Institute of Technology Management and Entrepreneurship

INVESTIGATION ON PREDICTIVE POLICING ADOPTION, INNOVATIVE OFFICER PERFORMANCE AND CRIME MITIGATION AMONG ABU DHABI POLICE

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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INVESTIGATION ON PREDICTIVE POLICING ADOPTION, INNOVATIVE OFFICER PERFORMANCE AND CRIME MITIGATION AMONG ABU DHABI POLICE

HIND RASHED SALEH AL SHAMSI

A thesis submitted
in fulfillment of the requirements for the degree
of Doctor of Philosophy

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DEDICATION

This work is dedicated to the inspiring person in my life… my dear father and my dear mother who always wanted me to have the best, for her love, and the prayers that she made for me.

…To my husband …

My husband is wonderful, a great companion and so much more in my life. He is always a source of love, courage and strength at every tough instant throughout these years.

…To my great guide…

My dear supervisor, Datuk Assoc.Prof.Dr.Su'aidi Dato' Safei for his visions in artificial intelligence.

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I would like to appreciate the dedication of my beloved family who educated me and motivate me to learn until this level, and the lecturers and friends who constantly give me support and advice throughout the research. Without their blessing and encouragement, this research is impossible to complete on time

ABSTRACT

In the face of rapid technological advancements and globalization, Abu Dhabi Police encounters challenges in the adoption of predictive policing. This approach, characterized by technological integration, data privacy concerns, and potential resistance among law enforcement personnel, requires overcoming obstacles such as training requirements and adapting to new methodologies. The global trend of widespread adoption of predictive policing, leveraging artificial intelligence and big data, underscores the urgency to combat crime, enhance surveillance, and keep law enforcement agencies abreast of criminal activities. In Abu Dhabi Police, predictive policing emerges as a potential linchpin in the criminal justice system, aiding investigations and bolstering public safety initiatives. Nonetheless, uncertainties surround the adoption behavior of this technological paradigm, prompting the study to delve into how predictive policing, incorporating key components of artificial intelligence and big data, can effectively mitigate crime through officer training and collaborative learning within the General Command of Abu Dhabi Police. The research draws on theoretical foundations such as activity theory, complexity theory, crime theory, and technology adoption to establish a conceptual framework for analysis. Embracing a quantitative and systematic approach rooted in positivism, the study employs a deductive approach for theoretical inference, employing theory and hypotheses to validate evidence in the field. A survey targeting 2,500 police officers engaged in crime scene management at Abu Dhabi Police, with a sample size of 357 (n = 357) using a fairly stratified sampling approach within the criminal security sector, serves as the primary data collection method. The study utilizes a validated survey questionnaire, emphasizing validity and reliability to enhance overall research credibility. Prior to the main data collection, a pilot study was conducted to validate the data collection tool. The findings underscore that the adoption of predictive policing enhances officer performance in innovation, collaborative learning, and overall crime mitigation. Notably, the study reveals a positive correlation between predictive policing and innovative officer performance, with officer innovation performance subsequently positively impacting crime reduction performance. Collaborative learning serves as a significant mediator, enhancing the effect of officer innovation on crime reduction performance within Abu Dhabi Police. The implications of this study extend to government, corporate entities, academia, and society, offering insights into the transformative potential of predictive policing in enhancing law enforcement effectiveness and public safety.

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KAJI SELIDIK TERHADAP PENGGUNAAN KEPOLISAN RAMALAN, PRESTASI PEGAWAI INOVATIF DAN PENCEGAHAN JENAYAH DALAM KALANGAN POLIS ABU DHABI

