IDEA ANALYTICS

JARVIS: JUST A REALLY VERY INTELLIGENCE SYSTEM

Data and Technology in Modern Policing

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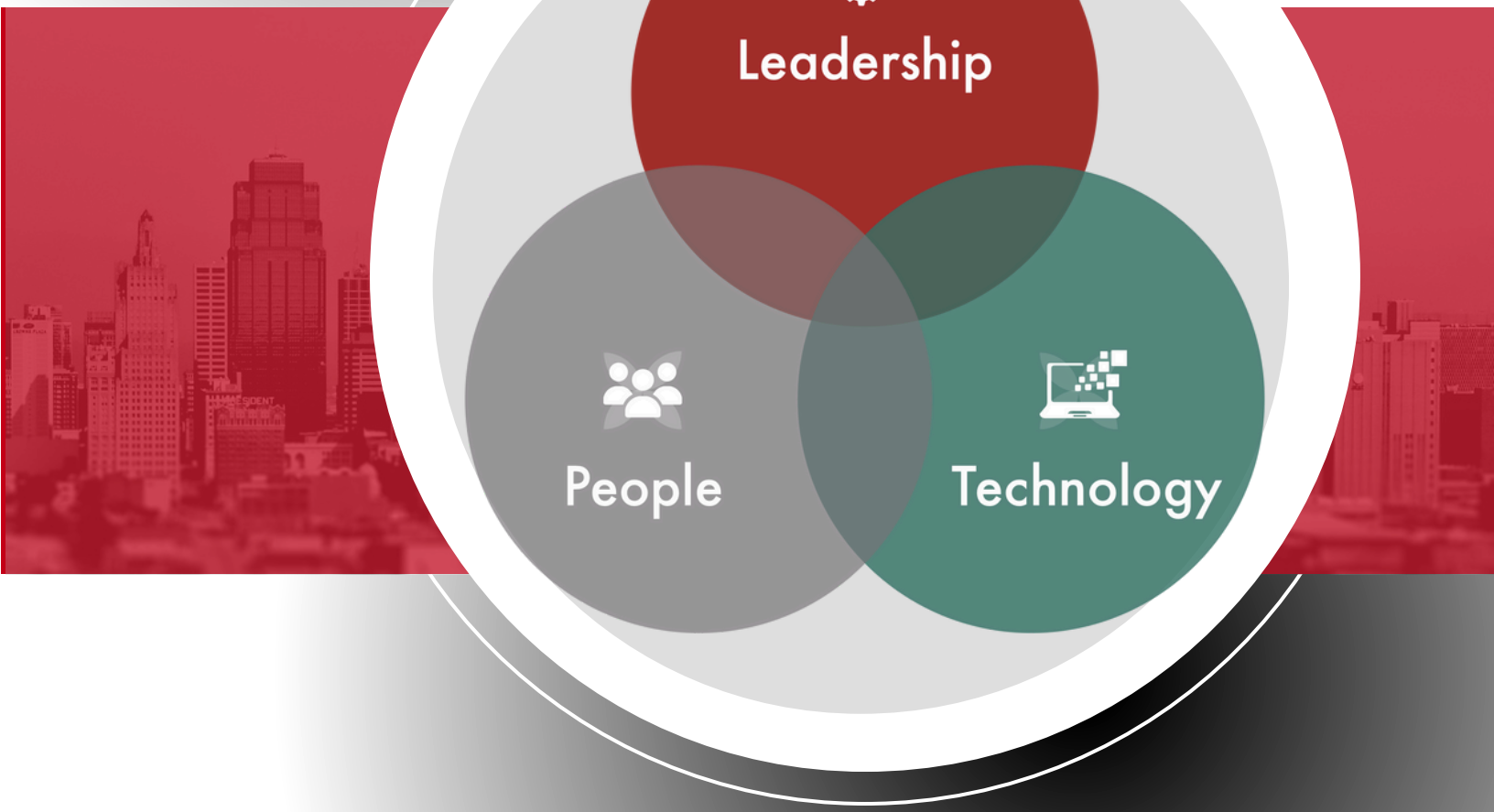

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PREFACE

This article was originally submitted to *Policing: A Journal of Policy & Practice* for consideration in their 2023 special edition on police-practitioner partnerships. I am grateful to the editors and blind reviews for their thoughtful review and consideration of this work. Their feedback strengthened the analysis and reinforced my commitment to making this research accessible to the broadest possible audience.

While I opted to not submit to the journal and remain behind a paywall where it might have limited reach among practitioners and researchers who need it most, I have chosen to publish it independently through IDEA Analytics. This decision reflects the business framework and proprietary development of the framework through 100+ projects across the nation over a decade. My belief continues to align that research on police technology implementation should be readily available to the agencies, policymakers, and scholars working to advance evidence-based practices in law enforcement.

To my fellow researchers and practitioners evaluating technology efficacy in policing: we stand at a critical juncture. Agencies across the country are investing heavily in technological solutions—body-worn cameras, predictive analytics, records management systems, real-time crime centers—yet too often these implementations fall short of their promised outcomes. The problem is rarely the technology itself, but rather the absence of systematic frameworks to guide organizational change.

