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A Seat at the Table and a Room of Their Own: Interconnected processes of social media use at the intersection of gender and occupation

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Abstract

Social media have enabled people to connect with others in unprecedented ways. Existing scholarship has so far provided conflicting insights regarding what people do with these connections. Here I propose that to make sense of what people accomplish with social media-enabled connections, one needs to examine more closely their foundations. Specifically, one key way to understand social media-enabled connections is to consider how social media enable people to come together on the basis of joint social identities. This study focuses on how people use social media in ways that connect them to one another at the intersection of gender and occupational identities, i.e. two social identities that have been central to many organization studies and are critical in today's societies. The study relies upon the qualitative investigation of how women and gender non-binaries data scientists used social media. The study reveals that, at the intersection of gender and occupation, people use social media to engage in three interconnected processes of promoting inclusion, co-producing equalizing resources, and fostering exclusive enclaves. It brings light to new ambivalence reflected in people's uses of social media as they seek, simultaneously, to reshape gender dynamics in their occupation and to protect their reputation as competent workers. It unpacks why and how, with social media, the professional and the political have become intertwined.

Keywords

connectivity, data scientists, diversity, exclusion, gender, inclusion, occupational identity, social media

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@Someone I get so excited seeing #RLadies helping each other that I might cry

A panel of technologists who happen to all be women but are not talking about women in tech.

Women in data science are invisible, we can change that, from @Someone (Tweets)

Introduction

Recent years have seen the rise of the "network society" (Castells, 1997, 2001). Connectivity has characterized all domains of society, from the personal, to the political, and the professional (Dery, Kolb, & MacCormick, 2014; Kolb, 2008; Kolb, Caza, & Collins, 2012). Digital technologies such as social media have made it possible for many to connect electronically with one another (Young, Selander, & Vaast, 2019). Social media-enabled connections have inspired vibrant empirical (Hutchings, 2011; Vaast, Safadi, Lapointe, & Negoita, 2017) and conceptual (Bennett & Segerberg, 2012; Jenkins & Carpentier, 2013) scholarship.

Yet, so far, this scholarship has yielded conflicting insights regarding what people actually do with these social media-enabled connections. Some scholarship has highlighted the positive consequences that can be associated with social media-based connections. It has noted how the use of social media enables a participatory culture with low barriers for engagement and participation and with a strong sense of connections and affiliations among people (Jenkins, 2004; Jenkins, Ito, & boyd, 2015). It has considered how people's professional and personal lives can benefit from technology-enabled sharing (Jarvis, 2011). Some scholarship has also revealed how the use of social media can be associated with new forms of societal engagement by providing multiple sources of information (Tufekci & Wilson, 2012) and by enabling unprecedented forms of collective organizing (Gerbaudo, 2012; Kavada, 2015).

Other scholars, on the other hand, have warned against negative side effects and unanticipated consequences associated with the use of social media, such as the rise of "surveillance capitalism" (Trottier, 2016; Zuboff, 2019), the potential loss of real social connections and meaning (Turkle, 2011, 2015), the harassment of marginal and vulnerable populations (Ging & Siapera, 2018; Marwick & Caplan, 2018; Siapera, 2019), as well as the growth and circulation of misleading information (Mihailidis & Viotty, 2017; Tucker, Theocharis, Roberts, & Barberá, 2017). Others still have been sceptical regarding whether people are really socially engaged on social media and do more than participate in "*phatic*" communications that are purely social rather than informational or dialogic (Miller, 2008, 2017). Others have further wondered whether social media uses contribute to actual social mobilizations (Karpf, 2010).

Such conflicting insights, while fascinating, blur our understanding of what people do as they connect with one another through the use of social media. In this paper, I argue that one way to make sense of and reconcile these diverging insights is to focus on the foundations of social media-enabled connections. Probing what brings people together on social media helps understand what they actually do with social media and what processes these connections generate and sustain. This is particularly important to understand how people deal with the "duality" between connecting and disconnecting that is inherent to new technologies (Kolb, 2008).

Specifically, this study focuses on dual foundations for connections, that is, on connections that emerge at the intersection of two social identities. By considering connections at the intersection of social identities, one can make sense of how and why different processes unfold with social media use. This study then focuses of how people use social media as they share two social identities associated with gender and their occupation since these social identities are particularly important in contemporary societies.

The study relies upon the qualitative examination of women and gender non-binaries in a particular occupation, that of data science. The study reveals that these data scientists used social media intricately to promote inclusion, to co-produce shared equalizing resources, and to foster exclusive havens.

This study adds to scholarship on social media cultures by explaining how people use social media not only to take public part in emerging collective engagement, but also in semi-private shelters that provide them with the support they need to deal with vulnerabilities arising from public engagement. This study shows how the use of social media enables people to become actively involved in diversity efforts, come together, and develop new connections and shared resources. The study highlights that when there are dual, possibly conflicting, social identities at play, people navigate finely their use of social media to engage in public and semi-private forums. The study also brings light to mixed feelings reflected in people's uses of social media as they seek, simultaneously, to reshape gender dynamics in their occupation and to protect their reputation as competent workers. This study also adds to scholarship on social media and work by unpacking why and how, with social media use, the professional and the political have become intertwined.

Conceptual Foundations

Social media and connectivity

Social media correspond to web-based applications that enable their users to connect, communicate, and exchange with multiple others beyond geographical or temporal distance and organizational boundaries (boyd & Ellison, 2008; Kaplan & Haenlein, 2010; Leonardi, Huysman, & Steinfield, 2013). Examples of popular social media applications include blogs (Ferguson, Soekijad, Huysman, & Vaast, 2013; Vaast, Davidson, & Mattson, 2013), microblogging applications such as Twitter (Vaast et al., 2017), or social networking applications such as Facebook, LinkedIn, or even GitHub (Leonardi & Vaast, 2017).

