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Exploring Critical Success Factors for Data Integration and Decision-Making in Law Enforcement

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Agencies from various disciplines supporting law enforcement functions and processes have integrated, shared, and communicated data through ad hoc methods to address crime, terrorism, and many other threats in the United States. Data integration in law enforcement plays a critical role in the technical, business, and intelligence processes created by users to combine data from various sources and domains to transform them into valuable information. The purpose of this qualitative phenomenological study was to explore the current conditions of data integration frameworks through user and system interactions among law enforcement organizational processes. Further exploration of critical success factors used to integrate data more efficiently among systems of systems and user interactions may improve crime and intelligence analysis through modern applications and novel frameworks.

Keywords: *anticipatory governance, data analytics, data integration, law enforcement intelligence, critical success factors, systems theory*

Introduction and Background

As early as the 1980s, law enforcement agencies worked with data within organizational silos, converting information into operational intelligence in the form of reports, transcripts, word documents, and relational databases. Data sharing and integration at the local and regional levels

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gained steam in the early 1980s and 1990s in response to the public outcry against increased acts of crime across numerous communities (La Vigne et al., 2017). In wake of the September 11 attacks, the law enforcement community and the public expressed a significant need for expanding data integration and sharing, thus pressing federal, state, and local law enforcement agencies to improve their systems and disaster management capabilities to address the information gap on national security threats (La Vigne et al., 2017). Moreover, through increased interagency and cross-jurisdictional data sharing, a paradigm shift occurred in data retrieval by multiple users through various computer systems via online networks, which evolved into data systems to store large portions of data on individuals of interest (Carter, 2004; Schwabe, Davis, & Jackson, 2001). This historic development brought about the emergence of digital record keeping, network interfaces with access to online data sources, and data-sharing applications (Carter, 2004; Schwabe et al., 2001).

P. Roberts (2010), a subject matter expert in unstructured data extraction, acknowledged that technology and framework designs were approaching data thresholds of expansion that would result in missed opportunities in timely decision-making abilities, thus causing leaders to see only a fraction of the picture. Furthermore, decisions by leaders also were affected by the scalability and restriction of data not being fully available to the end user or customer (N. C. Roberts, 2011). These two authors' viewpoints outlined the growing expansion of unstructured data and the challenges in scalability. This problem created failed processes in data integration efficiency for law enforcement analysts and their respective systems in attempts to anticipate acts of crime efficiently because of data expansion and limited integration efforts (Akhgar et al., 2015). Through evolving processes of proactive threat intelligence, government organizations must be able to extend warning times based on pinpoint-data feedback. Furthermore, Dr. Leon Fuerth, former foreign service officer who spent 14 years on Capitol Hill, shared similar views on threat prevention. However, he suggested implementing a management system of systems that needed to be postured to integrate data more efficiently through foresight initiatives and effective feedback.

Statement of the Problem

The increased volume of data is not being completely integrated for analysis at the federal, state, or local levels of the government, thus preventing law enforcement crime and intelligence analysts from accessing and analyzing all additional data available to support timely decision-making (Akhgar et al., 2015; Babuta, 2017; Osborne, 2006). Consequently, law enforcement leaders have difficulty achieving a unified overview of available data to optimize anticipatory decision-making (Carter & Carter, 2009; Osborne, 2006; Ratcliffe, 2007).

The problem described above has a negative impact on user and system-of-systems interactions dealing with crime analysis applications, end user requirements, and implementation of new data integration frameworks, as these elements are value added to federal, state, and local processes and the end user. Massive and disparate data sources derived from the physical and cyber domains cover events, people, actions, and so on. These data sources range from criminal actions and emerging threats to data-centric support for emergency management services. Law enforcement organizations such as intelligence fusion centers use these multiple types of data sources to address various types of crime (Coffey, 2015). The expansion of big data impacts law enforcement systematic processes as organizations are challenged within the law enforcement community to disseminate and integrate various types of data, key requirements, and information to prevent crime from happening (Coffey, 2015; Vandervalk, Jeanotte, Snyder, & Bauer, 2016). Osborne (2006) noted that limited access to federal databases, top-down level data communications, and limited data integrated frameworks would prevent local law enforcement crime and intelligence analysts from discovering critical links needed to anticipate acts of crime.

