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Diffusion of Ideas and Technology: The Role of Networks in Influencing the Endorsement and Use of On-Officer Video Cameras

Jacob T. N. Young[1] and Justin T. Ready[1]

Abstract

On-officer videos, or body cameras, can provide objective accounts of interactions among police officers and the public. Police leadership tends to view this emerging technology as an avenue for resolving citizen complaints and prosecuting offenses where victims and witnesses are reluctant to testify. However, getting endorsement from patrol officers is difficult. These incongruent cognitive frames are a cultural barrier to the utilization of innovative technologies. Understanding the mechanisms that lead to the deconstruction of these barriers is essential for the integration of technology into organizations. Using affiliation data collected from a large police department in Southwestern United States over a 4-month period, we find that interactions with other officers provide a conduit for facilitating cognitive frames that increase camera legitimacy.

Keywords

legitimacy, police culture, technology, network autocorrelation

Introduction

As of May 2013, it has been estimated that 91% of adults and 78% of teenagers own a cell phone (PEW, 2013). For both groups, PEW reports that nearly half own a smartphone. These figures reveal the widespread diffusion of handheld devices capable of

[1]Arizona State University, Phoenix, USA

Corresponding Author:
Jacob T. N. Young, School of Criminology and Criminal Justice, Arizona State University, 411 N. Central Ave., Suite 600, MC: 4420, Phoenix, AZ 85004-0685, USA.
Email: Jacob.Young.1@asu.edu

recording events. Moreover, near ubiquitous access to the Internet has made the world increasingly connected. For example, since 2005, the percentage of 18- to 29-year-olds who use social networking sites has grown from 16 to 86. Technological innovation and the widespread diffusion of mobile devices incorporating these innovations have fundamentally altered the public's knowledge of police conduct. Recordings of police behavior are becoming increasingly prevalent on social media sites (Potere, 2012). Extreme cases of police misconduct have generated public concern, leading some to demand greater accountability among police departments. However, departments have been quick to question the representativeness of videos that are posted online and have emphasized that such videos may skew perceptions about the behavior of police officers.

In an effort to collect more accurate information and combat recordings of police–citizen contacts that are taken out of context, police departments have begun to utilize innovative technology by equipping officers with video cameras. Body-worn video devices are a potential tool for ensuring Fourth Amendment compliance by police (Harris, 2010). The increasing prevalence of on-officer video cameras (hereafter OVC) by police departments represents a diffusion of a technological innovation across organizations. OVCs can be situated within a broader movement by police organizations to adopt technologies that increase accountability through Compstat (Weisburd, Mastrofski, McNally, Greenspan, & Willis, 2003), reduce suspect resistance with Tasers (White & Ready, 2010), and improve communication with Twitter and other social networking applications (Heverin & Zach, 2010). Innovations are simply a new idea, product, or practice that meets some existing need.

However, the use of OVCs has been met with resistance. In particular, a non-trivial proportion of officers question the implementation of the device. Specifically, concerns over the effectiveness of cameras in facilitating prosecution, access to and review of video files, and perceived encroachment on police discretion are at the heart of resistance by officers. To the extent that these concerns are collectively shared, they represent a barrier to the effective implementation of technology for achieving the goals of police departments. As a consequence, decisions by police departments to adopt a technological innovation as a consequence of external pressures simultaneously create a within-organization dilemma under these conditions.

In this article, we examine whether social context influences an officer's framing of OVCs as legitimate. We develop a model where communication about the utility of OVCs diffuses through shared incidents among officers. Communication among officers about OVCs is predicted to generate cognitive frames where OVCs are perceived as legitimate or not. When OVCs are framed as legitimate, then officers are more likely to use them (i.e., compliance with authority). In the next section, we discuss the issue of accountability of police departments to the public. We then discuss research on the occupational culture of policing and relate this to research on compliance and legitimacy.

Accountability and Technological Innovation

Why would police departments adopt OVCs? Police agencies are accountable to the public that they serve. To the extent that a police department does what the public expects, it is said to be accountable (Koppell, 2005). As discussed above, incorporating

OVCs is an innovative approach for police departments to address concerns that may arise regarding the interests of the public. OVCs are a device that can effectively demonstrate accountability on a practical and symbolic level. Organizational accountability can be conceptualized in multiple ways (Koppell, 2005) and OVCs facilitate accountability through a particular concept: transparency. Transparency "requires that accountable individuals and organizations are reviewed and questioned regularly" (Koppell, 2010, p. 35). OVCs make it easier for the public and oversight groups to observe interactions between police and citizens, thus facilitating the review of critical incidents. However, as discussed below, use of OVCs in a manner that achieves the goals of the department may be perturbed by particular ideologies regarding authority and pragmatism. We now turn to research on occupational culture and integrate this literature within a discussion of legitimacy.

Occupational Culture and Policing

Research on the concept of "police culture" has been a persistent theme in organizational research on policing. This research has focused predominately on describing the occupational culture of police. That is, the "accepted practices, rules, and principles of conduct that are situationally applied and generalized rationals and beliefs" (Manning, 1995, p. 472). Paoline (2003) has observed, "occupational cultures are a product of the various situations and problems which all vocational members confront and to which they equally respond" (p. 200). Research on the occupational culture among police has focused on describing the content of such culture. These studies are divided between those that focus on cultural homogeneity and those that focus on different styles or types of officers (see Ingram, Paoline, & Terrill, 2013 for a review). In the former, culture is described as being the product of socialization to a monolithic institutional mandate. In the latter, studies describe the extent to which officers are segmented with respect to their particular attitudes toward the public and authority.