Social media scholarship has noted that these technologies offer action potentials, or "affordances," (Gibson, 1977), that allow their users to relate to one another through the connectivity of features such as, e.g., linking, friending, tagging, following, or direct messaging (Leonardi & Vaast, 2017; Sharon & John, 2018). In a related manner, scholarship on social media cultures had noted how the "participatory culture" (Jenkins, 2009) relies upon people's "affiliations." This has led to insights onto a wide range of phenomena such as, e.g., fandom (Baym, 1999; Jenkins & Carpentier, 2013), church communities (Hutchings, 2011), engagement in connective action (Bennett & Segerberg, 2012; Vaast et al., 2017), or, even, tendencies towards political radicalization (Marwick & Lewis, 2017). Scholarship has also noted how online and offline connections are often intricately related to one another, even if they are not fully identical (Hutchings, 2011; Vaast et al., 2013).

Beyond these diverse insights, these examinations have in common that they take social media-enabled connections for granted. Instead, the argument at the core of this study is that the social foundations for these affiliations are key to understanding what people actually do with social media. Specifically, this study considers that social media enable connections among people at the intersection of two or more social identities.

Seminal scholarship on online communities had noted how people could come together in an online community on the basis of a "common identity" (Ren, Kraut, & Kiesler, 2007). However, by providing user-friendly ways to create, nurture, and change relationships among multiple people, social media enable people to connect with others on finer grounds. Social media make it possible for people to connect with others on the basis of shared joint social identities given their

affordances that enable the creation, support, and transformation of relations among users (Evans, Pearce, Vitak, & Treem, 2017).

Of note, this study subscribes to neither technological nor social determinism. Considering the affordances of social media, that is, the action potentials associated with social media for the people who use it enables us to unpack how these technologies can participate in new and different social dynamics, without determining their outcomes (Orlikowski, 2007).

Examining social media use at the intersection of gender and occupations

This study focuses on social media-enabled connections based upon gender and occupation. The reason for this choice comes from the fact that gender is an "*omnirelevant*" category (Garfinkel, 1967) whose significance for work has long been documented (Hatmaker, 2013; Webster, 2014; West & Zimmerman, 1987). Gender is associated with differences in job choices (Barbulescu & Bidwell, 2013), hiring decisions (Gorman, 2005), promotions (Armstrong, Riemenschneider, & Giddens, 2018; Powell & Butterfield, 1994) as well as broader organizational dynamics (Hanson & Pratt, 2003; Huffman, Cohen, & Pearlman, 2010). Management scholarship has provided important analyses of how organizations and the men and women who work in them participate in gendered processes (Ashcraft, 2013). It has provided conceptualizations of gender as socially constructed in organizations (Ely, 1995) and has retraced efforts towards transforming these ongoing social constructions (Ely & Meyerson, 2000, 2010). There has also been seminal scholarship on organization-level attempts at changing gender imbalances in professional fields such as academia (Bilimoria, Joy, & Liang, 2008; Van den Brink & Benschop, 2012), or accounting (Kornberger, Carter, & Ross-Smith, 2010).

Considering the intersection of gender and occupational identities is particularly significant for occupations that have been gender imbalanced. For instance, nursing and teaching have long been highly female, while firefighting, construction, and technical fields have been highly male. Specifically, the computing and STEM-related occupations in developed economies have been particularly gender imbalanced (Margolis & Fisher, 2003). Historical perspectives have indicated that the percentage of women in these occupations has decreased over time (McGee, 2018). It is often difficult for women and gender non-binaries, i.e., for gender minorities, to act and present themselves in masculine professional domains (O'Connor, O'Hagan, & Gray, 2018). Studies have also revealed how the use of social media can expose gender imbalances and possibilities of discrimination and harassment (Bivens & Haimson, 2016; Braithwaite, 2016; Ging & Siapera, 2018). Little is however known about social media use at the intersection of both gender and occupational identities. I turn to the methods of this study to tackle this issue.

Research Methods

Research design and setting

This research adopted a single case study design to develop an in-depth understanding of how people who shared gender and occupational identities used social media as a foundation for theoretical development (Flyvbjerg, 2006). This research design was chosen because it enabled a consideration of how some people used social media to connect with others at the intersection of the two social identities of gender and occupation. The qualitative case study design helped gain an understanding of the phenomenon under investigation through the collection and triangulation of diverse types of data (Miles & Huberman, 1994).

Specifically, the case examined data scientists' uses of social media. Data scientists are new and highly skilled knowledge workers who collect, analyse, and visualize multiple types of data to generate value in diverse domains, from the business to the non-for-profit or the academic worlds (Provost & Fawcett, 2013; Van der Aalst, 2014).

The focus on women and gender non-binaries among data scientists was expected to be particularly revealing for several reasons. For one, data science is gender imbalanced in that there are far more men than women in data science (Crowdflower, 2017; Schutt & O'Neil, 2013), as in most STEM disciplines. Hence, many of the difficulties encountered by gender minorities in technical disciplines were likely to be experienced among data scientists as well. Moreover, the data scientist occupation has risen as attractive and prestigious (Blau, 2015; Davenport & Patil, 2012). Given growing discussions of gender imbalance and, more generally of diversity issues, in technological occupations (Phillips, 2005), and frequent calls to change this situation (Hacker, 2017), it was likely that data scientists had to grapple with this issue as well. Furthermore, because data scientists had recently appeared, they had used social media for most of the history of their occupation. Also, this was a tech-savvy occupation: data scientists used social media heavily, in many aspects of their work and social life. Finally, and more pragmatically, the author had studied the emergence of the data scientist occupation and was thus familiar with key issues of importance to data scientists, including, for some, gender imbalances. They had also made connections with some data scientists for another project, which eased access to data in this study and helped understanding data scientists' practices and the issues they faced.

Of note, the focus on women and gender non-binaries in data science and the qualitative research design implied that the ambition of the empirical study was to understand how some data scientists used social media to connect with one another on the basis of shared gender and occupation. The goal of the research design was not to provide a statistically representative snapshot of how all data scientists used social media.

Data collection and analysis

This study relied upon the qualitative collection and analysis of diverse data. Table 1 summarizes the main collected data.

Semi-directed interviews with data scientists were conducted in order to grasp, from their perspective, the state of gender in data science, to learn how they used social media in the context of their work, and to understand whether and how they used social media in ways that aimed at addressing gender issues in data science.

