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Behavioral Visibility: A new paradigm for organization studies in the age of digitization, digitalization, and datafication

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Abstract

The digitization, digitalization, and datafication of work and communication, coupled with social and technical infrastructures that enable connectivity, are making it increasingly easy for the behaviors of people, collectives, and technological devices to see and be seen. Such digital connectivity gives rise to the important phenomenon of *behavioral visibility*. We argue that studying the antecedents, processes, and consequences of behavioral visibility should be a central concern for scholars of organizing. We attempt to set the cornerstones for the study of behavioral visibility by considering the social and technological contexts that are enabling behavioral visibility, developing the concept of behavioral visibility by defining its various components, considering the conditions through which it is commonly produced, and outlining potential consequences of behavioral visibility in the form of three paradoxes. We conclude with some conjectures about the kinds of research questions, empirical foci, and methodological strategies that scholars will need to embrace in order to understand how behavioral visibility shapes and is shaped by the process of organizing as we catapult, swiftly, into an era where artificial intelligence, learning algorithms, and social tools are changing the way people work.

Keywords

algorithms, artificial intelligence, connectivity, datafication, digitization, visibility

Over the past several decades scholars have described, debated, and documented how the increased digitization, digitalization, and datafication of social action facilitates new opportunities for organizing and diverse forms of organizations (see Benkler, 2006; Castells, 2000; Huber, 1990; Zuboff, 1988, 2019). Before going further, it makes sense to define terms. *Digitization* refers to the

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encoding of actions or representations of actions into a digital format (zeros and ones) that can be read, processed, transmitted, and stored by computational technologies. *Digitalization* refers to the ways in which social life is organized through and around digital technologies. *Datafication* refers to the practice of taking an activity, behavior, or process and turning it into meaningful data. Although changes in organizations occurring in the age of digitization, digitalization, and datafication (what we call the "3Ds") have been viewed at various times as supporting dominant systems of global capitalism, or affording new systems of decentralized activism, there is broad agreement that we live in a time where organizational life is increasingly reliant on digital tools and resources. The question is no longer whether digitization, digitalization, and datafication will change the ways we work, but rather whether our existing theoretical frameworks are equipped to understand, interpret, and even possibly predict the nature of this change.

In this article, we argue that the discussions related to digitization, digitalization, and datafication too frequently ignore the critical role of connectivity in enacting these processes. Specifically, we claim that connectivity affords a massive increase in the behavioral visibility of actors, and that centering scholarship on questions of how behavioral visibility is performed, managed, and evaluated can offer a new paradigm for organizational studies. We attempt to set the cornerstones for the study of behavioral visibility by dividing this article into four parts. In the first part we consider the social and technological *context* in which visibility is increasing at a speed and scale that is dramatically changing how we think of what it means to see others and to be seen by them. In the second part, we develop the *concept* of behavioral visibility by defining its various components. In the third part we explore the *conditions* that enable behavior to become visible. In the fourth part we outline some potential *consequences* of behavioral visibility. We do so by eliding questions concerning whether increased behavioral visibility is to be lauded or whether it poses dangers for individuals and organizations (it is surely guilty of both) by describing three paradoxes that arise as behavioral visibility intensifies. We conclude with some conjectures about the kinds of research questions, empirical foci, and methodological strategies that scholars will need to embrace in order to understand how behavioral visibility shapes and is shaped by the process of organizing as we catapult, swiftly, into this age of digitization, digitalization, and datafication.

The Context: Digitization, Digitalization, and Datafication

In recent years, organizations across all manner of industries have begun to move toward more digital forms of work. We can understand digitization as the transformation of analog inputs into digital forms (Flyverbom, 2019). Take for example a photograph taken with a 35 mm camera. The images captured via the optical lens are recorded on strips of cellulose acetate and then transferred to a resin-coated paper. Want to send that picture to a friend? You can stick it in the postal mail or you can digitize it by scanning the analog image into a bit string that can be sent via email, uploaded to a social media site, or stored on a cloud-based server. In addition to digitizing the analog, data can also be created digitally from the start through digital input devices (Bailey, Leonardi, & Barley, 2012) as is the case with digital cameras which capture, store, and render images in digital forms.

Digitization alters organizational processes by eliminating or lessening material constraints associated with work including limitations of time, space, location, or capital requirements. Whereas work and communication can become digitized, it is more appropriate to treat organizing as a process of digitalization. When organizations take advantage of the digitized nature of work to produce new forms of organizing, they are digitalizing the organization. Changes associated with digitalization include increasingly distributed and flexible work arrangements (Hinds & Kiesler, 2002), the automation of administrative tasks systems, the adoption of knowledge management

systems (Alavi & Leidner, 2001), and enterprise social media as communication platforms (Treem & Leonardi, 2012). Because digitization drives the marginal cost of producing information goods to near zero, and digital storage costs continue to fall, organizations are able to dramatically increase the amount of data that is visible and available. For contemporary organizations, undergoing a "digital transformation" is a process of both digitization and digitalization that many see as necessary to pursue innovation and remain competitive (Hinings, Gegenhuber, & Greenwood, 2018; Leonardi, 2020).

The digitization and digitalization of work has brought with it a second important change in the way organizations operate: datafication. Datafication refers to the ways that social activity is rendered into meaningful data (Mayer-Schönberger & Cukier, 2013). The process of datafication is exemplified by the widespread use of personal fitness tracking devices that track and display information related to personal activities and states that are deemed valuable and whose quantification is uncontested, such as individuals' movements, heart rate, or sleep patterns. Datafication causes us to rethink organizational processes by expanding the volume and diversity of information available for capture, analysis, and reporting. Workers are tracked, scored, and analyzed by algorithms that evaluate past behavior and provide predictions of future actions (Hansen, 2015). Growth in datafication has created a whole new sector of data-driven organizations whose business model is based entirely on processes of gathering and distributing data (Flyverbom, 2019; Zuboff, 2019).

In isolation digitization, digitalization, and datafication are largely processes of production, storage, and structuring, and questions specific to the 3Ds are ones of scale, volume, or form. We argue that it is only when digital data are paired with connectivity that we see the possibility for dramatic shifts in processes of organizing. For organizations, the value of digital data is not in its presence, but the ways it can be connected to databases and analytic tools where they can be analyzed, classified, commoditized, and, increasingly often, sold (Davenport, 2014; Zuboff, 2019). The centrality of connectivity in understanding the consequences of the 3Ds is a product of two interrelated social constraints: (a) organizations and workers have limited information processing abilities and attention; and (b) digital data are visible regardless of whether they are actively or willingly provided. Digitally enabled connectivity produces a context in which actors cannot possibly keep up with the digital data visible to them, yet rely on what is visible when making key decisions.

Although the 3Ds can create the illusion that all information can be captured, stored, and represented, the finite limits of our ability to experience connectivity shapes and constrains our organizational realities. For instance, scholars increasingly speculate on the ways that organizations might use big data to automate organizational decision making or gain detailed insights into consumers, but empirical investigations indicate that most organizations are severely restricted in doing so because they lack individuals with expertise to organize and produce representations of large, complex data. As a result, many contemporary organizations utilize a small fraction of the data available to them (Davenport, 2014).

