cross-cutting themes around engagement with the movement. We returned to interviews when we needed to clarify codes. We then examined and refined themes in the central concepts of participation and perceived impact of the hashtag movement.

4 RESULTS

In our analysis, we found a tension between feelings of connection to the collective identity and ambiguity about intersecting identities associated with participation in identity hashtag movements (marginalized, professional, online). Participants in the movement felt a sense of empowerment and connection with other participants, but were uncertain about the reach and tangible effects of the hashtag. We discuss influences on participation and perceptions of impact.

4.1 What influences participation?

Interviewees reported experiencing uncertainty about the boundaries of the collective, how posting would be perceived by others, and impact on imagined audiences through participation. We discuss these themes below and summarize them in Table 3.

4.1.1 Identifying with the movement. We found that participation was influenced by one's sense of whether or not they belonged to the collective identity of the movement. Participants formed a mental image of the "ideal poster" of the movement, and judged their similarity to this prototypical poster in order to decide if they should participate.

Is this women-only? Do I qualify as an engineer? Every poster we interviewed identified with their presumed ideal poster. These interviewees felt that their social category fit squarely with the ideal poster, primarily by being a woman and an engineer, or experienced discrimination and harassment similar to what Anchalee, the original poster, described:

Personally people would be like, "Oh, you don't look like an engineer!" so that happened to me before and it really hits close to home, and that's why I wanted to join in. (P4)

Others were less sure about the bounds of participation. Two interviewees were not sure how to support these diversity initiatives as men. One compared it to the Grace Hopper conference, which celebrates women in computing:

Table 3. Participation Themes

Theme	Defining Question	Description
Identifying with movement	Who is the collective and do I belong?	Ambiguity about if I can participate and how
Public image consequences	How will posting affect how others view me?	Concerns about how posting will affect impressions and relationships with others
Perceptions of audience impact	Who will see my post and how will it affect them?	Impact or lack of impact on the views of an imagined audience for a potential post

It's the same problem I feel with Grace Hopper...They don't recruit me or ask me and all the talks are about women so I don't do that and it's the same with the [hashtag]. I'm aware it exists...but it's like, "Oh, that's good, but I'm not supposed to participate in that or if I am I haven't gotten any signal that I'm supposed to interface with that or interact with that." (O22)

In addition, while all interviewees agreed that the ideal poster is an engineer, the boundary defined by "engineer" was not always clear. Although some interviewees did not post because they belonged to a different profession, two interviewees personally considered themselves engineers, but were afraid others would not agree.

I think, for me, I felt like maybe I wouldn't be considered an actual engineer, as crazy as it sounds. I think by definition, I didn't want to be misleading...I love the movement...but I didn't think it really applied to me in the true form of an engineer, if that makes sense. (R32)

We found that this "true form of an engineer" was a major source of ambiguity influencing participation. A number of interviewees disagreed about who can or should be considered an engineer. Some interviewees limited the definition of engineering to specific types, such as licensed engineers (which may exclude certain types of engineers such as software engineers), or having an engineering degree (R7, O16, O22, R32). Other interviewees stated that the engineering identity did not depend on having a license or degree, but rather on a set of skills such as problem solving or building applications in their work (P5, P9, P15, O19, O20, O21, O27). This disagreement in responses came from people who identified as engineers and people who did not, demonstrating that the engineering identity is not well-defined both within and outside of the engineering community.

Source and origin story. Perceptions of the collective identity also seemed to be influenced by the source from which interviewees learned about the hashtag. The first hashtag-related posts participants saw influenced their mental prototype for the ideal poster. For example, some interviewees learned about the hashtag from major news websites that showed tweets with pictures of only female engineers, or only described the movement as focused on "what women in engineering look like" (O18, O21, O22, O26). We note that many of the top shared links from our sample of tweets were news sources that explicitly mentioned gender in their headlines (Table 5). Similarly, common hashtags posted together with #ILookLikeAnEngineer were often gender-related (e.g., "#womenintech" or "#women", Table 4). Even those who first read Anchalee's original Medium post (which did not limit the hashtag to gender) viewed the collective as women in engineering (R2, P12, C30, C31).

Still, some interviewees who saw the hashtag on Twitter encountered posts from both men and women, and developed a broader prototype for the movement:

...some men who were people of color also posted in the hashtag...[in a professional Slack group] we discussed whether that was appropriate...we settled on the fact that it was fine because the broader issue is representation by underrepresented populations regardless of gender. (P1)

Table 4. Top hashtags used with #ILookLikeAnEngineer in our tweet sample.

