

Knowledge-Based Management Systems for the Police Force

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Abstract—Knowledge-Based Management Systems enable new ways to process and analyse knowledge to gain better insights to solve a problem and aid in decision making. In the police force such systems provide a solution for enhancing operations and improving client administration in terms of knowledge management. The main objectives of every police officer is to ensure the security of life and property, promote lawfulness, and avert and distinguish wrongdoing. The administration of knowledge and information is an essential part of policing, and the police ought to be proactive in directing both explicit and implicit knowledge, whilst adding to their abilities in knowledge sharing. In this paper the potential for a knowledge based system for the Mauritius police was analysed, and recommendations were also made, based on requirements captured from interviews with several long standing officers, and surveying of previous works in the area.

Keywords : Knowledge Management, Expert Systems, Police

I. INTRODUCTION

Knowledge is increasingly being recognised as the new strategic essential of various organisations, so there is a need for an organisation like the Mauritian police to have a repository that can be easily managed, with the capability to seamlessly share all the knowledge acquired through the course of their duties. such as any kind of criminal related cases and investigations. To further understand their requirements, interviews were carried out with a centrally located division of the Mauritian Police Force. Mauritius is a small island 2,000 kilometres off the southeast coast of the African continent, with an ethnically diverse population, that live in relative harmony. Due to the isolation of the island, the police pride themselves on being proactive with the local communities, however recently due to increases in population, the use of ICT is becomingly increasingly important to help them in their day to day operations. As such, a knowledge based system was presented as a solution during an interview with long serving officers (more than 20 years) to gain an insight into how they could benefit from it, and the types of knowledge that could be managed, in order to develop a platform to support some of their ICT needs.

II. KNOWLEDGE MANAGEMENT

The use of knowledge management has helped organisations in coordinating their employees, processes and the structure of the organisation. Several organisations across the world are

now implementing knowledge management due to its benefits; the implementation of this system is also required by law enforcement agencies such as the police force, considering that the police officers, carrying out both proactive and responsive measures, need to also be aware of the latest information (e.g.crime patterns), and also comparing information about the discovery and prevention of crime [1]. Knowledge is an important asset of an organisation; it is also said that knowledge is power, however, hoarding of knowledge often leads to negative consequences such as empire building, reinvention of the wheel, feelings of isolation, and resistance to ideas from outside an organisation[2]. Most individuals tend to hoard their knowledge because it makes them valuable to the organisation. Nevertheless, for an organisation to grow knowledge needs to be passed on to one another. Research has shown that organisations that pass knowledge to one another do have a competitive edge and their growth is usually rapid; in other words, the ability to share knowledge is at the heart of knowledge management [3]. Knowledge can be grouped into two types which are tacit knowledge and the explicit knowledge. Tacit knowledge can be described as a knowledge that dwells in the head of the person that has it. Explicit knowledge can be described as a type of knowledge that can be stored in systems, services, products and facilities. Over the years productivity of workers with knowledge needs a different approach in carrying out activities, and technology has played a major role in enabling communication, collaboration and accessing high volume of information [4]. Tacit and explicit knowledge can be achieved through interaction or innovations; both types of knowledge can be used in the day to day activities of the organisations and it will help in achieving the objectives of the organisation. Organisations normally have a challenge with tacit knowledge - the first issue is trying to identify the tacit knowledge that will be useful to the organisation [3].

III. THE USE OF KNOWLEDGE IN THE POLICE FORCE

As noted in [5] it was established that police officers normally come in contact with a lot of information, when carrying out their day to day activities. So this requires that the police officers need to be proficient knowledge workers, as this will help the police officers in accessing, assimilating and using the knowledge effectively whilst discharging their

