Measuring police innovation: issues and measurement

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Abstract *This paper investigates conceptual and empirical issues in the study of police organizational innovation. In particular, previous studies of police innovation have rarely created measures of innovation that are in accord with established methods and theory employed in innovation studies of other organization types. To mitigate this oversight, this paper first describes four relevant issues in organizational innovation, and applies these issues to create a fivefold measure of police innovation with data on the 431 largest municipal US police departments. Second, the components of this fivefold typology of police innovation are factor analyzed, to assess their unidimensionality. The results of these analyses indicate that three of the five innovation types are, in themselves, multi-dimensional. Overall, police innovations do not adhere to the five innovation types suggested by theories of organizational innovation. Instead, the multi-dimensionality of police organizational innovation is demonstrated here.*

For much of their history American police departments have utilized innovative programs, tools, and methods of administration. In many instances one innovation has superseded another over time. For example, patrol has progressed from foot patrol, to horse-drawn patrol wagons (Harring, 1983), automobiles, aircraft, and in some cases back to foot patrol. Similarly, police management and administration have evolved from direct appointment by ward bosses, to Civil Service selection, training academies, and education requirements (Fogelson, 1977; Roe, 1890). Finally, police departments have often utilized specialized units and programs such as detective bureaux (Klockars, 1985), women's bureaux (Owings, 1925), juvenile squads, and hate crime units (Walker and Katz, 1995).

Not surprisingly, police innovations continue to dominate current policing. Recent works have explored the adoption of community or problem oriented policing (Moore and Sparrow, 1988; Skolnick and Bayley, 1986; Sparrow *et al.*, 1990; Weisburd and Uchida, 1993; Zhao, 1995), and technical innovations such as computers (Klug *et al.*, 1992; Mullen, 1996; Peterson and Moore, 1995), or uniforms (Monkkonen, 1981). Others have described the impediments to, or the requirements for, changing departmental management (Guyot, 1979; 1991) and the diffusion of police innovation (Mullen, 1996; Spelman *et al.*, 1992; Weiss, 1992, 1997). It is apparent that the police infatuation with innovation continues today.

Unfortunately, the study of police innovation has not yielded a complete understanding of why some departments are more innovative than others. Indeed, this failure to reach a thorough understanding of police innovation is exemplified by a disagreement between two recent studies of police innovation.

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Zhao (1995) concludes that police innovations are primarily adopted due to environmental factors. However, Mullen (1996) concludes that police innovations are adopted due to internal, departmental factors. Such disagreements are certainly not unique to studies of the police. At first blush it would appear that the solution to this disagreement could be solved by turning to the extensive body of knowledge of innovation and non-police organizations[1].

Unfortunately, it is evident that disagreements about the causes and correlates of organizational innovation are not unique to the study of police departments; these disagreements also permeate the innovation literature on non-police organizations (Downs and Mohr, 1976; Fiol, 1996; Wolfe, 1994). For the past 20 years the literature on innovations in non-police organizations has wrestled with a failure to reach conclusions about the causes of innovations. Indeed, Downs and Mohr conclude, "Factors found to be important for innovation in one study are found to be considerably less important, not important at all, or even inversely important in another study. This phenomenon occurs with relentless regularity" (1976, p. 700). Some have claimed that this conclusion has not changed since 1976 (Fiol, 1996; Wolfe, 1994). Despite this empirical morass, the non-police innovation literature can provide guidance for the study of police innovation.

Drawing upon the non-police, and police innovation literature, the present study will explore issues in the measurement of police innovation. Unfortunately, few prior studies of policing have fully discussed organizational innovation, nor simultaneously measured the five aspects of organizational innovation. This oversight makes it difficult for the findings from various police innovation studies to be compared with each other. Similarly, because it is difficult to compare previous findings, it is not clear where the state-of-the-art is currently in the police innovation research. Therefore, the present study first describes the general state of knowledge of organizational innovation and applies it to past police studies. Second, the present study creates and explores the unidimensionality of five measures of police organizational innovation.