Digital transformation is not simply a matter of procurement and deployment. It requires understanding how technology reshapes workflows, decision-making processes, communication patterns, and ultimately, the relationship between law enforcement and the communities they serve. Without frameworks that account for these complex organizational dynamics, we will continue to see expensive technology initiatives that deliver limited value or, worse, create unintended consequences.

The Digital Transformation & Analytics Capacity™ (DTAC) framework developed by IDEA and presented in this article offers researchers and agencies a structured approach to understanding where technology can genuinely advance policing objectives and where organizational readiness must be developed first. By examining technology adoption through the lens of organizational capacity, strategic alignment, and change management, we can move beyond the cycle of hype and disappointment that has characterized too many police technology initiatives.

I encourage you to engage critically with this framework, test it in your own research contexts, and share your findings with the field. Evidence-based policing requires not just rigorous evaluation of specific technologies, but also systematic approaches to the implementation process itself.

For more information on the lessons learned from digital transformation projects in the field, follow our Substack blog here.

For additional information about the DTAC program, consultation inquiries, or to discuss collaborative research opportunities, please use this form and schedule a transformation call.

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A special thank you to my coauthors for their commitment to the work during this case study, and in the many years since.

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ABSTRACT

Purpose: Data to inform police decision making has been promoted as a best practice for decades. Yet, building the analytical capacity of police departments to fully embrace data and use data sources ethically and equitably has produced barriers to repeatable, reliable, and reproducible information. This article conducts an embedded, multiple-case analysis of two local city municipality police agencies in implementing crime centers focused on building problem-solving efforts for crime reduction. A five-domain data and organizational framework grounded in data science and organizational research is used to assess the readiness and capacity of organizational culture and operations to use data in decision making.

Area of Inquiry: This study directly focuses on two of the four contemporary issues in the policing field requested by special edition. First, the People Resources domain focuses on ***recruitment and hiring of professional staff*** (e.g., information technology, crime analysts) as a critical element to analytical capacity and problem-solving approaches. As police departments have continued to hire professional staff, commonly referred to as civilians, due to these technology demands, understanding these practices for recruitment and retention of civilian staff to support crime reduction strategies and problem-solving efforts will impact the future use of crime centers in policing. Second, the data and organizational framework requires ***interagency collaborations and problem solving*** to support information sharing, data integrity and responsiveness to crime patterns. Two domains in the framework address the information sharing capacity and data quality/access to support interagency collaboration.

Methods: This embedded, multiple case analysis evaluates the five domains of analytical capacity in an organization among two agencies. An evaluation of initial capacity includes the review of documents, interviews, and group sessions among police leaders to identify gaps and opportunities for support. Documentation, interviews, and observations performed periodically throughout a three-year period for each site enabled measures of progress across all domains.

Findings/Implications: Outcomes from this framework further informs police agencies on how to develop analytical capacity and policies, interagency cooperation, problem-solving approaches, and strategies to address crimes (i.e., violent crimes) with police and community-based service providers.

Keywords: data driven, analytics, technology, organizational change

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The authors would like to thank the continued support of their agency leadership to take risks and advance the methods of policing for our communities.

INTRODUCTION

Police agencies inherently collect a large amount of data on people, places, incidents, and environmental characteristics. Decades ago, this collection was evident by file rooms and boxes of paper in storage. Today, it is the requirement of robust computer-aided dispatch (CAD) and record management systems (RMS) to support multiple methods of digital data collection and ensure data governance standards. Additional technology advances have provided a plethora of applications, connected software, and other platforms that manage data processing in real time (e.g., digital evidence processing, real-time data reviews). The "big data" demands of policing have called for systemic transformations of building and maintaining data infrastructure, relevant training for officers and analysts, and an adherence and understanding of the responsible use that comes with this paradigm shift.

However, there are three key shortcomings of technology in the digital transformation of police data. First, many data systems in policing just *collect data.* Police agencies need systems or processes that allow *access, analysis,* and *reporting of data* in a timely, accurate, and actionable manner. This requires agencies to think about the entire data lifecycle (refer to Figure 1).[1] The myopic focus on collection has stunted agencies' selection of software platforms, burdened the officer in report writing processes, and created information silos.

A second shortcoming of technology in the digital transformation of police data is the inability for primary record systems (i.e., CAD, RMS) to support the multiple collection methods and workflow management processes used in policing today. Modern policing is not just police

[1] The data lifecycle is a five-step process that acknowledges basic processing of information into valuable intelligence for decision makers. The technical skills needed in each of these phases often require multiple personnel to support proper data governance.

reports – it includes electronic tickets, field investigation cards, license plate reader (LPR) records, video surveillance camera files, digital photography, cell phone records, and the list goes on. Each of these data sources have different collection practices (e.g., officer-initiated v. dispatched) and occur at different times of their workflow (e.g., initial call, supplemental follow up, business check during proactive time). Furthermore, the management of these data points within and across incidents require additional workflow functions that are unique to each department.

Figure 1. Data Lifecycle

Lastly, police agencies are experiencing personnel challenges to manage the modern demand of data. Over the last few decades, police departments have removed information technology positions, if existent at all, to share resources with city or county departments. While this consolidation of positions may support city or county-wide practices, the lack of dedicated staffing for police technologies often results in deviations from technology implementation and management practices. The positions of data analysts, or crime analysts, to fill technology gaps has become an emerging trend. Several crime analysts have developed data science (e.g., machine learning) and data engineering skills (e.g., relational database management, SQL coding) to address the big data management demands on police systems. Yet the field of crime

analysis does not fulfill the gaps completely. For example, the inefficiencies of manual and replicative data development (e.g., retyping data into a spreadsheet) are still common in crime analysis workflows. These practices are indicative of both technology (e.g., inability to extract into usable data format) and people (e.g., lacking computer language or data management skills) deficiencies.

