"DESIGNING AND IMPLEMENTING AN INTEGRATED FRAMEWORK FOR RISK MANAGEMENT IN POLICE WORK"

“Case study of big data analytics in crisis management”

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Abstract

This article reviews, evaluates and reflects relevant literature on big data analytics in law enforcement. In order to bring together the various discussions around big data, this paper begins with defining what is meant by "big data" and identifying the primary difficulties associated with it. The utilization of big data analytics to derive meaningful and valuable insights from vast amounts of data has been the primary focus of this research to improve the efficiency of crisis management in the field of policing. Big data analytics was underlined, which mostly deals with extensive structured and unstructured data that is necessary to improve police risk management and security crisis management. This is because big data analytics largely deals with extensive structured and unstructured data. In a nutshell, the discussion of this paper demonstrates that established police agencies that focus on innovation have looked into text, audio, video, and social media data analytics to improve policing during times of crisis and to improve predictive analytics of future crimes. According to the findings of this study, new statistical methods that can handle large amounts of data are required to bridge the gap between large data sets and smaller data collections. The vast majority of the statistical methods currently in use were designed for more manageable data sets that are made up of samples. In brief, there have not been any breakthroughs in the analytical methods used for big data yet. Real-time analytics will definitely develop into a prominent field of research in the years to come as a direct result of the proliferation of location-aware social media and mobile applications. Because big data is so massive, linked, and unreliable, statistical techniques that are more effectively adapted to mining big data while remaining sensitive to distinctive characteristics are anticipated to develop shortly. The large amounts of data that are considered to be less trustworthy could lead to further major findings.

Keywords: crisis management, big data, risk management, analytics, theory.

Background of Study

Life in the present century and in contemporary civilization is increasingly interconnected by complex networks that link the globe and generate various opportunities, new services, and benefits for humanity. And concurrently, these underlying networks have enabled the rapid global dissemination of potentially hazardous and deadly events. Its complexity presents organizations with a formidable challenge. (Roman, 2020).

In the past two centuries, technological advancement has had a profound impact on the work of law enforcement. Several industries have been transformed by big data, including law enforcement and policing. Big data analytics is a combination of two concepts: massive data and data analytics. When big data is coupled with data analytics, it refers to the use of algorithms to evaluate huge quantities of data to uncover specific patterns, variable correlations, and sensitive information. Big data, in other words, refers to a massive volume of data that may be structured or unstructured. (Elgendy & Elragal, 2014).

Big data analytics has numerous applications, including predicting consumer purchasing behaviour, mitigating natural disasters, designing government programs, upholding the law, and preventing terrorism. Big data analytics is a developing topic of study as a result of the fact that several innovators continue to create new tools and methods. Nonetheless, the bulk of poor countries confronts considerable obstacles that may hamper their ability to properly employ big data. A low level of workplace digitization is one of the most critical obstacles for many industries. (Kshetri, 2014).

The volume of data collected and shared by enterprises, public agencies, a variety of commercial and non-profit sectors, and scientific research has exploded. Using big data analytics in law enforcement led to a substantial shift from reactive to proactive policing. Big data is a strategy commonly associated with intelligence agencies. (Agarwal & Dhar, 2014; Uthayasankar et al., 2017)

In order to address concerns regarding risk management in policing, an integrated impact assessment should be performed at the beginning of every new police analytics project. This assessment should include data protection, human rights, discrimination risk, evaluation of empirical accuracy and operational effectiveness, as well as any other relevant legal requirements. The purpose of this assessment is to determine whether or not a clear justification for using big data analytics has been established. (Bundy et al., 2017).

Risk Management

A risk in this context might be characterized as a random event or incident that may or may not occur, but which, if it does occur, would have an impact that is unwanted on the organization's objectives or the work that it undertakes (Vose, 2008). Risks can be categorized in a variety of different ways, depending on the discipline. The standard method for classifying risks divides potential dangers into three groups: "known unknowns," "known knowns," and "unknowns." Different degrees of uncertainty are represented by each of these three categories (Jorion, 2009).

The act of recognizing negative occurrences, determining the possibility that those occurrences will take place, and methodically preparing in advance is known as risk management. A risk manager can estimate the chance of the best- and worst-case outcomes, the threat appearing in the future, and the damage that the organization would face should this threat become true by running simulations and random variables with risk models, such as scenario tables (Adam, 2021).

Complicated networks, which are typically the primary factor that contribute to the escalation of crises, are a risk to today's society (Helbing, 2013). Nonetheless, there is a lack of comprehension regarding how risk manifestations in a variety of industries interact with one another. Whether or not it is acknowledged, the efficient operation of interconnected networks is of great importance to modern enterprises and organizations. This is the case whether or not it is acknowledged. It is possible that increasing the number of links connecting the various infrastructure systems would result in improved service efficiency; but, doing so will also make the work systems involved more vulnerable to failures in cascades as a whole (Bakdash & Marusich, 2015).