Purpose of the Study

The purpose of this qualitative phenomenological study was to explore the current conditions of data integration frameworks through user and system interactions among law enforcement organizational processes. The research questions were as follows:

> *Research Question 1:* What do crime and intelligence analysts working in law enforcement agencies perceive as critical success factors (CSFs) in law enforcement data integration processes?
>
> *Research Question 2:* What do crime and intelligence analysts working in law enforcement agencies perceive as needed system and network access to employ CSFs to achieve conditions of success through data integration processes?
>
> *Research Question 3:* How are CSFs in data integration supportive to specialized data sets, methods, and technology that crime and intelligence analysts can continue to build upon and use to reduce crime?

This research provided a different outlook on data integration issues in law enforcement through the subjective lens of law enforcement crime and intelligence analysts with extensive associations, interactions, and direct influences on working with data-centric law enforcement systems. Implementing a data integration framework or structured process tailored to criminality place theory, systems theory, anticipatory governance concepts, and best practices by law enforcement crime and intelligence analysts who understand the importance of data integration may provide the building blocks for future, novel system applications. This will enable analysts to integrate the necessary data sources fully for effective communication and concise, analytical foresight analysis.

Definition of Terms

This research focused on the concepts of anticipatory governance, CSFs, and systems theory. The following paragraphs provide a brief overview of these key concepts conveying how users work within organizational systems or control certain aspect of system processes that support law enforcement and decision-making.

> *Anticipatory governance:* A "system of systems"–based approach for enabling governance to cope with accelerating complex forms of change (Fuerth & Faber, 2012). Anticipatory governance can be used by law enforcement agencies to proactively act against crime through actionable data, thereby improving processes needed to leverage data efficiently.
>
> *Critical success factors (CSFs):* A few key areas [or factors] of activities in which favorable results are necessary for a manager to reach his or her goals (Bullen & Rockart, 1981). They are particularly effective in supporting planning processes, communicating the role of information technologies to senior management, and promoting structured analysis processes (Boynton & Zmud, 1984).
>
> *Systems theory:* A collection of parts unified to accomplish an overall goal. If one part of the system is removed, the nature of the system is changed as well. A system can be viewed as having inputs, processes, and outputs. Systems share feedback among each of these three aspects of the system (Olum, 2004).

Assumptions and Limitations

The assumptions of the study reflect the notion that each study participant (SP) likely conducted or engaged in some type of action within an organizational system at various levels of law enforcement. In conducting the study, it was assumed that access to the law enforcement community would be obtained through SPs within the organization of interest. Moreover, the experiences and perspectives explored through the sample population were assumed to have direct links to data integration concepts, database management, and an understanding of the respective organizational culture. It was assumed that broad perspectives and experiences of law enforcement analysts would reveal key conditions in CSF application and best practices as they work at various levels of law enforcement. This would thus provide deeper insights into the study through in-depth interviews covering all aspects of law enforcement processes based on this assumption being true.

The limitation of this study involves the relatively small sample size of 11 SPs to address the phenomena. In relation to this research, phenomenology enabled the researcher to observe how selected participants constructed meaning and insight through interpretations and experiences (Boynton & Zmud, 1984; Smith, Flowers, & Larkin, 2009). This was based on SPs' experiences, associations, and their shared viewpoints of data integration processes through key CSF influence. However, due to issues of access and the research methodology guidelines, the research only focused on 11 SPs. Therefore, the results were not transferrable to a "larger" population that would need to be in line with the selected research methodology. A larger population size may generate new qualitative responses and insights through subjective experiences, but with a different research methodology. Data saturation occurred with the 10th SP, as no new themes emerged during the preliminary coding process.

Literature Review

As data drives the focal point of analysis and system of system processes, data analytics are more likely to assume significant roles within organizational frameworks, thus enforcing data integration among disparate sources to transform data into meaningful and valuable insights for the end user (La Vigne, et al., 2017). The main literature themes discussed in this study cover key CSFs that have successfully affected law enforcement organizational processes among user and system interactions relative to data integration efforts. In doing so, has shown existing conditions and building blocks of data centric frameworks that have integrated the necessary data for communication and analytical foresight analysis.