It is clear – data-driven policing is a requirement for modern agencies and police have big data issues. To meet this requirement and address big data, police agencies have built new units or transformed existing capabilities to advance their use of data, resulting in several examples of analytical units, real-time crime centers, and the integration of analysis and digital forensic activities for investigations. Police agencies are seeking strategic processes to advance their uses of data and technology. The mistakes and financial waste of building temporary tools or purchasing other intelligent information systems that may not survive budget cuts or operational changes has inhibited data advancements for agencies. It is timely for agencies to consider research from data-driven organizations and change management to guide the future path of data and technology for policing. Data-driven organizational frameworks enable agencies to transform their operations while strategically aligning leadership, people, and technology for long-term growth and advancements.

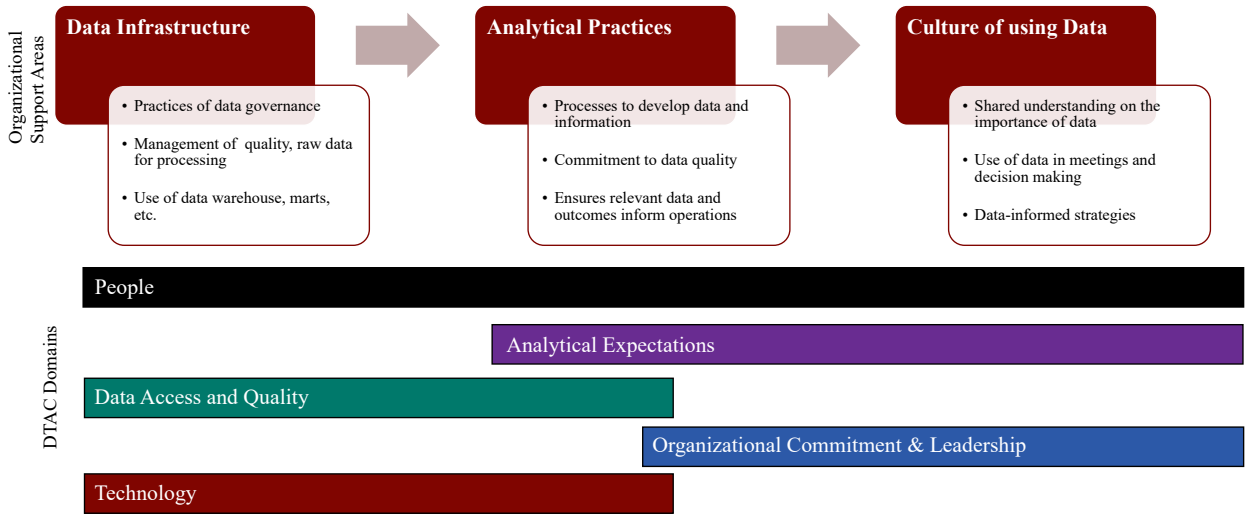
This study addresses these common gaps and issues in advancing organizations toward data-driven operations in evaluating the IDEA Analytics (IDEA) Digital Transformation & Analytical Capacity ™ (DTAC) program and implementation process to police agencies transforming their data processes and culture. The IDEA DTAC program is a five-domain assessment, strategic planning, and implementation process that enables agencies to align and enhance resources, shift their organizational data culture, and advance toward predictive and

prescriptive analytical outcomes. The five domains – People, Analytical Expectations, Data Access and Quality, Technology, and Organizational Leadership & Commitment – provide a shared language and understanding across the organization and allow for consistency throughout the multi-year process to assess, plan, and implement the desired transformations for the organization. The sections below define the domains, their evidence-base, and their application within the IDEA DTAC program.

Literature Review

Theoretical understanding of technology innovation has suggested several stages or phases of adoption, implementation, and maintenance (Rogers, 1962; Manning, 1992). These stages or phases are repetitive, or agile, due shifts and dynamics of the technology innovation over the last two decades. Organizations routinely revisit the core characteristics of their data practices to refine, adjust and realign. Namely there are three organizational support characteristics to build and maintain data-driven decision making (DDDM). These characteristics include core data infrastructure, analytical practices (e.g., handling volume or veracity), and the organizational culture of using data (Gill et. al., 2014; Morrison, 2015). The five domains of the IDEA DTAC program build upon these support areas and address the embedded characteristics that allow a policing organization to advance their leadership, people, and technology (see Figure 2).

Figure 2. Conceptual Framework for Thematic Coding (Organizational Support Areas & DTAC Domains)



People Domain. Embedded throughout the organizational supports described above, this domain examines job tasks for personnel managing data infrastructure, analytical practices, and decision making. The DTAC program leverages job task analysis and interview methods to first examine categories for internal personnel and external stakeholders involved with data infrastructure and governance and then examine their data workflows within the phases of the data lifecycle (see Figure 3). For police agencies, these personnel are often dispersed throughout the organization and include different workflows due to the silos of police units and divisions. Interviews and site observations reveal how the organizational structures impact these workflows and usage of data.