There are opportunities for danger in every sphere of life, including nearly every sector of the economy, the business world, governmental administration, and law enforcement. As a result, decisions need to be taken consistently to mitigate risks using any and all resources and technology available (Roman, 2020). In order to ensure that the work will be suitable, it is vital to have a solid understanding of the uncertainty. On the other hand, the field of risk management was established as a discipline in order to assist organizations in recognizing and mitigating risks via the application of methodical methodologies and procedures.

Police risk management

Methods for risk identification, risk assessment, and risk management should be seen as an effective, albeit constrained, way to improve the likelihood of identifying and averting future victimization or criminal activity (Alexander & Marion, 2020). The police can more effectively deal with risks and maintain control of criminal activity with the use of completely automated machine learning algorithms. However, the efficacy of the algorithms that are employed in policing depends on the accuracy of the data that are used by these algorithms (Alexander & Marion, 2020).

Organizational and operational risk management are the two types of RM that can assist police agencies in effectively controlling risk. The concept of organizational risk management refers to the process of managing overall threats by bringing together various organizational departments and processes. In contrast, operational risk management is concerned with addressing the dangers posed by a single event, such as the execution of a warrant or the giving of testimony in court (Gordon, 2012). On the other hand, law enforcement entities such as police departments can frequently be held accountable for any kind of wrongdoing, harm, or violation of rights that is committed against the community. Also at risk are cities, towns, and countries; hazards for the police come when they fail to carry out their responsibilities responsibly and lawfully, or when they violate the rights or safety of an officer (Copple & James, 2018). Therefore, the health and safety of law enforcement officers should be a high priority for the purpose of risk management in law enforcement for a variety of reasons, not the least of which is the fact that healthy officers are less likely to engage in risky behaviours such as the excessive use of force and the abuse of power (Mark, 2014).

Risk reduction techniques encourage police officers to try out more place-based involvements as a means of addressing citizen complaints that person-focused policing and overly aggressive policing tactics are being deployed (Kennedy et al., 2018). When it comes to risk management, the primary focus in policing is on locations, not individuals. In the same vein, risk analysis provides evidence-based justification for risk events regarding how risk factors increase the likelihood of a criminal act taking place. In this regard, risk reduction techniques include detailed information regarding what should be done, where one should go, and at what time one should go there. In addition, police risk management encourages community engagement and

citizen participation in crime prevention efforts using risk reduction strategies (Kennedy et al., 2018).

In a similar vein, identified twelve high-risk critical tasks that have an effect on law enforcement operations. These tasks include the use of force, pursuit and emergency vehicle functions, search and seizure including arrest, care, custody, and control of prisoners, domestic violence, property and evidence, off-duty conduct, sexual harassment or misconduct, selection and hiring, internal investigations, special operations, and finally, dealing with people who have mental illnesses or emotions. (Kennedy et al., 2018).

1.1.1 Risk management practices

RM is the process of identifying, evaluating, and prioritizing risks (defined in ISO 31000 as the impact of uncertainty on the objectives), which is then followed by the coordinated and economical use of resources to reduce, monitor, and control the likelihood of failed events and their impact, as was mentioned earlier, risks can originate from a wide variety of places, such as unpredictability in the financial markets, potential threats to the success of a project, legal obligations, credit risks, accidents, natural causes and disasters, intentional attacks, or uncertainty or an unexpected causal event.

1.1.2 Risk Identification

The literature on project management makes heavy use of several different concepts, but two of the most common are risks and uncertainty, Although these terminologies are very similar to one another, many authors differentiate between them, Therefore, it is difficult for workers who are at risk to recognize and differentiate them. It is common practice to modify the concept of risk or uncertainty concerning the application of a certain project. proposed that determining where the risk lies is an essential step. He went on to say that uncertainty is an abstract measurement of the things that we do not know. Uncertainty is eliminated once each and every potential risk has been located and analyzed. Uncertainty can be defined as the presence of knowledge gaps that we might not even be aware of. Hence, it is necessary to evaluate the risks involved before beginning any project.

1.1.3 Risk Analysis

The second stage of the RM process is known as risk analysis, and it entails performing an analysis of the data that was gathered concerning the potential risk. Analysis of risk can also be characterized as the process of picking, among all of the potential dangers found during the

identification phase, those risks that have the potential to have the most substantial impact on the task. (Kennedy, 2018).