Defining and classifying organizational innovation

Innovation means different things to different people. Likewise, the organizational innovation literature reveals that different authors conceptualize, study, and measure innovation in different ways. Explicating these differences is the first step in untangling the sometimes confusing body of organizational innovation research. Fortunately, a recent meta-analysis of organizational innovation studies not only identifies four major differences in the prior research, but also shows the contrasting results these differences produce (Damanpour, 1991). These four issues will be discussed below and applied to prior police innovation research.

Defining innovation

As with much of the prior literature, there is a lack of consensus on what innovation is; therefore, definitions of innovation abound. Kimberly (1981) categorizes definitions into two groups, each with two possible focuses. The first definition defines innovation as a process which brings some new method into an organization. This view may either focus on just the implementation of an innovation, or may require that the implementation of an innovation results in "a 'fundamental' change in a 'significant' number of tasks" (Wilson, 1966, p. 196) in an organization. Either way, both these perspectives employ the criteria that something is an innovation only if it is a process that changes the manner in which an organization performs its task.

The second definition sees innovation as a "discrete product or program" (Kimberly, 1981, p. 85) that an organization adopts. This second definition may either use the criterion that the innovation be "state-of-the-art" to the field of possible adopters (Baldridge and Burnham, 1975; Kimberly, 1981; Kimberly and Evanisko, 1981), or that the innovation merely be new to each adopting agency (Rogers and Shoemaker, 1971; Wilson, 1966; Zaltman *et al.*, 1973). Research which uses the criterion that the innovations be "state-of-the-art" for possible adopters sometimes assesses innovativeness by measuring practitioners' opinion of what is "new," or what has been touted as new in trade or academic journals. On the other hand, using individual adopters as the judges for what is new requires that each adopter assess the newness of each product or program.

Generally, prior studies of police innovation have used the requirement that an innovation must be new to the field of policing, or "state-of-the-art." Unfortunately, these same studies have not always been clear how "state-of-the-art" for policing was ascertained. Weiss's (1992) definition of police innovation required that the innovation be new to policing, but it is not clear how Weiss ascertains what is "new to policing" and why there are only seven such innovations (one radical, two administrative, and four technical). Likewise, Mullen (1996) appears to use the criterion that an innovation is "state-of-the-art" for policing, but like Weiss it is not clear who deemed some items as being innovative. Two recent studies of police innovation have described their process for determining state-of-the-art more carefully. Zhao (1995) conducted a review of the literature to ascertain what is "state-of-the-art" for policing. Likewise, Moore, *et al.* (1996) utilized panel interviews of police experts, a survey of practitioners, and literature review of journals to identify police innovations. The innovations identified by Moore *et al.* (1996) were subsequently used by Spelman *et al.* (1992) and King (1998).

Different research types

Three research types have been used to study innovation: diffusion studies, innovativeness studies, and process studies (Wolfe, 1994). Once again, the research technique used often results in different findings (cf. Mullen, 1996)[2].

Diffusion of innovation studies generally describes and predicts the spread of an innovation or innovations across a group of adopters, over time. This research design attempts to explain who adopts first, who adopts later, and why. Diffusion of innovation has been used in four recent studies of American police innovation: uniforms with 57 police departments (Monkkonen, 1981); the spread of a mixed group of innovations to 134 departments (Weiss, 1992, 1997); the adoption of computers and software by 303 police agencies (Mullen, 1996); and the effect of some innovations on the later adoption of other innovations in an unspecified number of police departments (Spelman *et al.*, 1992). Overall, most of these diffusion studies conclude that innovations in policing are adopted slowly (by a few departments) at first, and then, over time, the rate of departmental adoption increases. Usually, the adoption of innovation resembles an "S" shaped curve and larger police organizations adopt before smaller departments.

Innovativeness studies are usually cross-sectional studies which quantify adopted innovations in each organization and then explain why some organizations adopt more innovations than others. Innovativeness studies have been used in three recent investigations of policing (Mullen, 1996; Weiss, 1992; Zhao, 1995). Mullen (1996) concludes that departments with more computers are larger and have adopted a greater number of other innovations. Zhao's (1995) analysis of the adoption of COP in 215 American police departments leads to the conclusion that more innovative departments are compelled to become innovative by external factors such as environment and social disorganization.