[insert Figure 3]

Data governance practices most frequently stem from information technology departments and leaders (e.g., Chief Technology Officers, Chief Information Security Officers) (Patil & Mason, 2015). Data governance is ingrained in these professional fields and the elimination of these professionals within policing organizations has had direct impacts on the

field's ability to ensure sustainable data-driven practices. Over the last three decades, there is a juxtaposition of data governance practices in policing. Policing organizations have eliminated agency-specific technology staff, relying on city or county staffing to support their needs. This has resulted in declining data practices within the police agency and part-time (at best) attention to data governance. For some agencies, the loss of dedicated personnel has stagnated police data with basic collection practices (e.g., data warehousing) and descriptive statistics (Davenport, 2013; Turban et. al., 2015; Berndtsson, et al., 2018).

Necessary skill sets include computer languages and infrastructure management. The quality of this data is highly reliant on the data collection and data entry practices of staff (e.g., officer report writing quality). The lower the quality, the lower the analytical insights that can be developed. Line staff officers' and detectives' entry and access to data may be through graphical user interfaces (GUIs) and other user-friendly formats (e.g., pre-set reports). The more this staff uses reports, the more they are vested in the quality, or accuracy, of information. When quality lacks, these users are often the first to disengage in data processes. Data access and quality looks differently for leadership, which often results in misaligned perceptions of the true quality of an agency. Leadership access to data is often secondary, delivered through final reports which have been developed by other staff. As personnel seek to ensure satisfaction among their supervisors, personnel responsible for the development of reports may default to manual or unrepeatable processes to develop these final reports.

This domain also evaluates any efforts toward the advancements of data mining and developing analytics to identify patterns and intelligence from their information to guide operational changes that require additional strategies in policing (Berndtsson, et. al., 2018; Han, et. al., 2012). Overlapping with the analytical practices support area, these efforts demonstrate

the readiness of the agency to move toward relevant data. The emergence of crime centers is a demonstration of this readiness, as these centers provide brick and mortar space for analytical capacity and should be meeting data analysis standards and practicing relevant diagnostics toward mission objectives (Hollywood, et. al., 2018; Hollywood et. al., 2019).

The use of job task analysis tools during the assessment phase enables clear implementation steps for agencies seeking to transform staffing and data processes. The job task analysis examines the tasks critical to a specific job and identifies the presence or absence of expected skills to realign or enhance staff assignments (Maurer, et. al., 2003). The use of job task assessments policing has varied from general community policing skills (Pelfrey, 2007), specialty units (Silk et. al., 2018), and agency-wide evaluation (McGraw, 1978; Manning, 1992; Manning, 1996) to determine training, selection of officers, and differentiation of rankings. As big data has impacted policing, there has been a push for police agencies to understand the specific and professional skills needed to truly develop data, produce analysis, and provide informative details to change behaviors, policies, and align resources.

In addition, this evaluation includes a comparison of any data development to analytical standards and techniques (International Association of Crime Analysts, 2017; Leblanc, et. al., 2015). Common gaps identified within this domain include personnel skill deficiencies, overall lack of analysis being performed, broken data workflows (e.g., do not or cannot use data), or deviations from data workflows (e.g., re-entry of information into a personal spreadsheet that creates silos). These deficiencies impact the analytical practices support area and further inform the agency on how to build capacity among staff and within the analytical expectations.

Analytical Expectations. The development of data in big data organizations can commonly result in basic data outputs, particularly for immature data cultures. For policing, data

developments have largely been influenced by administrative mandates (e.g., state, or federal reporting systems) or influenced by public or political priorities (e.g., concerns with current burglary series, violent crime rates), resulting in a focus of data practices to report descriptive statistics about what has happened. The basic reporting of descriptive statistics of past activities and actions may provide awareness about high or low crime trends, but they often do not provide insightful outcomes to drive decisions or realign resources effectively.

A critical goal for any organization seeking DDDM requires that outcomes inform operational actions – either in real time or as an overall strategy (Mandinach, et. al., 2008; Kerrigan, 2014; Anderson, 2015; Morrison 2015). To examine the presence of this in policing, the DTAC program assessment criteria evaluates the identification and articulation of data priorities within the organization (e.g., clarity of staff on mission objectives), how data priorities apply to analytical techniques available within the organization (e.g., strategic, tactical), and how data is used to inform resources to advance the organization goals (e.g., use of data in meetings or policy change) (Anderson, 2015; Morrison, 2015; Hagen & Hess, 2020). This domain is intertwined with both analytical practices and data culture organizational support areas. It is also directly related to the *People* domain, as the skill development among staff to access, process, analyze, and report data is highly dependent on the leadership's ability to use data for decisions. Furthermore, this domain allows for the organization to explore advanced data infrastructure and analytical processes.