Connectivity also creates a context in which the significance of digital data is inherently interdependent, both in the sense that data are often evaluated in relative terms and that the production and availability of digital data can make other digital data more or less visible. Individuals in industrialized contexts often do not have the option to purposefully produce digital data; data are produced for them and about them as they engage in mundane activities such as buying groceries, making a phone call, or going for a run. Moreover, through connectivity the absence of digital data is itself a form of digital data (e.g., someone may be on Facebook but not Twitter; an organization may not appear on the first page of results for a search term). In an environment of connectivity there is no opt-out; there is no way to be invisible.

Although the 3Ds allow for the material shaping of organizations and work in new ways, it is through connectivity that organizations are materially performed in a way that is visible to others. Digitization, digitalization, and datafication are necessary, but not sufficient, preconditions for behavioral visibility. Visibility is only enacted through forms of connectivity that make information accessible, presentable, and confrontable. As a result, though digitalization and datafication are desired as tools to objectively, consistently, or dependably capture or represent information in a known way (Hansen, 2015), connectivity shapes the inherently performative nature of visibility by altering the ways in which information is materially experienced. The 3Ds provide the fuel and kindling, but connectivity provides the spark that ignites the flame of behavioral visibility—and it is that flame that draws people in, mesmerizes them, and often distorts their vision.

As Kolb (2008) points out, the increasing technical connectivity made possible through an array of networks and technological devices provides the infrastructure upon which digital data can easily travel. As the underlying technical infrastructure connecting people grows more robust, expectations for social and organizational connectivity intensify. And, as Kolb, Caza, and Collins (2012) observed, the increasing availability of digital data makes it possible for people in organizations to expect ever more social and organizational connectivity because job tasks are viewed to be easily portable, which then compels organizations to increase investment in their technical infrastructures to ensure enhanced levels of technical connectivity. In short, "digital data help to produce more demands for technical and social/organizational connectivity that build upon each other recursively to the point where people in organizations expect to be constantly connected to each other at all times" (Wajcman & Rose, 2011).

In the digital age where constant connectivity is expected, the behaviors of people, organizations, and even technological devices and the natural world are, by association, expected to be able to be seen (Flyverbom, 2019; Flyverbom, Leonardi, Stohl, & Stohl, 2016; Hampton, 2015; Kallinikos, 1995). This expectation for visibility into other's' behaviors is wide reaching. Individuals seeking romantic partners online are likely to search for visible information about prospective matches prior to initiating or continuing interactions (Gibbs, Ellison, & Lai, 2011). Organizations scour the online activities of potential employees, and applicants have come to expect this form of surveillance (Berkelaar, 2014). Stakeholders, watchdog organizations, and activist groups seek visibility into the activities of organizations to evaluate their behaviors as corporate citizens (Schnackenberg & Tomlinson, 2014). Companies increasingly extract information that provides visibility into the media habits, retail purchases, and even physical patterns of consumers, aggregating this data to more effectively target advertising and messaging (Turow, 2005; Turow & Couldry, 2018). Individually and collectively these examples indicate how the visibility of behavior necessitates choices regarding what actors chose to highlight, scrutinize, and value as meaningful.

The Construct: Behavioral Visibility

We argue that one of the most profound shifts enabled by the interplay of digitization, datafication, and connectivity is the intensification of behavioral visibility. As we have argued elsewhere (Leonardi & Treem, 2012; Treem & Leonardi, 2012) visibility is tied to the amount of effort people must expend to locate information. As research shows, if people perceive that information is difficult to access, or they do not know what information exists for them to access, they will likely not seek it out (Brown & Duguid, 2001). In this regard, information about people's work behaviors, tasks, knowledge, or whatever else, though it may be theoretically available for people to uncover, may be, for all intents and purposes, invisible. The 3Ds and the connectivity through which their effects are made possible reduce the effort required to make one's own behaviors visible, or to see

Table 1. Defining Behavioral Visibility.

Definition of behavioral visibility	The sociomaterial performance of the behavior of people, collectives, technological devices, or nature in a format that can be observed by third parties through minimal effort such that patterns, causes, or motives can be inferred
Key features of definition	Explanation
Sociomaterial performance	Behavior is rarely observed directly. Performances of behaviors are enacted through and by the sociomaterial practices that produce representations that can be observed by various actors
Behavior of people, collectives, technological devices, or nature	Entities of various types act. Their behaviors are constructed through various data points collected about their action
A format that can be observed by third parties through minimal effort	Behaviors are visible when actors who were not the intended recipients of data about them (those in the empirical audience) have to expend very little effort to see those behaviors
Patterns, causes, or motives can be inferred	Observers assemble data to make inferences about whether an actor's behaviors are consistent, what effects they have, or why they were conducted. The more diffuse the data signals, the broader the range of inference
Antecedents of behavioral visibility (the "3Ds")	Definition
Digitization	The encoding of actions or representations of actions into a digital format (zeros and ones) that can be read, processed, transmitted, and stored by computational technologies
Digitalization	The ways in which social life is organized through and around digital technologies
Datafication	The practice of taking an activity, behavior, or process and turning it into meaningful data

the behaviors of others. Although the 3Ds by no means cause behavioral visibility, the increasingly intense amounts of data about people's behaviors that they make available means that we no longer live in a world where people are invisible and need to work to make themselves visible. Rather, we are always—through traces of us left in data—already visible to others. How visible and in what ways we are visible are the important questions. In this section, we consider what it means to say that behavior is visible by offering a definition of behavioral visibility that considers the role of sociomaterial performance, audience perception, effort, and inference. We then begin to explore three mechanisms through which the 3Ds are beginning to make behavior visible.

We define behavioral visibility as the sociomaterial performance of the behavior of people, collectives, technological devices, or nature in a format that can be observed by third parties through minimal effort such that patterns, causes, or motives can be inferred (regardless of the veracity of those inferences). This definition requires considerable elaboration, which we provide by focusing on its key features. These features are summarized in Table 1 and elaborated below.

Sociomaterial performance

First, we conceptualize visibility as a *sociomaterial performance* of behavior, not a behavior itself. The term performance is used rather than representation to connote both that behavior

visibility is associated with actions of an actor or actors that make information available in some form, and that visibility is only enacted when information is observed by some audience. It is not enough for data to exist in some digital form; behavioral visibility only exists in the action and interaction of sociomaterial performances between actors and observers (real, imagined, or perceived). For example, in the context of work someone might conduct a variety of behaviors when building a financial model in an Excel spreadsheet. The behaviors involved in this work—data aggregation, calculation, model specification, discussing analysis parameters, etc.—are often conducted out of the sight of others. But when a worker files her financial model, those who use it or review it can infer the behaviors she conducted to build the report. If she files that report in a cabinet in her boss's office, that report (and by extension, the behaviors inferred from reading it) will only be visible to people who have access to the boss's office and who have the right technical or cultural knowledge of their own to understand the model. But if she were to post the model on the company's intranet or in a shared folder, or if she constructed the model on a cloud-based document platform, the universe of people who have access to the model and who can use it to infer her behaviors grows. Further, if she were to post the model on the company's enterprise social networking site (ESNS) or simply to post a message to the ESNS mentioning that she completed the model, even more people would see it. Or, what if a search algorithm were deployed in the organization to track the evolution of financial models built across the company in the past five years? The algorithm would extract numbers from the model and classify them according to programmed parameters and the aggregate data would provide some kind of visibility into the behavior of the worker who built it.