In the field of police, risk analysis provides support for risk practices by shedding light on how certain elements can interact to raise the possibility of criminal conduct taking place (Kennedy, 2018). Conventional methods of risk analysis have a tendency to underestimate the probability and impact of risks (such as pandemics, financial collapses, and terrorist attacks), because sometimes the existence of independent clarifications is wrongly assumed, and cascading errors that can occur in complex systems are not considered. This causes a tendency for conventional risk analysis methods to underestimate the probability and impact of risks (Roman, 2020).

For the purpose of this work, the steps of risk analysis will be treated as a single process following the model that was developed. This is even though other academics differentiate between the terms risk evaluation and risk analysis and characterize them as being two separate processes. The examination of risks is an essential part of effective project management, as it helps to ensure that there are as few surprises as possible as the project moves forward. Risk analysis enables companies to make confident projections about the future; it is essential for predicting the outcomes of uncertainties and minimizing their occurrence or influence. The implementation of risk management practices boosts the likelihood of a job well done while simultaneously lowering the associated dangers. (Kennedy, 2018).

1.1.4 Risk Evaluation

One of the most important procedures in RM is to evaluate risks following their levels of likelihood and to estimate the impact on the organization to define the level of risk that is involved. In addition, the Risk Management team investigates and evaluates the various potential courses of action that could be done to manage these risks. Before going on to the next phase, it is important to determine whether or not the residual risk that remains after mitigating measures have been discovered is acceptable. Once mitigating measures have been identified, likely, there will still be some residual risk. An organization runs the risk of being put in jeopardy if it performs a risk assessment and then takes all the necessary precautions but then fails to put those measures into action.

1.1.5 Risk Response

RM is a multi-dimensional variable. The results of prior research indicate that RM can be quantified along several parameters simultaneously. It has been discovered that some dimensions, such as risk identification, risk analysis, risk appraisal, and risk response, are cited quite frequently in the relevant body of research. In contrast, only a few studies found other aspects that were not adequately explained or quantitatively measured in any of the research that was done on crisis management.

In this final level of the RM process, the measures that will be taken to respond to the risk are indicated. The course of action and method chosen for responding to risks are contingent on the sorts of risks Specific information and additional particulars of the action performed in response to the risk are included in the risk response (Kennedy, 2018).

Big data

Discussions regarding big data were first brought up in the early 1990s, but the term has only lately started to gain traction in both the technological world and the general consciousness. Big data refers to extremely large datasets that can only be analyzed by a computer, either on their own or in conjunction with other data sets, to discover previously unknown data patterns, trends, and relationships between the vast network of data sources (Roman, 2020).

The three characteristics that typically characterize big data are referred to collectively as the "three Vs": volume, variety, and velocity (McAfee & Brynjolfsson, 2012). (1) Volume refers to the processing of increasingly larger volumes of data (such as terabytes, petabytes, or even larger amounts of data). (2) Range refers to the diversity of the created data, which can come from a variety of different sources and is generally classified as structured, semi-structured, or unstructured data. (3) The term "velocity" refers to the rate at which data is generated, processed, and assessed. Due to the wide diversity of data formats, distinct processing abilities and expert algorithms are often required.

The term "big data" can refer to either huge data collections or the tools that are utilized to edit and examine a significant amount of data. On the other hand, this phrase does not only refer to the information acquired from a variety of sources; rather, it refers to the reasons behind the gathered information as well as the information itself. When large amounts of data are collected using algorithms (a set of instructions that tell a computer what to do), which cross-reference data both within and between datasets, the computational software that processes the data finds

patterns. Algorithms are defined as "a set of instructions that tell a computer what to do." The use of big data is crucial for a wide variety of applications relating to law enforcement, such as predictive policing, which involves constructing and identifying patterns of criminal activity (Daniel & Akwasi, 2019). The concept of big data has begun to seep into every aspect of our life. Due to the growing number of people who are interested in the subject of big data (Akter & Wamba, 2017).

A similar definition is provided by the McKinsey Global Institute, which suggests that big data is datasets whose size is beyond the ability of standard database software tools to acquire, store, manage, and analyze (James et al., 2011). This is a definition that shifts with the advancement of technology over time, so it is important to keep up with the latest developments. There are a few different ways that big data might be characterized. The "three Vs" is a well-known notion that concisely describes the challenges that must be overcome when dealing with vast amounts of data. This phrase is being influenced in many ways by several factors, including the increasing "Volume" of data, the rising "Velocity" with which it is produced and processed, and the increasing "Variety" of data types and sources (Gartner, 2011). The conventional methods of storing, processing, and analyzing data, which frequently make use of relational databases, are hampered in their technical capabilities by each of these Issues.