duties [6]. Currently, knowledge and information are acquired in the police force through various means; the police force uses explicit knowledge in making decisions, actions, and guidance because they could capture knowledge in various document formats such as police standard operating procedures [6]. Documented or explicit knowledge is being used in the police force as their daily routine in recording the official documents. These documents include records of the criminal, trends of crime, crime threats and any other information related to incidents or crises. On the other hand, the police force also makes use of tacit knowledge, which includes the skill of the police officers, experience, and competence. Some concerns have been raised as with regards to the use of tacit knowledge in the police force in the area of sharing and creating knowledge [6]. The ability and willingness of officers to create and share knowledge among themselves is a major issue. Thus it is required that the officers recognise the essence of knowledge sharing to boost efficiency [6]. Law enforcement agencies like the police force need knowledge as an intensive affair; research shows that the use of technologies in the police force has helped the police force to acquire the necessary information at the right time that has helped in analysing evidence [7]. The use of technologies has also helped in terms of organising and distributing important information among the officers especially where they are investigating crime related issues [7]. Knowledge management can be used in service processes which include maintenance and allocating the knowledge of the workers correctly by enabling the collaboration between them; in the health and welfare sectors, the use of service processes is being used in different units of the organisation [8]. Moreover in the expert organisations where services are being provided in a client and operational process, the way experts will coordinate the knowledge is crucial to the delivery of the service chains[8]. In the law enforcement sector, knowledge management can be used in the police force in the area of investigations, apprehending criminals, and by also putting all the evidence that has been collated from investigations together [1]. Investigations can be divided into two categories - preliminary investigations and the follow-up investigations. The police force carries out follow-up investigations by using officers that have been trained in the field to investigate these types of cases; the preliminary investigations are done by the police officers during patrol [1]. Knowledge-based management systems enable knowledge sharing to occur between these two categories of police activity which can enable decisions to be made more efficiently. There are some short-comings however that have been raised through the use of technology; some employees have raised some concerns that too much structure with the help of technology has made them add little autonomy in their work. [4]. The challenge therefore is being able to demonstrate the benefits that technology can bring and the advantages of maintaining a knowledge-based management system.

IV. KNOWLEDGE BASED MANAGEMENT SYSTEMS AND TECHNOLOGY PROLIFERATION IN THE POLICE

Knowledge management can be described as a means where organisations identify, acquire and maintain knowledge that will be useful to the firm and organisations can also yield benefits from the acquired knowledge [3]. Carrying out investigations is the major part of the police activity, considering that they are concerned with the apprehension of suspects. Gathering of data leading to the arrest of the suspects, are used often for the purpose of attaining convictions; most times investigations are usually carried out through the help of trained officers with the potential of some investigative techniques [1]. In [1], it was identified that knowledge management can be used in four stages of police investigations such as officer to technology (Stage 1), officer to officer (Stage 2), officer to information (Stage 3), and officer to the application (Stage 4). These stages aid in the understanding of the requirements of the system. Stage 1 deals with the way information technology is being used by workers with knowledge, including using email, excel spreadsheets, and word processing. Using these basic tools, the police force can keep records of crimes or any form of activities that they need to report at any point in time. Some of the issues however with these types of methods, is maintenance of compatibility across different software packages and operating systems. Stage 2 refers to the ability for internal communications to be in place for exchange of knowledge. This often takes the form of intranet networked systems. Some of the challenges of deploying such a system include facilitating a broadband connection to the wider internet, whilst maintaining an adequate level of security. Stage 2 also requires the use of communication technology for what is tacit to tacit knowledge transfer, which can be difficult to formalise and be made explicit for what is essentially dynamic and unlimited amounts of information about anything and everything. The sharing of information during this stage enables superior team working. Stage 3 encompasses police information which has been documented in a searchable database format. The use of a database management system will play a very important role in the police force as it can also enable the officers work efficiently in their services like in crime related issues, sexual crimes, assault or any crime specific cases of any such. COPLINK [9] can be used as a very good case study of this; it was used by the police department in Tucson for capturing crime related cases [1]. Stage 4 finally deals with the aspect of application use. An important application used by the officers in this continuum is data mining. Due to the massive size of datasets, the computerised approach is highly essential to the workers with knowledge as it helps them to understand the association between data elements [1]. Expert systems can be used to aid in this regard because it will enable the staffs that require the knowledge, to have access to the knowledge that the experts have provided. Otherwise decision support systems can aid in providing several options as part of a decision making process. These types of systems will be discussed in

the following sections.