In none of these cases would the actual behaviors involved in producing the model be visible to those not involved in the process. But with each successive stage of social and technological assistance, performances of the behavior diffuse across the organization, albeit at increasingly higher levels of abstraction (Thompson, 2005). Such abstraction is the product of sociomaterial enactment (Orlikowski, 2007). The performances of the behaviors conducted by a person, system, or natural phenomenon are produced as the social system of work inheres in the material infrastructures through which the performance unfolds (Barley, 2015). In other words, performances are sociomaterial configurations in their own right—not simply copies or static representations of behavior.

Behavior of people, collectives, technological devices, or nature

The behavior of subjects of varying types can be made visible through the process of sociomaterial performance. For organizational scholars, it i's the behavior of people that appears most straightforward. Individual actors—people—within organizations engage in all kinds of behaviors. Some of those behaviors involve completing work tasks, others are more communicative in nature. And behaviors occur at different levels of complexity. Simple behaviors, like talking to customers, can open to more complex groups of behaviors that cluster in some recognizable way, such as "customer service" (Pentland, 1992). Whether basic or more complex, behaviors can be rendered sociomaterially through text summaries, screenshots of work products, or quantification via tracking of number of tasks completed. Behaviors can also be pieced together by employees through narrative threads made by people who talk about their own behaviors or ask questions of others on tools like enterprise social networking sites (Leonardi, 2014).

Collectives, technological devices, and nature also produce behaviors that can be performed sociomaterially. Teams, organizations, or industry associations are examples of collectives that engage in behaviors. Hiring routines are a collection of behaviors that are, in the aggregate, attributed to organizational actors (Pentland & Feldman, 2008). In other words, organizations hire,

people don't. But when people want to see hiring behavior they typically have to be satisfied with sociomaterial performances of it. Records kept of applicants and selection or evaluation heuristics have to be read and the thought processes behind them reconstructed to understand what behaviors were made in the selection of certain candidates and the rejection of others. Technological devices also conduct behaviors. Computer-based simulation technologies compute finite element analyses and visualize data in three-dimensional animations. Often, the behaviors that technological devices conduct are black-boxed from the human operators. The algorithms embedded in them perform calculations and make permutations of data that produce outputs that can be reverse engineered to learn what the algorithm is doing, but the actual behaviors of the algorithm are typically imperceptible to most operators (Burrell, 2016). Objects and phenomena in the natural world also behave. Glaciers, for example, display an array of complex behaviors such as (in lay terms), advancing, cracking, and decaying (Carr, Vieli, & Stokes, 2013). Those behaviors are rarely observed directly by scientists but rather indirectly via sociomaterial performances. Measurements of glacial positioning evincing advancement or decay can be taken with a variety of devices and the data recorded in them computed to make determinations about the behavior of the glacier. Of course, as studies in the sociology of science and technology remind us, processes such as "measurement" construct objects rather than capture them because measuring is always mediated by the devices through which measurement happens (Lynch & Cole, 2005). In short, most of what we know about the behavior of collectives, technological devices, and natural phenomena we know from our observations of their sociomaterial performances. The more visible those performances become, the wider our purview of such behavior.

A format that can be observed by third-parties through minimal effort

Perhaps the most consequential part of our definition of behavioral visibility is that the behaviors of actors performed sociomaterially can be observed by third parties through minimal effort. A fundamental goal of communication is to make one's own behaviors visible to someone else. In technical terms, that someone else is a target audience. When people conduct their behaviors in the presence of a target audience they typically style them in such a way to communicate a certain message to that target. Knowing information about the target is essential for crafting that message because if one knows how a target is likely to interpret a behavior or string of behaviors, he or she can design those behaviors (or their communication) to fit the target's interpretive style (Aakhus, 2007). Of course, the same holds true when a person communicates about his or her behavior to the target. But when a person's behavior becomes visible to third parties—people who were not in the target audience—the actor loses the ability to design the message in a way that will resonate. In technical terms, that third party is an empirical audience, an audience that can observe a behavior intended for a specific target.

In the age of digital connectivity actors are constantly connected to third parties who experience behaviors that were made visible for specific targets (Van Dijck, 2013). Studies of social media use show that even when actors do not have a specific (single) target in mind, they often craft messages of their behavior (or messages that are behaviors) to a plethora of unknown actors (Litt, 2012). But even these actors represent an imagined audience that is a specific target (Marwick & Boyd, 2011). Third parties typically lack the inferential bases for decoding communicative acts of behavior intended for specific targets.

Focusing on the effects of interpretation by third parties is a shift in paradigm for most studies of organizations and organizing (c.f., Sergeeva, Huysman, Soekijad, & van den Hooff, 2017). The current paradigm of research focuses on the activities individuals or organizations perform to strategically or unwittingly influence targets. Behavioral visibility made possible through digital

connectivity means that the performances of one's behaviors are no longer in his or her province. Those performances belong to a broad and heterogeneous empirical audience that typically has to expend very little effort to become exposed to them because, as we will discuss below, the presentational nature of most technologies in the age of digital connectivity, along with the active propagation of content via algorithms and data aggregation, make it easy to see the behaviors of others and enter communication about those behaviors in dyadic encounters for which their third party perception was not intended.

Patterns, causes, or motives can be inferred

The final component of our definition focuses on inference. When individuals can see the behaviors of others directly (e.g., see them building that financial model), they do not have to make many inferences about what activities were conducted and how those activities were conducted because they saw them (Nardi & Engeström, 1999). But when behaviors are not observed directly, but are made visible through sociomaterial performances, empirical audiences are often left to infer what kinds of activities constitute particular behaviors. The fewer the number of behavioral cues that are made visible, or the larger the heterogeneity among those cues, the bigger the inference made by the empirical audience must necessarily be (Kunda, 1987; Griffin & Ross, 1991).

Existing research shows that when behaviors become visible, third parties are not shy about making such inferences (Leonardi, 2014). In fact, they infer a broad array of things by piecing together the visible behavioral cues available to them. For example, research shows that people infer whether an actor's behavior is routine for that person, whether their behaviors caused certain outcomes (positive or negative), and what their motives were when conducting certain behaviors or communicating in specific ways. Studies have shown that the inferences that people make based on the visible behaviors of other actors are sometimes quite accurate (Leonardi, 2015) and other times not accurate at all (Kim, 2018). The important point here is that the inferences about patterns, causes, or motives that third parties infer by watching visible behaviors are typically treated by those third parties as though they are accurate, whether or not they actually are. Of course, direct interaction with an actor may be able to correct inaccurate inferences. But it is also possible that inaccurate inferences can lead third parties to orient to and treat actors in ways that align with their inferences and, consequently, lead the actor to produce the very behavior that the third party already inferred they had (Marti & Gond, 2018). Consequently, inferences, regardless of their veracity, can be performative—an important aspect of behavioral visibility that we will discuss in more detail below.

The Conditions: Mechanisms Through Which Behavior Becomes Visible

We now turn to discussing three mechanisms through which the behavior of people, collectives, technological devices, or nature becomes visible to third parties as their work and communication patterns are increasingly digitized, digitalized, datafied, and brought into connection with others in the organization. These include mechanisms of self-presentation, aggregate quantification, and algorithmic ordering. Table 2 provides summaries of these mechanisms.