1.1.1. Big data analytics

The analysis of big data can be broken down into two distinct parts, as stated by Lyria and Janet (2014). The ability to store and manage enormous datasets is referred to as the "technical part," while the analysis of the data is referred to as the "data analysis" part. They also proposed that the "technical part" can be broken down into two stages: the first stage involves identifying correlations, and the second stage involves establishing linkages (typically through the use of statistical inference or machine learning). Using these stages, they suggested, one could arrive at more significant conclusions regarding crucial topics such as law enforcement. The first step of the process is computing, and the second step involves drawing conclusions about the data, what the data shows, and other topics in addition to those topics. Data can establish that certain characteristics are associated with high reoffending rates, which would enable a legal judgement to be drawn.

Big Data Analytics is rapidly becoming a popular strategy that many firms are adopting to extract usable information from large amounts of big data. Big data analytics is a term that

encompasses techniques that are based on innovative tools and algorithms that can rapidly process enormous amounts of data from a variety of sources and with varying data architectures. These techniques can do this because big data analytics is based on cutting-edge technology. Even though the analytics process, which includes deploying and using big data analytics tools, has the strategic potential to develop new income streams and achieve competitive advantages over competitors, organizations view it as a means to improve operational efficiency. This is because the process includes deploying and using big data analytics tools. Yet, there are many distinct kinds of analytical applications from which one might choose. As a consequence of this, businesses need to get an understanding of big data analytics before diving headfirst into the implementation of pricey big data technology (Uthayasankar et al., 2017). Given the significance of big data analytics, the purpose of this study is to conduct a literature analysis that offers a broad perspective on big data analytics and the applications that are associated with it.

1.1.2. Big data analytics in policing

In the 21st century, crime prediction has become increasingly reliant on modern technologies to reduce the likelihood of future criminal activity. Because of recent advancements in technology and big data analytics, recent strides have been made in the field of crime prediction (Kennedy et al., 2018). According to Jennifer (2013), two primary categories can be used to classify crime prevention. The primary goal of prevention efforts is to lessen the influence of the factors that put people at risk for engaging in illegal activity. The second group consists of methods of criminal justice that are directed at known or suspected criminals. On the other hand, youth correctional facilities and prison rehabilitation programs are geared towards reducing the likelihood that convicted criminals would commit other offences.

Data is essential for correctly anticipating, prioritizing, and preventing danger or injury to law enforcement personnel as well as others who interact with law enforcement and the general public. The public's trust in the policing mission can also be strengthened with the help of big data. In light of this, accurate data collection is essential for effective and accountable police (Copple & James, 2018). Because of its potential, big data gathered from online sources plays an essential part in the process of developing a framework for big data analytics. This is especially true in the case of forecast analysis, which is utilized in particular fields such as the prediction of crimes by police detectives.

1.1.3. Big data in UAE police

It is well known that the Dubai Police Force is open to adopting new technology to strengthen law enforcement and protect the residents of Dubai and the surrounding communities (Desk, 2016). Now, the Dubai Police Department is making an investment in big data to predict crimes. The predictive policing software developed by Space Imaging Middle East (SIME) is already being used extensively by the Dubai Police Department. The software examines previously gathered intelligence as well as patterns of criminal activity from police databases. Then, with the use of complex algorithms and big data analytics, it generates extremely accurate data regarding when and where the next crime is most likely to take place. The software, which is the first of its kind in the region, was developed in support of the UAE's Smart Governance Initiative. It was designed specifically to complement the modernized approach that the Dubai Police force is taking to crime prevention and improved public safety. The software is the first of its kind in the region. With the help of this knowledge, patrol teams can determine which neighbourhoods may require additional resources to avoid potential criminal behaviour. In a nutshell, the following big data systems have been established in the headquarters of the Dubai Police Department: a report management system, an automated central communication system and a big data analysis and decision support centre.

1.1.4. The challenges of big data analytics

According to Rob Kitchin (2014), big data analytics has four essential characteristics that every company should be able to manage. These characteristics include colossal volume, which can consist of terabytes or petabytes of data; colossal velocity, which can range from milliseconds to seconds; and massive variety. high velocity, consisting of data created in or near real-time; extensive variety, both structured and unstructured; exhaustive in scope, to capture entire populations of systems; fine-grained resolution, to achieve full detail while remaining indexical in identification; relational, with common fields that enable the joining of different data-sets; flexible, with traits of extensionality (Kitchin, 2014).