Hashtag	Count
#tech	871
#womenintech	837
#stem	696
#engineering	675
#diversity	333
#womeninstem	313
#news	251
#women	236
#engineer	229
#engineers	224
#technology	195
#iamanengineer	145

Table 5. Top shared links in our tweet sample.

Count	Company	Title
1394	TechCrunch	#ILookLikeAnEngineer Aims To Spread Awareness About Diversity In Tech [link]
831	NPR	Sexist Reactions To An Ad Spark #ILookLikeAnEngineer Campaign [link]
682	TechCrunch	The #ILookLikeAnEngineer Community Hosted One Of The Most Powerful, Inspiring Tech Events I've Ever Attended [link]
587	TechCrunch	#ILookLikeAnEngineer Is Coming To A San Francisco Billboard Near You? [link]
557	BuzzFeed	Women Challenge Gender Stereotypes With #ILookLikeAnEngineer [link]
513	Washington Post	#ILookLikeAnEngineer Wants to Challenge Your Ideas About Who Can Work in Tech [link]
478	Medium	You May Have Seen My Face on BART [link]
363	USA TODAY	#ILookLikeAnEngineer Challenges Stereotypes [link]
347	The Guardian	#ILookLikeAnEngineer: Engineers Take to Twitter to Dispel All-Male Myth [link]
312	NY Times	Woman Behind #ILookLikeAnEngineer Says Campaign Against Gender Stereotypes Is 'Long Overdue' [link]

4.1.2 Public image consequences. Twitter is a highly public and decentralized platform; therefore many of the interviewees were concerned with how others, who can easily access and spread their post through retweeting, would view their posts for the hashtag movement. Several of the interviewees, including two posters, identified the potential for negative impressions and high exposure as limiting factors for participation in the hashtag movement.

For example, some interviewees described concerns that posting in this movement would hurt the "professionalism" of their Twitter account (O16, P17, O22, C29). These interviewees utilized Twitter primarily for professional reasons, such as for keeping up to date with news within their professional field, or connecting with others who do similar work. They felt that social justice issues, being potentially controversial or too personal, were not appropriate on accounts that are public to people with whom they might work.

I was thinking about it for a while, because my [Facebook and Instagram] persona, is very personal, but Twitter I use...more for work. So I hesitated... (C29)

Those without a strong Twitter identity were opposed to magnifying that identity or concerned that posting would define them (O16, O18, O20, O26, O27). Those who did not have Twitter accounts or did not use their account heavily mentioned that they were not comfortable putting pictures of themselves online for others to see:

In part because I am kind of shy, so actually posting [a] picture on social media is not my thing. (O16)

While most of the interviewees who dealt with impression management on social media were non-posters, two of these interviewees were posters who overcame this concern after realizing that they should not have to hide their identity from other people (P11, P17):

Just because this is my professional account and I know employers can potentially see it. But at the same time they should know my truth, right? They should know I'm here, and I shouldn't have to hide. (P17)

4.1.3 Perceptions of impact on audience. As suggested by previous work [40], interviewees also considered the identity of viewers on Twitter. When deciding whether to participate or when tailoring their posts, they imagined the audience who would view their posts and how that audience would be impacted.

Audience identity and awareness. Interviewees considered who would view their post, and how viewers would be affected by it and react to it. Several non-posters anticipated little impact and decided against posting a picture of themselves (R6, O16, O21, O25). One participant cited their limited network and limited novelty of the message as a contributing factor for not posting:

I don't really see how my posting would have any value or impact because most of my family and my circles who actually read the stuff that I post already know about it. And they are very aware of the things, of how women in technology look. (O21)

Conversely, many interviewees were motivated to post because they anticipated having impact with their post. For instance, 8 of the 12 posters believed that their post would help raise awareness about engineering stereotypes. Moreover, interviewees who anticipated affecting an audience considered the potential responses and reactions their post would receive. They expected having their post retweeted, gaining more followers, and inspiring people in their network to join the movement. Some participants worried about backlash that their post might receive, such as negativity towards their picture (P4, P5), but ultimately decided to post when they saw many others who were willing to post:

Well, I was slightly worried that people might cat-call or do some weird replies or whatever. Yeah, that was just the initial, hesitation, but after a while, I was like, "you know what, it's okay" because I saw a lot of people were doing it as well. (P4)