This literature has been recently criticized for not specifying the mechanisms through which such culture develops. Ingram et al. (2013) have postulated that culture develops within police workgroups: "patrol officers assigned to the same squad or work schedule, on the same shift, and in the same precinct" (p. 367). In a similar vein, Klinger (1997) has noted "[The] universal desire to protect themselves will lead to a norm in every work group that officers take highly vigorous action against citizens whose actions endanger them" (p. 295). As officers in these workgroups interact and engage in tasks jointly, they communicate their experiences relating to their job. This communication produces convergence, leading to a shared understanding among officers regarding different aspects of the job. In this way, an element of occupational culture develops through small social groups.

Legitimacy and Compliance

Research on police culture has predominately focused on officers' attitudes toward superiors, their relationship with the public, and the role of patrol officer. Much as these attitudes may endorse or undermine the goals of departments, implementation of technological innovations may be influenced by cultural elements. When new technology is introduced, some officers may perceive on-officer video policy implemented by superiors as a systematic attempt to limit discretion and sanction line officers for trivial violations. Moreover, officers may question the utility of using cameras in improving prosecutions and the quality of police work. Thus, concerns among the rank and file represent a legitimacy problem for department managers who seek to have officers comply with their authority.

These perceptions describe the way in which the implementation of OVCs is framed among officers. Specifically, these frames are defined by whether officers see the use of OVCs as a legitimate tool capable of achieving the expressed goals of the organization rather than supporting a covert objective. Suchman (1995) defines something as legitimate when "actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions" (p. 574). To effectively achieve the goals of the department that are intended by the use of cameras, the devices must be perceived by officers as legitimate. If officers view the cameras as illegitimate, then they will be less likely to comply with departmental authority regarding camera use. However, if officers view OVCs as a tool that serves their own interests (e.g., increases safety, reduces complaints), then use of cameras will be seen as legitimate for *pragmatic* purposes (Suchman, 1995).

As with the development of shared understandings described by Ingram et al. (2013), we argue that the shared understanding of OVCs as legitimate develops through a similar process of social interaction within small social groups. That is, officers' views of whether OVCs are legitimate or not are partially the consequence of communication through shared incidents with other officers. Participating in common events with other officers should facilitate the alignment of cognitive frames toward the use of OVCs. When officers reach similarity in their view of the devices, it is shared and represents a cultural element among those involved. The shared understanding among officers that OVCs are legitimate or not represents a *cultural frame* (Benford & Snow, 2000). Cultural frames that undermine OVCs pose barriers to acceptance and utilization of the device, ultimately undermining department goals. In other words, when officers do not see the devices as legitimate, they will be less likely to comply with the mandate or policy to use the devices.

This process is illustrated in Figure 1. In particular incidents, officers' perceptions of the utility of devices may be influenced by external factors. When officers share particular experiences, they may discuss the pragmatic elements of having an OVC. Because cognitive frames supporting OVC use are themselves innovations, they may diffuse by way of *contagion*, whereby "people adopt when they come in contact with others who have already adopted" (Young, 2009, p. 1900). Specifically, the content of framing is shared through direct relationships with other officers through a process of communication. As incidents are shared with particular others, and contagion proceeds, OVCs are framed as beneficial, reasonable, and ultimately legitimate. When an officer views the camera as legitimate, then he or she will be more likely to use it during police–citizen contacts.

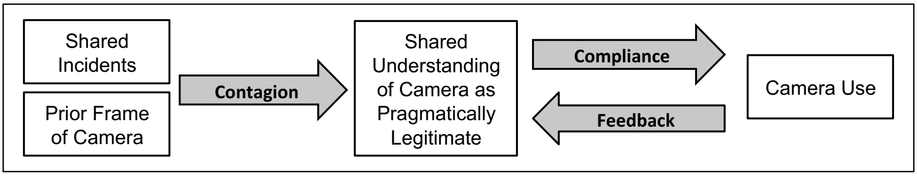

Figure 1. Diffusion of pragmatic legitimacy frame and compliance.

Network Properties and the Diffusion of Cognitive Frames

We expect the perception of cameras as legitimate to be partially influenced by shared incidents among officers. In this way, experiencing events together provides a channel for the communication of information regarding the cameras. We anticipate that officers obtain information from other officers about whether they view the cameras as legitimate and this in turn influences their own perceptions. Rogers (2005) uses the term *innovation champions* to describe the critical players within an organization that facilitate change. Officers who volunteer to wear OVCs and who endorse the technology may serve as a conduit, linking the commanding officers who set policy to the line officers who are resistant to innovation. Understanding *why* networks matter for some outcome often centers on the notion of social capital (Granovetter, 1973; Valente, 1995). The position of an individual in the network may have consequences for some outcome. For example, how often an individual participates in joint activities with others or how many of his or her friends are also friends with each other. As a result, differences between individuals in some outcome are a consequence of variability in some network property that describes their position. As Burt (2001) has noted, two schools of thought exist on the creation and consequences of social capital: closure and brokerage.

Closure emphasizes that dense or hierarchical networks increase the flow (bandwidth) and reinforcement (echo) of information. Regarding the diffusion of cognitive frames of legitimacy, officers may receive detailed anecdotes from other officers at the same event about why a camera was helpful or not under those particular circumstances. The validity of these anecdotes may decrease as the telling officer becomes more distant from some focal officer. That is, the fidelity of the information may decrease the farther it has to travel in the network (i.e., bandwidth). This may make such information less influential than direct information transmitted from an officer. This information may be echoed in dense networks as officers who hear some anecdote may also hear it from another officer. When the connections are not dense, these messages may not be reinforced (i.e., echoed).