ABSTRAK

Dalam menghadapi kemajuan teknologi dan globalisasi yang pesat, Polis Abu Dhabi menghadapi cabaran dalam mengamalkan kepolisan ramalan. Pendekatan ini, yang dicirikan oleh penyepaduan teknologi, kepentingan kerahsiaan data, dan potensi penolakan dalam kalangan anggota penguatkuasa undang-undang, memerlukan inisiatif mengatasi halangan seperti keperluan latihan dan menyesuaikan diri dengan metodologi baharu. Aliran global penggunaan meluas kepolisan ramalan, memanfaatkan kecerdasan buatan dan data besar, menekankan keperluan mendesak untuk memerangi jenayah, meningkatkan pengawasan dan memastikan agensi penguatkuasaan undang-undang terus berada di barisan hadapan dalam menangani aktiviti jenayah. Kepolisan ramalan dalam polis Abu Dhabi merupakan projek yang direkayasa sebagai sebahagian daripada strategi kecerdasan buatan di Polis Abu Dhabi. Kepolisan ramalan muncul sebagai tulang belakang yang berpotensi dalam sistem keadilan jenayah, membantu siasatan dan mengukuhkan inisiatif keselamatan awam. Memandangkan etika penggunaan paradigma teknologi baharu ini masih dipersoalkan, kajian ini bertujuan untuk menyiasat bagaimana penggunaan kepolisan ramalan (komponen utamanya kecerdasan buatan dan data besar) boleh membantu mitgasi jenayah melalui latihan pegawai dan pembelajaran kolaboratif - Perintah Am Polis Abu Dhabi. Kajian ini berasaskan teori utama, termasuk teori aktiviti, teori kerumitan, teori jenayah, dan penggunaan teknologi bagi mewujudkan rangka kerja konseptual untuk analisis. Melihat kepada teori-teori ini dan menyokong topik-topik kritikal kajian, rangka kerja konsep untuk analisis diperkenalkan. Penyelidikan menggunakan pendekatan kuantitatif dan sistematik dari perspektif positivisme. Pendekatan deduktif terhadap inferens teori juga berasaskan teori dan hipotesis bagi mengesahkan bukti teori yang wujud dalam lapangan terbabit. Tinjauan menyasarkan 2,500 anggota polis yang terlibat dalam pengurusan tempat kejadian jenayah di Polis Abu Dhabi, dengan saiz sampel 357 (n = 357) menggunakan pendekatan persampelan yang agak berstrata dalam sektor keselamatan jenayah, berfungsi sebagai kaedah pengumpulan data utama. Kajian ini menggunakan soal selidik tinjauan yang disahkan, menekankan kesahan dan kebolehpercayaan untuk meningkatkan kredibiliti penyelidikan keseluruhan. Sebelum pengumpulan data utama, kajian rintis telah dijalankan untuk mengesahkan alat pengumpulan data. Dapatan kajian menemui kesan positif penggunaan kepolisan ramalan, yang meningkatkan prestasi pegawai dalam inovasi, pembelajaran kolaboratif, dan pengurangan jenayah secara keseluruhan. Kajian ini mendedahkan korelasi positif antara kepolisan ramalan dan prestasi pegawai yang inovatif, dengan prestasi inovasi pegawai. Pembelajaran kolaboratif berfungsi secara khusus dalam memudahcara kesan inovasi pegawai terhadap prestasi mitigasi jenayah dalam Polis Abu Dhabi. Implikasi kajian ini meluas kepada kerajaan, entiti korporat, akademia dan masyarakat, menawarkan pandangan tentang potensi transformatif kepolisan ramalan dalam meningkatkan keberkesanan penguatkuasaan undang-undang dan keselamatan awam.

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LIST OF ABBREVIATIONS

AVE	-	Average variance extracted
ADP	-	Abu Dhabi Police
AV	-	Analysis of Variance
CD	-	Standard deviation
CFA	-	Confirmatory factor analysis
CR	-	Composite reliability
EFA	-	Exploratory factor analysis
AI	-	Artificial Intelligence
GCC	-	Gulf Corporation Council
GoF	-	Goodness of fit
PS	-	Participative style
SDG	-	sustainable development goals
SEM	-	Structural equation modelling
SPSS	-	Statistical package for the social science
UAE	-	United Arab Emirates
VIF	-	Variance inflation factor

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Hind Rashed Saleh Al Shamsi, Su'aidi Safei. 2023. PLS-SEM Model of Crime Mitigation Performance of Abu Dhabi Police Predictive Policing. *Tropical Scientific Journal* (ISSN: 2710-5997). Vol 2, Issue 2, 2023. URL: https://scientificacademic.com/index.php/tsj/article/view/22.

Hind Rashed Saleh Al Shamsi, Su'aidi Safei. 2023. Artificial Intelligence Adoption in Predictive Policing to Predict Crime Mitigation Performance. *International Journal of Sustainable Construction Engineering and Technology*. Vol. 14 No. 3 (2023) 289-298. DOI: https://publisher.uthm.edu.my/ojs/index.php/IJSCET/article/view/15323/5911.

