41 Crime Indicators-Based Information System in Public and Judicial Management

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Improving crime prevention strategies is of high importance in public and judicial management and contributes to a better quality of human life. This paper presents an information system that was designed for monitoring crime indicators in order to improve decision-making tactics in crime prevention in public and judicial management. The developed information system can be used to store and process information regarding predefined crime indicators regarding several categories of crimes. Interpreting the variances of the proposed crime indicators can support decision making process. Furthermore, the system can help public managers to develop predictive models and perform crime risk assessment for protecting human life. This paper describes the developed application, its structure and the implementation technologies and also how it can be used in public management in adopting proactive measures regarding crime prevention policies. Considering the latest development of Information and Communication Technology (ICT) and the increased amount crime information, it is significant for the public authorities utilize an information system for managing this kind of data in order to evaluate crime associated issues and also to prevent crime expansion. Furthermore, the developed system can be used as a decision-making tool for applying more efficient crime prevention and urban management strategies.

41.1 Keywords:

Crime Indicators; Information System; Judicial Management; Public Management.

41.2 Introduction

Information and Communication Technology (ICT) has been adopted in public decision making strategies, since a large amount of information related to management issues must be processed, analyzed and stored [1][2]. Management information systems have promoted a more computerized way of data management and also the construction of improved decision making models according to the provided information [3][4][5].

Criminal actions have a negative impact on the society in many sectors such as public safety, tourism and economic development. Applying crime prevention strategies is very significant, especially in urban environments and contributes to an improved quality of life. Furthermore, crime violence is considered as a strong inhibitory factor in the citizens' activities and also for the people who want to visit the city [6][7].

The integration of crime indicators in public decision making strategies can facilitate the measurement of the public safety performance and promote sustainable crime prevention strategies [8][9].

Considering the increased amount of crime information in public management and planning and also the development of new information management systems, Information and Communication Technology (ICT), must be integrated in public and judicial administration, especially when an increased amount of crime data related to decision making must be processed and analyzed statistically.

In this research, an information system was developed for monitoring crime indicators and crime related factors (e.g. Socioeconomic factors) in public and judicial management for promoting sustainable safety management strategies by using several technologies for storing and elaborating the collected crime data. In the next sections, the system and its application framework are described.

41.3 Theoretical framework

41.3.1 Crime Indicators

Crime indicators are considered as a systematic approach for measuring and reporting on crime performance aiming at a reliable estimation of crime trends and in measuring urban sustainability [10][11]. Classifying crime into basic categories in a unified classification system have been investigated by the European Union authorities so as to construct an EU-level offence classification system with offence definitions [12]. Figure 1 shows a wide range of priority offences according to the EULOCS: The EU Level Offence Classification System.

	Offence Categories / Types
General offence categories / types	European Arrest Warrant (EAW)
	Crimes against Persons/Children
	Crimes within Eurojust Mandate
	Crimes within the EUROPOL mandate
	Cross-border offences
	Organized crime
	CTS and CVS indicators
	Traditional offences
	High volume offences
	EU-defined offences
	High level aggregated data
Specific Offence Categories / Types	Assault and battery
	Intentional homicide
	Rape
	Theft
	Motor vehicle theft
	Robbery
	Racist violence & related racist crimes, (including xenophobia, anti-semitic etc.)
	Offences against labour law
	Trafficking in Human Beings
	Smuggling of Migrants
	Drug law offences
	Terrorism
	Financing of terrorism
	Fraud and Money Laundering
	Fraud to insurance and the various categories of fraud
	Cross border fraud offences

Figure 1: Categorized offences according to EULOCS: The EU Level Offence Classification System[28].

[28] Source: https://ec.europa.eu/home-affairs/sites/homeaffairs/files/doc_centre/crime/docs/eulocs_en.pdf

Also, another organization, the United Nations Office on Drugs and Crime (UNODC) has classified crime by creating crime categories and subcategories as a tool against criminal activities. The developed crime classification was called International Classification of Crime for Statistical Purposes (ICCS). The ICCS is a classification structure of crimes with hierarchical categories which have a degree of similarity. The scope of the ICCS is to promote the comparability of the crime statistics at national and international levels.