Finally, process studies attempt to explain the manner in which an innovation is first discovered, learned about, first adopted, changed, and then employed by an organization. There have been a number of process studies of police innovations (although the authors sometimes fail to frame their analyses in terms of the innovation literature, such analyses are informative nonetheless). For example, Guyot (1991) details the impediments and facilitators of innovation faced by one police department when changing its management style. Similarly, a number of recent works have described the process of adopting COP (Skolnick and Bayley, 1986; Sparrow *et al.*, 1990). Finally, Buerger (1993) suggested that some innovations may be more readily adopted by departments because they appeal to line officers' desire to be seen as crime fighters.

Different organizations

In a recent analysis of the organizational innovation literature, Damanpour (1990) highlights the different results achieved by studying different organizational types. In particular, Damanpour notes that research results differ between public and private organizations, and between organizations that provide a service as opposed to organizations that produce a product. This particular finding provides guidance for those seeking to apply findings from non-police organizations to the police. Researchers combing the non-police

innovation literature for findings applicable to policing would do well to limit their search to public, service organizations. Studies of other organizational types will provide useful guidance for research designs, theories, and measurement issues; however, it appears unwise to apply findings from general organizations to police organizations.

Different innovation types

Finally, previous works have often distinguished differences in innovations and tried to classify these types. This study uses a fourfold classification of innovations presented by Damanpour (1991) (and used by Moore *et al.*, 1996) as the starting point for the data analysis on police innovation. Damanpour's classification of innovations as being radical, administrative, technical, and programmatic has been supported by a meta-analysis which indicates that there are different correlates of these four innovation types (1991)[3].

Unfortunately, prior police innovation studies have not always distinguished among different innovation types. In particular, innovativeness studies have sometimes resorted to summated scales to measure overall departmental innovativeness, by summing the total number of innovations each department had adopted (Weiss, 1992, 1997). Unfortunately, this crude summing process often lumps various innovation types together and may result in a single measure of innovativeness which is not unidimensional. Likewise, some researchers have included some innovative programs to create a summated measure of *organizational structure* (instead of innovation), thus confounding the relationship between organizational structure and innovation (cf. Mullen, 1996). Finally, it appears that none of the police-innovation studies using a summated index to measure innovation has checked the summated index for possible multi-dimensionality.

Table I presents the various aspects of organizational innovation, which aspects have been studied by prior police-innovation research, and the focus of the present investigation.

In comparison to the innovations and their typology presented in Table I, prior police innovation studies appear to have employed less than ideal measures of innovativeness. Of greatest importance to the present analysis, however, is to explore the unidimensionality of these five innovation types with data from US municipal police departments. Theoretically, an analysis of police innovations should cluster into these different innovation types. This clustering, however, is an empirical question which can be addressed in a number of ways.

On the one hand, various measures of innovation could be analyzed as one group, via a data reduction technique (such as factor analysis) to see if these innovations cluster into different types, as the theory predicts. Unfortunately, such an exploratory analysis disregards the theoretical (and sometime empirical) conviction that different innovation types exist (Hurley *et al.*, 1997). On the other hand, it could be assumed that these innovation types exist (because the theory predicts that they do), and searching for evidence of

Defining innovation (Kimberly, 1981)
1. Innovation is a process that is implemented
2. Innovation is process the requires massive change (Wilson, 1966).
3. Innovation is a product or program that is new to that organization (Rogers, 1971).
4. *Innovation is a product or program that is state-of-the-art for possible adopters (Kimberly, 1981). This definition has been used in police research by Zhao (1995), Moore* et al. *(1996), and King (1998), and appears to have been used by Mullen (1996) and Weiss (1992).*

Type of study (Wolfe, 1994)
1. Process study. Study how an innovation changes as it is adopted and utilized.
2. Diffusion of innovation. Study how innovations spread across the population of possible adopters. Diffusion of innovation studies with police organizations include Monkkonen (1981); Mullen (1996); Spelman *et al.* (1992); and Weiss (1992).
3. *Innovativeness study. Measure the overall innovativeness of police organizations by quantifying the number of innovations adopted. Police innovativeness studies include King (1998), Mullen (1996), Weiss (1992), and Zhao (1995).*

Stage of adoption (Damanpour, 1991)
1. Initiation. Is the organization cognizant that this innovation exists?
2. *Implementation. Has the organization adopted this innovation? This stage of adoption has been used in prior police research (King, 1998; Monkkonen, 1981; Mullen, 1996; Spelman* et al., *1992; Weiss, 1992; Zhao, 1995).*

Classifying innovation types (Damanpour, 1991; Moore *et al.*, 1996)
Radical innovations. Require massive restructuring or changes in the organization.
Administrative. Change the management of the organization.
Technical. Change the hardware used to produce a service or product.
Program. New units or operations to meet an organizational goal.