A current hot topic in the field of modern policing is the challenges that must be overcome when forecasting with big data. It is essential to acknowledge that the availability of large amounts of data does not in and of itself ensure that issues will be resolved (Bacon, 2013). Academics, city planners, and business executives all share a common interest in, and at least some level of anxiety around, the topic of "big data." A significant number of offenders have been apprehended as a

direct result of the rapid growth of big data analytics. Because of the rapid proliferation of big data technology and the widespread acceptance of the concept of big data in both the public and private sectors, there is little time left for academic discourse on the potential problems that may occur as a result of the use of big data in policing (Amir & Murtaza, 2015).

1.1.5. The techniques of big data analytics

In a void, enormous data is meaningless. It is only when it is put to use in decision-making that its actual value can be appreciated. In order to support this kind of evidence-based decision-making, organizations require methodologies that are both efficient and capable of turning vast volumes of rapidly changing and diverse data into valuable insights. The whole process of extracting useful information from large amounts of data may be broken down into five stages:

- **Data management** (Acquisition and Recording, Extraction, cleaning and Annotation Integration, and Aggregation and Representation)
- **Analytics** (Modeling Analysis and Interpretation)

1.1.6. Measurement of big data analytics

Big data analytics is a multifaceted idea. According to the theory put forth by Laney (2001), the three components of big data are volume, diversity, and velocity. It is common practice to use the three Vs as a framework when attempting to discuss large data (Chen, Chiang, & Storey, 2012; Kwon, Lee, & Shin, 2014). In this part of the report, the researcher will provide the three Vs as well as other aspects of big data that are given by the computing industry. These aspects are explained further down.

- **Data volume**

The quantity of information amassed or produced by an entity, whether it be an individual or an organization, is referred to as volume. The fact that 1 terabyte is now the smallest amount of data that can be considered "big data" is evidence that the definition of "big data" is always evolving in response to advances in technology. At this time, one terabyte is equivalent to the amount of data that can be stored on approximately 16 million Facebook photographs or 1,500 CDs or 220 DVDs (Gandomi & Haider, 2015). E-commerce, social networking, and sensor technology all contribute to the production of a significant amount of unstructured data, which includes voice, photos, and video. A greater quantity of computing devices is connecting to the internet, which

results in an increase in the rate at which new data is being added. The rapidity of both the generation of new data and its processing is referred to as "velocity" (Lee, 2017).

- **Data velocity**

As time passes, the data velocity increases. Batch processing systems were initially utilized by businesses to evaluate data due to the slow and expensive nature of data processing. Since the speed at which data is produced and processed has increased, real-time processing has become the standard for computing applications. According to Gartner (2015), the number of connected devices that will be in use across the globe will increase from 6.4 billion in 2016 to 20.8 billion by the year 2020. It was anticipated that in 2016, 5.5 million new devices would connect to the internet each and every day to gather, analyze, and share data. The expanded capability of connected devices to stream data will further accelerate the velocity (Lee, 2017).

- **Data Variety**

The quantity of different types of data is referred to as diversity. Because of advances in technology, companies can now generate data in a variety of formats, including structured, semi-structured, and unstructured data. Text, images, music, video, clickstream data, and sensor data are all examples of unstructured data. These types of data do not have a defined framework, which is necessary for efficient processing. Data that is semi-structured does not conform with the specifications of relational databases, but it can be constructed to meet the requisite structural requirements of applications. An example of semi-structured data is the Extensible Business Reporting Language (XBRL), which was designed to facilitate the exchange of financial information between private businesses and public sector organizations. Structured data is data that has been predefined and may be discovered in a range of different sorts of standard databases. The development of new analytics tools has resulted in the kind of data becoming less of a barrier to analysis, which has resulted in an increase in the rate at which unstructured data is generated in comparison to structured data. Veracity is the fourth dimension that IBM introduced to draw attention to the inherent unreliability and unpredictability of data sources. Incomplete and inaccurate data, as well as delays, inconsistency, subjectivity, and dishonesty, are all factors that contribute to unreliability and uncertainty (Lee, 2017).

Crisis management

According to Jaques (2009), the idea of crisis management emerged after the end of the second world war. It rose to prominence after the Cuban missile crisis and established its credibility as a legitimate management discipline after the Tylenol poisoning scandal and the Chernobyl disaster, both of which occurred in 1986. Tylenol sales returned to their pre-crisis levels as a direct result of Johnson & Johnson's prompt and effective response to the product damage scenario; to this day, it is still regarded as an excellent and instructable example of effective crisis management (Latson, 2014).