UNODC has grouped criminal offences into homogenous categories, at four hierarchical levels: Levels 1, 2, 3 and 4. Level 1 categories were constructed to cover all criminal acts that constitute a crime. Criminal offences at Levels 2, 3 and 4 provide observations at more aggregated levels. Figure 2, shows level 1 crime categories designed by the United Nations Office on Drugs and Crime in order to cover all criminal acts.

	LEVEL 1 CATEGORIES
1	Acts leading to death or intending to cause death
2	Acts leading to harm or intending to cause harm to the person
3	Injurious acts of a sexual nature
4	Acts against property involving violence or threat against a person
5	Acts against property only
6	Acts involving controlled psychoactive substances or other drugs
7	Acts involving fraud, deception or corruption
8	Acts against public order, authority and provisions of the State
9	Acts against public safety and state security
10	Acts against the natural environment
11	Other criminal acts not elsewhere classified

Figure 2: Level 1 crime categories developed by the United Nations Office on Drugs and Crime to cover all criminal acts [29].

Furthermore, some countries and their police departments have classified crime into crime indicators in order to deal with crime statistics with a more formal way. For example, by the Toronto Police proposed the following crime indicators: assault, auto theft, break and enter, murder, sexual assault and theft over. Figure 3, shows the percentage change of the crime indicators proposed by the Toronto police from the year 2016 to the year 2017.

This research adopts a core set of crime indicators based on international crime practice and a secondary set of detailed offences rates that will be helpful in interpreting the core set of crime indicators. The core set of crime indicators consists of the following indicators: assault, auto theft, break and enter, murder, robbery, sexual assault and theft over.

[29] Source:http://www.unodc.org/unodc/index.html

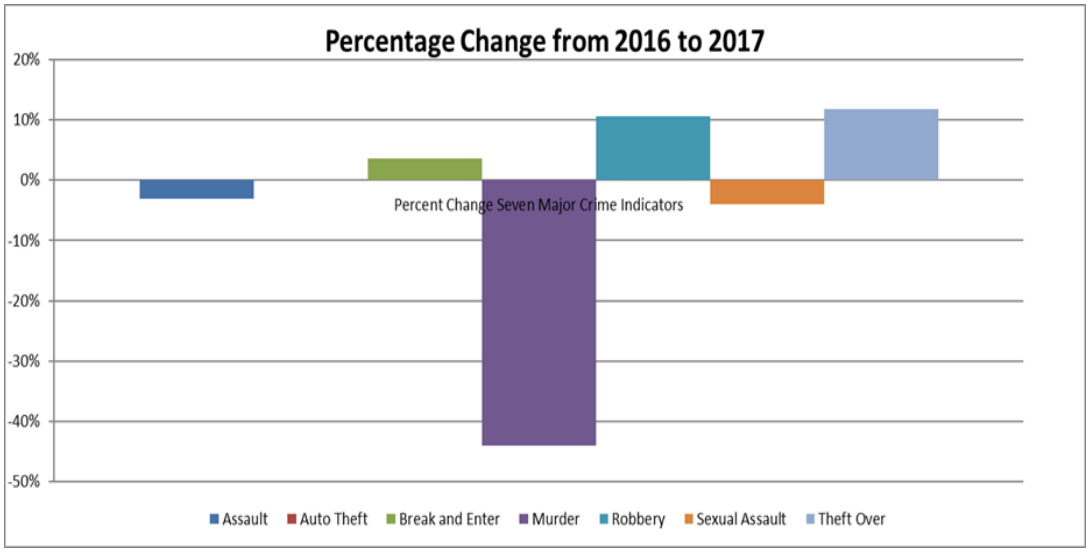

Figure 3: Percentage change of the crime indicators proposed by the Toronto police[30].