Self-presentation

As Goffman (1959) outlined more than a half-century ago, when people face tensions in their social roles, they often seek to reduce those tensions by presenting particular versions of

Table 2. Mechanisms Through Which Behaviors Become Visible.

	How does it work?	What are the benefits?	What are the drawbacks?
Self-presentation	Individuals and organizations decide to make certain aspects of their behavior visible by "working out loud" or to communicate with target audiences via digitally connected infrastructures that allow empirical audiences to access their content	Individuals and organizations can proactively curate a set of behaviors that they want others to see, thereby shaping the inferences people make of them	When self-presentation does not result in desired third-party inferences, individuals and organizations may be tempted to engage in strategic presentation or obfuscation and produce simulated or dissimulated behaviors that corrupt the system
Aggregate quantification	Behavioral fragments are too obtuse to provide any strong basis for inference. Manual or statistical aggregation of these fragments can reveal broader patterns that provide clues about behavior that are rich in inferential qualities	Individual behavioral fragments that are too lean to convey meaning by themselves can be brought together to demonstrate patterns that tell a great deal about the actor	Aggregating content is difficult to do over time. The larger the base of content available, the more data analytic expertise necessary. Often that expertise resides in centralized locations within organizations, thus constraining access
Algorithmic ordering	Algorithms are programmed to selectively order behaviors so that they are salient. Not all behaviors are prioritized by algorithms and with the use of AI for algorithm optimization not everyone sees the same behaviors in the same ways	Due to a glut of data in the age of digital connectivity, behaviors that would otherwise be visible are often functionally invisible due to lack of processing time or bounded rationality. Algorithmic ordering chooses and serves content that the algorithm perceives as relevant to you	Algorithms are not value-neutral. Not all data are indexed by algorithms and the sorting and ranking functions are programmed with certain user-profiles and behavioral templates in mind. Thus, they artificially favor certain types of behaviors and not all behaviors are available to be seen

themselves to others. The motivation behind such self-presentation is to shape another person's impressions in ways that change their attitudes or behaviors. As Goffman so keenly observed, impression management is hard work because it is difficult to carefully orchestrate and control one's own presentation of self due to the ongoing demands of the social context in which he or she is embedded. Every observable action, whether intended or not, provides a cue with which observers make attributions about a particular actor. Because it is nearly impossible to script every action one takes, it is difficult for actors to present themselves exclusively in the way they desire.

In contexts where the majority of communication and interaction occur through tools enabled by digital connectivity, the stakes of self-presentation are often higher than they are in contexts where people are co-located (Cristea & Leonardi, 2019). Because mediated channels constrain the overall number of cues an actor communicates, there are fewer cues available for observers to use when making attributions of and forming subsequent impressions about that actor (Sproull & Kiesler, 1991). In short, every action a person does or does not take when communicating through a mediated channel has an outsized influence on the interpretations others make of him or her (Metiu, 2006). And research shows that this same finding applies for collectives such as teams, and organizations as well (Pollock & Rindova, 2003; Vaast, 2019).

As one example, a few years ago we conducted a field study of computer technicians who provided basic user support to administrators at a federally funded research laboratory (Leonardi & Treem, 2012). The computer technicians were organized into a department, but they worked alone; none of their coworkers saw them fix a software problem on a user's computer. The only way they could learn what one of their co-workers did was to read the documentation a fellow technician wrote in their knowledge management tool about how they solved a user problem. The target audience was the IT department head, who wanted to see that each technician was doing the work they were supposed to be doing. The empirical audience comprised all the other technicians in the department. As technicians began to read each other's documentation, they began to use it (because there were few other available communicative cues to use) to make inferences about who was an expert. Someone who wrote a "crappy" documentation was deemed not to have expertise in the problem they were working on. Someone who wrote an "elegant" documentation was deemed to have expertise, especially when the solution appeared "more elegant" than what someone else had done previously. People who wrote long documentation were also considered to be more expert than people who wrote short documentation—because in the words of one technician, "If you didn't really understand what you did to make it work, you won't have much to say about it and no one cares that you got lucky."

The importance of the empirical audience was made manifest when technicians were empowered by their boss to assign jobs to the person who had the most "expertise" to complete it. Some technicians were upset that their coworkers were not assigning them jobs in areas they thought they had expertise. Others were upset that their coworkers were assigning them jobs in areas they did not like, even though they felt they had expertise in those areas. Some technicians felt undervalued and quit their jobs. Other technicians began to game the system. They would make up documentation—write things they did not do—into the knowledge management tool to communicate cues that others would use to infer they were experts, even though they themselves did not believe they were. One technician justified such action as follows: "I want to learn how to fix that problem. But if no one thinks I already know how to fix the problem, they won't assign me the job, so I'll never learn. So, I have to make up some documentation so they think I know, so that they'll assign me the job and then I can have the chance to really learn it."

Aggregate quantification. Although people and organizations may sometimes take advantage of their digital connectivity to purposefully present certain aspects of their behaviors such that third parties in the empirical audience can make inferences about them, self-presentation is less likely (though not impossible with the right kind of programming) for technological devices and unlikely for objects or phenomena in the natural world. Another mechanism for behavioral visibility enabled by digital connectivity is what we call aggregate quantification. Through practices of quantifying the various behavioral data available through digitally connected devices, individuals or computer code operating on behalf of individuals can begin to aggregate diverse data points into a holistic picture that enables them to see the behavior of others.

Individuals participate in their own local activities of data aggregation. Several studies of enterprise social media use have demonstrated this aggregation in action (Chin, Evans, & Choo, 2015; Kim, 2018). The common thread in such studies is that organizational users conduct behaviors on digitally connected platforms that allow other users within the organization to see. For example, people "work out loud" by writing narrations of the tasks that they conduct in their normal course of work (Sergi & Bonneau, 2016). Or people communicate with specific targets through posts that can be seen by a wide empirical audience across the organization, rather than through directed messages. Each piece of data that is made available, implicitly approved for dissemination by virtue of its actor choosing to perform it through enterprise social media, and then becomes accessible based on the absorptive knowledge of

those seeing it means little by itself. As Leonardi (2018, p. 562) summarized, "Integrating separate pieces of information so that they coalesce to form a complete picture took patience and practice and represented a different way of processing information than most informants said they were used to." This aggregation is typically quantitative in the sense that it really amounts to the summation of instances of behavior into categories of perceived action. In other words, if a person does something enough times, an observer can infer that it is a pattern. This kind of aggregation is also something that individuals do on behalf of the collectives in which they work when the behavior of competitors or markets are visible to them. They pull together disparate data sources to make sense of uncertain product environments (Dimoka, Hong, & Pavlou, 2012) or discern whether particular changes constitute threats or opportunities for firm-level action (Dutton & Jackson, 1987).