The second school of thought regarding the consequences of social capital focuses on brokerage and posits that new information flows between groups. As a consequence, cross group connections produce a comparative advantage in the generation of novel ideas. Closure facilitates the circulation and reinforcement of information within groups, whereas brokerage facilitates the spread of new information. Such a property is important to consider for the diffusion of cognitive frames. In the case of a shared-incident network, officer *i* may share incidents with *j* and *k*, but *j* and *k* may not share incidents. In this case, officer *i* brokers information regarding the legitimacy of cameras between *j* and *k* (if *i* is the only broker between them). In terms of receiving novel information, *i* is in a position of comparative advantage because he or she has two channels of information: those flowing through *j* and those flowing through *k*. If *i* is the only broker for *j* and *k*, then *j* depends on sharing incidents with *i* to receive information that flows to *i* through *k* (and vice versa).

With this in mind, we specify several hypotheses about how the structure of a shared-incident network, and an officer's position in that network, may influence the transmission of information relating to OVCs.

Hypothesis 1: Framing cameras as legitimate and camera activation during incidents are correlated.
Hypothesis 2: An officer's framing of cameras as legitimate is influenced by how other officers, with whom the focal officer shares incidents, frame cameras.
Hypothesis 3: Officers who share more incidents with other officers are more likely to change their prior framing of cameras.
Hypothesis 4: Officers embedded in dense, shared-incident network positions are more likely to change their prior framing of cameras.

Method

Data

We recruited patrol officers from a large metropolitan police department in the Southwestern region of the United States as participants in the current study. One hundred officers were selected from five contiguous patrol districts to take part in a quasi-experimental evaluation. One half of the officers ($n = 50$) were placed in a treatment group and were subsequently assigned to wear an OVC. Half of these officers ($n = 25$) were randomly assigned to wear the cameras whereas the other half ($n = 25$) responded to a department-wide request for volunteers. The video device, the Axon Flex manufactured by Taser International, was equipped using a wraparound headset that allowed the camera to follow the officers' field of vision. Video feed was uploaded after recording using Evidence.com software, which was integrated with the department's records management system.

The remaining 50 officers in the study were assigned to a comparison group and did not wear the equipment. The officers assigned to the comparison group were matched to the treatment group based on age, race, gender, and patrol assignment. During a briefing (or roll call) held every third month, the research team explained the evaluation methodology and its purpose to the officers. This included obtaining their informed, voluntary consent for completing an officer survey and allowing us to access their personnel files. They were presented with a consent form indicating their willingness to participate in the study. They were informed that regardless of their participation in the study, the department would still require them to wear the OVCs. Their consent was limited to their participation in the data collection process to evaluate the technology. Officers were informed that they may decide not to participate in any part of the evaluation, that their involvement is entirely voluntary, and that all data collected will remain confidential. Data for this study come from two instruments: an officer survey and field contact forms.

Officer survey. The officer survey was administered to the 100 officers (50 treatment and 50 comparison) twice with an interim period of 3 months. The survey contains items relating to the officer's use and perception of the technology, including citizens' reactions to the cameras and the perceived costs and utility. The response rates for completion of the officer survey at Waves 1 and 2 were 89% and 90%, respectively.

Field contact form. The purpose of the field contact form is to study any differences in what happened during police–citizen encounters for officers wearing the cameras (treatment group) compared with officers not wearing the cameras (comparison group). Each officer participating in the study was asked to complete field contact forms 1 day per month. During the randomly selected days, each officer filled out one hardcopy of the field contact form for each citizen encounter. The officers completed the form after giving a final disposition for the incident, regardless of whether they were the primary officer on the scene or backup. Thus, multiple field contact forms were filled out when more than one officer responded to a call for service or police-initiated contact.

The field contact forms contained a unique identifier for each officer to link them to their experimental group, but no background information, names, or badge numbers were included on the form. The officers submitted the field contact forms to their commanding officer at the end of their patrol shift. Officers were not required to fill out field contact forms during any other days over the course of the month. The field contact form consists of a one-page hardcopy, front, and back. It contains questions relating to what happened during the encounter, the suspect's behavior, level of cooperation, verbal and physical resistance, and use of force during the encounter. Days when data collection occurred varied from officer to officer depending on their patrol assignment. This process yielded more than 400 field contact reports per month. For this study, we use 4 months of field contact forms involving 2,202 reported incidents. The field contact forms and officer surveys gathered over this data collection period span the first 4 months in which the department implemented the OVCs. The field contact forms are used to construct the shared-incident networks.

Shared-incident network. Following two steps, we create a shared-incident network. First, using the field contact data, we construct the incident-to-officer network where nodes represent both incidents and officers and lines represent the field contact report.[1] Each incident that involved two or more officers connects these officers, allowing the construction of a two-mode network. The network is *two-mode* because there are two partitions (i.e., officers and incidents) where connections occur only between partitions, not within partitions (i.e., officers are not directly connected). To examine officer-to-officer connections, the two-mode network can be transformed into a one-mode network (i.e., officers are directly connected), by creating a *projection*. By definition, officers are not directly connected. However, in the projection, they are connected

Table 1. Descriptive Statistics for Legitimacy Items.