One definition of a crisis is an event that, due to the nature of its effects or consequences, poses a threat to essential national interests or fundamental human necessities, calls for prompt decision-making, and mandates coordination across a large number of government departments and agencies (Abderrazak et al., 2020). When an event or situation reaches a critical stage, it is referred to be a crisis. The seriousness of the occurrence or the circumstances is another factor that determines how serious the crisis is. The crisis interferes with an organization's ability to carry out its mission and interferes with its ability to plan. As a result, every business ought to have the capabilities necessary to respond effectively to unforeseen emergencies (Bickley, 2017). In addition, crisis management helps an organization and its stakeholders formulate an appropriate response to a potential risk by identifying the nature and scope of the problem (Adam, 2021). The crisis management strategy is at its core a multifaceted problem, requiring knowledge from a variety of fields including sociology, psychology, political science, and public administration (Boin et al., 2018). Nonetheless, despite the fact that the root cause of the crisis is unclear, crisis responsibility can be used as a prediction.

That there are several stages in the process of crisis management, and that crisis managers must divide each crisis into appropriate sub-crises, analyze and include all five phases in the whole process of crisis decision-making, in particular by thinking of the aftermath and post-crisis phases in their initial decision making (Pedersen & Ritter, 2020; Abderrazak et al., 2020). (Jaques, 2009; Greve et al., 2010; Bundy et al., 2017). Each step is explained in detail below:

- **Pre-crisis:** Knight's (1921) definition of risk as occurrences for which the result can be evaluated using probabilistic products can also be used to guide the prediction phase. However, uncertainty is difficult to measure, therefore its evaluation cannot rely on any probabilistic foundation.

- **Crisis emergence**: In the emerging phase, a crisis has not yet begun, but its signs are becoming more apparent. Government agencies and organizations still have time to prepare for and maybe delay the onset of the catastrophe (Laari-Salmela et al., 2019)
- **Crisis occurrence:** If a crisis arises, the organization is obligated to initiate tactical crisis responses, which may include communication, actions, and individualized strategies. Depending on the nature of the crisis, the organization might respond in several different ways. For instance, British Petroleum implemented these safety precautions following the explosion at its Texas City refinery in 2005 as well as the explosion at Deepwater Horizon in 2010. (Andersen & Andersen, 2014)
- **Crisis aftermath:** There is a period immediately following a crisis that is mostly devoted to repairing the damage (e.g., after natural catastrophes), providing relief to overworked response units (e.g., police, fire departments, health care professionals), and resuming interrupted or postponed job processes (e.g., replenishment of warehouses).
- **Post-crisis:** After a crisis, each organization strives to resume business as usual (Coombs, 2007). As a predicted consequence of crisis outcomes, the organization could be worse off (unable to return to its previous position), better off (capable of regaining its original position), or back off (come out of the crisis strengthened in some way). It is possible that several systems, such as companies, networks, or countries, will impact the outcome.

A crisis can appear in a variety of ways (e.g., natural disaster, self-inflicted) and take on a variety of forms (e.g., immediate, sustained). Current crisis literature has debates on the number of phases that comprise a crisis's lifecycle (Faulkner., 2001). A limited view of the crisis, according to Coombs (2007), consists of three phases: pre-crisis, crisis, and post-crisis. However, the issue of crisis management literature suggests that the period immediately before the crisis, when it is building, should be considered to identify and respond proactively to early symptoms (Ansoff, 1975), as well as the period immediately after the crisis, when unusual activities are required to deal with its effects before a new stable stage is achieved, to ensure that the organization learns from experience and prepares for future crises (Madsen, 2009). Pedersen et al. (2020) presented a crisis management model based on five crisis phases: (1) pre-crisis normality; (2) emergence; (3) occurrence; (4) aftermath; and (5) post-crisis normality.

The benefit of crisis management as a practice is that it enables enterprises and government agencies to anticipate unanticipated occurrences before and after they occur. In the business

environment, crisis management involves particular procedures, such as business continuity plans. With the assistance of analytical methods and specialized crisis teams, the effects of crises will be minimized. Our results indicate that consistent with current studies on crisis management Thus, every business should be able to respond to a crisis by providing the required instruments for crisis management and control.

1.1 Security crisis management

Previous research has shown that the phrases "security" and "safety" are frequently used interchangeably; yet, the two concepts refer to very different things. Examples of security breaches and risks to people's safety include acts of intentional violence or aggressiveness, as well as actions of criminal activity. On the other hand, activities that take place as a result of inadvertent or accidental occurrences, such as mishaps or risks, are not regarded as security measures. There are several overlaps in the approaches necessary to tackle security and safety risks, and serious safety incidents, such as car accidents, can occasionally have additional security repercussions. Although some firms make a clear distinction between the two categories and even have separate security and safety management processes, the vast majority of smaller organizations will manage issues about both security and safety using the same management approaches (Bickley, 2017).