Data Integration and Analytics in Law Enforcement

The emergence of big data and the ability to capture, integrate, and analyze them has created operational challenges across law enforcement and intelligence agency systems (Akhgar et al., 2015), reflecting a crossroads between user and system interoperability, access, and most importantly, integration. Williams (2015) examined federal agency efforts in fraud, waste, and abuse, while discussing the importance of integrating data analytics to help organizations identify the right type of data through various data analytic techniques and pattern analysis via big data. Moreover, data analytics has offered the capability to "revolutionize government accountability and performance" through data integration (p. 19). However, according to Williams, "no standard approach or framework exists for measuring the success of data analytics" (p. 21). In addition, data warehouses may be strained by the scalability of big data and their various sources, thereby constituting a challenge in integrating real-time data to various application designs (Williams, 2015).

Taylor, Kowalyk, and Boba (2007) conducted an exploratory study and cross-sectional survey on crime and intelligence analysts. The sample population came from an electronic mailing list of specified listservers in the law enforcement community. A key aspect of the 2007 survey as it relates to the current study was the organizational fit of crime analysis integrated with organizational processes. Respondents who developed pattern analysis and crime mapping strategies played critical roles in data-driven decision-making processes among upper management. However, the significant paradigm shift of data-driven analysis affected the interaction of analysts with frontline patrol officers in the field. Taylor et al. noted a key point during this period when there was a growing issue related to analysts' work capacity to effectively integrate analysis and data back to frontline officers to "quickly turn crime data into actionable intelligence" (p. 165). Moreover, the authors also observed a difference in analysis from tactical to strategic, as patrol officers related more to tactical data, while analysts and managers preferred strategic data.

Impacts of Data Integration Concepts and Capabilities

Kadadi (2015) acknowledged the complexities among one of the core organizational processes for data management, namely data integration, while focusing on organizational tools and techniques. In contrast to Kadadi's research on enabler applications and software tools, Kurlander's (2005) study on law enforcement data management and integration extended beyond just information sharing, tools, and resourcing. Osborne (2006) highlighted key points about data in law enforcement. According to this author, data aggregation was well known in 2006, especially from reports on crime statistics that only generated quantitative specifics of statistical data, whether it was terrorist or crime data. However, this type of data was not talking to other data and there was a limited scope of data available to crime and intelligence analysts.

Methodology

Research Design

The purpose of this qualitative phenomenological study was to explore the current conditions of data integration frameworks through user and system interactions among law enforcement organizational processes. During the research process, analysts participated in semistructured interviews based on their interactions with organizational processes dealing with data integration and system interoperability at the federal, state, and local levels. The research was in alignment with key factors of qualitative research, reflecting the setting for patterns and connections in data integration efforts, and through the subjective lens of law enforcement crime and intelligence analysts with associations, interactions, and direct influences working with law enforcement systems.

Phenomenology enabled the researcher to observe how selected participants construct meaning and insight through their knowledge of CSFs that have influenced or will influence their relationships and shared viewpoints on data integration processes (Boynton & Zmud, 1984; Smith et al., 2009). Through phenomenology, the researcher compiled a sample of 10-11 participants to uncover patterns, themes, or anomalies that represent characteristics. Interpretative phenomenological analysis (IPA), a subset of phenomenological study, represented a useful research design for this study that aimed to outline the phenomena of CSFs that have impacted data integration processes (Smith et al., 2009). This approach led to extensive analysis of crime and intelligence analysts' transcripts from the interview process to interpret their perceptions and understanding of experiences dealing in data integration processes (Smith et al., 2009). Furthermore, the emphasis on IPA focused on rich in-depth information based on subjective interview responses from selected SPs

who likely shared a common experience or action (Smith et al., 2009). In addition, the researcher documented factors aligned to the research criteria, along with associations that analysts have while working with federal, state, or local level agencies as they deal with data-driven tasks (Moustakas, 1994; Simon & Goes, 2011).