	Wave 1		Wave 2	
Items	*M*	*SD*	*M*	*SD*
"I think that the use of body cameras should be expanded to other departments"	2.786	0.855	2.922	0.938
"I think the [Nearby][a] Police Department should adopt body cameras throughout the city"	3.022	0.904	3.078	0.932
"The advantages of police departments adopting body cameras outweights the disadvantages"	2.681	0.941	2.888	0.879
Composite Measure				
Legitimacy	2.831	0.819	2.959	0.85

[a]Name of specific police department redacted to maintain confidentiality of data.

through their shared involvement in an incident.[2] The one-mode network that is created by projecting the two-mode network is used to examine whether sharing events with other officers influences an officer's view of camera legitimacy. The one-mode network is used to construct the weight matrix, for the network autocorrelation analysis (described below).

Variables. We use three items from the officer survey to measure *legitimacy* (see Table 1). The items measure the extent to which officers consider the cameras to be pragmatically legitimate. Each item is measured on a 4-point Likert-type scale. Higher values indicate greater agreement with the question. Taking the average over the items created a legitimacy scale. The α reliabilities at the first and second waves are .867 and .885, respectively.

We use one item from the field contact form to measure *camera activation*. For each incident, the officer was asked whether he or she activated the camera. Of the 2,202 incidents, 912 (41%) involved an officer wearing a camera. Of these 912 cases, 66% (603) of the incidents resulted in the officer activating the camera. As mentioned, 50 officers were assigned a camera to wear and 50 served as controls. In our network autocorrelation model (discussed below), we include a dummy variable *treatment*, which takes the value 1 if the officer was assigned a camera and 0 if the officer was in the treatment condition.

Analytic Strategy

Descriptive Analysis of Legitimacy

To test Hypothesis 1, we compare the change in framing cameras as legitimate between the treatment and control groups. We would expect that officers who were assigned a camera would show increases in the level of legitimacy as they gained experience using the device. We then examine whether officers in the treatment group were more likely to use a camera if they perceived cameras to be legitimate. Following Hypothesis 1, we would expect that officers are more likely to frame the camera as legitimate as their use of the device increases.

Network Autocorrelation Model

To examine the influence of the shared-incident network on officers' framing of cameras as legitimate (Hypothesis 2), we use a network autocorrelation model (see Leenders, 2002 for a review). Network autocorrelation models measure the extent to which nodes that are connected have similar values for some attribute. The logic is the same as spatial autocorrelation models, which examine the correlation between contiguous units (e.g., neighborhoods) on some outcome (e.g., crime). In the case of *network* autocorrelation, individuals who are connected are expected to have more similar levels of some variable, relative to those whom they are not connected to in the network. A hypothetical example of network autocorrelation is illustrated in Figure 2 where the color of the node corresponds to a value of a fictitious attribute.

As the plot shows, nodes that are connected are more similar in their color relative to nodes that are not directly connected. In the context of this analysis, we use the shared-incident network to determine whether an officer's report of legitimacy is correlated with those with whom he or she shares incidents.[3] Specifically, we determine whether changes between Waves 1 and 2 on the reports of legitimacy are correlated in the network. In our implementation of this model, we use the one-mode projection (discussed above), which represents the number of shared incidents between two officers. As mentioned, shared incidents are coded from the field contact forms where two officers who shared an incident each provided a field contact form on that incident.

Descriptive Analysis of Network Position and Legitimacy

To test Hypotheses 3 and 4, we examine the relationship between changes in legitimacy and two measures of network position. An important property of networks is the degree distribution, which represents the distribution of ties across nodes. Individuals who have many ties are more centralized in the network relative to those with few ties. Drawing on this concept, we test Hypothesis 3 by examining the relationship between the prevalence of shared events for particular officers (i.e., *degree*) and changes in legitimacy. The degree for each officer measures how many events he or she shares with other officers. We would expect that officers who share more events are more likely to change their views of cameras as legitimate.

Another important property of networks is the extent to which nodes share ties (i.e., *clustering*). For three nodes, *i, j*, and *k*, the presence of ties between all three indicates a cohesive structure. While an officer, *i*, may have a high degree (i.e., shares many events with other officers), his or her experience may be limited to individuals, *j* and *k*, who do not share events. However, if *j* and *k* share events together, then the network surrounding *i* is more cohesive (i.e., higher clustering). In this case, it is not just the number of events that an officer shares (i.e., degree) but with whom *other* officers