What to Post. Those who believed they would have influence not only decided to post a picture of themselves, but also strategized in choosing the picture or text they would include in their post. They expected people would see their post and experience a change in their perceptions of the engineering field. They constructed their post to counter perceived engineering stereotypes. One participant, for example, wanted to show to her audience that people can be an engineer without having studied engineering in school:

I said that I was an English major turned software developer, that I loved to dance, something silly about myself, because I just wanted to show that I'm not typically what you would consider an engineer, but I am one. (P9)

One participant believed that she might have a young audience, and hoped to set a good example:

I'm a transgender woman, so I really care about creating role models for young women and young transgender women of color. (P1)

Another participant strategized by trying to add an element of entertainment to her post, in order to pique interest in feminist-related issues:

They'll usually just be like, "Oh, there's this serious kind of feminist thing again," like, who cares, whatever. And here, they can be like...this can also be something that's amusing. (P5)

4.2 What was the perceived impact of the movement?

According to Anchalee's original blog post, #ILookLikeAnEngineer was created in order to "spread the word" about engineering diversity and "redefine what an engineer should look like." In this section, we discuss the impact the interviewees believed the movement had on themselves and on the engineering community as a whole (summarized in Table 6).

4.2.1 Individual feelings about the engineering community. Even if they did not post to the movement, female interviewees felt empowered by the movement and the positivity around the posts they saw. For example, one non-poster, who was transitioning into engineering at the time, felt more confident in joining the field as a result:

I was reading all these horror stories of women who had run into really, really tough situations and hurtful things and bad environments...and it was like, "This whole landscape sucks for women." And then that happened and I was like, "This is very reassuring." (R24)

Interviewees felt an increased sense of belonging in the engineering community as a result of seeing others who looked like them or experienced similar bias:

...you feel a little alone...feeling like you don't look like what an engineer should look like, and so it was nice to see, kind of a minority community come together and be like, "Hey look there's a lot of us." (P13)

Interviewees also reported increased awareness and concern about diversity issues in the engineering community. Seven interviewees never experienced negative stereotypes themselves and now realized the extent of the problem as well as their own biases about what an engineer looks like. Some said that they would now pay more attention to engineering stereotypes, and showed interest in participating in engineering diversity initiatives, including hashtag movements similar to #ILookLikeAnEngineer (R7, P8, P11) and meetups for underrepresented engineers (P3, P9).

Table 6. Perceived Impact Themes

Theme	Defining Question	Description
Individual movement reflection	Did the movement affect me?	Experiences of personal empowerment and personal awareness regardless of posting
Perceived effects on others	Did the movement affect other people?	Raised awareness and connection between participants against stereotypes, but uncertainty about changing others' biases
Tangible effects of the movement	Did the movement influence actions beyond posting?	Connection between participants on Twitter and some low-cost actions in support of the movement, but few high-cost actions

4.2.2 *Perceived effects on other people.* About a third of participants (12 out of 32) believed the movement raised awareness about the existence of stereotypes and the marginalization that certain engineers face. Some took the movement as a sign that the engineering community is progressing because it is starting to address its diversity issues. Some acknowledged the hashtag as part of an "ongoing conversation" (P15) that will continue to be brought to attention.

A few interviewees believed that the hashtag brought members of this community together to support each other against issues of bias and discrimination (P1, R2, R7, P9, P13, O26).

You find your tribe, you find the people who have something similar, and you have courage, it provides you with some kind of courage at times to reveal yourself. Not always, sometimes it just gives you comfort, and you absorb. At times, it motivates you to say something, and anytime it opens up a discussion, a conversation, it's good. (R2)

However, several interviewees felt that the community brought together was limited to those who identified as an underrepresented engineer or were already concerned about engineering diversity. They believed people outside of these groups either did not see the hashtag, or saw it and did not experience a change in their own biases.

I don't think that a man who disregarded a woman because she's a woman will wake up one day and realize that he did that to women, unless a woman at his workplace actually comes up to him and says I've been feeling this way. A lot of people who do this, they probably don't even know they're doing it. They think [this movement is] a good thing, it's a good trend, but I don't think they notice it in themselves. (O26)

Though many interviewees perceived that there might be changes in attitudes in themselves or those who saw the movement, the intangible nature of attitude shifts led interviewees to question if there were any tangible effects overall. As one participant noted:

I mean, I feel like for stuff like this you can't tell if it changes.... If people stop saying misogynistic things to women in STEM that'll mean that the field has changed, but...there's no active feedback you'll get that there has been a change, so I don't really know. (O27)

In the following section, we discuss whether there were any tangible effects of the movement, specifically in any actions that interviewees were influenced to take.