Sampling Method and Procedures

The selection of law enforcement professionals was appropriate for the study because of their interactions, lived experiences, and perceptions relating to law enforcement database management processes. The target population involved law enforcement crime and intelligence analysts who combat, prevent, and analyze crime and terrorism. The SPs selected among the law enforcement community had access to a particular perspective of the phenomena under study (Smith et al., 2009). Applying snowball sampling allowed the researcher to overcome the problem associated with sampling concealed populations within an organization such as the International Association of Crime Analysts, which became the primary provider of SPs, as the researcher acquired direct access to key SPs willing to participate in the study. Working with leadership from the original organization of interest and International Association of Crime Analysts provided the researcher with a link between the initial sample/organization of selection and others in the same target population. Because the focus of the researcher in IPA is quality rather than quantity, the study was tailored to 11 SPs instead of 10 to meet data saturation requirements, based on the complexity and subjectivity of most human phenomena. According to Smith et al., "IPA studies usually benefit from a "concentrated focus" on a small number of cases" (p. 51).

Instrumentation

Semistructured interviews were the primary data collection instrument. The study encompassed criteria that fit the research framework for data collection through the experiences and perspectives of law enforcement crime and intelligence analysts who provided consultation services, technology innovation, and data-driven strategies targeting crime reduction. Semistructured interviews were conducted by the researcher to acquire subjective, personal testimonies on data integration, system interoperability, and conditions in data management, all leading to CSF application and familiarization. CSFs were incorporated from the literature on the problem under study that was expanded in a discussion of CSFs during the interview process. Multiple sources of qualitative data can be derived from interviews, observations, and research literature, thus framing the boundary of the phenomenological study (Flick, 2014; Simon & Goes, 2011). This approach addressed the research problem and questions that correlate to key factors of interest (FOIs) in the study—data acquisitions, data storage, processing analytics, and application service—as well as the insight factor being affected—data integration.

Data Collection and Analysis

This research reflected the importance of understanding and discovering CSFs that reinforce data management and the analytical interactions with information systems. Bullen and Rockart (1981) identified CSFs as essential elements of activities, signposts, or key areas of emphasis that required explicit attention from management to ensure successful operations. The explored FOIs and discovered CSFs in the literature served as a starting point for semistructured and open-ended interview questioning on data integration concepts that work well in law enforcement processes. Recorded interviews by the researcher were transcribed verbatim with approximately 130 pages of single-spaced transcriptions.

Transcriptions were uploaded into NVivo 11 software for analysis. The transcribed data were collected and categorized into themes, as recommended by Kohlbacher (2006). This approach helped determine the meaning of the data collected and the themes derived from them, along with asserting statements based on lessons learned from law enforcement crime and intelligence analysts' meanings from the transcribed data. One of the key methods used in analyzing the data was categorizing and coding the raw data from the semistructured interviews. The strategy for analyzing the data collected began with interpreting the data to gain familiarity and to identify points of analytical interest.

The researcher grouped similar data elements into codes using key descriptive phrases that would contribute to a major theme. Key descriptive phrases were applied only to data that related to the research questions, or invariant constituents. The researcher then reviewed the codes and grouped similar codes into themes that aligned with the interview questions to address the desired research question. Table 1 visualizes the key themes that emerged during data analysis. Codes that contributed to the key themes were created. Moreover, a representation of quotations helped reference each theme from the SPs' responses.

Table 1. *Key Themes Derived From the Interview Analysis*

Theme	Contributing Codes	Study Participant Quote
(1) Useful and accurate data	Accuracy; mining useful data; positive impact on outcomes; reliable ways of linking different databases; crime analysis and big data; use of tip lines	"I consider factors of success with the accuracy of the information. If the information is not accurate, then it can breach or misguide you."
(2) Accessible data	Communicating and educating; easy to access/consume	"Another factor of success is not only being able to link that data together but to be able to present it in a clear and concise manner that allows the end user to be able to make decisions on it."
(3) High accessibility creates a security risk	Human factors; info-sharing networks; intelligence oversight; need for checks/balances	"You have to have a series of security levels with all of your information so that it doesn't fall into the wrong hands."
(4) Low accessibility limits effectiveness	Intelligence gaps/risks to officers; need for timely info for action; risk of falling behind	"If we're not pursuing, if we're not utilizing these capabilities, then we're missing the opportunity to better protect folks that could be vulnerable."
(5) Integrating and expanding databases	Ability to access data; keeping up with tech advances; knowing who has the information; need to reach out; progress/ways to go	"We're really pushing to get things a little more streamlined. To get more of the agencies to use the same records managements system, so that everything is coming to everyone else at the same format."