Often, however, individuals or organizations are unable to see patterns in visible behavioral data despite the fact that they are trying to put together the pieces. This is because behavioral traces are often so small, diffuse, or separated by long periods of time that they are unable to engage in aggregation. In these instances, larger strategies of quantitative aggregation are needed (Günther, Mehrizi, Huysman, & Feldberg, 2017). The rise of big data analytics and the corresponding role of data scientists within organizations provide new mechanisms for making behavior visible through aggregate quantification (McAfee, Brynjolfsson, Davenport, Patil, & Barton, 2012). Data science is a tool through which behavior can become more accessible and, consequently, more visible. For example, large consumer-facing technology companies such as Google, Facebook, and Amazon have pioneered data analytic techniques that allow people's patterns of consumption to be rendered visible (Zuboff, 2019). Each time someone searches for a particular item of clothing, or buys a certain pair of pants, their micro behaviors are available (via data tracking) and approved for the company to view (via a consent agreement that the user clicked when first becoming a customer of the company) for the company to access in aggregate through techniques of mass quantification. In isolation, each of these micro-behaviors tells the company very little about the behaviors of its users. But when aggregated via advanced data analytic techniques, the company can begin to construct probabilistic models that predict what kinds of behaviors consumers are likely to conduct next (Davenport, 2014). Of course, such visibility is only possible because of the digital connectivity that ties users and companies together.

Algorithmic ordering

A third mechanism through which behavior becomes visible is algorithmic ordering. Though a plethora of data and information is accessible to actors, algorithms serve to make content functionally visible by sorting, ranking, recommending, and categorizing information so that it is presumably more easily understood and useful (Lyon, 2002). As Gillespie (2014, p. 167) suggests:

> Algorithms play an increasingly important role in selecting what information is considered most relevant to us, a crucial feature of our participation in public life. Search engines help us navigate massive databases of information, or the entire web. Recommendation algorithms map our preferences against others, suggesting new or forgotten bits of culture for us to encounter. Algorithms manage our interactions on social networking sites, highlighting the news of one friend while excluding another's. Algorithms designed to calculate what is "hot" or "trending" or "most discussed" skim the cream from the seemingly boundless chatter that's on offer. Together, these algorithms not only help us find information, they provide a means to know what there is to know and how to know it.

Consequently, algorithms perform a disciplining functioning by directing our limited attention and potentially suppressing other social activity. For example, Bucher (2012) describes the ways that Facebook's frequent changes to how it populates its NewsFeed feature creates a "threat of

invisibility" for users. The central visibility of algorithms and the rankings they produce can create a false sense of rationality and certainty, obscuring the underlying content and possibly discouraging further scrutiny (Hansen, 2015; Hansen, Christensen, & Flyverbom, 2015; Tsoukas, 1997). Furthermore, because these algorithms are often created by organizations or institutions, actors may not be aware of the ways their visibility is being manipulated (Kennedy & Moss, 2015; Napoli, 2014). Others may actively make behaviors and activities purposely more or less visible in an effort to manipulate algorithms in desired ways (DeVito, Gergle, & Birnholtz, 2017). The role of algorithms in shaping behavior visibility highlights the distinction between accessibility and availability in a world of digital connectivity. Though digital connectivity creates the potential of seeing or being seen, we must rely on tools of representation (Kallinikos, 1995) to enact performances that make behaviors visible. That process of sociomaterial performance is increasingly facilitated through algorithms that automate the selection of what is made more or less visible. As digital connectivity continues to become ubiquitous, algorithms will grow in significance.

In addition to the relational component of digital connectivity that connotes similarity or interdependence, digital connectivity also makes possible temporal permanence in ways that link information across different periods of times. Algorithms not only facilitate forms of visibility that allow us to track, access, and aggregate contemporary online activities, but also provide visibility into the past through the maintenance and indexing of archives (Pötzsch, 2017). This affords the opportunity for individuals and organizations to be exposed to behaviors over time, and also out of time sequence in ways that may allow them to potentially discover patterns, themes, or relationships that were previously unknown. For individuals, this visibility into past activities can help facilitate a "quantified past" that allows people to reflect upon past behaviors and choices and inform future decisions (Elsden, Kirk, & Durrant, 2016). Digital connectivity can provide a snapshot of visibility into our ongoing relations and actions, as well as a lens to look back at where we have been, or forward to where we may be going.

But such visibilities are also produced by algorithms rather than simply shown by them. For example, Gillespie (2014) argues that algorithms do not make all behavior visible, nor do they make different kinds of behavior visible in the same way. Only data that are available through digitally connected infrastructure are ready to be inputs to algorithmic processing. Further, programmers of algorithms decide what of this available data will make it into the indexical features of the algorithm. Also, programmers of algorithms attempt to know and predict their users and thus build in selection heuristics and salience heuristics that correspond with the kinds of behaviors they believe users will want to be visible to them. Google's page-rank algorithm does this implicitly, but so too does Facebook's edge-rank algorithm that decides whose behaviors one would like to see as well as more proprietary algorithms that select from the available behaviors to suggest to organizational hiring managers who they might like to interview (Chander, 2016). Also, an algorithm's programmers decide for us what is likely to be relevant to us. In so doing, the algorithms position some behaviors as institutionally legitimate and worthy of our consideration while others are not (Ananny & Crawford, 2018; Faraj, Pachidi, & Sayegh, 2018). And finally, algorithms do not treat everyone equally if for no other reason than the behaviors made visible through algorithmic ordering are not uniform for all viewers. Search engines like Google regularly engage in "A/B" testing, presenting different rankings to different selected classes of users to determine what kinds of content users will respond to most favorably (via clicks) and then, through comparative assessment, making these determinations through artificial intelligence about how to modify the core algorithm experienced by the core base of users. But with the incorporation of artificial intelligence into the construction and testing of algorithms, it is likely that at any moment multiple people are being exposed to different algorithmic orderings, making it difficult for users to build a common base of knowledge or shared cognition.

Table 3. Paradoxes of Visibility.

Paradox	Summary
Connectivity paradox	Efforts to combat the potential lack of connection that an actor may experience with other organization members facilitates a work environment of overcommunication, interruptions, and interference
Performance paradox	Actors who dedicate the most resources to superior task performance may have less ability, opportunity, or inclination to make those performances visible to others because their efforts are directed at conducting their tasks
Transparency paradox	Efforts by organizations to provide greater transparency into communication, information, and operations can actually obscure and obfuscate organizational activities, rendering them functionally invisible

The Consequences: Three Paradoxes of Behavioral Visibility for Organizations

Up to this point we have explored how organizational decisions to digitize, digitalize, and datafy work and to enable constant connectivity among employees has created a context in which behavior can become visible. We then defined behavioral visibility and discussed how this new organizational context has produced the conditions through which behaviors can become visible by reducing the amount of effort it takes people to see others and be seen by them. In this section we explore the consequences of behavioral visibility by identifying and elaborating three paradoxes for organizations that arise as people's behaviors become increasingly visible. Table 3 summarizes these paradoxes and we describe each, in turn, below.

The connectivity paradox: how behaviors intended to foster connection can lead to the need for disconnection

The connectivity paradox occurs when actors who fear being disconnected from the organization begin to use new technologies in ways that establish a connection with the organization that is so intense that they have to devise practices that enable them to disconnect (Fonner & Roloff, 2012; Leonardi, Treem, & Jackson, 2010). In other words, efforts to combat the potential lack of connection a distributed worker may experience with other organization members facilitate a work environment of overcommunication, interruptions, and interference. The potential benefits of distributed work such as flexibility and the ability to avoid distractions are then undermined by, often well-intentioned, communication from coworkers. Workers often feel obligated to remain connected to the organization when they believe that it is a group norm or consistent with the practices and expectations of other organizational members (Mazmanian, 2012).