Note: The criteria used in the present study are italicized

Table I.
Police innovation: previous definitions, study types, stages of adoptions, and classifications

their actual existence could be forgone. This second option blindly assumes that a typology of organizational innovation correctly mirrors police innovation and suggests that any confirmatory analysis be skipped. This "blind faith" is also inappropriate, for science is useful for refuting untrue statements.

Therefore, the present analysis chooses a middle path between theory and empirical exploration, by assuming that these five innovation types exist. Therefore, the unidimensionality of each innovation type will be assessed in turn with factor analysis. Using factor analysis to produce different innovation types would trample the theory, while failing to check for evidence of these alleged innovation types would be an exercise in faith, not science.

Data and methods

This next section is composed of two parts. First, the two data sets are described, as are the five measures of police innovation. Second, the five measures of police innovation are subjected to data reduction (factor analysis) to explore each for unidimensionality.

The departments studied are the 431 municipal police departments in the USA with at least 100 sworn, full-time officers in 1993. This population of departments is studied for three reasons. First, a wealth of data is readily available for these departments which permits measurement of most aspects of innovation. This is not true of other police organizations (such as campus, special, state, private police agencies, sheriff's offices, and smaller police departments). Second, the previous police innovation literature has studied the large, municipal police departments (Monkkonen, 1981; Mullen, 1996; Weiss, 1992, 1997; Zhao, 1995). For the results of this study to be comparable to these previous works, the large municipals are studied. Finally, thanks to prior research we know more about the organization of large, municipal police departments than other police organizations (Langworthy, 1986; Maguire, 1997a). It seems likely that the increased task scope and different political environment of other organizations, such as sheriff's offices, would cause differences in both structure and the adoption of innovation (e.g. Falcone and Wells, 1995).

Data

Two data sources were used for this study. First, data from the 1993 wave of LEMAS, The Law Enforcement Management and Administrative Statistics study, were used to construct some of the measures of police innovation (US DOJ, BJS, 1993). LEMAS is a comprehensive survey of American police departments conducted by the US Bureau of Census for the Department of Justice in 1993. Although LEMAS collected data from 831 police agencies with 100 or more sworn full-time officers, this study includes only the 431 large municipal agencies. The LEMAS data have been used before to measure various aspects of police department structure and functioning (cf. King, 1998, 1999; Maguire, 1997a, 1997b).

Using a sampling technique similar to LEMAS, the Police Foundation conducted a survey of community police practices in over 1,600 police agencies in 1993 entitled *A National Survey of Community Policing Strategies*. Of the 431 municipal departments used in this analysis, 345 responded to the Police Foundation survey (for an availability rate of 80 percent). A number of measures of police innovation will be constructed from the Police Foundation data, such as radical and programmatic innovation.

Measures

Innovation. The present study first constructs a fivefold typology of police innovation and then tests the unidimensionality of these five innovation types. In accord with prior police innovation research, police innovation will be defined as something that is new and "state-of-the-art" to the field of policing. Fortunately, prior research has already asked experts, surveyed practitioners, and conducted a content analysis of journals to ascertain what is "state-of-the-art" for policing (Moore *et al.*, 1996). The results of this study are classified (with one alteration) as the different innovation types, in Table II.

Whereas Moore *et al.* (1996) divide police innovations into four categories, recent work suggests a further division of police innovation. In particular, Buerger (1993) suggests that technical innovations, which are perceived by line police officers to enhance their law enforcement image, will be more readily adopted than technical innovations which do not enhance a law enforcement image. In short, the correlates of adoption of technical innovations will be different, depending upon their reception by line officer culture (Reuss-Ianni, 1983). The third column in Table II bifurcates technical innovations into those that appeal to line officers and those that do not.