Credibility and Validity

The research criteria for reliability and validity have undergone various changes in qualitative projects. As noted by Krefting (1991), "too frequently, qualitative research is evaluated against [research] criteria appropriate to quantitative research and is found to be lacking" (p. 214). Krefting (1991) and Leininger (1985) acknowledged Guba's (1981) model of trustworthiness in qualitative research, where the validity of qualitative perspectives leads to the sense of gaining knowledge and understanding of a phenomenon, rather than validity being measured by an instrument of study from a quantitative approach. To address the reliability and validity of this study, feedback from interviews and multiple sources from literature enabled the researcher to contrast, compare, reference, and classify CSF themes (Fisk, 2005; Simon & Goes, 2011). Qualitative phenomenological research expands beyond just identifying CSFs within a system of systems via experiences and interactions. This research methodology paved the way for an open-ended investigative approach to associate and to determine key CSFs among known organizational processes and systems for creating themes from the emerging data.

Moreover, establishing trustworthiness in this study was critical, thus helping the researcher demonstrate qualitative rigor during data analysis. The four key elements of trustworthiness are credibility, transferability, confirmability, and dependability (Krefting, 1991; Lincoln & Guba, 1985). These key elements ensured that the appropriate qualitative rigor was met to justify the actions of the research, in addition to establishing a utility of qualitative inquiries that can be challenged at any point in the research. Achieving validity through trustworthiness in the research was based on the extent to which the data were collected, and the researcher's interpretation of the data through the phenomena's characteristics and meaning (Krefting, 1991; Leininger, 1985; Lincoln & Guba, 1985), thereby representing the credibility of the research.

Findings

Evaluation of Research Data

The SPs consisted of 11 law enforcement crime and intelligence analysts with at least 2 years of experience working in significant roles for integrating and acting on judicious datasets throughout the law enforcement community, mostly at the federal and local levels. Data saturation occurred with the 10th SP as no new themes or ideas emerged during the preliminary coding of the SP's interview transcription process. An interview with the 11th SP allowed the researcher to confirm that data saturation had occurred. Through IPA, the researcher applied an analytical approach via data triangulation towards understanding each SP's viewpoint during the interview sessions. This entailed taking into account each SP's response to each interview question and focusing on all SPs' perspectives to build structured context through emergent patterns, themes, and commonalities among responses.

The strategy for analyzing the data resulted in major themes being identified when 50% or more of the SPs used related terms or phrases in their responses to the interview questions. According to Smith et al. (2009), this approach enabled the researcher to focus on the initial clustering of the data from SP responses, interpret the context, and discern which were good data versus data that were not applicable. Furthermore, the researcher was able to develop major themes of interest based on 50% or more of the SPs using related terms or phrases in their responses, thus leading to structured thematic categories that directly aligned with the research questions in the study. The major themes of interest discovered were: (a) useful and accurate data, (b) accessible data, (c) high accessibility creates a security risk, (d) low accessibility limits effectiveness, and (e) integrating and expanding

databases. Table 2 illustrates the major themes of interest based on 50% or more of the SPs using related terms or phrases in their interview responses. One of the major themes discovered, namely integrating and expanding databases, was the leading theme with the highest number of responses by SPs during the interview process. In particular, 81% of the SPs' responses to Research Question 3 expressed favorable conditions such as "bridging-frameworks" to support federal, state, and local agencies.

Table 2. *Calculation of 50% or More of Study Participants Using Related Terms or Phrases From the Interview Process*

	Participants Contributing to Theme	
Major Theme	***N***	**%**
Research Question 1 (n = 11)		
Useful and accurate data	8	72%
Accessible data	8	72%
Research Question 2 (n = 11)		
High accessibility creates a security risk	6	55%
Low accessibility limits effectiveness	6	55%
Research Question 3 (n = 11)		
Integrating and expanding databases	9	81%

The discovery of CSFs in both the literature review and through data collection and analysis of the lived experiences of crime and intelligence analysts provided a rich set of actionable CSFs, thus potentially enabling analysts to apply a baseline framework of CSFs that may be useful in crime reduction. During the interview sessions, the SPs all stressed the need to improve the integration of data to access and network unified frameworks proficiently throughout their respective communities. El-Roby (2016) and Akhgar et al. (2015) shared similar viewpoints in their research, as they also discussed users were very likely to benefit from a unified interface of data from an integrated system of systems approach, pulling information and feedback from multiple data sources. This serves to underpin the significance of the research on expanding databases through data transparency.