Data Access and Quality. As one of the more technical domains, data access and quality addresses the data infrastructure and analytical capacity support areas. This domain examines how information is made accessible to multiple persons in the organization and the quality of the data (Anderson, 2015; Morrison, 2015; Han et. al., 2012). Data quality is a significant challenge

in organizations dealing with big data. Big data refers to large and complex data sets that require more than traditional data-processing application software (Sagiroglu & Sinanc, 2013; Han, et. al., 2012). One framework used to help organizations make sense of how to wrangle in big data is the Four V's: volume, variety, veracity, and velocity– of data made available to the organization and required by the organization to evaluate for decisions creating significant challenges to work processes and technical capabilities (Nguyen, 2018). Each of these characteristics-data present challenges for organizations. The *volume* of data strains technology-operating platforms for collection and storage (e.g., server space, cloud infrastructure). The *variety* of data demands complex data architecture of relational data tables which require ongoing documentation, management or maintenance, and technical skills to access. The *veracity* of data refers to the quality and validity of data collected. As most organizations are relying on multiple data collection points (e.g., data entry by several persons, collection of data from different industries), the demand to develop, maintain, and define data codebooks and metadata is necessary to ensure usability of data. Lastly, the *velocity* of data refers to how quickly information comes into the organization, and the swiftness in which the organization can evaluate the information for decision makers.

To manage the four Vs of data, organizations have transformed their data governance practices keeping pace with the demand. For example, the United Kingdom's (UK) adopted national prescription drug data by the National Institute for Health (NIH) and Care Excellence to assist public health care decisions. This required all drug prescribing entities (e.g., doctors, pharmacies) to adopt a shared language, metrics, and data platforms for reporting and aggregation. In the United States, the 2012 Data Research and Development Initiative examined 84 big data programs across six departments to further scientific discovery and innovation for

cyber security, national defense programs, and public health (National Science and Technology Council, 2021). This initiative highlighted the need for all federal agencies to address big data challenges with more advanced infrastructure and processes. The 2019 Data Strategy for the Department of Justice focuses on four goals for all justice agencies: 1) Enterprise Data Management, 2) Enterprise Information Sharing Capabilities, 3) Enterprise Identity, Credential and Access Management, and 4) Enterprise Data Workforce. Overall, this national guidance has pushed some state and local agencies to follow along. Currently, approximately 81 cities in America have launched open-data portals for government data sources over the last two decades.[2] These efforts have included data-driven decision making (DDDM) to advance local economic development and communicate information more effectively for their residents.

However, the translation of the national efforts to state, local, and tribal policing has been erratic due to under-investments in police data infrastructure. The rising costs of data transformations have not matched cities with economic instability due to housing crises or economic development and population changes. As a result, police agencies have entered consolidated models of information technology infrastructure. These models may enhance the data infrastructure; however, the data access and analytical practices are directly impacted without clear documentation and additional technology support within the policing organization (Lee et. al., 2017; Haskins, 2019).

Technology. This domain is defined by the hardware, software, and infrastructure available to the organization and how it is managed. Wrangling big data within business objectives is a key component for data-driven organizations (Anderson, 2015; Hagen & Hess,

[2] Smart City Initiative is a global effort to advance the use of data in local government and community services. In the United States, these initiatives have focused on government transparency, transportation, and economic development categories. Not all Smart Cities in the US have included policing data.

2020). For many police agencies, the technology systems and platforms have been purchased or upgraded at asynchronous intervals due to budgets, short-term business needs, or shifting leadership priorities. Without a consistent technology strategy, common pitfalls include interoperability barriers, data access issues, and data development silos. These pitfalls prevent reaching the modern goal for today's policing – to automate key data points to respond to information requests and public safety concerns in a timely and transparent manner. Assessment of the technology components allows agencies to detail the pathways toward more advanced infrastructure (e.g., cloud storage, data warehousing), software (e.g., machine learning tools), and visualization tools (e.g., business intelligence platforms). For agencies that have consolidated data infrastructure, this domain addresses the ability for personnel to have technology platforms (e.g., software) that enable repeatable and reliable data processing and analytical methods.

Organizational Leadership & Commitment. While digital transformation projects are initiated by local government officials (e.g., mayor, city manager) and the police chief, they require more than one leader to be committed to the project. Transforming the organizations data culture, infrastructure, and processes requires additional operational leaders and other project champions throughout the IDEA DTAC program. Throughout the assessment, planning, and implementation process, small work groups are formed and leveraged to advance multiple goals. These individuals support problem-solving and innovative solutions via agile project management processes and agency-wide learning efforts, in addition to economic or social changes that impacted the project.

Since the development of CompStat in the 1990s, agencies have sought to transform data and technology practices. With over 16,000 jurisdictions, these changes have occurred sporadically and with varying levels of achievement. As crime centers have emerged, they have

contributed to the cities that have – or have not – successfully integrated data and technology for operations. Impact assessments have led to descriptive case studies on operational functions and have proven difficult to compare or provide a leading, scalable 'model' for the different police departments across the nation (Hollywood, et. al., 2018; Hollywood, et. al., 2019; Strom, 2016; Santos, 2012).

Current Study

This study is not a comparison nor a conviction of a model for crime centers. Rather, it presents the complexities of essential organizational changes and characteristics necessary for police departments' advancing the use of data and technology for operations. The examination of two agencies on this path seek to contribute to the emerging literature about how to advance data and technology in policing, paving the path forward for more insightful impact evaluations. Specifically, this study examines the organizational characteristics of the DTAC domains for two agencies during their development of a centralized crime center over a multi-year period. This study uses the interviews, reviews of documentation, assessments, and job observations with leadership, agency staff, and analysts conducted during multiple project activities and milestones occurring between 2015 and 2022. The details of how each organization evolved across domains during this period highlight the necessary foundations and strategy to successfully implement data-driven practices.