A. Expert Systems in Police Applications

An expert system can be used to make choices that would normally be performed by a domain expert. They have a wide range of collective knowledge, which could be classified as an artificial intelligence that could be saved in a computer containing knowledge that would be useful to the police officers [10]. The use of an expert system in the police force would help in resolving crime related cases, and considering that it has an artificial intelligence potential, with the help of an expert system police officers across the world can also be able to have access to any crime related databases from any location [10]. The expert system can be used to support investigations, especially since the increase of crime related data is becoming overwhelming sometimes leading to frustration when carrying out investigations [11]. The use of expert systems in the police force has helped in retrieving information when carrying out investigations, as seen in the case of the AICAMS a system which was built to identify suspects [1]. The AICAMS system was built with a facial recognition capability, which gives an ability to accumulate a varying number of conceivable facial composites by changing the size of the components - furthermore the AICAMS also has a mapping interface called geomapping [1]. Expert Systems can be categorised further into two types of system - Rule and Case based.

1) *Rule Based* : Some computer programs utilise an orthodox approach in problem-solving by making use of structured algorithms and data structures in discovering solutions, while conventional rule-based expert systems utilise human intelligence; knowledge exhibited by experts are most times based on rules or data that is stored in the computer. Thus for problems to be resolved, rules and data are required by the experts. For example, the type of expert system used to provide legal advice is known as a rule-based legal expert system. This type of rule-based expert system was used to fight crime against women in the India judicial system [12].

2) *Case Based*: Case-based reasoning frameworks are a method of demonstrating knowledge application through explicit historic cases in policing. This methodology is not the same as the rule-based based approach in light of the fact that the knowledge is not ordered and deciphered by an expert; rather, the experiences that formed the experts knowledge are specifically utilised as a part of making decisions. Notwithstanding, the issue with the case-based reasoning is learning, in light of the fact that with the insignificant expansion of new cases to information repository. Officers are continually searching for comparative cases to figure out how they were taken care of in the past, and this approach makes case-based reasoning systems an appealing application in policing. The use of this system in the police force has been found very helpful. However before the fourth stage (officer to application) can be productive, it has to be built upon a grounded knowledge of the police force [1]. Regardless, to resolve issues using this system a substantial level and size of

knowledge repository must be provided to support the related problems.

B. Decision support systems

Decision support systems can also be described as a predictive police patrolling; it is used by the police in order to reduce any form of criminal acts, and this system was created by the Spanish national police corps [13]. Since instinct is a major part of the police duty, the use of knowledge by the superintendent in the law enforcement sector has been proven to be a proficient tool in fighting crime [13]. Decision support systems are used by the police officers in making decisions, and particularly in the case of a emergency, having those decisions available at the right time, could help in resolving issues immediately. However these decisions may sometimes have a negative impact, therefore, making a wrong decision may sometimes lead to a deadly outcome [14]. However, considering that decision making is a sensitive and time-consuming process and the impact it could have on the quality of their response to services, it is sometimes required for the officers to utilise a decision support system [14]. The use of this system by the Indian police for example, has been in existence since 1986, where they implemented this system in order to help in investigations by providing the officers with extensive details on crime and criminal data within the state [15]. The San Francisco Police Department also implemented decision support systems in order to deploy officers for patrol - this system is used to forecasts hourly needs, and helps in scheduling police officers to take full advantage of their coverage and also helps to satisfy human needs. The process helps in the evaluation plan and sometimes suggest an alternative, the system has the ability to evaluate options for deployment strategy [16].