Examination of Research Questions

There were three research questions in the study that helped guide the methodology, research design, and process of data collection. The research questions helped the researcher frame the investigative approach for the study, which involved data triangulation of literature themes, frameworks, and theories that affected the output of the findings (Simon & Goes, 2011). Moreover, the importance of research questions helped the researcher define the purpose of the study and accurately addressed its aims (Simon & Goes, 2011). The research questions were structured through qualitative analysis to explore, define, and understand open-ended outcomes or solutions. All responses were tailored back to the research questions to address the research problem.

Analysis of Relevant Research Data

The results of the data analysis were categorized based on each research question addressed within the study. Guba (1981) explored the rationalistic paradigm shift in research criteria that had been used to address the rigors of qualitative and quantitative analysis. Relative to this study, the researcher referenced literature themes and key factors as opposed to variables in Guba's qualitative studies based on research criteria, which was also discussed by Krefting (1991) and Campbell and Stanley (1963). The key factors relative to this research known as FOIs (i.e., data acquisitions, data storage, processing analytics, and application services) were explored as one particular data source based on each function and impact that each factor had on big data integration processes among law enforcement crime and intelligence analysts (Yu & Hu, 2016). Achieving efficient data integration processes through baseline FOIs favored conditions of success for analysts when dealing with big data, thereby allowing desired CSFs to be achieved and applied.

The study referenced key literature themes, FOIs, and CSFs through qualitative rigor and research criteria to achieve internal validity, thus addressing key relationship themes to reach the desired results (Lincoln & Guba, 1985). Data triangulation enabled the researcher to explore main pieces of literature themes from multiple data sources and perspectives, in addition to key interpretations from the analysts' lived experiences that emerged during the interview sessions. This prevented the distortion of research information from single data sources or biases (Krefting, 1991). The literature themes depicted in Table 3 drew on a different perspective from relevant research data within the study relating to elements that drove not just the technical aspects of data integration, but also the organizational aspects of data integration processes. The theme alignment of CSF reflections versus key literature themes were also impacted by systems theory and concepts from criminality of place theory.

The theme alignment for CSFs illustrated in Table 3 drew on key generalizations to ensure that external validity for the study could be applied to a wider population of the phenomena for future studies and other research methodologies. A main finding from Table 3 depicts Theme 5 (i.e., integration and expanding databases), as the leading theme discovered during the transcription of the raw data during data analysis. This theme also shows the highest reflections of 47 SP responses that align with both Theme 5 and the key literature themes from the study. Furthermore, this point of emphasis reinforced the validation of Theme 5 from the interview sessions as being the most contributed theme by the SPs.

Table 3. *Alignment Between Critical Success Factor (CSF) Reflections Versus Key Literature Themes*

	Theme Alignment of CSF Reflections vs. Key Literature Themes				
Key Literature Themes	**Theme 1 (*n* = 24 SPs)**	**Theme 2 (*n* = 41 SPs)**	**Theme 3 (*n* = 24 SPs)**	**Theme 4 (*n* = 23 SPs)**	**Theme 5 (*n* = 47 SPs)**
No theme alignment					
Accessibility	SP 10	SP 4,11	SP 2,4,10	SP 7,9,11	SP 8
Adaptive				SP 11	SP 9
Application of big data utilization	SP 1,6				SP 5,8
Collaboration		SP 1,3,4,8			SP 2,3,4,8,9
Creative problem solving		SP 1,8			SP 11
Feedback		SP 3,4,7			SP 4,8
Information sharing		SP 1,3,7,8	SP 2,4,10	SP 1	SP 2,3,5,6,8,9
Innovative thinking			SP 4		SP 8,11
Integration	All	All	All	All	All
Interpersonal	SP 3,4,8				SP 4
Intra-agency	SP 3,8	SP 2,4,10			SP 2,3,4,6
One-way federal IE		SP 1	SP 2		
Operational efficiency		SP 3		SP 1,8	
Relationship-building		SP 8			SP 2,4
Success to the mission	SP 3		SP 4		SP 8
System interoperability	SP 6	SP 1,6,8			SP 2,5
System of systems	SP 6	SP 7	SP 4,8,10	SP 7,11	SP 2,6
Teamwork		SP 3,8		SP 8	SP 2
Technology development	SP 6				SP 6
Time	SP 4		SP 4	SP 1,6	SP 3
Transparency		SP 1,7,8			SP 8