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CHAPTER 1

INTRODUCTION

1.1. Introduction

This chapter provides an insight into this dissertation titled "Use of Artificial Intelligence in Abu Dhabi Police to Mitigate Crime". This chapter begins with the background of the study that discusses the overview of the issues in this area. In section 1.3, the study presents problem statements that show the gaps in the study. To address the problem statement, the study presents the research questions and research objectives in sections 1.4 and 1.5. Next, the significance of the study was presented to show the relevance to conduct the study in section 1.6. This chapter continues with the scope of the study, and the limitation of the research in sections 1.7 and 1.8. The next section presents the operation definitions to indicate the terminological terms of the variables. In section 1.10, the study shows the structure of the whole thesis. Lastly, in section 1.11 the study presents the summary of Chapter 1.

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1.2 Background

The future of policing is no doubt inter-locked with the application of computers to complement traditional policing techniques (Adams, 2012). Predictive policing constitutes the use of technology to predict potential criminal activity using various forms of intelligence algorithm, simulation, and big data analytics of huge amounts of data (Ferguson, 2019). Predictive policing has recently been used by law enforcement agencies to direct patrol officers, target expected crimes, and conduct real-time analysis in the critical response division of the law enforcement organisation (Saunders et al., 2016). This next level of smart

police innovation builds on voluminous data with historical and real-time properties to create a smart policing weapon with the potential to mark crimes before they occur (Mohler et al., 2015; Ferguson, 2019).

Despite the potential of predictive policing through the use of AI and big data for the purpose of crime mitigation in law enforcement organisations, significant challenges have been highlighted (Ekblom, 2013; Meijer and Wessels, 2019; Richardson et al., 2019). The use of such systems has remained questionable in the wake of jeopardised public safety, the use of "dirty data" and "bad predictions", with increasing rights violations (Richardson et al., 2019). Meijer and Wessels (2019) in a systematic literature review, highlighted that predictive policing is being hit by a number of drawbacks, including crime increase and the lack of proper implementation. Ultimately, strong tension exists between predictive policing and the police officer's craft (Ratcliffe et al., 2019). The need to resolve these tensions is critical to the effective application of predictive policing to realise the inherent benefits (Ferguson, 2019).

With the need for training, substantial costs, and the lack of willingness of police officers to change their role by adopting the new technology systems, seriously threaten predictive technology operationalisation (Ferguson, 2019). Ferguson (2016) asserts that training is critical to release the burden of effective and efficient application of predictive policing technology. This leads to the ultimate conclusion that the adoption of predictive technologies necessitates that officers go through the right training. Nonetheless, evidence exists that officers are often uncomfortable with paperwork and technology systems; the overall commitment to the use of such systems has remained low (Kirschner et al., 2018).

Effective training is essential to the accurate input of data, proper use of predictive policing methodologies, overcoming of system vulnerabilities and the correct interpretations of predictive policing system responses (Mohler et al., 2015; Ferguson, 2016; Ferguson,

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2019). The adoption of innovation training and learning mechanisms have as well encouraged to realise the long-anticipated benefits of predictive policing (Saunders et al., 2016; Kirschner et al., 2018; Meijer and Wessels, 2019; Ratcliffe et al., 2019; Ferguson, 2019).

In the bid to mitigate and prevent crime in the UAE, the region has witnessed an increased role of artificial surveillance, predictive policing, and the use of big data officers to curb crime and facilitate crime investigation (MENA Herald, 2018; Shouk 2019a). AI and big data have already proven effective in ending crime (zero crime) in dedicated communities in Dubai (Shouk. 2019b). Through AI data analytics in a special AI-driven program called the "Oyoon" (meaning Eyes in English), the Dubai Police was able to solve crimes and identify security gaps across, residential, industrial, shopping and all community centres, in an integrated data-driven AI system that operates independently of human intervention across thousands of cameras within the city (Shouk. 2019b). According to Col Suleiman Al Kaabi, director of innovation and foresight at Abu Dhabi Police:

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> *"AI is capable of changing our ideas and vision thanks to a new system that will govern humanity… when borders no longer exist between what is normal and artificial, real and superficial, and human and artificial, AI will put in place mechanisms that can learn, think and take decisions,"* Malek (2018).