41.3.2 Crime Related Indicators

Several studies have shown a significant relationship between crime rates and socioeconomic factors such as unemployment, tourism, population and other factors [13][14][15]. For this reason, the system was designed by taking into consideration also other factors that affect crime.

Several socioeconomic indicators that affect crime rates were selected according to several studies. A research has shown that there is a positive relationship between unemployment rates and vehicle theft rates by examining twenty-two years of data in several States of USA [14]. Another study has examined the influence of unemployment on crime by using datasets of several European countries. The results have shown that unemployment has a positive impact on crime rates [15]. Moreover, several other researchers have shown that there are various factors that affect crime rates, such as population [16][17], poverty and income [18].

The crime related socioeconomic indicators that were selected for designing the systems' database according to the above researches are illustrated in table 1.

Category	Indicator
Demographic	Population
	Population density
Educational and cultural	Illiteracy rate
	Average schooling
Employment	Unemployment rate
	Average income
Income and poverty	GDP per capita
	Average familiar income
Tourism	Number of tourists per year

Table 1: The proposed set of the crime related indicators.

[30] Source: https://www.torontopolice.on.ca/statistics/crime_indicators.php

41.4 Information System Design

The first step in the system's design is to define the kinds of data that will be inserted and processed in the system's Database Management System (DBMS). The information system was designed to support all kinds of indicators proposed in the previous sections. Also, the system was designed to be flexible, since any new kinds of indicators can be added to the system. The system was designed to support data regarding the crime indicators (value, region, time that was measured, unit, etc.). Also, the system was designed to store predicted values of the crime indicators. This is helpful when crime indicators are predicted by several kinds of methods (e.g. By using neural networks). This helps the stakeholders and the public managers to adopt crime prevention strategies.

Several researches have shown a positive relationship between crime rates and other factors such as poverty, unemployment, tourism, population and other factors [13][14]. For this reason, the system's database was designed in order to store also other factors that affect crime indicators such as: socioeconomic factors.

41.5 Implementation Technologies

The system was implemented by utilizing a Database Management System (DBMS) and several other technologies and programming tools. Visual C Sharp was used as a programming language in order to build the forms of the application. Visual C Sharp is an object-oriented programming language which permits the utilization of objects of many kinds (ActiveX Data Objects, Data Access Objects, etc.) in order to build the GUI (Graphical User Interface) of the system [19]. Microsoft SQL Server was utilized as a database management system which is considered as one of the most reliable database management systems. Microsoft .NET Framework was used as a framework for constructing the application.

41.6 Results and Discussion

Considering that the public safety management strategies include the interpretation of several urban indicators in order to adopt the most suitable strategies for protecting the citizens, a prototype information system was designed to facilitate the decision-making process in crime prevention and safety management.

The developed system provides a more computerized way of monitoring and managing crime indicators and crime related data of several kinds. The data can be inserted, stored and processed in the searchable database of the system.