4.2.3 *Tangible effects of the movement.* Despite skepticism over the effects of the movement, 66% of interviewees (21 out of 32) experienced tangible effects of the movement, albeit with some limitation.

Connecting with similar people. Posters and retweeters described interacting with participants in the movement, including co-workers, other Twitter users, and meetup attendees. The movement introduced them to other self-identified engineers who looked like them or shared their social justice interests.

I definitely found a lot more people that day than I normally would to connect with just because they're self-identifying. People don't always put in their profile that they work with data or that they're an engineer. (P8)

Interviewees who posted also personally experienced increased visibility. They gained more followers on Twitter (P4, P5, P11, P12, P15) and even received direct messages asking for engineering advice (P5, P9, P12).

Conversely, almost half of the interviewees (14 out of 32) did not experience any changes in their personal community. Most were non-posters who felt disengaged from the community formed by the hashtag. Some viewed Twitter as a "lens into the world" (C29) and not necessarily a place for them to interact with other people.

Activism beyond Twitter. While effects in personal community were limited to only posters and retweeters, interviewees at all levels of participation were still influenced to take actions around engineering diversity outside of Twitter. 15 out of 32 interviewees reported having discussions with their friends, co-workers, and professional groups about workplace diversity and personal experiences they had with stereotypes. Twelve tried to expand the reach of the hashtag by emailing other engineers (R7, P8, C31, R32), writing about the hashtag on their blog (P3, R7), or interviewing with news publications that had contacted them (P5, P9, P13). Interviewees did this in order to inform others and increase movement participation:

I think I sent an email to a couple of my female colleagues like, "hey this is happening," like the ones that aren't normally on Twitter but they have a Twitter account, "Hey this is happening, you might want to get on there and say something." (P8)

Most of these actions were low-cost, as there was no risk or great effort associated with them. Only a few participants attempted to take high-cost actions. Two participants donated to a fundraiser organized by the creators of the hashtag to set up #ILookLikeAnEngineer billboards around San Francisco, where the original ad with Anchalee appeared (P1, C31). Others pursued their own offline initiatives to promote diversity in engineering, though these initiatives were ultimately foiled. One participant discussed a proposal to change the hiring process at his workplace by focusing on recruitment, but was unable to implement the proposal due to a perceived lack of interest:

And those conversations go to HR, and HR's like, that's a nice idea, and then never say anything again. That's the really frustrating bit. (R6)

One participant observed a GitHub group that formed to build a tool to promote diversity, but explained that a lack of structure prevented them from creating anything:

They never really ended up building anything, because they, you know, they didn't have a product to stick on it... (P12)

5 DISCUSSION

5.1 Deploying personal engineering identity online

The #ILookLikeAnEngineer movement utilized an identity deployment strategy, where users participated by posting selfies with the hashtag. We found that this strategy had a mobilizing effect for a number of posters, who joined in to post about their own experiences after seeing others' shared photos and stories. These expressions of identity appeared to provide a "frame" for the movement, which has been described in prior work as necessary for recruitment in order to

Table 7. Recommendations for Identity Hashtag Movements

Recommendation	Description	Support from study
Movement exemplars	Multiple exemplars showing who should participate and modeling ideal participation behavior	Ambiguity around collective identity associated with movement, who is allowed to participate and how
Diverse forms of participation	Stories, anonymous posting, concrete actions as alternative forms of participation	Discomfort with intersection of multiple identities, desire for tangible change
Audience awareness	Indicators of audience presence and viewing behavior on social media platforms, targeting posts for specific subgroups	Ambiguity around who would see posts and impact of the movement

showcase the issues that a collective faces and its ability to challenge them [45]. Subsequently, people could recognize and assimilate to the collective identity that was forming around the movement.