The Abu Dhabi Emirate has prepared its citizens to thrive in a future dominated by artificial intelligence, and the Abu Dhabi Police and other law enforcement agencies in the other Emirates are playing their individual and unique roles towards the realisation of this vision (Malek, 2018; Ramahi, 2018; Larsen, 2017; Harrison, 2019). However, the area of officer training has been ignored, especially regarding newly introduced automated

intelligent tools and how to make the best use of big data (Babuta, 2017). Babuta (2017) observes that law enforcement officials and detectives manually trawl through vast amounts of data, often unaware that they have access to automated tools that could save them a significant amount of time. Evidence exists that thorough technology training is often absent. However, analytical tools are only as effective as the individual operating them, and investment must be directed at ensuring that the officers are able to use any new technology systems effectively.

As part of the Abu Dhabi Police AI strategy, the Department plans to advance from the current proactive policing to the full operationalisation of predictive policing (Figure 1.1) (Abu Dhabi Police GHQ). Starting from the reactive stage, the police department would often react to crime events after they are reported. No form of actions to prevent crime happen before this stage. Here, the efficiency and effectiveness of crime prevention lie in the responsiveness of the police to the crime call, and the time it takes the police personnel to reach the crime scene. Proactive policing represent a stage where the police take some pre-emptive action towards crime mitigation. These actions are not often based on intelligence but on general data available on crime hotspots. Frequent patrols and surveillance, police engagement, alongside other proactive moves to curb crime.

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The final stage of policing strategy that the Department is working towards is predictive policing. At this stage, the police apply various forms of technology to facilitate and create the intelligence necessary to react before a crime occurs. This ensures that the police remains ahead of crime and is more capable of controlling crime seamlessly. In this quest, the use of Big Data and AI have gained popularity, as argued in the context of the present study. Given this strategic path, the time is right that closer attention is dedicated to the adoption and proper application of predictive policing through effective training and collaborative learning (Kirschner et al., 2018).

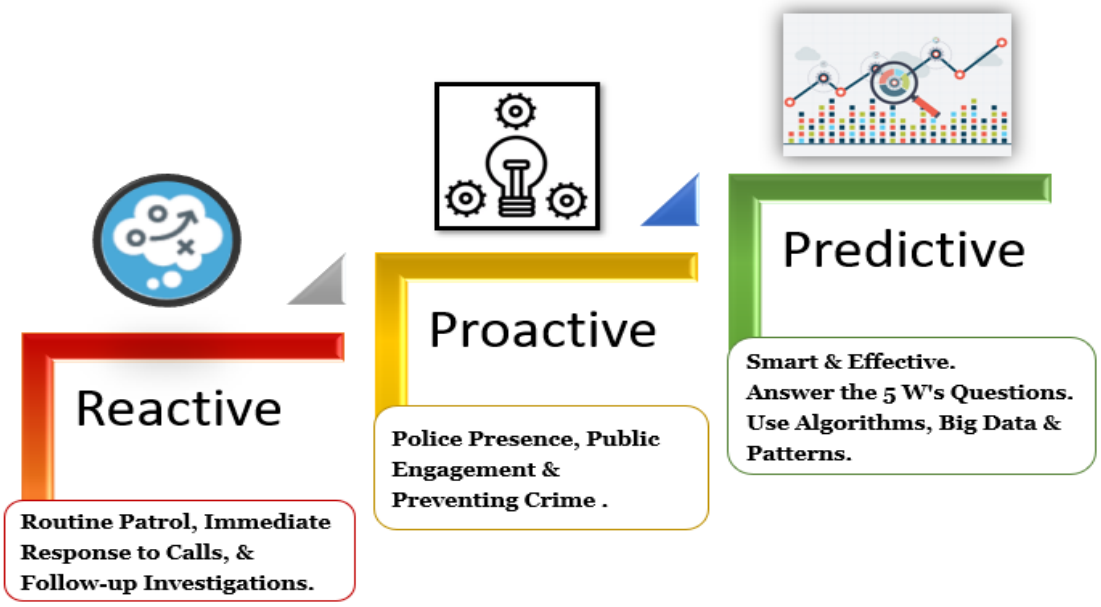

Figure 1.1: Abu Dhabi Police GHQ strategy for moving from reactive to predictive

Source: Abu Dhabi Police GHQ (2020)

1.3 Problem statement

The rapid evolution of technology, particularly Artificial Intelligence (AI), is disrupting established norms and ushering in an era of uncertainty. AI, as a pioneering technology, has demonstrated its efficacy in managing intricate tasks involving real-time data processing, signal interpretation, and knowledge accumulation (Krasadakis, 2018).