The author interviewed 69 data scientists for this study: 45 women, 22 men, and two gender non-binaries (one biologically female, the other biologically male). Compared to the occupation of data science as a whole (Levy-Bencheton & Cutt, 2015), relatively more women and gender non-binaries were interviewed than men. This was the case because, given their minority status in the occupation, women and gender non-binaries experienced their gender identity more strongly than did men. Interviews continued until saturation occurred, i.e., until the addition of a new interviewee did not bring new information for the analysis (Charmaz, 2006; Glaser & Strauss, 1967).

Due to the geographical dispersion of respondents that reflected the global but differentiated localizations of data science positions at the time (Blau, 2015; Crowdflower, 2017) (see Table 2), interviews were conducted in face-to-face meetings, via telephone, or via videoconference.

Interviews lasted between 30 and 75 minutes, were recorded, and transcribed. Pseudonyms are used to preserve anonymity, as some of the issues associated with gender and work discussed in interviews were delicate. Questions from the interview guide had to do with the career path of the

Table 1. Collected data.

Data types (*covered period*)	Information on collected data	Use in analysis
Semi-directed interviews with data scientists (*March–May 2017*)	Respondents selected for their diversity in terms of gender, geographic location, and career stage 69 interviews – interviews conducted until saturation	Providing emic perspective, experience of gender dynamics in data science and of social media use Understanding from respondents' point of view of involvement in changing gender dynamics with social media use
Archival records from data scientists on social media (*November 2015–July 2018*)	Theoretical sampling of public archives from various social media applications Online discussions associated with gender and data science from LinkedIn, Stack Overflow, GitHub, Twitter, Blogs, Facebook, and Slack	Etic perspective onto occupation of data scientists and use of social media. Insights onto actual use of social media applications Identification of situations highlighting involvement in changing gender dynamics in data science with social media
Mainstream media and professional reports on data science and women's positions in data science (*November 2013–July 2018*)	Secondary data collection: documents, including O'Reilly book on women and data science, reports on career insights for data scientists, special issue article on past and future of data scientists and gender, etc.	Develop a more in-depth understanding of the context of formation the data scientist occupation and of gender in data science

Table 2. Geographical location of interview respondents.

Geographical region	
Africa	1
Australia, New Zealand	4
Europe	21
North America	40
South America	3

respondents, their current uses of different social media applications, their considerations of the motives and consequences of these uses, as well as the current state of gender in data science, and whether and how they associated their use of social media with efforts towards bringing awareness to or transform gendered processes in data science. The interviews helped gain an understanding of the complexity of gender-related dynamics in data science.

In addition, secondary, publicly accessible, data were collected (see Table 1). Industry reports and trade publications provided some insights regarding data scientists and gender in data science. Importantly, as well, data from social media use associated with gender dynamics in data science were collected on several social media applications (in particular, Twitter, GitHub, StackOverflow, Slack, LinkedIn, and Facebook). These data were theoretically sampled (Glaser & Strauss, 1967) to focus on those most relevant to gender dynamics, rather than the entire, ongoing stream of social media data. This theoretical sampling was particularly useful to identify and dig into several critical incidents that were revealing of gender dynamics in data science and of the ways in which some

data scientists used social media to address them. The study complied with emerging ethical guidelines on qualitative social media scholarship (Vaast & Walsham, 2013; Whelan, Teigland, Vaast, & Butler, 2016) in particular by ensuring the anonymity of the quotes, by protecting their sources, and by manually rather than systematically collecting only theoretically relevant social media data.

As typical of grounded qualitative research (Charmaz, 2006; Denzin & Lincoln, 2000), data collection and analyses overlapped: emerging analyses of existing data led to the search for additional data. The qualitative data analysis software Atlas.ti was used in order to manage the data and facilitate the analysis process.

An early step in the analyses involved examining whether and how data scientists perceived that their gender affected their work or career as data scientists. Analyses also covered how data scientists used social media in the context of their work, e.g., to find information, communicate with peers, etc. Then, the analyses focused on how data scientists actually used social media in ways that participated in the gender dynamics of their occupation. Some shared and differentiated patterns appeared whereby gender minorities (women and gender non-binaries) tended to be proactive in their use of social media to change their situation in data science. Notably, though, some men also supported and participated in such efforts.

As analyses on how social media use participated in efforts at reshaping gender imbalances in data science unfolded, three, distinct yet interconnected, key processes associated with social media use at the intersection of gender and data science appeared gradually (Strauss & Corbin, 1998). The author and a research assistant worked together to analyse systematically and deepen the interpretations of the entire data set. They worked as each other's "devil's advocate" to push the analyses further (Eisenhardt, 1989; Feldman, 1995). Several data scientists who had been interviewed earlier in the study also provided their perspective on the analyses in progress, which helped refine the interpretations in an ongoing manner.

Findings

This section first presents the situation of gender minorities in data science before detailing how some data scientists used social media to promote greater inclusion in data science, co-develop equalizing resources, and foster exclusive online enclaves.

Gender in data science

Many data scientists considered that data science was relatively welcoming of gender minorities, compared to other occupations in technology and in specific scientific disciplines such as computer science or software engineering. A data scientist compared her situation in data science positively to that of many women in the tech world: "I have not experienced some of the really meanest things that women can experience in tech" (Juliet, interview). Yet, data scientists also recognized that women were much less represented than men in data science, and that, partly because of this, they often found themselves having to face damaging gender-based stereotypes. A report on data science noted for instance that negative stereotypes could also be internalized by women in data science in ways that made them less confident and less inclined to seek promotion opportunities: "Internalized stereotypes can cause women to feel they don't have the 'right' knowledge or skillset for success in the field" (Report on obstacles and opportunities for women in data science). A woman data scientist also noted that she had often had to deal with clients' surprise at her knowledge of sophisticated analysis and visualization techniques as she mentioned: "I do not want to assume that we are stereotyped, but I have certainly had my awkward moments" (Karen, interview).