Assessing the unidimensionality of the five innovation types

The following section describes how each of the following measures of innovation were constructed, and the results of the factor analyses.

Radical innovations. Moore *et al.* (1996) conclude that only POP and COP are truly radical police innovations. Unfortunately, only information on the adoption of COP is provided by the present data. To construct a measure of the adoption of COP, two variables from the Police Foundation Survey of Community Policing Practices were combined. First, departments which reported that they had adopted community policing were tentatively counted as having community policing. Indeed, 304 of 345 (88.1 percent) respondents reported that they had or were implementing community policing. As an additional check on this question, a second question from the Police Foundation survey was used. Departments reporting that they had implemented, or were planning to implement, the permanent assignment of officers in certain areas (or areas with certain needs) were coded as implementing an important

		Incremental		
	Radical Management technical	Line technical[a]	Administrative	Programmatic
COP	CAD	9mm handguns	Hiring women	Asset forfeiture
POP	AFIS	Pepper spray	Affirmative action	Neighborhood watch
	Mobile phones	Restraint devices	Interagency communication	Domestic assault
	DNA typing	Non-lethal impact dev.	Civilianization	DARE
	MDTs	Unmarked cars	Participative mgmnt	Call screening
		Armored cars	Mission/values statements	Victim assistance
		Choke holds	Decentralization	Street sweeps
		10mm hand guns	MPO rank	Directed patrol
			Accreditation	Crime analysis
				Hate crimes
				ROP
				Foot patrol
				Special populations
				Fear programs

Table II. Types of police innovations

Notes: Adapted from Moore *et al.* (1996, Table 1).
[a] The distinction between management- and line-technical innovations is not made by Moore *et al.* (1996). This distinction has been added here

component of COP. However, only departments which responded that they had adopted both of these requirements were counted as implementing COP[4]. A total of 246 departments satisfied this requirement and were thus counted as adopting COP (71.3 percent).

Technical innovations. First, in accord with Buerger's (1993) prediction, technical innovations are initially composed of two types: those that appeal to police managers (called management-technical innovations), and those that appeal to street-officers (called line-technical innovations). The management-technical innovations are AFIS, CAD, MDTs, DNA testing, and mobile phones. LEMAS data record if departments have AFIS, CAD, and MDTs. Furthermore, LEMAS records if a department conducts its own lab testing, which is the closest proxy for DNA testing available. Unfortunately, neither LEMAS nor the Police Foundation survey asked about the presence of mobile phones, and therefore this innovation cannot be included in the present measure. Departments with one of these innovations received a "one" for each management-technical innovation they possessed, and a "zero" for each innovation they did not possess. Therefore, possible scores for management-technical innovation ranged from zero to four. The descriptive statistics for this variable are reported in Table III.

When the four variables comprising the measure of management-technical innovation are subjected to a factor analysis, all four variables load on one factor (see Table IV). This result indicates that, with the present data, management-technical innovation is unidimensional.

The second type of technical innovations are the line-technical innovations which are presumed to appeal to line-officers' sense of "real" police work. These innovations are teargas, restraint holds, armored cars, 9mm and 10mm handguns, non-lethal impact devices, Tasers, and unmarked cars. Departments received one point for adopting each of these innovations, and these points were summed to create an overall line-technical innovation score.

When the line-technical innovations are subjected to a factor analysis, however, this measure bifurcates into two sub-categories. The first sub-category

Dependent variable (innovation) (range)	*n*	Mean	Median	SD
Radical (0-1)	345	0.71	1.00	0.45
Administrative (0-5)	335	1.92	2.00	1.29
Field oriented admin. (0-3)	341	1.26	1.00	1.02
Management oriented admin. (0-2)	423	0.63	1.00	0.65
Technical (0-10)	420	3.63	3.00	1.50
Management oriented technical (0-4)	431	1.77	2.00	0.99
Technical (line oriented tactical) (0-3)	431	0.66	0.00	0.79
Technical (line oriented weapon) (0-3)	420	1.19	1.00	0.71
Programmatic (0-10)	342	5.90	6.00	1.75
Program (crime oriented) (0-4)	342	1.04	1.00	1.18
Program (efficiency oriented) (0-3)	342	2.47	3.00	0.72
Program (COP oriented) (0-3)	342	2.39	2.00	0.67