In the United Arab Emirates (UAE), the government is harnessing innovation to reshape perspectives, enhance industrial prospects, and bolster emergent sectors like healthcare (Halaweh, 2018; Wehbe and Svetinovic, 2018). A standout approach involves deploying AI across vital domains, deviating from incremental improvements and leading to significant advancements (Halaweh, 2019). Research by Bessen (2018) underscores how AI streamlines work processes, optimizes resource allocation, and elevates citizen services. Moreover, AI's potential to create sophisticated roles, such as AI web programmers, artificial engineers, and robotics experts, highlights its impact on workforce augmentation. Bessen

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(2018) adds that AI addresses data challenges, enhances cognitive processes, and advances predictive capabilities, enabling governments to make informed policy decisions.

The UAE government's utilization of AI is evident in driving business efficiency, enhancing employee productivity, and revolutionizing customer experiences through technology-driven sales recommendations and fraud detection (Shah and Shaheen, 2016). The UAE's AI strategy (2017) underscores the imperative of AI in achieving a customer-centric approach, guiding service representatives in delivering effective solutions. Additionally, AI offers cost-saving potentials, with estimated annual savings of billions through automation (UAE AI strategy, 2016). The strategy highlights the possibility of redirecting resources towards enhancing service quality and accommodating evolving needs.

The UAE government's commitment to innovation extends to public services, industrial opportunities, and national well-being (UAE AI strategy, 2016). The strategic employment of AI in public services, particularly predictive policing, seeks to expedite service delivery and bolster overall service quality (Dave and Sharma, 2019). To ensure alignment with national visions (UAE vision 2021; UAE vision 2030), AI technology is harnessed to enhance citizen satisfaction.

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Despite these advancements, the effective operationalization of predictive policing technology faces challenges related to alignment with police officers' expertise (Ratcliffe et al., 2019). The opacity of predictive models leads to errors that hinder effective application (Meijer and Wessels, 2019; Ferguson, 2019). Meijer and Wessels (2019) emphasize the need for officers to comprehend predictive algorithms for optimal decision-making. Addressing the lack of evidence on specialized training for AI and big data usage in crime mitigation, this study aims to shed light on this area (Ferguson, 2019). Collaborative learning, informed by educational psychology theory, is also crucial for optimizing officer performance (Kirschner et al., 2018).

The adoption of predictive policing, innovative officer performance, and crime mitigation initiatives within law enforcement agencies presents a multifaceted landscape marked by several challenges and issues (Meijer, and Wessels, 2019). In the rapidly evolving technological environment, law enforcement agencies, including the Abu Dhabi Police, encounter substantial hurdles related to the integration of predictive policing technologies (Kaufmann et al., 2019).

These challenges encompass issues such as technology integration complexities, potential resistance among law enforcement personnel, and critical concerns regarding data privacy and security (Hardyns, and Rummens, 2018). As predictive policing relies heavily on advanced technologies like artificial intelligence and big data analytics, the transformative impact of these tools necessitates a careful consideration of the ethical, legal, and operational implications surrounding their implementation (Alikhademi et al., 2022).

Furthermore, the effectiveness of innovative officer performance, a key component in the predictive policing paradigm, faces its own set of challenges (Galiani and Jaitman, 2023). Overcoming barriers related to training requirements and the adaptation to new methodologies emerges as a crucial aspect (Galiani and Jaitman, 2023). Officers need to acquire new skills and competencies to effectively utilize predictive technologies, and this transition may encounter resistance or reluctance within the existing law enforcement culture (Ugwudike, 2022). The successful integration of predictive policing technologies also demands a reevaluation of traditional policing practices, necessitating a cultural shift and comprehensive training programs (Birks et al., 2023).

Predictive policing, driven by artificial intelligence and big data, is gaining global prominence due to its potential to enhance crime surveillance and aid law enforcement agencies in staying ahead of criminal activities (Ajil and Staubli, 2023). However, the ambitious goals of these technological advancements are met with skepticism and concerns

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