Methods

This study uses an embedded, multiple case study design to evaluate the complex contextual characteristics across the DTAC domains. This design examines the units of analysis (i.e., five domains) within each agency case and in comparison, to each other (Yin, 2009). The DTAC program takes a critical action research approach by routinely evaluating the five

domains as analytical units throughout the phases (Forester et. al., 1993; Friedman & Rogers, 2008; Altricher, et. al., 2002). The iterative process for action research approaches is viewed as beneficial for innovative business operations which is applied toward the data transformations of policing in this construct (Bryman & Bell, 2011).

DATA

Data collection for this research occurred periodically throughout the seven-year period in which Orlando (FL) and Salisbury (NC) Police adopted the DTAC framework as their guide to implement centralized crime centers. Data collected to assess and implement the DTAC program included policy documents, city or county reports on data governance, research notes and journaling, social observations, recorded and transcribed interviews, surveys, and feedback during technical assistance sessions (Yin, 2009). All data was aligned/matched/evaluated within the DTAC five domain framework. If applicable, extraneous information that was outside the scope of the domains were made available to the agency leadership and/or workgroups.

The DTAC framework enabled the launch of fully operational crime centers that have impacted their patrol and investigation operations and continue to advance their use of data for operations. Interviews and site observations held after at least one year of operations provide this case study with information on what worked, what is needed next, and what challenges remain. This research should further inform agencies seeking to overcome barriers in data and technology and the support of a research partner in this effort.

Analytical Plan

All data was evaluated using deductive, flat coding framework based on the five domains defined above (Creswell, 2014). Subthemes for four of the five domains are noted for more descriptive value to organizational characteristics (see Table 1).[3]

Table 1. DTAC Program Inductive Codes

DTAC Domain (code)	Main Themes (code)	Sub-themes
People (proles)	Knowledge (proles-1)	Formal education (e.g., college degree) Professional certificates (e.g., data science) Professional Development Courses (e.g., subject specific courses)
	Skills (proles-2)	Technical skills (e.g., computer coding/languages) Analytical skills (e.g., research methods, statistical methods) Critical thinking (e.g., deductive and inductive reasoning)
	Abilities (proles-3)	Explanation of information (e.,g written or oral) Data visualization (e.g., accurate display of information)
	Role in data governance (proles-4)	Contributions to data collection Skills and processes for data development Management of data for analysis Reporting procedures

[3] Subthemes are not applied to Organizational Commitment & Leadership for this article due to sample of two agencies. Additional social, political, and economic subthemes emerge in larger sample sizes and longer durations based on intellectual property and practices by IDEA Analytics.

DTAC Domain (code)	Main Themes (code)	Sub-themes
Analytical Expectations (anexp)	Identification of data priorities (anexp-1)	Articulation of data priorities across the organization Consistency of data priorities over time
	Analytical techniques (anexp-2)	Strategic Analysis Tactical Analysis Operational or Administrative Analysis Crime Intelligence Analysis
	Articulation of using data in decisions (anexp-3)	Organizational meeting routine Identified performance metrics Articulation of key performance indicators
Data Access & Quality (dataq)	Access points for data per role/position (e.g., personnel processes and access methods) (dataq-1)	Personnel process for extraction Personnel processes for data management Personnel awareness of data locations (e.g., discoverability of information)
	Quality assurance processes (dataq-2)	Record validation process Responsibilities for editing and/or quality control of records
	Access to information (e.g., user permissions) (dataq-3)	Availability of information across roles or units Information sharing protocols
Technology (tech)	Hardware (tech-1)	Computers Surveillance technology (e.g., cameras, LPRs) Response monitoring technology (e.g., drones, body worn cameras)
	Software (SW) (tech-2)	SW for Data Collection SW for Processing Data SW for Analysis of Data SW for Reporting Data
	Data storage (tech-3)	On-premises Cloud hosting Third-party vendor management (per application)

DTAC Domain (code)	Main Themes (code)	Sub-themes
Organizational Commitment and Leadership (orgcomm)	Prioritization for department (orgcomm-1)	
	Prioritization for city/county government (orgcomm-2)	
	Agency-wide knowledge and awareness (orgcomm-3)	
	Dedicated personnel (orgcomm-4)	
	Financial support (orgcomm-5)	

We explore the characteristics of the five domains of both cities based on three periods of the agency's evolution – initial, mid, and present. These phases are not defined as a single point in time, but rather characteristic phases for each agency. The initial phase is the capacity building phase where assessments and initial planning for implementation occurs.[4] The mid-phase is where traction across all domains has been achieved in implementation, and where the centralized crime center is open for operations for approximately six months.[5] This phase is defined by the introduction of the new function and processes inherent with the crime center. Finally, we explore domains on current operations, which are defined as one year of full

[4] For Salisbury Police: The agency first embarked upon data driven organizational changes in 2016 with the new leadership of Chief Jerry Stokes. Chief Patrick Smith (then captain) was appointed as the department's leader to improve the implementation and use of data and technology. Capacity building for this agency occurred between 2017 and 2019. For Orlando Police: An initial assessment occurred in September to December 2019 following the directive from Police Chief Orlando Rolón to advance the agency's use of data and development of a crime center in the January 2019 Strategic Plan. Captain Jay Draisin was appointed as the department leader to advance the objectives of the strategic plan and further implement technology.