More generally, for many women and gender non-binaries, the combination of their gender and their working as data scientists was challenging. This was the case because the work environment of data scientists was dominantly male: most interviewed women and gender non-binaries were the only one of their gender in their workplace. Women and gender binaries often felt less visible than men at work. This happened often, for instance, when their clients confused them for assistants rather than data scientists. Gender minorities data scientists also expressed regrets at not being able to find mentors within their proximate work environment who could understand their specific situation:

> So most of my career has been working in all-male environments (. . .). That can be something you have to find a mentor like yourself, and it's actually very difficult, and if you're unlucky not to get a mentor who is a typical white male in the industry, then you end up without that sort of mentorship. Or, you find a mentor who cannot also understand the difficulties that you may be having. (Edina, interview)

At the same time, data scientists often voiced their passion for data science, and wanted to encourage others to participate in it and to address the negative consequences of gender imbalances that they faced. A data scientist acknowledged in a tweet her explicit willingness to address negative stereotypes of competences for women in technical domains: "I know I'm an effective evangelist & not scared of rejection, but most of all it's my responsibility to both challenge stereotypes & inspire, by being VISIBLY technical" (Tweet, emphasis in original).

Many data scientists, women and men, expressed a desire to bring a better representation of gender minorities in data science. Some interviewees considered that data science, by virtue of being relatively new, stood a good chance of being more welcoming to gender minorities than longer established occupations:

> You know, engineering already has this sort of stigma attached to it, of, you know, engineers tend to be male, and it tends to be very difficult for women to break into engineering. And I feel like, because data science is new, we have an opportunity to create a better, more welcoming environment, for people from all different walks of life. (John, interview)

Another data scientist also noted that it was important to promote greater gender diversity in data science to bring more balance to society at large:

> In any field that is having an effect on society, and I think data science certainly is an example of such a field, it's important to have a good representation of people because I think you want to get as diverse a set of opinions as possible. (Mark, interview)

Data scientists used social media in ways that participated in three processes associated with gender dynamics in data science: towards promoting inclusion, towards co-producing equalizing resources, and towards fostering exclusive enclaves. Table 3 summarizes these three processes.

Promoting inclusion

Data scientists used social media in order to voice their support for greater access to data science for all genders. Social media could be used to promote inclusion in a public manner, e.g., through tweets (i.e., microblog posts from the application Twitter), blog posts, or LinkedIn and Facebook

Table 3. Processes associated with social media use by gender minorities in data science.

Processes	Practices	Key social media applications used	Key uses of social media
Promoting inclusion	• Informing public about gender imbalances in data science • Enrolling and promoting allies • Publicly informing and actively influencing events and situations to make them more gender inclusive	• Twitter • LinkedIn • Facebook • Blogs	• Publicly advocating for gender diversity for data science • Creating public connections among gender diverse data scientists • Teaching others about gendered issues in data science
Co-developing equalizing resources	• Developing common ground and resources associated with gender in data science • Building shared arguments to advocate for greater gender balance in data science	• Twitter • GitHub • Blogs	• Co-producing and circulating databases of data scientists for public engagement • Co-developing career guides directed at gender minorities • Developing and circulating records of arguments against gender imbalances in data science
Fostering exclusive enclaves	• Developing private sub-communities in data science on the basis of gender • Retreating from engagement in public spaces	• Slack	• Engaging in online safe spaces with select others • Venting privately about gendered situations • Protecting self and strengthening connections with peers

updates. Data scientists expressed publicly, and often with forceful language, the importance of diversity in data science, which included, but was not limited to, gender diversity:

> Among other things, racism, sexism, and other prejudices in the workplace are inefficient. We cannot afford to ignore talented brains because of superficial physical factors such as gender or skin color that are irrelevant to work competence. (Tweet)

An interviewee who was involved in bringing awareness of gender imbalances and in training gender minorities in machine learning techniques noted:

> There are a lot of women who don't have a community [in their local environment] and don't talk about this stuff. They think that it is because they are not good at data science or at their job or something like that. I use Twitter to talk about gender issues. (. . .) Twitter is a very important platform for me and for speaking out about these feminist issues. You get a lot of support from other people. (. . .) You are connected with others. There will always be people who will always support you, even if it is just one or two people. (Irma, interview)

This comment was notable because it articulated the importance for gender minorities in data science to come together, and because it explained some of the roles that the use of social media played in such community building. This data scientist considered that social media provided ways

to "speak out" about gender, as well as to be supported by others while doing so by enabling connections among peers, beyond geographical or organizational distances.

An important aspect of fostering inclusion in data science via social media involved using social media to publish positive stories through multiple applications (e.g., blog posts that were then linked to other applications such as microblogging, social networking applications). This was especially the case of hybrid online-offline groups dedicated to gender minorities in data science, such as "*R-ladies*" groups, the "*Pythonistas*," or the "*AIClubGenderMin*." A data scientist noted his support of these groups in the following manner:

> The fact is that women are underrepresented and they are facing more challenges. So I think that it is fantastic that they are teaming up and that they support each other. These groups are generally supported by a lot of males and females. The R-community can show that this community is actually trying to really urge female practitioners. (Trent, interview)

Such a quote illustrated how these groups attracted members and allies. Furthermore, these groups, which brought together people on the basis of commonalities in gendered experiences and in knowledge domains, often operated in large parts with the use of social media applications (e.g., thanks to the meetup.com social platform, microblog accounts, or hashtags organizing online discussions). These groups presented positive and welcoming messages via social media. They emphasized as well that they enhanced learning for all of their (prospective) members:

> New @RLadiesNYC blog post is up! 🎉 In which @Someone:
>
> - gives an overview of @rstatsnyc 2018
> - includes links to talks and resources
> - 💜 discusses the influence of R-Ladies (Tweet)

Promoting inclusion via social media involved publicly supporting the activities of these groups in data science:

> 🍣 👯 Hungry Gender Minority #Pythonistas at last night's #pandasSprint!! Sustenance for our #GitCommit & bantering with my #AlgoTrading #GameDev #CyberSec techie friends == perfect evening 🤳 💻
>
> Big thanks @py_sprints & @HNTechnology for supporting #TechDiversity #InclusiveTech 🌬️✋ (Tweet)

This tweet referred to an event dedicated to bringing together Python experts identifying as gender minorities. It articulated key messages of inclusion and diversity while highlighting the expert topics that the attendees had discussed (algorithmic trading, game development, cyber security).