This paradox is a product of the ubiquity of mobile information and communication technologies (ICTs) that make communication available over time and space and allow constant connectivity among organizational members. For example, Mazmanian, Orlikowski, and Yates (2013) documented how the growth of devices offering mobile email access creates an "autonomy paradox" where workers have greater control over how they access work information, but feel a constant obligation to attend to messages. The ubiquitous connectivity creates a contradiction in that workers express greater feelings of autonomy in how they conduct their tasks, but also greater expectations of commitment. Hafermalz (2020) found similar dynamics, showing that as people became more physically distanced from others in their offices, they used the very technologies that enabled them to work remotely in order to try and build stronger connections with those colleagues, thus undermining many of the benefits of working remotely.

Given the broad adoption of mobile ICTs in industrialized contexts it is easy to ignore the recency and novelty of this technology for organizational life and the behaviors of workers. Though questions of organizational commitment and expectations have always existed, issues regarding how individuals approach and manage efforts to create boundaries between work and non-work activities are largely a product of material shifts in technology that allow for workplace communication to occur at any time. Although research demonstrates that individuals with high levels of perceived constant connectivity with work experience negative outcomes such as increased levels of stress and lower job satisfaction (Fonner & Roloff, 2010), studies also show that individuals with greater organizational commitment are more willing to engage in supplemental work outside the office. As mobile devices and applications continue to proliferate, workers are likely to continue to experience tensions regarding the appropriate, desirable, and effective levels of connectivity with organizations.

Organizational members engage in a variety of strategies to manage this connectivity paradox and reclaim and retain control of their visibility and communication demands. For example, workers may simply disconnect from technologies for periods of time, making it difficult or impossible to maintain communication with coworkers and creating a period of independence (e.g., Leonardi et al., 2010). Other workers seeking a more subtle approach may display connectivity, but indicate that they are unavailable for direct communication. This could take the form of an automated email response, or status message on a messaging platform, or marking themselves as unavailable in a shared calendar application. In these instances, the worker is able to simultaneously signal that they are actively engaged and connected to other organizational members, but that they are unable to respond to messages synchronously. Hancock and colleagues (2009) refer to instances when workers feign unavailability as "butler lies" and characterize this activity as a polite and largely socially acceptable activity. The presence of the connectivity paradox and associated efforts to avoid constant connectivity have also been documented in collocated work settings where workers may engage in dissimulation to avoid messages and disruptions (Birnholtz, Dixon, & Hancock, 2012).

The connectivity paradox highlights the fact that a lack of visibility (i.e., disconnection) can in many cases be conspicuously visible. Connection serves materially as a precursor to visibility both in the sense that it allows actors to make themselves visible to others, and it allows others to observe those who are visible. Therefore, because organizations often expect connectivity, workers are confronted with a situation where their visibility is something that is managed, whether intentionally and purposely, or passively and without forethought. At any given time, actors' visibility can be assessed relative to others. From the observers' standpoint others are never invisible, others are merely not visible; this means that the disconnection of others (perceived or actual) is a visible act.

The performance paradox: how behaviors aimed at making expertise visible make it harder to perform like an expert

The performance paradox recognizes that those who dedicate the most resources to task performance may then have less ability, opportunity, or inclination to make those performances visible to others (Leonardi, 2014). This paradox concedes that in many organizational contexts work does not speak for itself, but rather we are reliant on actors communicating about work in order to assess performance. This paradox is particularly relevant in organizational settings where work activities are largely ambiguous or not visible, and the outputs of work are not standard or explicit—e.g., knowledge-intensive or professional service work (Treem, 2012, 2016).

The performance paradox demonstrates the entanglement of connectivity and visibility by highlighting that our understandings of social action are mediated by what we observe and confront—i.e., the nature of our connection to what we are seeing (Pinch, 2010). This connection is

strongest when the communication of work is directly observable and easy to evaluate such as when workers are collocated and tasks are interdependent and team-based, or when work is standardized. For instance, organizations that produce tangible outputs may have a lower burden to communicate about their work relative to organizations whose work is less clear (Robertson, Scarbrough, & Swan, 2003). However, absent these direct and reliable signals to evaluate work, observers will use any available communicative cues to assess the expertise and knowledge of workers (Bunderson, 2003).

An implication of this performance paradox is that it forces us to call into question the nature of organizational knowledge and expertise and the ways we often associate organizations and their members with having rights, jurisdiction, or access to valued knowledge (Alvesson, 1993, 2011). Instead of this view of organizational knowledge as an existing, known, or static resource, recent scholarship views both individual and organizational expertise as communicatively constituted through interactions and texts (Treem, 2012, 2016). This framework instead asserts that expertise operates as an active performance that is observed and assessed as exclusive, esoteric, or exemplary. For example, in a study of the work of public relations firms Treem (2016) found that teams established detailed, extensive, and time-consuming practices regarding communicating about the work done on behalf of clients. These firms had expertise in creating report presentations, and documents to perform their knowledge. Paradoxically, the resources dedicated to communicating about work mean there is less time and effort spent on active client work. As Alvesson (1993, p. 1004) noted regarding the importance of how organizations communicate about their knowledge, "Being perceived as an expert is then more crucial than being one."

There are a number of cognitive biases that make the performance paradox more likely by leading individuals to struggle in evaluating how they are being viewed by those around them. For instance, the spotlight effect notes the tendency for people to overestimate the extent to which others are paying attention to them (Gilovich, Medvec & Savitsky, 2000). Workers who believe they are being actively seen and evaluated by others may not dedicate as much effort into making their work visible to others. Similarly, individuals can be influenced by an illusion of transparency (Gilovich, Savitsky, & Medvec, 1998) that leads them to believe others are able to discern their internal state. A worker who thinks their colleagues already understand their dedication and commitment to the organization may not feel the need to attend optional activities or participate in group meetings.

More broadly, the performance paradox necessitates greater attention to not only the materiality of work itself, and the technologies used to conduct work tasks, but to the material outputs of work that are visible to others. For instance, our previously mentioned study of IT technicians who used entries into a shared knowledge management system to help determine appropriate job assignments found that technicians used the length and complexity of posted material to assess the expertise of coworkers (Leonardi & Treem, 2012). As result, technicians who were more strategic in crafting their communication in the knowledge management system were more likely to be seen as experts in their respective desired area of work. The perception of technicians' expertise was not a result of evaluating the actual performance of IT tasks, which were conducted independently and out of sight, but rather assessments were made based on the shared, visible communication about work.

Collectively, this body of research shows not only that we understand and evaluate work and organizational knowledge as a communicative performance, but that this performance is shaped by the nature of our connection to the work itself. When those are mediated through communication technologies or performances, they can be shaped, altered, or managed in various ways. As the 3Ds enable organizations and their members to make work more or less visible, managing the connection of that work to others can be viewed as its own form of knowledge worthy of study.