However, we found that not everyone was able to easily assimilate to the collective identity, as tensions emerged in the boundaries of participation through identity deployment. People drew different lines between who they considered to be "us" versus "them," such as stereotypical versus non-stereotypical engineers, underrepresented (by gender or race) versus non-underrepresented engineers, and the different engineering disciplines (e.g. software versus mechanical engineering). Paradoxically, despite the goal to increase inclusivity in engineering, people held different opinions about the level of inclusivity for the movement's identity. Polletta and Jasper state that a movement's collective identity should "clearly distinguish 'us' from opponents and bystanders" [45], however the lack of clear boundaries confused the definition of the collective identity, and caused disagreement over who can participate and to what extent (e.g., retweeting only or posting pictures).

Boundary issues likely arose due to the need to deploy personal identity while conforming to the collective identity. Potentially, different feelings and motivations around inclusivity resulted from different experiences of identity, such as at a *personal* level focused on the individuated self, and a *social* level in relation to others or social groups [9]. For instance, in deciding whether to post, non-posters appeared to be concerned with their identity at the personal level, focusing on aspects of themselves that distinguished them from others they saw posting (e.g., not being female, not being a "true" engineer). On the other hand, while some posters described their unique features as part of their tweets (e.g., non-traditional backgrounds, hobbies or fun facts), they experienced their identity at a social level, ultimately being compelled to join based on the shared characteristics and experiences they had with the presumed ideal poster.

At the same time, interviewees experienced additional boundary stress in managing their online identities. Posting a selfie is public and highly identifying, where that picture could be spread to anywhere. This made interviewees wary of not only how they would be viewed by others, but also how others would be affected by their post—especially when their Twitter account was used for professional reasons. Ollier-Malaterre and colleagues suggest that social media users engage in different boundary management behaviors in order to maintain a positive image to their professional contacts online. While interviewees engaged in *audience management behaviors*, segmenting their identities into different platforms (e.g., Twitter for professional, Instagram for personal) [44], a selfie in the movement would bring together their professional, personal and, for some, their marginalized identity in one shared space. This led to a context collapse of colliding identities [40], causing

interviewees to consider self-censorship and other *preventative* strategies, including retweeting, commenting, or only observing to avoid potential misunderstanding, disinterest, or controversy from their overlapping audiences [37, 52].

While several issues resulted from the use of identity deployment in the movement, our results suggest that this strategy has important benefits for members of underrepresented groups. Interviewees who readily posted pictures of themselves forged better connections to the engineering community, both in feelings of belonging and in actual relationships built with new people. These benefits are especially important for promoting diversity in engineering, given that reduced feelings of belonging can result in "chilly" environments and lower rates of recruitment and retention in engineering [3, 27, 28, 42]. Overcoming the aforementioned challenges is thus necessary in order to increase participation and share the accompanying benefits.

5.2 Changing stereotypes with identity deployment

Unlike other hashtag movements, which are often used to work in tandem with physical protests, or to organize around debating or expressing solidarity with events and public figures (e.g., #occupywallstreet, #morsi, #jan25, etc. [17, 50, 53, 59]), #ILookLikeAnEngineer had a much broader target of attention and goal. That is, the identity of participants themselves were highlighted, rather than a specific event or person, in order to change views about a stereotype, rather than to promote action on a specific policy or cause.

The broader focus of the movement likely led interviewees to perceive limitations in its effects. For instance, the movement relied on exposure to individual posts to achieve its goals; however, interviewees believed that these posts may not have reached or influenced those who were not already aware of diversity issues or are not underrepresented engineers. Past research has suggested that Twitter users are generally exposed to like-minded others in regards to political content [30], thus it is possible that #ILookLikeAnEngineer was mostly seen by those already interested in diversity in STEM. This would imply limitations in how much awareness was actually raised, especially in those who know the least about the topic and may be most in need of exposure. Moreover, even if these individuals see the hashtag, they may not react to it. Interviewees who were non-underrepresented engineers, for instance, pointed out that despite seeing the hashtag, they were unsure what to do about it. Taken together, it appears that, as in the case of hashtag participation suggested by past work [15], hashtag impact may be limited to those with pre-existing interests.

Interviewees also questioned whether the posted selfies actually made any impact. The call-to-action of posting a picture was less concrete than other actions employed by movements, such as donating money or attending a rally [8], where participants can see the change they are making and reactions that they incite in others. Though research has shown that pictures and stories can be an effective means to overcome stereotypes [23, 48], and both our results and previous research have shown benefits of personal empowerment and awareness [14, 17, 19], interviewees still evaluated overall impact based on concrete actions. Since there was little feedback indicating that the pictures were causing attitude shifts about stereotypes, people could not tell what effect they were having and looked for concrete actions as a more tangible indicator of impact.