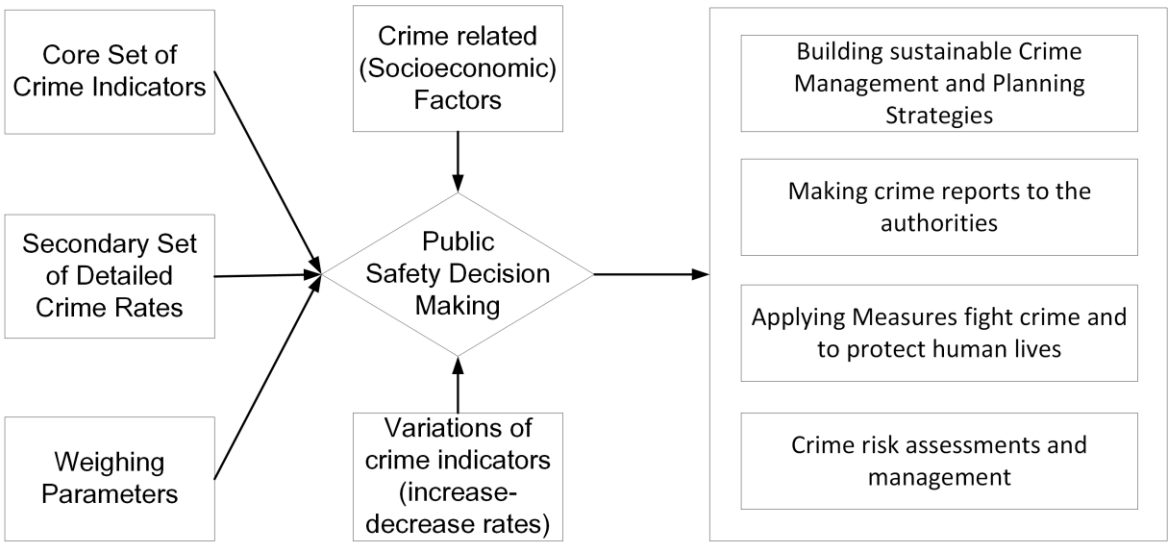

Figure 4: The proposed model of using the developed system.

Figure 4 illustrates the proposed model for using the developed crime indicators information system. The collected crime data regarding the core crime indicators, the detailed crime data of every crime and the crime related factors (unemployment, poverty, etc.) as they were described in section 2.2, are inserted into the system's database. The decision makers can put weights in the crime indicators (for example weights according to the severity of every crime indictor by using Wolfgang Crime Severity Index [20]) to calculate the total crime impact when they have to make a decision about a crime related issue.

The decision-making process includes the development of the optimal strategies for building the best decision making models by weighing the inserted data about the crime data. The constructed decision making models are useful in order to adopt sustainable public and judicial management strategies, and also to make reports to the authorities (Ministry of Justice, judicial authorities in investigating crime cases, etc.). Furthermore, the system can be used to facilitate the stakeholders in taking crime prevention measures in order to protect the human lives and also to perform crime risk assessments for evaluating the degree of the public safety for the citizens and the tourists.

Also, the system supports the insertion of every kind of crime data and not only crime indicators, which helps the stakeholders and public and police managers to investigate the connection between an indicator and the levels of another crime factor and also this helps managers to produce new sets of crime indicators.

The advantage of the developed information system compared to others [21][22] is that authorities and the stakeholders can take into consideration multiple factors: crime indicators, crime related socioeconomic indicators in order to facilitate a sustainable decision making in crime issues in a more holistic way.

Another advantage is that the system can be easily used to extract datasets that can be used when sending reports to the public and judicial authorities. Also, the system can manage a large number of data compared to the traditional decision making applications.

By using the developed system, crime data regarding crime indicators and crime rates for every offence can be monitored (in order to adopt crime prevention strategies in regions where crime indicator levels are too high) and analyzed in order to adopt the

adequate public safety strategies for protecting the human lives and for advancing the prosperity of life.

41.7 Conclusions

The rapid development of Information and Communication Technology (ICT) has led to the construction of new information systems for supporting decision making tactics regarding public management issues [5][23].

Several researches have shown that the development of sets of indicators can be used for implementing sustainable management practices in several sectors of public management and planning [11][24].

Considering the development of Information and Communication Technology (ICT) and the highly-increased amount of crime data, and also the development of new information systems for managing and monitoring data, it is very important for public administration to utilize an information system, like the one described in this paper, that will manage all crime – related data regarding also indicators which will help to perform crime risk assessments about the safety dangers in a more holistic way by using the collected data.

The significance of the crime indicators is very high for evaluating possible public safety dangers and also for helping public administration to adopt crime prevention, management and planning strategies.

Also, monitoring and interpreting the levels of the crime indicators through the developed information system can be utilized as a tool for a more efficient crime and urban management. Furthermore, the system provides information about factors connected to crime such as socioeconomic factors and demographic factors useful in public decision making for assessing crime prevention models.

This research contributes to the prevention of the negative impacts of crime on human lives by monitoring and processing crime indicators and crime related data in order to help the public authorities and stakeholders to adopt the adequate strategies for fighting crime and preventing crime expansion.

41.8 References

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