A sense of camaraderie and shared experiences was often expressed by interviewees who took part in these groups:

> I see a lot of support for R-Ladies groups around the world, retweeting each other's meetup announcements and welcoming each other when there are new chapters, and other R people and organizations retweeting things about R-Ladies groups, so I feel like within the R community there's been particularly a lot of support for promoting R-Ladies-related things on social media. (Helen, interview)

This quote illustrated how using certain social media features (e.g., the retweet feature on Twitter: Marwick & boyd, 2010; Vaast et al., 2017) participated in engaging in this support. Also, social media were at times used to debunk negative stereotypes of competence associated with gender minorities: "A complaint about gender stereotypes - women can be geeks too! Hurray!!" (Tweet). This tweet exemplifies how some data scientists worked towards discrediting stereotypes by adopting an upbeat tone ("Hurray!!"). It was however notable that at times the tone turned more critical and confrontational. This was particularly observed during an incident in June 2018, when a conference dedicated to data science applications in finance drew criticisms about having 56 speakers but no woman among them. News of the situation and condemnations of the organization of the conference soon appeared on social media, as illustrated in the following posts:

> Are you looking to attend an all-male conference in #DataScience? #rfinance2018 has got you covered! 100% male committee, 100%male speakers, no Code of Conduct. Yes, this is 2018! #BinderFullofMen. (Tweet)

> The typical "there is no sexism" responses in reply to an event that has *56 men and 0 women* speaking show how far people are willing to suspend their disbelief on a topic. (Tweet)

Data scientists used social media to articulate how the lack of women speakers at the conference resulted from hidden biases and lack of efforts toward inclusion:

> It's incredible that people can actually convince themselves that it's likely this was a result of a
>
> -totally unbiased committee selection process
>
> -totally inclusive advertising of the request for proposals
>
> -totally unbiased speaker selection process
>
> -perfectly welcoming event. (Tweet)

Some posts highlighted how data scientists, in particular, should have diagnosed the issue at hand, given their expertise in scientific methods and probability:

> And the special irony is you'd think data science people would be open to questioning why they're getting skewed results. smh [shake my head]. (Tweet)

Other posts made use of popular memes to make their point:

> Me pointing the conference organizers to all the great women in data science who they could have invited like
>
> 
>
> (Tweet)

Some data scientists soon turned to social media to call for a boycott of the conference and the companies that sponsored it:

> To be clear, intentionality is not the issue here. It is no longer acceptable to host
>
> professional conferences without considering #diversity. Full stop. #2018 #boycott (Tweet)
>
> Meet the companies financially supporting this unrivaled level of gender exclusivity:
>
> @Microsoft @MicrosoftR @uicbusiness @quasardb @CitadelCareers @RConsortium @rstudio @WilliamBlairCo It's 2018, not 1818. You can & should do better than this. #rfinance2018 (Tweet)

The mounting public criticisms and pressure on the conference organizers led to the addition of talks on diversity during the conference, prompted by an initiative from a women-led group:

> These talks were added after-the-fact as a response to the public spotlight on this issue. Members of @RLadiesGlobal who were at #rfinance2018 volunteered to speak on the topic of diversity – a much needed addendum to the schedule. (Tweet)

Rapidly, some of the groups in charge of the organization of the conference even offered an apology and a commitment to making more efforts towards inclusion, which drew praise from those who had initially drawn attention to the issue:

> R Consortium encourages and promotes diversity across R (#rstats) Community events and activities, and R/Finance 2018 has not upheld R consortium principles. The R Consortium believes deeply in diversity and inclusion and 1/2
>
> We are working with the organizers and RLadiesGlobal to ensure this and all conferences we support going forward are diverse and inclusive. 2/2 (R-Consortium tweet)
>
> It's great to see an acknowledgment by #rfinance2018 sponsors @RConsortium and @rstudio (via @Someone) of their mistake and a commitment to support diversity at conferences in the future. Haven't seen a statement from the others yet. Thank you, @RConsortium and @rstudio. (Tweet)

This example showed how some data scientists participated in a push towards greater inclusion in data science as they used social media to bring to light gender imbalances in data science and to call for changes to alleviate them.

Co-producing equalizing resources

In addition to promoting inclusion through public messages, the use of social media also enabled the co-production of resources to bring more gender balance in data science. This was seen in posts that brought together web-based content to help gender minorities join the occupation (e.g., to get trained, feel welcome in the community, and learn how to work and communicate as a data scientist). A database available on the social platform GitHub (a social media application especially used to share and co-develop code-related content) was advertised in a tweet in the following manner that explicitly emphasized the activist purpose of these resources:

> Women in data science, know your resources. Others, be an ally. Link (Tweet with a link to a GitHub post with multiple links of educational resources available on social media, and targeted to women in data science)

Another tweet mentioned a list of social media links under the umbrella: "Ultimate list of resources for women in data science. . ." Yet another one illustrated how, on social media, arguments for redressing gender imbalances were at times associated with more traditional resources for learning the technical craft of data science (cf. below "debunking the pipeline myth" alongside "learn deep learning" and "data science career advice"):

> Learn deep learning: course.fast.ai
>
> Computational linear algebra: github.com/fastai/numeric. . .
>
> Data science career advice: fast.ai/topics/#advice
>
> Myths about AI: bit.ly/myths-AI
>
> Biased AI: bit.ly/AI-biased
>
> Debunking the pipeline myth: bit.ly/not-pipeline (Tweet)

Some data scientists used social media in order to create and circulate information aimed at helping others actively contribute to more gender equity in data science. For instance, in April 2018 a gender non-binary data scientist wrote a blog post dedicated to bringing awareness to and to providing concrete ways to remedy the lack of representation of gender minorities in data science events. The extensive post started in the following manner:

> Help! someone has pointed out my conference has diversity issues!
>
> How do I fix this?
>
> I get asked this question a lot.
>
> Often it is in response to me refusing to speak at a conference because it does not meet our team's Diversity & Inclusion policy. I will decline to speak at a conference if the lineup is all white men or if there has been little to no effort by the organisers to ensure that attendees from diverse backgrounds are able to attend. . . (Blog post https://ada.is/blog/2018/04/16/help-someone-has-pointed-out-my-conference-has-diversity-issues/).