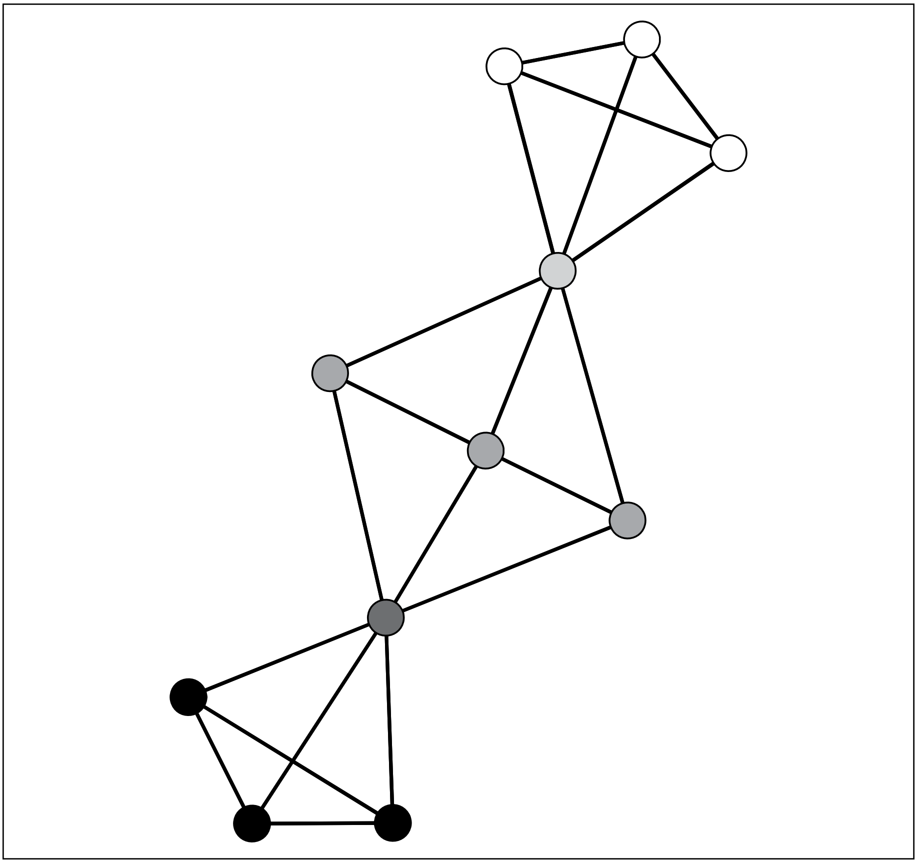

Figure 2. Hypothetical example exhibiting network autocorrelation.
Note. Node color corresponds to values of fictitious attribute.

overlap in their shared incidents. Following Opsahl and Panzarasa (2009), a clustering coefficient for weighted networks is constructed to measure the extent of clustering in a particular officer's network.[4] The coefficient is bounded between 0 and 1, where higher values indicate greater clustering in *i*'s network. We would expect that officers embedded in dense, shared-incident network positions are more likely to change their prior framing of cameras.

Results

Camera Use and Legitimacy

To test Hypothesis 1, we compare the framing of cameras as legitimate between the treatment and control groups. We then examine whether officers in the treatment group

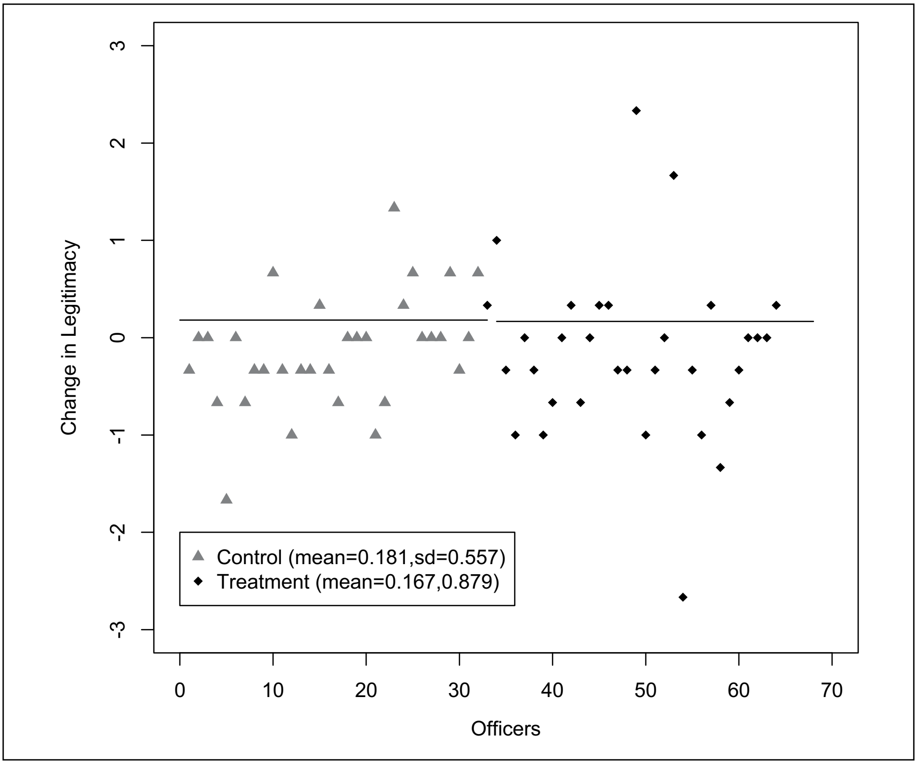

Figure 3. Changes in legitimacy for officers.
Note. Means shown as horizontal lines.

were more likely to use a camera if they perceived cameras to be legitimate. Figure 3 shows the change in legitimacy for the control (gray triangles) and the treatment (black squares) groups. The figure shows that there is almost no difference in the average change in legitimacy for each group. However, there is much more variability for the treatment group. Both groups showed little change from their baseline position. In addition, several officers in both groups showed increases in legitimacy whereas others showed decreases.

Next, we examine the use of cameras by officers based on their views of cameras as legitimate. Of the 2,202 incidents, 912 (41%) involved an officer wearing a camera. Of these 912 cases, 66% (603) of the incidents resulted in the officer activating the camera. Figure 4 shows the number of times a particular officer activated a camera and the officer's change in legitimacy. The figure reveals a weak linear relationship between activation and changes in legitimacy. The (non-significant) slope of the line in the plot is 0.077. Thus, to produce a standard deviation increase in legitimacy (i.e., 0.879), an officer would have to make, on average, nearly 12 camera activations.