[5] For Salisbury Police: First six months of operations for the Rowan Regional Crime Center was January – June 2021. For Orlando Police: The first six months of operations for the Orlando Crime Center is defined as October 2020 to March 2021. This time frame was delayed due to COVID-19 impacts to staffing offices in March 2020 to October 2020.

operations with a crime center and implemented technology. For both agencies this occurs in late 2021 to early 2022.

Lastly, we discuss the future of each of the five domains for the respective agencies. The similarities facing these agencies as they further their use of data and technology suggest that there are more organizational changes and requirements necessary for policing. Furthermore, the operational processes of a centralized crime center to manage different technologies, analytical processes, expectations, and contribute to department's missions indicate a different level of learning, skill development, and overall maturity.

RESULTS

During the initial phase, both agencies identified the priority to develop data and technology through a centralized analytical unit structure (*orgcomm*). Pathways to develop this structure included financial support for the unit (*orgcomm-5*), ideas to centralize analysts (*prole-4*), and focus analytical practices (*proles, anexp*). In furthering their efforts, both agencies acknowledged a need to enhance the understanding of data and analytics for operational staff (*proles* and *anexp)* and to develop crime analyst roles (*proles-1-3*). For Orlando, restructuring existing crime analyst roles from decentralized assignments to the Crime Center evolved over a year as the agency developed the Crime Center as a new division. Information gathered during the assessment period indicated clear gaps of foundational knowledge and skills for these roles (*proles1-2*) and an ability to perform analytical expectations (*anexp2-3*). While this informed implementation activities, this also informed expectations for intentional hires for new positions. Job requirements for these roles were revised to focus on data practices with preexisting skills in data management, crime analysis and/or critical examination of data for complex social problems (*proles-1-3*). Salisbury did not have the dedicated staff for analytical roles, resulting in new

hiring for these roles with a level of knowledge, skills, and the ability to grow with the departments' new goals. For both agencies, the practice of hiring staff to align with the new direction of the department allowed for new standards and expectations to be set by leadership (*orgcomm*).

The physical development of the respective agency's centers during the initial phase enabled advancements for technology implementation (*tech*) and data access (*dataq*). A key factor in this phase was complete ownership by the police agency for all technology characteristics (*tech1-3*). This required new personnel and skill development (*proles-2*) for managing data and staffing alignment to support data governance and technology management for multiple systems (e.g., surveillance systems, LPRs). Both agencies responded to this need with identification of sworn staff with technical capabilities and/or leveraging parttime professional staff (*tech, people*).

At the mid-phase of operations, both agencies indicated significant shifts in the development and use of data (*orgcomm-1, anexp-1, anexp-3*). The refinement of data access (*dataq-1, dataq-3)* during new technology integrations supported new roles and analytical techniques for crime analysts and officers supporting the Crime Center. These practices ensured timely and actionable data and analysis, a core purpose of analytics, could be developed and shared with operational staff (Morrison, 2015; Alston, et.al., 2017). According to Captain Smith,

> *"Our data is much cleaner and accurate. State and federal agencies now reach out to us when a major event occurs in and around our area to see what we have gathered prior to pushing information out of their own centers. It was quoted by the Director of our State Fusion Center that he views us as a "fusion' center in our region."*

Weekly and monthly meeting formats for both agencies were revised from a review of past crime information (e.g., descriptive statistics) to estimations on place and person-based

crime trends (*anexp*). Responsibilities on interpretation of data (*proles-3*) became shared throughout divisions (*anexp-3, orgcomm-3*) and outcomes included changes to patrol or investigation resources based on information, demonstrating shifts in the data culture. The inclusion of video surveillance, LPRs, and radio monitoring for both agencies (*tech-1, tech-2*) also resulted in real-time data support. During calls for service, analysts and/or officers in the respective Crime Centers can enter vehicle descriptions or direction of travel to isolate cameras and have additional eyes on incidents. Direct communication between the responding officers and personnel in the Crime Center have led to the recovery of evidence for shooting cases, apprehension of offenders in assaults and thefts, and arrests for murder suspects (agency interviews and site observations).

After a year or more of crime center operation, some characteristics within the five domains have stabilized for each department. Roles and responsibilities for crime analysts and officers within the respective crime centers have normalized, supporting the revisions of policies and operating manuals to institutionalize practices (orgcomm-1, orgcomm-3, anexp-2, anexp-3). According to Captain Draisin, outputs for analytical changed significantly:

> *In the past our information was very broad and not provided in a timely manner, it was much more reactive. With the growth of the Crime Analysis Uni [within the Crime Center], analyst assignments allow for more timely review of data to a specific geographical area. Analysts now interact directly with Command Staff on assigned geographical areas, providing both weekly statistical information and then also providing a more detailed report with specific case information. We also provide information in real-time via the Crime Center which is new to our department and directly related to the production and sharing of information.*

Salisbury reported similar changes for analytical outputs with more timely officer safety bulletins with more professional delivery and details for regional partners and their own agency (interview, Captain Smith). These outputs have promoted information sharing among local, state, and federal partners, resulting in stronger cases for prosecutor at state and federal levels

(interview, Captain Smith). Furthermore, the delivery of bi-weekly and monthly crime trends has supported smarter resource allocation during staffing shortages to impact crime (interview, Captain Smith). Salisbury recognizes their impact to the field as:

> *"Early in the opening of the RRCIC, many divisions and agencies did not know how to utilize our resources or did not completely understand what we could do to help them. Now we are the first call for most of them in the early stages of their investigations." (Captain Smith)*

While Salisbury has retained crime analyst staff during this evaluation period, Orlando experienced staffing changes such as establishing a supervisory crime analysis position and an expanding total number of analyst staff to support more than eight hours of coverage. The established policies and procedures for crime center operations allowed for staff transition to occur without significant disruption to operations (*proles*, *anexp*). For both agencies, staff training for analysts have prioritized technical skills (e.g., mapping, computer coding), analytical techniques, and theoretical applications (e.g., crime reduction strategies) (*proles, anexp*).