Table III. Descriptive statistics for innovation variables

Innovation type variable	Factor 1	Factor 2	Factor 3	Factor 4
Management: Technical innovation				
AFIS	0.72630			
CAD	0.43639			
Lab testing	0.54311			
MDT	0.62360			
Administrative: Field oriented				
Sworn female officers	0.66704	0.23352		
Sworn minority officers	0.73259	–0.18039		
Decentralized field services	0.64842	0.11784		
Administrative: Management oriented				
Civilian employees	0.07493	0.70378		
Accreditation	0.03855	0.79261		
Line-Technical: Tactics				
Teargas	0.71337	0.03986	0.04671	–0.00678
Restraint holds	0.52326	–0.25826	–0.13015	–0.29574
Armored car	0.47822	–0.43633	0.25346	–0.34126
Line-Technical: Weapon				
9mm handgun	0.00356	0.59948	0.25420	–0.40418
10mm handgun	–0.29846	–0.58930	0.21655	0.22267
Impact device	0.23753	0.51143	–0.21648	0.20242
Unclassified				
Taser	0.46760	0.05377	0.16197	0.73624
Unmarked cars	–0.05348	0.17326	0.87931	0.03118
Programmatic: Crime oriented				
Domestic violence	0.69094	0.15282	–0.02533	
Victim assistance	0.70653	–0.06043	0.18376	
Hate crimes	0.69203	–0.00207	–0.13527	
R.O.P.	0.50167	0.19261	0.30212	
Programmatic: Efficiency				
Asset forfeiture	0.06604	0.59503	–0.08455	
Crime analysis	0.00569	0.76275	0.08204	
Call screening	0.06373	0.52969	0.15369	
Programmatic: Community				
Crime prevention	0.18913	–0.02462	0.75913	
School drug education	0.06177	0.16587	0.32737	
Foot patrol	0.37953	0.05786	–0.58784	

Table IV.
Factor analyses of four police innovation types

(composed of teargas, restraint holds, and armored cars) is composed of things which seem to extend an officer's use of force continuum. While armored cars are generally not placed on a use of force continuum, they are sometimes used

to intimidate people by their presence. For this reason (as well as the results of the factor analysis) armored cars are included with two other tactics which extend the use of force options available to a department. Three other innovations appeal to line officers (9mm and 10mm handguns, and the PR-24 baton); however, they allocate either deadly force, or the risk of serious bodily harm to suspects. These three innovations are called line-technical weapon innovations because they are loaded on the second factor, and imply a greater degree of force (compared to the tactically oriented line technical innovations). Finally, two technical innovations load on the third and fourth factors respectively. Unmarked police cars is the only line-technical innovation to load on the third factor, and is thus dropped from further analyses. Likewise, TASERs[5] load on the fourth factor, and are dropped from further analysis.

Administrative innovations. The measure of administrative innovation is composed of five variables. The percentages of sworn female officers, sworn minority officers, and civilian employees were computed. Departments with greater than the national mean for these three innovations (8 percent for female officers, 19 percent for minority officers, and 22 percent for civilians) received a "one", while departments with less than the national mean received a "zero." Departments reporting that they had decentralized field services received a "one", while those without received a "zero." Finally, departments reported by CALEA (Commission on Accreditation for Law Enforcement Agencies, Inc.) to have achieved accreditation before January 1993 were coded as "ones" and departments without accreditation were coded as "zeros"[6].

When submitted to a factor analysis, the five administrative innovations bifurcate. The first group (sworn female officers, sworn minority officers, and decentralized field services) are administrative innovations which seem most likely to appear on the street. In other words, these innovations, while administrative in nature, are likely to have their greatest impact on interactions between police officers and the public. For this reason, these three innovations are termed field-oriented administrative innovations. On the other hand, the other two administrative innovation types (civilian employees and accreditation) are more likely to alter the internal (or "behind the scenes"), administrative operations of the department, and for this reason are called management oriented administrative innovations.