Note. SP = Study Participant; IE = information exchange.

Recommendations

An initial framework constructed from key CSF themes in the study introduced a recommended approach for law enforcement crime and intelligence analysts to operationalize CSFs that would be favorable in data integration efforts. This type of framework was created based on a basic conceptual model of CSFs for software development projects. Moreover, this is an initial approach to improve user and system of systems processes for analysts to optimize best practices during data source management with various data source environments. In addition, this recommended approach may improve law enforcement leaders' unified view of adequate data presented to them by the analysts. Figure 1 provides a conceptual view of CSFs and dependencies that impacted key factors within a system or a specific process (Sudhakar, 2012). According to Sudhakar, his CSF model relative to the research design portrayed the most prioritized success factors, and most importantly, the arrows in Figure 1 associated with both the present study and Sudhakar's CSF model reflect information flow within the framework.

According to Sudhakar (2012), communication factors were the leading factor with the most occurrences to guide a software development project in enterprise research planning, composed of various activities such as teamwork, composition, top management support, and so on. Thus, similar to the current study's leading factor, integrating and expanding databases, that was associated with the most reflections/activities discovered during the interview process and Table 3. Moreover, the researcher applied the same approach with the most desired CSFs in the study reflecting Sudhakar's model concepts illustrated in Figure 1. Furthermore, this type of framework design can be extended to a more suitable support structure for decision support systems such as intelligence-led policing for law enforcement crime, intelligence analysts, and leaders in the field. Through intelligence-led policing, this concept, driven by information flow, may provide law enforcement leaders with enhanced information sharing abilities to better identify threats and become more efficient in proactive threat intelligence (Ratcliffe, 2003; Carter & Carter, 2009).

Moreover, Sudhakar (2012) noted the following key point: "The project success rate can be improved by the organizations working on software projects if they concentrate and keep working on the identified critical success factors for software projects" (p.17). Relative to this study, the integration framework success rate may also be improved based on the concentration and further implementation of key CSFs for desired law enforcement processes. The elements of importance, namely FOIs shown in Figure 1 (application services, processing analytics, data storage, and data acquisitions) represent a big data analytics framework that theoretically supports police Big Data analytics platforms (Yu & Hu, 2016). The police framework comprised of the FOIs discussed in the study provided a baseline reference point into which each CSF theme could feed into for data integration to efficiently occur. There were many possibilities of correlation for each CSF theme among each of the FOIs. However, the study has shown the basic reference points of interest from the literature that correlated best with each theme.