V. METHODOLOGY

In order to build a Knowledge-Based Management System for the Mauritian police, interviews were carried with two police officers to gather system requirements. The following sample of questions were asked:

- 1) Does the police have a way of exchanging information?
- 2) Does the police force encourage officers to exchange and share knowledge?
- 3) How does the police force currently manage information gathered during the course of duty?
- 4) What kind of information is being captured when storing criminal records?
- 5) What type of information is being captured when storing penalty details?
- 6) What kind of information is being captured during patrols?
- 7) Would you like a feature that would enable the citizens, to post information about any issues or suspicion of any form of crime activities?

Based on the findings, it was uncovered that they would like to adopt the approach of having a system which could enable them gain access to information on the move, whilst also

being simple to use at the station. In response to that, however the officers made it known that the police force were against mobile based systems as presented in [17], considering that if there is a case of any attack, it could lead to a breach of privacy once the attackers gain access to any form information. This would imply they would require a system with privacy by design, but indicated that it was not infallible in certain situations. After asking the officers if they would like a feature that would enable the citizens to post information about any issues, or suspicion of any form of crime activities, it was discovered that this type of knowledge sharing would be paramount. In response to the question, the officers revealed that the people of Mauritius prefer a face-to face approach in contacting the police officers because it makes them more confident, however they have implemented an email service specifically for complaints handling, and indicated that a web-based form based system with a searchable knowledge base would be advantageous for them. Overall, it was discovered that the police officers currently have to write on paper on the move, and the capture of information at the station on a computerised system with reasoning capabilities would aid them in their searching for the right information at the right time. In summary, it was highlighted that the police force would benefit from a system that could manage complaints and incident efficiently in a way that could be cross-referenced, prioritised and searched effectively.

VI. RECOMMENDATIONS

It was been understood that in police environments, database driven solutions play a significant role in managing and acquiring information. Research has shown that relational databases are being used by the officers for cases such as crimes, incidents, homicide, sexual crimes and assaults. Databases help to manage information which is being entered into the system and at the same time combine existing information that already exists in the system to aid search and recall. [18]. As such our solution follows this approach (Figure 1). The design of the system will help the police track the status and entering of information for both complaints made by the public and general incidents, which can also be used for crime scene management and follow-up.

VII. CONCLUSION

This paper presents a survey of information systems used in the police. This early stage work will be further developed into a prototype system which will be tested in conjunction with the Mauritian police in the future along with the creation of an expert system component and conversational agents to help capture complaints and incident information from the public.

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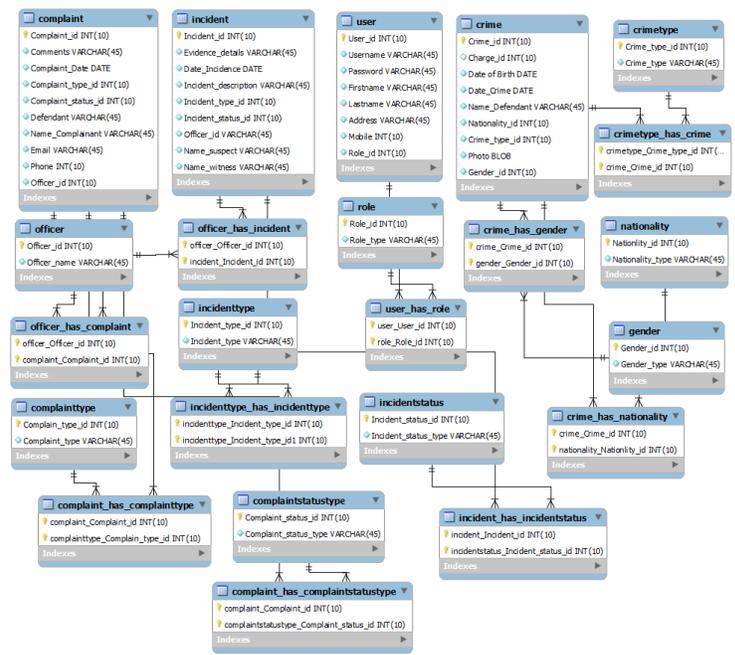


Fig. 1. Entity Relationship Diagram

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