The management of a security crisis can be broken down into three distinct stages: (1) pre-crisis, (2) crisis response, and (3) post-crisis (Coombs, 2006). During the pre-crisis period, the primary goals are to forestall an impending catastrophe and to make adequate preparations for it. The crisis response phase begins at the point at which management is required to actually react to a catastrophe. During the post-crisis phase, efforts are made to find ways to strengthen preparation for the subsequent crisis and to follow through on commitments made during the crisis period. For example, this phase may involve giving follow-up information on previous pledges. The three-pronged perspective on crisis management serves as the organizing structure for this entry. In addition, the response to the crisis is affected by several other circumstances. According to Bickley (2017), some of these elements include the following:

- **Coordinator in a crisis**: Coordination and management of the whole crisis management team, as well as primary decision-making authority. The Executive Director/CEO, who is responsible for executive decisions, typically reports to the Crisis Coordinator.

- **Human Resources**: It is a word used to designate a body that advises on HR policy and coordinates all aspects of the reaction to a major incident, including people, family aid, and insurance.
- **Operations and Program :**Handles all communication with the local team and offers counsel on the national context, programme activities, and key stakeholders.
- **Media and communication:** Offers media counsel and manages media interaction and internal communications.
- **Support and Management of Information:** Assist the crisis management team during the response and preserve information records.

1.2 Measurement of crises management

According to Fink (1986), crisis management is comprised of multiple phases (practices), beginning with the warning phase and concluding with the observation phase. Moreover, according to Khaddam (2014), crisis management consists of three stages: pre-crisis management, crisis management (during the crisis), and post-crisis management (after the crisis). In the same area, Faulkner (2011) presented a model consisting of the five stages of crisis management, what the organization must do at each level and the roles and tasks that must be determined at each stage. Thus, the company now has the necessary information to do this task successfully. These stages will be considered aspects of crisis management for the purposes of this study:

- **Detection stage**: This refers to the stage preceding the onset of a crisis, and it is characterized by the organization's ability to respond to warning signals that may trigger a crisis by implementing preventative steps.
- **Prevention Stage:** At this point, businesses must prepare an emergency response strategy and assemble a crisis management team with as much past experience in crisis management as possible.
- **Containment stage:** At this stage, a set of activities is identified, crisis field communication processes are arranged, the situation is stabilized, losses are reduced, the psychological and social repercussions of the crisis are addressed, and functional performance is improved more effectively.

- **Recovery Stage**: At this point, the activities and operations of the organization have been picked back up again. The company conducts an analysis of its losses and losses, as well as an analysis of the requirements necessary to profit from the activity and balance totally.
- **Learning Stage:** Additionally, known as the stage of extracting morals and lessons from previous crises to construct experiences capable of avoiding crises, preventing their recurrence, and standing at defects, improving, and avoiding them through the process of development and improvement (Bundy et al., 2017; Obeidat, & Otibi, 2015).

1.3 Theories of crisis management

In an effort to enhance the organizational capacity to assign expertise in anticipating, averting, and reducing crises, numerous models have been developed by scholars. Thus, the majority of models emphasize the need of taking charge rather than reacting. The crisis lifecycle consists of prevention, mitigation, and recovery. This concept is similar to a common paradigm that separates a crisis into three stages: before, during, and after. According to Coombs (1996, 2007, and 2015), the most important models are those based on a three-stage framework, such as Fink (1986), which are widely considered the pioneers of modern crisis management research:

- *Fink's Model: Steven Fink (1986) established a crisis management system based on four-stage crisis dimensions, including prodromal, acute, chronic, and resolution stages. The prodromal phase occurs between the onset of the Crisis's warning signs and the onset of the crisis.*
- **Burnett Model of Crisis Management**: In 1998, John Burnett proposed a strategy for crisis management that consisted of three key stages: identification, confrontation, and reconfiguration, each with two steps. Like with previous models of a lifetime, this one features a progression.
- **Mitroff's crisis management model:** Mitroff is developed based on a five-stage framework: signal detection (2) probing and prevention (3) damage containment (4) recovery (5) learning
- **Relational Model of Crisis Management:** The relational model of crisis management is composed of four main stages: (1) crisis prevention; (2) crisis preparedness; (3) crisis incident management; and (4) post-crisis management.
- **Contingency Theory:** There is no one best approach to the management or operation of an organization; rather, choices ought to be based on the circumstances that are now present. In some situations, a successful organizational strategy might not work as well as it does in others (Fiedler 1964).

The underpinning theory

The diffusion of innovations hypothesis comes from many areas. Diffusion is “the process in which an innovation is conveyed through certain channels over time among the members of a social system,” while communication is “the process in which people produce and share knowledge to establish a shared understanding” (Rogers, 2003, p. 5). We show how organisations use innovation to communicate internally and externally. Police forces employ big data analytics to help citizens during crises and major events. Innovation, time, communication channels, and social systems define DOI (Rogers, 1995).