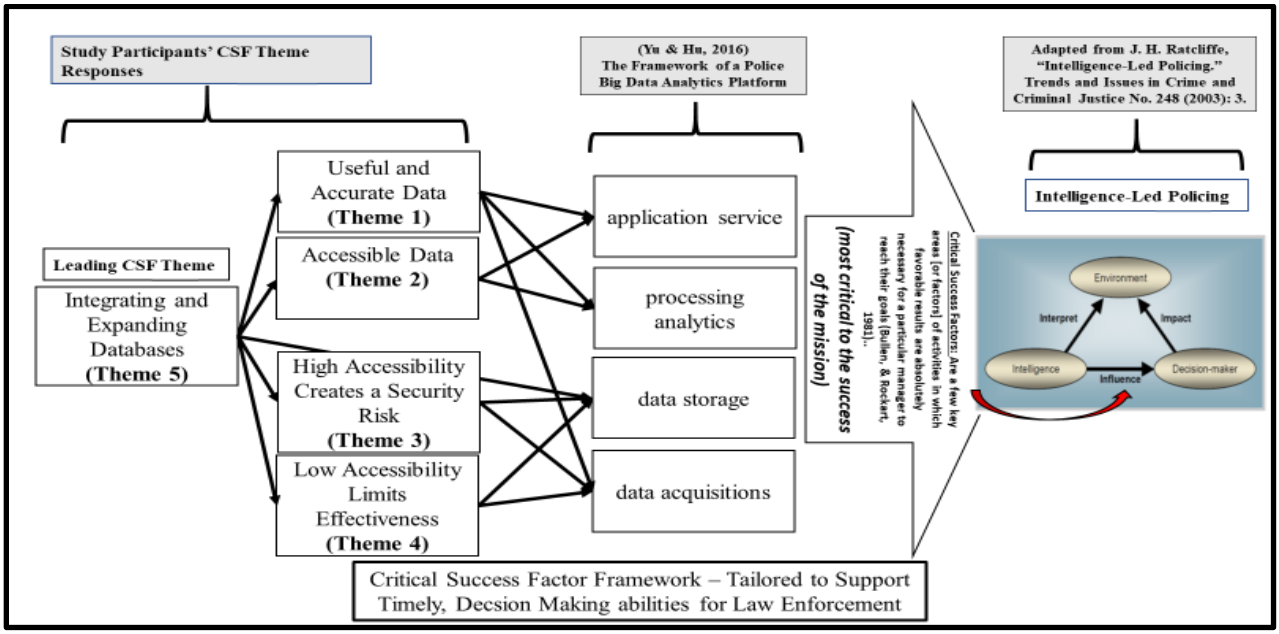

Figure 1. *Critical Success Factor (CSF) Framework: Tailored to Support Timely Decision-Making Abilities for Law Enforcement (Ratcliffe, 2003; Simeone, 2008; Sudhakar, 2012)*

Discussion and Conclusion

Summary and Implications

Law enforcement crime and intelligence analysts are responsible for ensuring and safeguarding against acts of crime and terrorism in the United States. The operational environment (OE) in which analysts work, comprised of both the cyber and physical domains, creates unlimited amounts of data that shape events, actions, activities, intentions, and many other characteristics of individuals who live, work, and operate within these areas known as "criminality of places" (Akhgar et al., 2015; Coffey, 2015). The OE is also impacted by various systems, internal or external, reflecting system theory concepts, and affecting the actions of law enforcement processes and of organizations as they apply best practices in proactive threat intelligence against crime. The most prevalent theme emphasized by the majority of SPs in this study was the ability to access data through integrating and expanding databases. Moreover, this theme was also reinforced by the literature expanding on the research on data communications processes, emerging information sharing initiatives such as Information Sharing Environment (2008), and complex digital frameworks that are being used in certain police network infrastructures.

There is a small area of qualitative research in data integration concepts tailored to system and user interactions across agency domains. Moreover, exploring CSFs among law enforcement processes was an ideal approach towards identifying and understanding key areas in data integration practices, along with successes that favor operational thru-put in data analysis efforts, thereby providing optimal services to law enforcement agencies. The areas identified in the study, namely key practices, activities, and applications, represented criteria for CSFs which law enforcement crime and intelligence analysts can apply as favorable factors in a feasible framework to reach unified mission goals across the community. Furthermore, the results of the study identified

potential pitfalls, factors of success, and best practices used, thus setting favorable conditions for analysts to increase the likelihood of implementing a framework suitable enough to reduce acts of crime within their respective OEs.

Recommendations for Future Research

Recommendations for future studies focus on a quantitative approach as to how much data is available versus how much is needed against an emerging development or event based on operational efficiency through crime statistics. According to Osborne (2006), crime statistics was just one of the foundational enablers for crime analysis. Future exploration may help researchers conduct quantitative studies tailored to specific areas of interests through crime generators or crime attractors on the basis of the percentage of criminal activities; that in turn may lead to anticipated actions from data integration processes based on precursors, indicators and warnings, and criminality of place theory concepts. Moreover, recommendation for future studies should also focus on the introduction of larger focus groups of analysts who could provide broader, more strategic perspectives and insight on organizational processes, heavily invested in data integration and shared across various domain constructs.

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