This blog post was later linked to in others' blog posts, as well as widely circulated on other social media applications, in particular Twitter and LinkedIn. It was often referred to during the aforementioned situation of the R-finance conference in June 2018 that did not originally include any gender minority in its lineup of 56 speakers. This example thus shows how people produced and publicized resources that were not meant only to be informative but also to become actively used to bring more gender balance in data science as others appropriated and reused them.

What is more, and specific to social media and their enabling user-generated content, the equalizing resources were in large part co-produced by multiple people. This co-production was particularly evident in a list of women data scientists that was created by an individual but that grew from women choosing to be added: "Just going to put this twitter list of over 1400 women in data science and related fields right here [Link to list] . . . (Let me know if you want to be added!)" (Tweet). The list had two key purposes. The first one was to help create connections among women and, more generally, gender minorities, in data science. This could help develop a sense of community among them as many lamented not having sufficient occasions to meet

peers in their workplace or local data science environment. The second purpose was to provide and grow resources for media and conference organizers looking for minority genders in data science for public speaking engagements. The availability of such social media-based resources aimed at facilitating a greater representation of gender minorities in public events in data science. The originator of this list, in an interview, clarified her intentions behind the creation and management of the list of women in data science: "I built my list of women in data science (and related fields) partly as a counter to the argument that there aren't enough women to ask to give talks at conferences" (Renee, interview).

Another data scientist commented positively about the list in a tweet: "Wow!! Super to be included in this list alongside amazing women who are passionate about #data #analytics & #datascience 😀" (Tweet). By referring publicly to the list in a tweet, this data scientist brought more visibility to it and emphasized a sense of community based upon gender and commitment to data science.

Moreover, the list was particularly notable for illustrating that these equalizing resources were not simply created and publicized by isolated data scientists. Instead, focal data scientists generated them and started to seed them with contacts, but then these resources grew by being co-produced. Data scientists therefore used the specific features of social media enabling user-generated content to facilitate the organic co-development of shared resources.

Also, some data scientists used these co-produced resources to craft arguments regarding how their participation in collective engagements towards more gender balance was consistent with a keenness to develop one's professional expertise:

> Multiple trolls that don't know me assumed that because I care about gender representation in tech, that I *don't* care about competence in data science. Nope, I care about the fair treatment & representation of the many many competent *and* diverse people in data science. (Tweet)

This was followed by two other tweets from the same person that articulated a connection between bringing greater diversity and greater competence in the field and the significance of using social media to generate shared resources for diversity in data science:

> Also: Assuming that I'd be willing to sacrifice technical competence & quality in order to create a diverse data science team? Your bigotry is showing. (Tweet)

> And, if you have followed me (or, here's a thought, looked at my tweets before making things up about what I think and support), you will know how many learning resources I build & share to help create even more competent data scientists. I'm proud of what I do here. (Tweet)

Co-producing equalizing resources thus also helped some data scientists respond to disapproval they had received when they made overt efforts towards promoting gender minorities. Interviewees at times explained that they had to deal with criticisms when they were publicly engaged in women and gender minorities groups. An interview respondent for instance explained that a high-level data scientist had expressed strong reservations about the group she was associated with:

> We try to get the R-ladies groups to send the word around our local group. The president of the statistical society here in Buenos Aires, who is a male, expressed strong concerns about discrimination. There was some discussion about this very powerful guy not getting the positive discrimination if you will. (Loretta, interview)

This respondent hinted at the need to have resources, co-produced through social media by data scientists from around the world, in order to be able to respond to disputes they faced locally (in this case, in Argentina). Referring to another group of women data scientists, this time in Spain, an interview respondent also explained how they at times had to deal with negative feedback from others: "Once we faced criticism about our R-ladies group. There was once a guy that said this group was completely illegal, and that what we were doing was discrimination against men" (Margot, interview).

Fostering exclusive enclaves

As they encountered criticisms when they engaged publicly in trying to make data science more gender balanced through promoting inclusion and through co-producing equalizing resources, some data scientists joined social media-enabled self-selected private groups. They used specific social media applications to protect themselves from wider and more open to criticisms encountered on public applications such as Twitter, Stack Overflow, or GitHub. The social media application Slack, introduced in 2016, was particularly used in this manner. Slack could be used by members of self-defined teams beyond organizational boundaries, in order to exchange among one another more freely than they would with the wider public, to share messages and advice as well as more generally have chats on wide-ranging topics. The participation in these safe online spaces was often triggered by an ambivalence expressed by data scientists involved in public efforts towards inclusion and in the co-production of equalizing resources:

> The thing that kind of like nags me at the back of my head, but I don't actually know if there's any truth to it, is that, because I'm involved, and sort of publicly involved, in like Pyladies and the Girls Who Code and the larger technology community and activism, I worry that I'll be perceived as that's my thing, and that's the thing that I do, and that's secondary to my professional – to my career, my actual job, and that's not really the case, but I sometimes worry that that's how I'm perceived. (Ethel, interview)

This quote articulates a tension between participating actively in collective engagement towards more gender-balanced data science and a perceived risk to one's individual reputation and career. For some, a way to address this tension was to join private social media-enabled groups on Slack. Some data scientists sought exclusiveness in order to feel safe talking freely about gender in data science to limit their risk of becoming perceived only as a member of gender minorities rather than as data scientists first and foremost.

Many of the gender minorities groups (e.g., R-ladies, Pythonistas, Women in Machine Learning and Data Science) had over time developed Slack groups as well. These groups constituted online havens for gender minorities where they could complain without fear of being misunderstood, harassed or encountering negative consequences. In these protected online environments, all participants were socially vetted and developed closer connections with one another than on more open and public platforms. Data scientists fostered exclusive enclaves where one belonged on the basis of similar experiences associated with one's minority gender and one's occupation.