Many interviewees did take actions beyond posting, potentially as a part of developing an "activist" identity [61]. However, very few took higher-cost concrete action, such as donating to the fundraiser for #ILookLikeAnEngineer billboards, or pursuing a diversity initiative in their workplace. This lack of tangible change pushed some to perceive the movement as "slacktivism," entailing low-cost actions that create little change. Literature suggests that online movements can, in fact, influence high-cost actions for more impact, such as donating money to a cause [36, 38]. Though donations for offline billboards spun out of the movement, one interviewee noted that

people may not have known about it because the billboards were only in San Francisco, and the donation system was not set up until after the hashtag was created (P25). Potentially, high-cost actions may not have been visibly tied to the movement, causing people to be unaware of them even if they were willing to take them.

5.3 Implications for identity hashtag movements

Our results have implications for organizers attempting to initiate collective action through identity hashtag movements as well as designers building technology to support collective action.

5.3.1 Movement exemplars. First, starting a movement with multiple or diverse exemplars could potentially clarify who should participate. A poorly defined collective for the #ILookLikeAnEngineer movement blocked participation. Interviewees built their perceptions of the collective identity according to their beliefs about the ideal poster of the movement, and whether their layers of identity fit. Multiple exemplars could thus provide a broader indication of who the intended members of the movement are. However, we note that there are potential challenges in the use of exemplars for movements that need to be further researched. Although highlighting specific individuals as exemplars can effectively reduce stereotypical attitudes [47, 48], using exemplars may have the drawback of forming "subtypes." Subtypes would allow people to maintain stereotypes (e.g., reinforcing the stereotypical subtype of "female engineer") [39], which would be detrimental to movements that are trying to address established stereotypes.

5.3.2 Diverse forms of participation. Second, movements should provide alternative forms of participation that are less personally identifying. Prototypical participation in #ILookLikeAnEngineer—posting a selfie on Twitter—limited those who felt uncomfortable with exposing themselves in that manner. Emphasizing variations of participation, such as sharing textual stories rather than images, posting about other people, or providing options for offline participation would provide venues not only for people who experience difficulties managing multiple identities online, but also for "allies" who are unsure of how to show support.

Moreover, explicitly linking concrete actions to participation would help people recognize the potential for tangible change of the hashtag, thereby motivating people to join the movement as well as allowing them to better evaluate its impact. Creating or finding professional organizational support could help provide resources and tools that movement organizers may not have to oversee these actions. However, having too many forms of participation could also hurt the collective identity of a movement, where being too broad could cause it to be less defined [45]. Movement organizers need to find a balance in the level of participation and inclusiveness they want to achieve.

5.3.3 Audience awareness. Movement organizers and platform designers can inform potential participants of the audiences reached by a hashtag movement. For example, view indicators (e.g., compilation of faces on a tweet showing all the avatars of people who had been reached) would change the dynamics of these movements. These indicators would show at a glance exactly what demographic of people viewed a particular tweet, the types of tweets those people are routinely exposed to, and the types of tweets they routinely author and retweet. These could help support participants' understanding and feelings of impact in response to hashtag movements. Platforms could provide affordances for targeting certain audiences online, such as groups or lists in Twitter. Targeting members of groups that are outside of marginalized groups could help increase their awareness of stereotypes and issues they face, while inviting them to support the cause as allies. Certain hashtag movements, such as #HeForShe and #GayStraightAlliance, exist explicitly for these alliances, and have shown potential for positive engagement from allies [34].

6 LIMITATIONS

Our analysis of the #ILookLikeAnEngineer represents just a first step in understanding the dynamics and nature of participation in identity hashtag movements. Our chosen research setting presents a unique opportunity to study multiple aspects of identity through one hashtag, including the overlap of professional and personal identity within online movements on social media, which has not yet been addressed in past hashtag-related research. We thus contribute important findings on the issues that arise from bringing these identities together for the strategies and goals of online social movements. However, there are some limitations to our approach that represent opportunities for future research.

Unique social issues. First, our findings are drawn from one hashtag at the intersection of marginalized identities and one particular professional identity. In addition, the evolution of that professional identity is in flux, and our findings represent participants' experience at this moment in time. While this hashtag provides a clear representation of issues that may be experienced across identity hashtag movements, it is important to recognize that some aspects of our findings are unique to this movement and the associated social issue of underrepresentation in the engineering field.