DISCUSSION

The synergies observed across all five DTAC domains demonstrate action-oriented application of the framework to support agency advancements. The shared language of these domains and inclusive characteristics have enabled these agencies to strategically transition into data-driven organizations. The growth of the organizational support areas and analytical capacity domains have established new importance for the use of the data, technology, and analytics in these agencies. Captain Smith recalls the buy-in among staff as being slow for mid-level supervision during the development which quickly shifted as success and benefits from the center (e.g., quick arrests, details for identifying offenders) started to be noticed (*orgcomm-3*). These quickly spread through the ranks to where the center became a vital part of all operational

components of the department during active calls or investigations. Specifically for Orlando, Captain Draisin has made a "concerted effort to recruit officers that already have a good reputation amongst their peers" to assist with communicating analytics and data from the Crime Center to operations (*orgcomm-3, orgcomm-4*). These data champions have supported successes for the center and field operations, which is a shared success for the department in managing crime incidents. Captain Draisin attributed these successes to the overall reputation of the Crime Center, which has led to additional professional development (e.g., specialized units, training) and promotions for staff. This advancement in knowledge and personnel status (e.g., four promotions in 2.5 years) supports the "perception (reality) created by our staff and the recognitions they have received sets a standard that others now wish to follow" (interview, Captain Draisin).

This importance also translates to attracting new officers and engaging new recruits. Both agencies have recruit tours for the center or dedicated time during the field training officer period for graduated staff. While each agency's center has a "wow" factor with screens and technologies running, the "more time they spend in the center, the more they realize there is much more information that is provided from the center opposed to just camera footage" (interview, Captain Smith).

Other characteristics have continued to be in transition, either advancing toward the next level of data-driven policing or causing tensions toward advancement. Advancements toward the next level of data-driven policing include the real-time geospatial analysis and responses through video or drones. As agencies are experiencing lower staffing numbers for sworn officers, having additional 'eyes on target' during active calls or responses provides a sense of security and

backup. Furthermore, the place-based analysis to focus divisional resources have assisted commanders and officers in prioritizing patrol staffing and developing operational strategies.

Yet the implementation and maintenance of these technologies require ongoing support from information technology (IT) staff. As these agencies have advanced their uses of data and tech, they either align or advance beyond the capacity of support from IT at the city or county level. The "we will do it ourselves" mentality of the agencies suggests a push toward re-establishing professional positions for IT management within policing once again. Both agencies acknowledge the need for ongoing training and skill development, as they are now a part of the fast changes and competitiveness of technology. This training and potential inclusion of additional staff are costly options, but the demand for these skills in-house may be necessary for police to continue to invest in the organizational support areas that ensure a data-driven culture and practices.

Researcher-Practitioner Impacts

Organizational change is difficult and requires support during the change and on the topics of change. The inclusion of a research partner during this period has proven beneficial for both agencies. Captain Draisin highlighted the differentiator for this project as the inclusion of the researcher during the implementation period, stating:

> *While I have been involved in projects in the past that were after-the-fact information sharing, this was the first time I have been involved in a project where a researcher was involved during the implementation. I very quickly realized that what we (law enforcement) don't know, we don't know. It was extremely helpful having an expert in the field that can provide up-to-date resources and provide guidance and recommendations. I believe the law enforcement field often uses the immediate availability of sworn personnel to accomplish projects that really are better suited for a non-sworn expert with the training and experience.*

Captain Smith shared similar sentiments as the support of the researcher embedded into agency practices and procedures. Contributions to analyst training, data development, availability for routine guidance on changes in technology, procurement practices, and planning for what is next are just a few of the value-adds to have a researcher attached to these efforts.

LIMITATIONS

There are three limitations to acknowledge for this study. First, it may be considered that a primary limitation of this study is the ability to tie crime center outcomes directly to crime rates. While crime analytics have proven beneficial to crime reduction practices overall (Boba & Santos, 2012; Santos, 2014; Alston, et. al., 2017), the anomaly of the COVID-19 pandemic suggests evaluations of crime rates would be inappropriate as cities across America experienced differences regardless of staffing or analytics.

Second, the use of a flat coding framework may be considered a limitation of this research as it prohibits the hierarchical assignment of importance among theoretical codes. However, it is routinely noted that the interrelated nature of these domains to support innovation in data governance requires all to be supported, rather than election of one more than others.

Lastly, it is common for case studies to have limitations to the application to other cities or sites. The election of these cities for this study are intentional to demonstrate the flexibility of the DTAC domains to cities and departments that are very different (e.g., size of department, city population, rural v. urban).

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