The ability to share freely among compassionate people who had likely had similar experiences was particularly appreciated among interviewees, and put in contrast with the use of more public social media applications such as Twitter:

> There is the R-ladies Slack team. We have a rant channel in this Slack, where some people are discussing any negative experience they have faced because of gender issues. So, if we don't want all of the exposure of Twitter, but we want to share more privately. Sometimes, it is better. (Margot, interview)

This quote shows how online havens were propitious to sharing frustration among peers regarding criticisms received from efforts at inclusion. Data scientists considered it sometimes unadvisable to respond publicly to such criticisms. Instead, they shared these negative encounters among a select few. This trend toward exclusivity enabled by the use of Slack helped these data scientists receive and provide sympathy among one another, but not attempt at changing the status quo in the broader data science occupation.

Discussion and Implications

Discussion

Social media make it possible for people to come together beyond distances and to engage in the coproduction and circulation of content (Jenkins et al., 2015; Kaplan & Haenlein, 2010). There has been much disagreement regarding what this coming together on social media actually does (e.g., Jenkins & Carpentier, 2013; Marwick & Caplan, 2018; Miller, 2008; Siapera, 2019). To make sense of these diverging insights, I focused on the foundations of connections since what brings people together shapes what they actually do with social media. Specifically, I considered that social media make it possible for people to connect with others on the basis of joint social identities, and examined social media use at the intersection of the two key social identities associated with gender and occupation. The qualitative study of women and gender non-binaries in data science revealed distinct yet interrelated processes associated with social media-enabled connections.

Before discussing the broader meanings of the findings of this study and highlighting their implications for scholarship, one needs to acknowledge the limitations associated with this study. For one, this is a case study of some participants in a particular occupation. It therefore does not aim at being statistically representative of all social media use for all genders and occupations. The processes highlighted in this qualitative study were meaningful for women and gender non-binaries in data science, but they should not be considered the only possible processes associated with social media use at the intersection of gender and occupation.

Another limitation is that feminist readings of social media and of gender-related dynamics at play in data science were mostly outside of the scope of this study. There exists a wealth of scholarship in this domain (e.g., Berg & Lie, 1995; McNeil, 2008; Wajcman, 2010). One notes that organizational scholarship has evolved in its consideration of gender, and that gender-related studies have become highly diverse (Fernandez-Mateo & Kaplan, 2018). Scholars interested in issues associated with gender, organizing, and technologies have thus experienced a tension between examining phenomena associated with gender while relying upon traditional qualitative research methods used by organization researchers, as this study did, and adopting research approaches that are uniquely suited for feminist studies. Acknowledging this tension, I consider that it would be particularly enlightening for future scholarship to undertake feminist readings of the study to deconstruct gender in data science and to perform critical analyses of the uses of and consequences associated with social media.

Beyond these limitations, this study offered a new way of considering how social media-enabled connections among peers at the intersection of gender and occupation can lead gender minorities in an occupation to participate in claiming "a seat at the table" and in establishing "a room of [their] own." A key, counterintuitive insight associated with the study was that people's use of social media at the intersection of two social identities could be seen as providing resources for empowerment but also for self-imposed isolation. More specifically, the study revealed that women and gender non-binaries in data science used social media in ways that supported three key processes towards: making the occupation more inclusive by sharing public content and connecting publicly with others on the basis of shared occupational and gender identities; co-producing, with

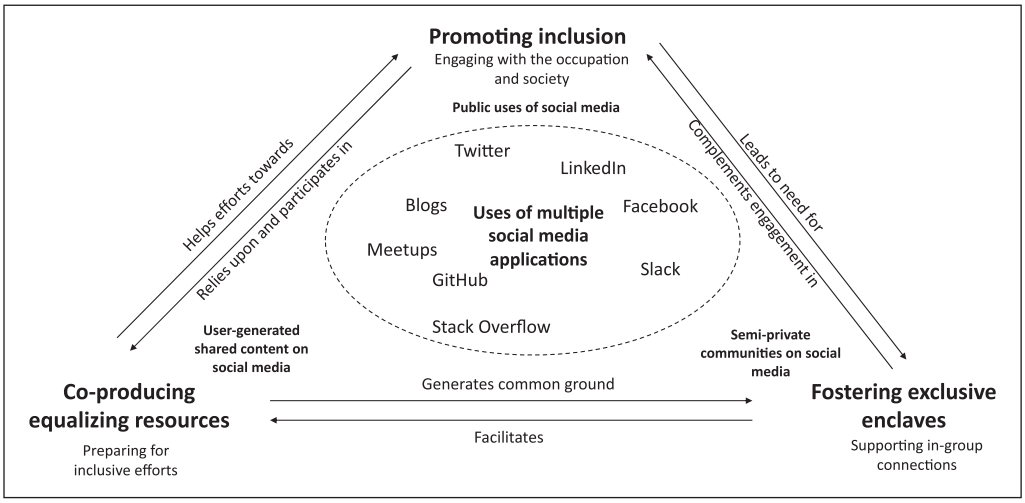

Figure 1. Interconnected processes of social media use at the intersection of two social identities.

user-generated content, equalizing resources that could be used to help redress gender imbalances in data science; and fostering exclusive online enclaves when the pressures associated to the first two processes were becoming too intense. The study revealed that these three processes were distinct, but interconnected (see Figure 1).

Promoting inclusion involves using social media to communicate publicly and tackle issues associated with, e.g., gender-based stereotypes of competence or hidden biases. People can use social media to publicize a diversity agenda promoting greater access to the occupation for gender minorities. People can communicate broadly their messages of inclusion and broaden others' awareness of gender-related issues. Also, social media enable people to participate in spontaneous actions that can contribute to changes. Hutchings (2011) had seminally explained how online and offline happenings can be intricately related. This study corroborates this idea. It further reveals how some people can use social media to echo offline events and promote change through electronic messages.

Promoting inclusion via public uses of social media, therefore, holds the potential for change, but can be exhausting for the people promoting it, due to the pressure to engage constantly with others publicly and the vulnerability to others' criticisms on the online public space. People thus complement their use of social media to promote inclusion with the two other processes.

Regarding co-producing equalizing resources, social media enable user-generated content, which makes it possible for people with limited formal or geographical connections to come together and share, store, and expand content associated with gender and knowledge of the occupation. With social media, then, people find ways to build and share resources (Bennett & Segerberg, 2011; Jenkins, 2009) that can provide arguments associated with engaging in change efforts. These co-developed resources accumulate and provide gender minorities with shared arguments to address criticisms of gender diversity efforts in an occupation.