Theoretical gap

Big data analytics research is still developing. Consequently, the phenomenon and variables that interact with big data and crisis management require further research and quantitative study. Big data analytics, risk management, and crisis management have yet to be integrated. Big data analytics progressed without management research, theoretical conceptions, or academic uniformity, maybe due to methodological rather than instructional difficulty. Hence, few research works have widely addressed big data's crucial concerns in the UAE or explored new theoretical models (George et al., 2014). Consequently, researchers should identify big data difficulties and link big data analytics methodologies to crisis management to determine how these two factors are related (Uthayasankar et al., 2017).

Big data does not prevent crises or guard against their effects (Bacon., 2013). Earthquake data is abundant, yet there is no reliable model to predict them (Silver, 2012). Several research indicated that crisis management issues are related to hypothesis, testing, and frameworks used for big data prediction (Poynter, 2013), while West (2013) was more concerned about the lack of theory to accompany big data in many businesses. Moreover, big data prediction issues should be considered (Hassani & Silva, 2015). Based on the previous assertions, this study will analyze risk management's direct impact on big data analytics and crisis management in UAE law enforcement agencies for the first time. Some scholars referred to the need to develop an innovative theory applied during extraordinary and unprecedented disasters and crises (Dillette & Ponting, 2020). While the development of policing algorithms based on big data analytics is often not supported by robust empirical evidence, researchers in this field claim that a thorough case study is often absent (Alexander & Marion, 2020). There is a need to develop big data models for collecting

and interpreting law enforcement agency and national data sets that can be used to identify and analyze risk (Copple & James, 2018). Some existing studies found that the challenges of crisis management are related to a hypothesis, testing and frameworks utilized for big data predicting (Poynter, 2013), whilst West (2013) recognized more concern on the absence of theory to complement big data in a wide range of industries. Besides, the diverse challenges linked to predicting big data should be given more consideration (Hassani & Silva, 2015). Based on the previous claims, this study examined the role of risk management on the direct relationship between big data analytics and crisis management for the first time in law enforcement agencies in the UAE.

Discussions

The literature review reveal that big data analytics, which primarily deals with extensive structured and unstructured data, is essential to improve police risk management and security crisis management. Today police departments who rely on innovation use certain sources of data to deal with crises and manage the security risks, e.g., text, audio, video, and social media data analytics to enhance policing at the time of crisis and predictive analytics of future crimes. As the majority of current statistical approaches were developed for smaller data sets made up of samples.The research argues that new statistical techniques for extensive data are needed to overcome the differences between big data and smaller data sets. Moreover, breakthroughs in big data analytical approaches have yet to occur. Such novel analytics are expected to appear soon. Because of the rise of location-aware social media and mobile apps, real-time analytics will undoubtedly become a burgeoning topic of study in the future. Because big data is so huge, interconnected, and unreliable, statistical techniques that are more efficiently suited to mining big data while sensitive to distinctive characteristics are likely to emerge. The enormous volumes of less 'trustworthy' data could yield further significant insights.

Conclusions

Global risk management is difficult. As datasets multiply, big data's catastrophe management potential grows. This paper reviews risk management big data applications. It describes what data existing risk management systems employ, which phases they target, and what enabling technologies have been deployed with big data technology to support risk management decision-making. After a systematic study, big data research into catastrophe information management procedures and practices is still developing.

As mentioned applications limit datasets, and seamless data integration is a critical shortcoming. Data consistency, accuracy, and completeness for decision-making is the biggest challenge in large data management for catastrophe monitoring. Risk data from multiple sources is noisy. To eliminate data discrepancies, use various data pretreatment methods. Risk management also requires data mining challenges. Data mining can uncover linkages, correlations, and trends to prevent calamities. Finally, data transmission and storage security and privacy must be constantly monitored to assure catastrophe data validity and protect sensitive information.

This article conducted an analysis of the function that big data plays in various surveillance methods by using a case study of Big data analytics. I explored why big data was embraced, how it is utilized, and what the ramifications of its use are by placing it within its social context and looking at how it is employed. New perspectives on social control and inequality can be gained by analyzing the relationship between various forms of surveillance, the legal system, and technological advancements. I contended that big data both contributes to and reflects the pre-existing social structures of our society. Big data is a new type of capital that is both a social product and a social resource; contrary to popular belief, it will not do away with human subjectivity and bias. The types of data that law enforcement agencies acquire, the processes that they use to analyze and interpret that data, and how they use it to guide their behaviour are all components of the same fundamental social process.

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