The transparency paradox: how making behavior more visible can render it invisible

This paradox acknowledges that efforts by organizations to provide greater transparency into communication, information, and operations can actually obscure and obfuscate organizational activities (Christensen & Cheney, 2015; Hansen & Flyverbom, 2015; Stohl, Stohl, & Leonardi, 2016; Ringel, 2019). Increases in transparency can produce a volume and diversity of communication and information that makes it more difficult to find or understand any single piece of communication. This assertion that transparency does not equate to visibility contradicts the widespread normative belief that transparency serves as an antidote to secrecy by making organizational action visible and allows the public to more accurately and completely assess organizational actors (Brighenti 2007; Christensen & Cornelissen, 2015). The dominant discourse remains that organizational transparency is a social good because by making more activity and information visible, organizational actors are subject to greater scrutiny.

The transparency paradox has a potentially insidious consequence by allowing organizations to espouse openness and portray themselves as responsible corporate citizens they can, in actuality, avoid meaningful scrutiny (Albu & Flyverbom, 2016). Organizations may espouse transparency, but make information visible in a manner that is ambiguous or difficult to understand (Flyverbom, Christensen, & Hansen, 2015). A corollary to this paradox is that when organizational actors appear to increase transparency it can deflect attention or interrogation of what is kept hidden or obscured (Flyverbom, 2015). Bernstein (2012) studied work at a technology parts manufacturing facility and found that employees in an open work environment designed to support transparency in operations hid behaviors aimed at improving efficiency because they feared being seen as violating norms. When an intervention led to some lines being isolated from others, workers in these non-visible settings were more likely to experiment with new ways of working and less likely to produce defective products. Bernstein noted, "broad visibility, intended to increase transparency, can breed hiding behavior and myths of learning and control, thereby reducing transparency" (Bernstein, 2012).

While transparency can offer increased potential connection and visibility to information, organizational activities, and actors, that connection is inevitably and inherently incomplete. There will always be organizational activity that is not visible, obscured, or secret. Research that recognizes the transparency paradox demonstrates that transparency can be wielded by organizational actors as symbolic currency to engender goodwill, to misdirect attention, or to avoid scrutiny. The diversity of potential connections between organizations and stakeholders offers organizational actors a variety of ways to both offer and withhold transparency.

A common thread in all of these paradoxes is the tension created as interconnected actors navigate different dimensions of visibility and invisibility. Actors have differential agency and resources related to their social visibility, and the opportunities to increase or decrease this visibility vary based on the changes in the sociomaterial environment over time. For instance, these paradoxes emerge in part from the ways mobile communication technologies allow individuals to remain connected to organizations across times and locations, and to make distinct connections to diverse and broad audiences. Conversely, this same technology creates a breadth and volume of connections to people and content that can be difficult to manage,

So, it is possible to consider the relationship between connectivity and visibility in two ways. One is to understand the networked nature of visibility. This means that an individual's visibility and invisibility can be influenced not only by their own actions, but by the actions of others in a social context, and the structure of the network itself. This runs counter to many of our theories of connectivity and visibility that focus primarily on the actions and goals of an actor's relationship to a known audience.

Another aspect of the relationship between connectivity and visibility is that individuals may possess differential desires, capabilities, and opportunities to manage and shape visibility. This could stem from varied perceptions of the consequences of visibility (e.g., cybervetting), differences in technological competence, or disparities in access to different communication tools. These different potential influences demonstrate how connectivity and visibility are the product of actions taken within distinct sociomaterial contexts that present different affordances and constraints.

Conclusion: Researching and Theorizing Behavioral Visibility

As the 3Ds—digitization, digitalization, and datafication—increase the potential for behaviors to become visible to third parties, scholars of organizations and organizing must begin to grapple with the pervasive phenomenon of behavioral visibility. As we have discussed above, behavioral visibility is not new. So long as behaviors themselves, or data about them, are available and accessible to third parties to find and view, any behavior can be visible. But the rapid increase in digital connectivity enabled by both social and technical infrastructures means that people and organizations are at risk of becoming hyper-visible (Kolb, Ivaturi, Henderson, & Srinivasan, 2015). As we have argued above, the ease and mutability of self-presentation in connected environments, along with quantification practices for aggregated data and algorithms that make salient and order snippets of behavioral data for our consumption, mean that in this age of digital connectivity it is increasingly easy to see and be seen. What is not clear for students of organizing is how a shift to third-party behavior visibility will alter the way that people, organizations, technological devices, and even the natural world are interpreted and folded into organizing practices based on the inferences we make from them.

To begin to imagine what the empirical and theoretical study of behavioral visibility might look like, we present Table 4, which considers how the context, conditions, and consequences of behavioral visibility interact with the constituent features of visibility—sociomaterial performance; behavior of people, collectives, technological devices, or nature; third party observation; and inference of patterns, causes, or motives—to suggest a set of preliminary research questions for the organizational study of behavioral visibility. The list of questions in Table 4 is, of course, not exhaustive, but is meant to help scholars to think through the kinds of empirical puzzles necessary to begin theorizing about the antecedents, processes, and consequences of behavioral visibility.

As the table makes clear, there are clear opportunities for research in each cell. For example, when exploring the *context* in which behavioral visibility arises, we know very little about how the 3Ds are bound up in the production, maintenance, and dissolution of behavioral visibility. Focusing on how digitization, digitalization, and datafication are performed sociomaterially, how they render behavior in ways that make them perceptible to third parties, and how they are draw on discursively and materially in the process of inference are all necessary foci for understanding how behaviors become and stay visible and invisible.

Agency is a key question implicated in the focus on *conditions* of behavioral visibility. As the example questions in the cells illustrate, we know very little about how the agency of people and of algorithms and smart machines is enacted in ways that produce and order modes of visibility. We have presented self-presentation, aggregate quantification, and algorithmic ordering as separate conditions for the sake of analytic ease only. In practice, these three conditions are likely to be intertwined. People's own intentions and capacity of action in the form of self-presentation, for example, will be buffered by the agency exhibited by algorithms that collect and order behavioral data in certain ways. Thus, focusing on the interplay between these three conditions and the other conditions that we have not identified here but that that are likely to emerge will be key issues for theorizing about behavioral visibility.

Table 4. Sample Research Questions for Studying Behavioral Visibility.

	What is Behavioral Visibility?			
	Sociomaterial performance	Behavior of people, collective, technological devices, or nature	Third-party observation	Inferences of patterns, causes or motives
Context				
Digitization	What behaviors are encoded in digital form, and what behaviors are not encoded?	How are digital representations of behaviors captured, collected, or combined across groups, organizations, and technology platforms?	Under what conditions do third parties have access to digital representations of behaviors?	What does the presence of digital representations of behaviors signal about the motives or activities of actors?
Digitalization	How does digitalization influence the material ways individuals interact with technologies and other actors?	How does digitalization facilitate new ways of organizing, working, and maintaining relationships?	How does digitalization afford new modes and sites of third-party observation of behaviors?	Does digitalization alter the speed, confidence, or willingness with which actors evaluate the behavior of others?
Datafication	What behaviors are translated into data, and what behaviors prove difficult to meaningfully represent?	How does datafication facilitate comparisons of the behaviors of groups, organizations, devices, collectives, or networks?	How is datafication used by third parties to track, score, rank, or report actors' behaviors?	When evaluating data representing behaviors, what inferences do actors make about the sources of, or contributors to, that data?
Conditions				
Self-presentation	What are effective means by which to assure that behaviors are performed in the way an actor desires?	How does programming affect the way that technological devices present their inner operations to users?	What cues or characteristics of an actor's self-presentation reliably capture third-party attention?	What kind of digital data lead to concordant or discrepant third-party interpretations of an actors' self-presentation?
Aggregate quantification	To what extent does advanced data analytic knowledge shape how something becomes visible?	Do certain types of quantification privilege the behavior of certain types of actors?	What kind of difference does it make if a third party attempts to aggregate data him/herself vs work with a data scientist to do so?	Where is the line between pattern recognition and inference when third parties turn behavior into numerical indices?