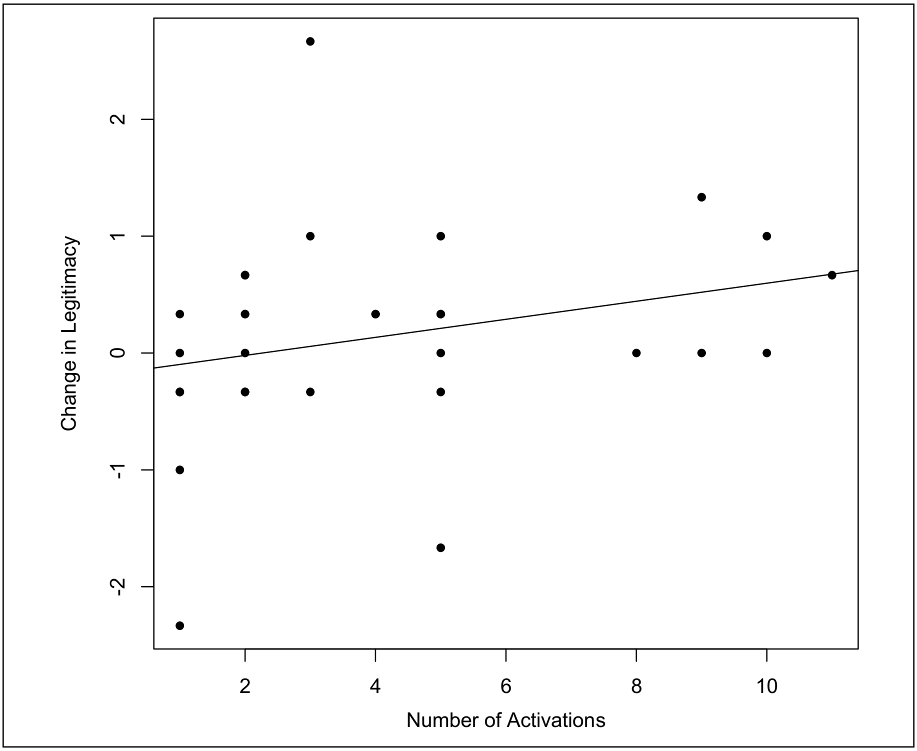

Figure 4. Changes in legitimacy by camera use.

The results for Figures 3 and 4 indicate that officers who were assigned a camera showed little change in the level of legitimacy as they gained experience with the device. Officers in the treatment group were more likely to use a camera if they perceived cameras to be legitimate, but the relationship was very weak. Thus, there is little support for Hypothesis 1, that officers are more likely to frame the camera as legitimate as their use of the device increases.

Network Autocorrelation

To test Hypothesis 2 (an officer's framing of cameras as legitimate is influenced by how other officers, with whom the focal officer shares incidents, frame cameras), we estimate several network autocorrelation models of the form described in the "Method" section. Table 2 shows the results of this analysis. Model 1 estimates the "pure influence" model where an individual's framing of legitimacy at Time 2 is only a consequence of social influence. Model 2 adds a lag for the officer's Time 1 legitimacy measure. The main difference between Models 1 and 2 is the sharp decrease in the network effect when the lagged measure is introduced. The strong effect for the lag is

Table 2. Network Autocorrelation Model for Legitimacy.

	Model 1	Model 2	Model 3
Legitimacy ($t1$)	—	0.913***	0.907***
		(0.053)	(0.056)
Treatment Condition	—	—	0.062
			(0.165)
Network Effect (ρ)	0.701***	0.110***	0.107**
	(0.027)	(0.039)	(0.040)
Model Fit			
Residual Standard Error	3.103	0.903	0.708
AIC	256	201	152
BIC	260	204	156

Note. AIC = Akaike information criterion; BIC = Bayesian information criterion.
**$p < 0.01$. ***$p < 0.001$.

due mainly to the minor changes in views for officers across the time points. In fact, an ordinary least squares (OLS) regression of $t2$ legitimacy on $t1$ legitimacy indicates that 35% of the variability in the $t2$ measure is due to stability from the $t1$ measure. Model 3 adds a control for whether the officer was in the treatment condition or not. Adding the treatment condition shows little change in the coefficients. Overall, however, the network autocorrelation model shows that, although small, an officer's framing of cameras as legitimate is correlated with how other officers in his or her incident network also frame cameras.

To illustrate the results of the network autocorrelation models, Figure 5 plots the weighed one-mode network used in the analysis. In the plot, node size is proportional to change in legitimacy. Dark gray indicates a negative change, light gray indicates a positive change, and white indicates no change. In addition, the width of each line shows the number of events shared between the two officers connected by the line. The figure shows that, except for a small group of five officers (at the bottom of the plot), the officers are all indirectly connected. In other words, the majority of officers are connected through a "chain-like" structure. Moreover, there is not a great deal of cohesion in the entire network. That is, officer i may share several events with officer j, who shares incidents with officer k, but i shares few or no incidents with officer k. Although this is a feature of the global network, the local structure for particular officers may be informative regarding changes to legitimacy.

To test Hypotheses 3 and 4, we examine the degree and clustering scores for each officer to examine the embeddedness of particular officers in incidents, relative to others. These results are shown in four different plots in Figure 6. The top-left and top-right panels show how the number of shared events (i.e., degree) influences legitimacy. The top-left shows the raw score for change in legitimacy and reveals a weak, positive linear relationship. The (non-significant) slope of the line in the plot is 0.030, indicating that to produce a standard deviation increase in legitimacy (i.e., 0.879), an officer would have to share, on average, 29 more incidents.