Programmatic innovation. Moore *et al.* (1996) identify 14 programs considered to be innovative. Measures of ten of these are available from either LEMAS or the Police Foundation survey. The Police Foundation survey asked departments about their use of call screening, crime analysis, and foot patrol. As before, departments reporting the adoption of these innovations received "ones" while departments without were scored with "zeros". LEMAS collects data on departments' adoption of repeat offender and victim assistance programs, hate crime and domestic violence units, community crime prevention, asset forfeiture, and school drug education programs. Departments reporting a full-time unit for each of these innovations received a "one".

When subjected to a factor analysis, the ten programmatic innovations load on three factors. The first factor is composed of programs which target particular crimes (hate crimes and domestic violence), chronic offenders (ROP), or the products of crime (victim assistance). For this reason, these innovations are called crime oriented programmatic innovations. Three other programs load on the second factor. Crime analysis and call screening are programs adopted in order to improve the efficiency of a department. Likewise, asset forfeiture (a drug-related tactic) results in increased capital for a department, and is thus included with the efficiency-oriented programmatic innovations. Finally, three programs which target communities or community crime prevention load on the third factor. Neighborhood watch (crime prevention), foot patrol, and school drug education, are three innovative programs designed to combat crime, fear of crime, or drug use through closer contact with communities. For this reason, these last three programmatic innovations are called community-oriented programmatic innovations.

Conclusion and discussion

Three observations can be made from the present study. First, it is apparent that police organizational innovation is certainly *not* a unidimensional construct. Future studies of police innovation should address this finding by exploring their measures of innovation for multi-dimensionality. Unfortunately, there is also little evidence that there are four or five innovation types among US police organizations, for all but one of the innovation types splinter into smaller subgroups when factor analyzed. Further analyses of these data with MPLUS software was similarly unable to produce tidy, unidimensional factors within each innovation type (except for management-technical innovation)[7]. Overall, police innovation defies attempts to classify it into theoretically defensible categories.

Second, although the innovations identified as being state-of-the-art by Moore *et al.* (1996) are becoming dated, the methods in the present study are not. Future research should be guided by the present dissection of previous methods and measurement issues. In other words, future police-innovation researchers must detail how they ascertain what is innovative, and such criteria must be in accord with the established methods present in the non-police innovation literature. Furthermore, future researchers should explore the dimensionality of their particular innovation measures. The present study's usefulness lies in its demonstration that police innovation is multidimensional, and should be treated thus in future studies.

Finally, the present finding that police innovation splinters into at least ten sub-groups bolsters the findings of Spelman *et al.* (1992) who explored the ways in which some police innovations impede or facilitate the later adoption of other innovations. Again, the ways in which the different innovation types relate to each other is highlighted by the factor analyses, and these interactions should be explored further.

Notes

1. The literature on innovations and general organizations is extensive, with 351 dissertations and 1,299 published articles on organizational innovation being cataloged between 1989 and 1994 (Wolfe, 1994).
2. Mullen's diffusion of innovation study produces different correlates of early innovation compared to the results of his innovativeness study (1996, pp. i-ii).
3. Moore *et al.* (1996) use the term "strategic" instead of "radical". The latter term will be utilized in the present study.
4. Obviously, this is a weak measure of the implementation of COP. Others have used alternative measures of COP but unfortunately these measures have also included other innovation types (such as programmatic and administrative innovation). In order to keep the five innovation types distinct, the present study must use this measure of COP. Readers concerned with an alternative method of measuring COP as an organizational innovation should see Zhao (1995).
5. TASER: Tom A. Swift Electric Rifle (according to Kornblum and Reddy, 1991).
6. The data on accreditation were kindly provided by Edward Maguire, who collected the data from CALEA.
7. One reviewer suggested that factor analysis was inappropriate for analyzing dichotomous variables. MPLUS software uses tetrachoric correlations matrices to estimate the underlying structure of dichotomous variables, and this is considered superior to phi coefficients (used by factor analysis). For a further discussion of MPLUS see Maguire (2000) and Maguire *et al.* (2000). The analyses conducted with MPLUS (not shown) are similar to those produced by the factor analysis and neither technique is capable of producing four of five unidimensional innovation types.

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