Participation bias. A second potential limitation of our study is the possibility of self-selection bias in our interviewee sample. Our sample was selected to contrast the experiences of people who posted and did not post with a selfie; thus, our findings provide important insights from people who engaged at various levels with the hashtag. Although we sample from diverse perspectives, we do not know the views or experiences of those who chose not to participate in our study. Our participants do not represent a random sample of perspectives on the movement or views from the engineering community. Moreover, participants knew the focus of the study was discussion of the #ILookLikeAnEngineer movement, which may have skewed our sample towards those with the strongest feelings about the movement. We specifically recruited participants in different categories of participation to control for this bias; however, we do not know the feelings or experiences of non-respondents and can only compare their tweets and participation levels.

Qualitative approach. Finally, our recommendations for identity hashtag movements are based on participants' perceptions of #ILookLikeAnEngineer versus quantitative indicators of the movement's effect on their behavior. While we do not quantify the participation, spread, and impact of the hashtag, the themes drawn from our participants' perceptions point to new directions for future work to further understand identity hashtag movements.

7 FUTURE WORK

Further research should expand on this work to better understand and support identity hashtag movements. Our work highlights three areas of opportunity for future research: 1) developing a general framework describing participant experience of identity hashtag movements, 2) empirically investigating the consequences of movement participation and observation through longitudinal studies and experiments, and 3) building tools and designing social media platforms that address identity-related needs of leaders and participants in online social movements.

Theorizing identity hashtag movements. One direction future work should take is to identify common traits and issues across various identity hashtag movements. As noted in our limitations section, this movement is focused on a particular social issue and thus draws on a certain population of participants, cultural concerns, and connection to professional and personal identity. Future research should work to identify parameters common across any identity movement that takes place on social media, versus traits specific to particular movements and cultural issues. We have identified factors in our research, such as origin story and boundary definitions, that we expect to influence movement participation and outcomes across all types of identity hashtag movements.

Other "#ILookLikeA*" hashtags (e.g., #ILookLikeAScientist, #ILookLikeACivilEngineer) would be interesting to compare against #ILookLikeAnEngineer, as they spun out of #ILookLikeAnEngineer and had similar goals but different or more targeted audiences. #ILookLikeADeveloper also differed in the support it received from large companies, where GA and Google held events and created graphic designs for prototypical posts. Understanding such hashtags would reveal the effects organizational structure and audience has on hashtags, in addition to how spin-off hashtags iterate on, evolve, and compare to the original hashtag.

Consequences on self-image, behaviors, and bias. Our findings suggest participation in identity hashtag movements could positively influence participants' self-image within a professional identity, increase likelihood of participating in future online and offline movement-related activities, and reduce bias for participants and movement observers. However, as noted in our limitations, because our research is observational in nature, follow-up work is needed to further examine the impact of identity hashtag movements. For instance, a quantitative longitudinal analysis of participants and non-participants in #ILookLikeAnEngineer and other identity hashtags would reveal how these hashtags persist or change over time, affect users' behaviors and activity online before/during/after the movement, and ultimately affect perceptions of biases at a large scale in the wild.

Future research should also examine whether exposure to these movements can reduce bias and influence perceptions of marginalized social groups. For example, an experiment that randomizes exposure to different types of posts from the movement and analyzes their impact on implicit bias could further our understanding about the effectiveness of these hashtags to reduce biases. Future work should examine the potentially detrimental side-effects of these types of tweets in increasing stereotyping, and identify conditions under which they help counteract biases versus increase their effects [22].

Better tools for identity hashtag movements. Finally, social media companies and researchers should consider implementing tools that better support leaders and participants in these movements. These can include improved visualizations for tweet statistics or better recommendation systems for targeting specific audiences. Better design and support that tailors open platforms for participation through identity deployment can help organizers and participants structure and follow hashtag movements, and reduce issues around boundary management and ambiguous impact.

8 CONCLUSION

This work contributes some of the first empirical insights on both participants' and non-participants' perceptions of participation and impact of identity hashtag movements, a type of online movement that displays users' personal identities in order to change views about a collective. We investigated the #ILookLikeAnEngineer hashtag and found key themes in empowerment and community building for those who identified with the collective associated with the movement. At the same time, tensions and uncertainty existed in the definition of the collective and the ability of the hashtag to reach people and change their attitudes. Our results inform research on identity and collective action in online settings, and offer guidance for the design and organization of hashtag movements that aim to influence social change.

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