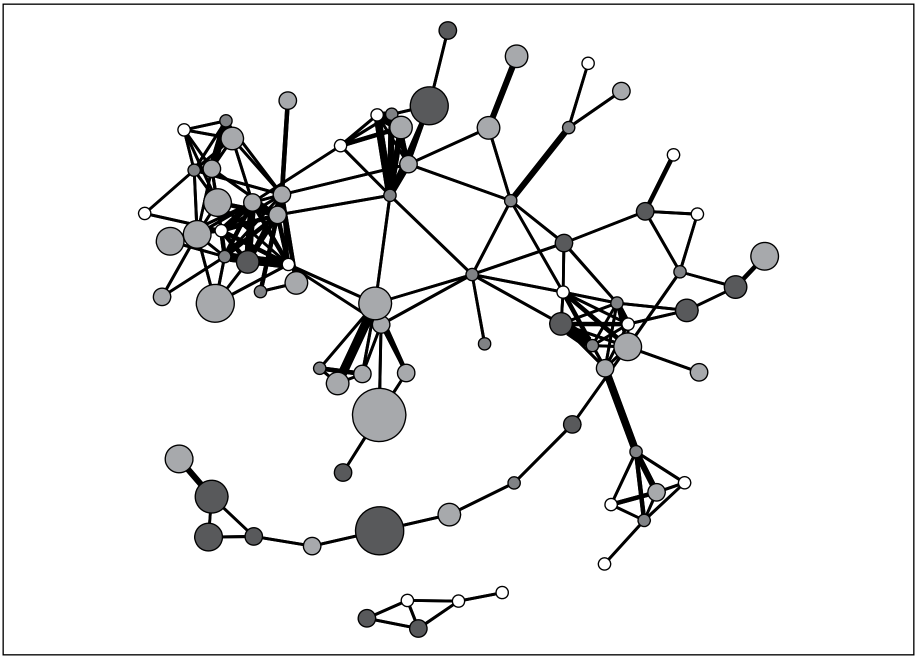

Figure 5. One-mode network of officers.
Note. Node size is proportional to change in legitimacy: darker = more negative; white = no change. Line size is proportional to number of shared incidents.

The top-right shows the absolute value score for change in legitimacy and also reveals a weak, negative linear relationship. The (non-significant) slope of the line in the plot is −0.026, indicating that to produce a standard deviation decrease in legitimacy (i.e., 0.879), an officer would have to share, on average, 33 more incidents. Both of these effects are considerably weak, given that the maximum number of shared incidents for a single officer was 12, providing limited support for Hypothesis 3.

The bottom-left and bottom-right panels show the relationship between embeddedness (i.e., clustering) and changes in legitimacy. The bottom-left shows the raw score for change in legitimacy (slope = 0.286, non-significant) and the bottom-right shows the absolute value for change in legitimacy (slope = −0.173, non-significant). As with degree, both plots for the relationship between clustering and legitimacy show fairly weak relationships providing limited support for Hypothesis 4.

Discussion

As police departments adopt new technology to further organizational goals, police managers and those in leadership positions must contend with how to establish the legitimacy of these innovations among officers. Historically, police agencies have been resistant to change until the technology in question is perceived as beneficial to

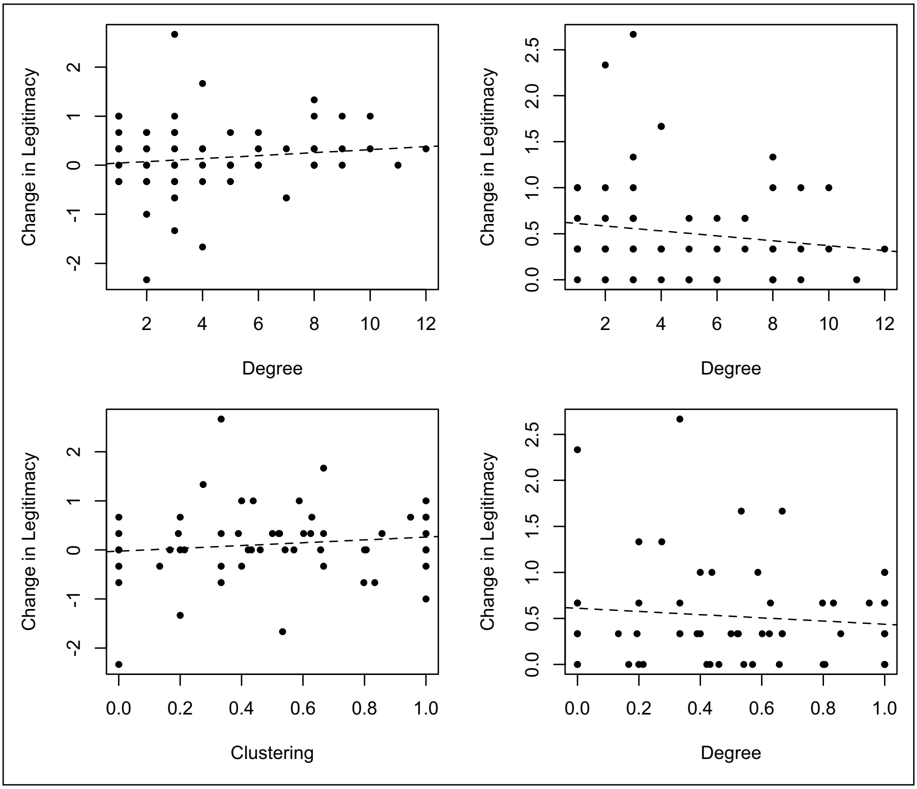

Figure 6. Changes in legitimacy.
Note. Upper-left panel: Changes in legitimacy by degree. Upper-right panel: Absolute value changes in legitimacy by degree. Lower-left panel: Changes in legitimacy by clustering. Lower-right panel: Absolute value changes in legitimacy by clustering.

the interests of line officers as well as managers. For example, over the past two decades, the adoption of global positioning system (GPS) patrol monitoring systems, dashboard cameras, and Tasers was met with resistance until their utility could be demonstrated. Critical anecdotes involving the effective use of these innovations have a legitimizing effect because they show pragmatic value to the beat cop on the street. Thus, the issue of encouraging buy-in becomes critical for organizational change. The current discourse over the utility of OVCs will follow this historical trend. In this regard, our findings may be instructive.