The third trend involves building exclusive, semi-private enclaves with the use of social media. This social media-enabled "backstage" contrasts with the inclusive aforementioned "frontstage" (Goffman, 1959) and allows people who self-selectively participate in it to vent, which provides online "catharsis" (Da Cunha & Orlikowski, 2008). The exclusivity sustained in these semi-private online havens allows people to receive and offer sympathy in response to experienced gender-related inequities in the broader occupation. People can share and support one another with these

uses of social media but, by doing so, they do not participate in transforming the status quo regarding gender relations in the occupation. They engage in "*phatic*" communications (Miller, 2008, 2017) and support one another (Vaast & Levina, 2015) but do not participate actively in promoting social change in an occupation.

These three processes are interconnected with one another as public efforts towards inclusion can bring about changes in gender dynamics but can also create vulnerability from public efforts, which leads to fostering semi-private enclaves. Moreover, efforts towards promoting inclusion require the accumulation of co-produced resources that can offer information and knowledge to gender minorities and can build new connections among people typically lacking access to such resources. Also, building semi-private enclaves on social media can provide respite from public engagement towards greater gender inclusion, but, by nurturing safe communities, can also unexpectedly stifle people's willingness to publicly promote changes in gender dynamics in a broader occupation.

Implications

Examining social media-enabled connections at the intersection of two important social identities helped bring original insights that hold implications for scholarship on social media cultures, social media use and work, and gender and occupations.

For one, the study helps deepen the meaning of conflicting insights in the existing literature on social media cultures and deepens the understanding of how people deal with the "duality" of connecting and disconnecting associated with new technologies (Kolb, 2008). Carpentier (2011) had also emphasized the need to differentiate between interaction and participation. This study provided an understanding of why and how people's use of social media can support actual social engagement but also turn mostly phatic or cathartic. It delved into dual foundations for connections to differentiate whether and how an interaction can be or become a participation.

Moreover, scholarship has noted how women and, more generally, any social minorities, could become "*other-ed*" online (Ging & Siapera, 2018; Marwick & Caplan, 2018; Siapera, 2019). This study revealed a complementary dynamic, whereby women and gender non-binaries rely upon the visibility of social media (Flyverbom, 2016) in order to promote inclusion. Some can cultivate a sense of "we-ness" via social media by heightening intersecting social identities.

This study also holds implications for scholarship by highlighting that, at the intersection of gender and occupational identities at least, people are aware of actual risks in their engagement with social media (e.g., online harassment or damage to professional reputation). They use social media in ways that acknowledge that social media facilitate entering the public space, but that there are also drawbacks to being constantly publicly visible. Because of this tension, people's public engagement towards inclusion with social media also brings with it a trend towards creating safe, exclusive spaces on social media. Developing supportive, semi-private shelters with certain social media applications provides a necessary counterbalance to continue promoting inclusive agendas on other more public social media applications. This study reveals how people appropriate different features and several distinct social media applications in order to fine-tune their public and semi-public behaviors and to navigate the tensions that come from public engagement. It also unpacks how and why people use diverse social media applications differently and manage multiple connections associated with their occupation. In this regard, with social media, people can engage with the "duality" between connecting and disconnecting (Kolb, 2008) in an original manner, by generating and cultivating over time different types of connections.

This study also holds implications to scholarship by bringing a deeper understanding of work-related connections and social media use. The study found that some people use social media not

only in their leisure time or to become successful workers but also to become more cognizant of gender imbalances and to participate in efforts to address them. It revealed that, in the context of their work, people use social media not exclusively for purposes such as knowledge sharing, communicating, or collaborating on work-related projects but, also, and in a deeply intricated manner, to participate in emerging collective engagement associated with diversity dynamics.

This is an important finding because so far much scholarship on social media use has emphasized potential tensions between the professional and the personal with social media (Ollier-Malaterre, Rothbard, & Berg, 2013; Vaast & Kaganer, 2013) and has highlighted how people's use of social media in the context of their work can have dimensions of games and gamification (e.g., Dale, 2014; Deterding, Sicart, Nacke, O'Hara, & Dixon, 2011). Other scholarship had also noted how new technologies lead to the blurring of the distinction between work time and non-work time (Dery et al., 2014). This study adds to this scholarship by revealing how the professional and the political have become increasingly interconnected with social media. People's uses of social media (i.e., to work, play, and be engaged in new forms of collective engagement) are intricately related to one another. These are not fully distinct domains of social media use: they inform and shape one another. Organizational scholarship needs to consider more these interconnections as the political and the professional realms cannot be considered fully separate anymore in today's organizational and technological environment.

This study finally holds implications for scholarship on gender and occupations. So far, much of this scholarship had highlighted diversity dynamics unfolding within organizations (Zanoni & Janssens, 2015) as well as organization-wide efforts at generating more gender balance (Kornberger et al., 2010; Van den Brink & Benschop, 2012). This study focused on some members of an occupation and recounted their social media-based attempts at reshaping gender imbalances. It found that these efforts came with ambivalence as some people wanted to be actively involved in bringing more gender balance to their occupation, but were also anxious at the idea of being perceived as overtly concerned with gender dynamics, at the expense of professional competence. This study showed how some people dealt with this ambivalence in their use of social media. It revealed how people use social media to bring awareness to diversity matters by making local contexts and events more global, such as when an issue with a local conference becomes the symbol of a problem with an entire occupation. It also revealed how the use of social media not only helps people use resources to balance gender dynamics, but also participates in co-developing such resources. The use of social media enables people to take part in collective efforts at growing common resources and to use them in their own practices.

Conclusion

Social media have participated in the emergence and transformation of connections in today's societies. This study focused on social media use associated with connections at the intersection of two social identities. It found that people use several social media applications for diverse, complementary, and at times opposing purposes. It focused on two key social identities of gender and occupation. Doing so, the study brought original insights to organizational scholarship on social media cultures, work and technology use, and gender dynamics at work. One hopes that others will find value and inspiration in this examination to further the understanding of the diverse processes associated with social media use for connections and connectivity.

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