(Continued)

Table 4. (Continued)

	What is Behavioral Visibility?			
	Sociomaterial performance	Behavior of people, collective, technological devices, or nature	Third-party observation	Inferences of patterns, causes or motives
Algorithmic ordering	What are the sociomaterial practices that shape how an algorithm chooses what it will make salient?	To what extent do algorithms represent behavior vs bring into existence the behavior they purport to represent?	How do the preferences embedded in algorithms shape what gets to be seen?	In what ways do the ordering of behaviors shown by algorithms affect people's inferences?
Consequences				
Connectivity paradox	How do perceptions of connectivity emerge from the sociomaterial practices of communication?	What kinds of behaviors are most salient and most obscured when people are digitally connected but not socially connected?	Do third-party observations of our behaviors shape the level of connectivity that we enact as we work with others?	What is the threshold for connection (requisite connectivity) that we and third parties use to determine whether we are connected enough?
Performance paradox	What would alignment look like between the activities required to perform our behaviors to others and those required to achieve good behavioral performance?	How can actors work in ways that showcase their behavior without compromising the goals toward which their behaviors are directed?	Who gets to determine what counts as good or bad performance? Does the perception of our behavior by third parties shift the locus of control?	How is performance socially constructed when it is entangled with the skill of an actor to make his/her behaviors in pursuit of that performance visible?
Transparency paradox	Do the way performances become configured sociomaterially make it easier to understand their contexts and motives behind them?	Do the behaviors of people scale up to the level of the organization to promote transparency?	Are behaviors that are made visible explicitly to targets or third parties more likely to be viewed as indicative of transparency?	To what extent is transparency inferred vs objectively assessed against manifestations of visible behavior?

Finally, in focusing on the *consequences* of behavioral visibility we have refrained from commenting normatively about whether visibility is good or bad, whether it should be promoted or discouraged, or whether it leads to healthy or undesirable outcomes. Surely scholars who focus on behavioral visibility's consequences will uncover evidence for all of these possible positions. A focus on paradoxical consequences highlights the fact that behavioral visibility will certainly be beneficial to some people in some circumstances at some times. And while it is providing positive outcomes for those people, it will entail a set of tradeoffs that may result in negative outcomes for those people, for others, or for the organizations in which they work. Unpacking these tradeoffs and exploring how people navigate them will be important areas of research on behavioral visibility.

To begin to make headway on the empirical study of behavioral visibility in the areas we outline above will require the use of multiple methods. Although the recommendation to use multiple methods is often made in the study of organizational phenomena, we believe that it is particularly important in the study of behavioral visibility. As our discussion of the context and conditions perpetuating and sustaining behavioral visibility (and invisibility) demonstrate, digital technologies and the production, dissemination, and ordering of data are part of the sociomaterial configuration of visibility. Thus, to be able to learn what is made visible and in what ways will require researchers to analyze the various data sources that are produced through digitization and digitalization activities. Scraping these data, classifying them and uncovering their correlational and causal relations with varying levels of visibility will be an important first step in this research. Using computational data to determine what kinds of data presentation and consumption qualify as making someone "visible" are also needed. Computational analyses can also be useful in explaining how visibility changes over time and for identifying patterns inductively in the data that demonstrate how the visibility of people's behaviors change over time alongside a changing landscape of digitization, digitalization, and datafication—not to mention how thresholds for what counts as visible or invisible begin to shift as the data environment becomes more or less saturated with traces of people's behaviors.

Because the conditions through which behavior can become visible are sociomaterial and dependent in large part on specific quantification regimes and algorithmic ordering schemes, researchers who study behavioral visibility must also be conversant in the mathematics and programming languages through which algorithms are constructed. Researchers must pay close attention to the ways that algorithms are bundled together through complex computation and ordered into models that make predictions about what kind of content people want to see. Depending on the kind of data that third parties are shown, they will have more or less visibility into other people's behaviors. Of course, given the fact that algorithms construct and reconstruct their recommendations in real time based on changes in data input, levels and types of visibility will likely constantly change, even for one observer. Because algorithms predict people's behaviors and, therefore, determine what kind of data about people's behaviors are shown, understanding the quantification regimes that become inputs to the algorithms and the computation through which algorithms order data and make it available to third-party observers should occupy a key place in organizational research on visibility.

In addition to computational methods and knowledge of algorithmic processes, robust studies of behavioral visibility must also explore people's motivations to become or remain visible/invisible and the activities they believe help them to accomplish their goals. Understanding the process of inference making by third parties is also important because it is not obvious what kinds of experiences with data representations of people's behavior warrant inference making. Exploring the subjective experience of remaining or becoming visible or invisible will be important for explaining the dynamics of behavioral visibility. Such experiences will help to explain how people navigate the various paradoxes in which they find themselves as their visibility shifts over time and with different audiences. Qualitative data collection techniques will likely be best suited to capturing motivations and inference making.

Finally, a critical-cultural eye is necessary to explore the varying ways in which people's participation in activities are digitized and is important in learning about who is included and excluded in important organizational dynamics. Similarly, the kind of data that are deemed useful enough to collect, store, and sort through algorithmically will be determined based on someone's choice. Understanding who has a voice in making those choices will be essential to assuring equity, fair representation, and lack of bias in the production of behavioral visibility and the consequences flowing from it. Of key interest here, of course, is the topic of connectivity. Not everyone is connected in the same kinds of ways—politically, culturally, digitally—and our varying levels of connection will affect the enactment of visibility. Scholars who study behavioral visibility must be able to cross levels of analysis to take a critical look at the power structures that enable and constrain the way people see and are seen in this era of digitization, digitalization, and datafication.

As we argued at the outset of this paper, studying the behavioral visibility that is constitutive of organizing processes may require a new paradigm of research. At minimum, such a paradigm shift entails a recognition that assumptions that people and organizations cultivate and direct their behaviors toward specific strategically crafted audiences misses the new reality that most of our behaviors become visible due, in tremendous measure, to digital connectivity, not to the audiences we intend them to. Instead, they are often seen by third parties who are voyeurs or eavesdroppers of our behaviors. And because of the increasingly complex and efficient large-scale data quantification practices and algorithmic ordering via artificial intelligence, those third parties have ample opportunities to make inferences about the contexts, motives, and causes of our behaviors and may act in ways that affect our behaviors in a performative manner. Thus, to effectively study behavioral visibility in this age of digital connectivity will require not only a focus on third parties, but a detailed understanding of the working of algorithms and data presentation and how such sociomaterial infrastructures are implicated in the emerging visibility of our behavior.

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