Our network autocorrelation model shows that, although small, an officer's framing of cameras as legitimate is influenced by the ways in which other officers in their incident network also frame cameras. Adding the treatment condition to the model shows little change in the coefficients, suggesting that changes in the perceived legitimacy of OVCs may not be dependent on officers gaining firsthand experience using the device in the field. Regardless of whether or not officers are equipped with the technology, attitudes about whether it is beneficial in specific types of situations and ultimately legitimate are influenced by participating in shared events with other officers who are equipped with the device, and who have exposure to the discourse occurring in these small workgroups.

It appears that officers assigned to the comparison group and others who are not among the first to receive the OVCs may nonetheless be exposed to treatment effects insofar as the OVCs have already affected the social dynamics and tactical procedures of the group. When an officer who is not wearing the camera has repeated contact with another officer on their squad who is wearing the device, much of the same information relating to costs and benefits of the technology may be diffused to the focal officer. The implication is that the integration of OVCs is likely to take place more rapidly when the first group of officers to be equipped with the device (i.e., pilot program) are not geographically concentrated within a small patrol area, but rather dispersed throughout the department to optimize the diffusion of information relating to the technology. That also means that adverse events compromising acceptance of the device may be particularly damaging because they will have a ripple effect that extends beyond those officers equipped with OVCs.

In terms of policy, our findings suggest that it may be beneficial for agencies to identify officers who endorse and volunteer to use the technology at the outset program implementation. These individuals may serve as change agents (see Rogers, 2005) by translating the management goals and perceived costs and benefits of the devices to those who use it in the field. Also, the use of mandatory activation policies, rather than giving officers the discretion to not activate the cameras, may accelerate the time that it takes for officers to adapt to the technology and identify when it is most beneficial. Mandatory policies may also improve field evaluations of the devices by providing more data points over a short period of time and a predictable amount of treatment dosage across experimental areas.

Our findings did not support Hypothesis 1, that framing cameras as legitimate and camera activation during incidents are correlated. Perhaps this is not surprising considering that the departmental policy during the first 4 months of implementing the OVCs was one of mandatory activation, unless activating the device during an incident endangered the safety of an officer or citizen. Under this policy, officers who view OVCs as legitimate and those who do not are both under scrutiny from their commanding officers to activate when reasonable. Interestingly, the policy changed from mandatory to discretionary activation in Month 5 of the evaluation, and this corresponded with a 40% decrease in camera activations. Although beyond the scope of the current study, further research is necessary to examine how legitimacy affects OVC activations under a discretionary policy.

Regarding limitations of the current study, several should be emphasized. First, the short interval of data collection may underestimate the extent of changes to perceptions of OVCs as legitimate among officers. Changes in officers' cognitive frames relating to camera technology may occur over a longer time frame than the study period. Second, on-officer camera systems available to police organizations vary in their physical features and capabilities. As a consequence, the generalizability of the findings in this study is limited to the extent that our results are conditional on the specific technological apparatus used by officers.

The diffusion of new technology within and across police departments is an iterative process that includes critical events that serve as setbacks and turning points for establishing or discrediting legitimacy. Future studies may benefit from more data points over time and multiple sites. Even so, our results may serve as a point of departure for examining how social networks effect changes in the legitimacy of OVCs and other new policing technologies. Our results indicate that officers' perceptions are not independent of their co-workers. Recognizing this interdependence, and identifying the structure of dependence (i.e., the network), is important for understanding how beliefs about OVCs may change (or remain stable).

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Notes

1. For the fixed vertex set **V**, the two-mode network is the union of two disjoint subsets A and B, $m = |A|$, $n = |B|$ such that the adjacency matrix is $n\mathbf{X}m$. That is, officers (n) provide reports on incidents (m).
2. Mathematically, this is accomplished by multiplying the $n\mathbf{X}m$ matrix by the transposition, $m\mathbf{X}n$. The product matrix (i.e., $n\mathbf{X}n$) elements show the number of incidents in which an officer filed a report in the diagonal and the number of incidents officers i and j shared in the off-diagonal.
3. If an officer i considers the opinions of those near him or her in the network, then the weights of y for j others in the network are given by the matrix **W**. The ijth entry in **W** represents the influence of j on i. **W** is row-normalized, where each ijth entry represents the value of that entry divided by the row sum across i. If actor i has two shared incidents with j and one shared incident with k, the ijth row-normalized entry in **W** is 0.667 (2/3) and the ikth row-normalized entry in **W** is 0.333 (1/3). Although the one-mode projection is symmetric (i.e., $ij = ji$), the row-normalization makes **W** non-symmetric because i and j may have different row sums.

4. Mathematically, the coefficient is calculated as the total value of closed triplets (i.e., *i, j*, and *k* are all connected) divided by the total value of triplets (defined as three nodes connected by two or three ties). For details, see Opsahl and Panzarasa (2009).

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Author Biographies

Jacob T. N. Young is an assistant professor in the School of Criminology and Criminal Justice at Arizona State University. He received his doctorate in sociology from the University of Washington. His research examines how social structure affects the diffusion and accuracy of information in networks and the consequences for behavior.

Justin T. Ready is an assistant professor in the School of Criminology and Criminal Justice at Arizona State University. He received his doctorate from Rutgers University, School of Criminal Justice. Much of his research is experimental and focuses on the link between crime and place, as well as the impact of police technology on crime control.