The Role of Information and Communication Technology in Crime Combat- A Case of Yemen

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Abstract **The rate of crime manifests a significant obstacle for police forces in Yemen. Especially nowadays that our communication mostly revolves around the internet, it has triggered a spike in crime activities targeting citizens, businesses and even government bodies. This study's main objective is to analyze the ICT tools available at the hands of the law enforcement agencies and introduce potential tools that can prove valuable in the near future. In developed countries, ICT has been successfully integrated into public safety and the legislation has even been updated to streamline ICT with law enforcement activities by allowing police to collect evidence on crimes carried out in the internet, however, Yemen is still behind in this and is yet to adopt this effective technology. This paper is based on secondary data collected from the internet, as well as, major survey findings that have already been published through Yemen's Polling Center (2013). Field work conducted between November and December 2012. This study has exposed a gap between the rapid growth of criminal activities and the current tools available with law enforcement towards fighting these crimes. ICT has various technologies which act as tools that can be utilized in combating crime. For example: CCTV, Social Media, GPS and GIS tracking technologies. All these tools are anchored by one vital aspect, which is ICT. It is also crucial that this information be accurate, timely and accessible. In order for Yemen to close the apparent gap between the growing crimes and its lack of modern crime fighting technologies, it must adopt ICT on a large scale.**

Keywords —: ICT, crime, Yemen. CCTV, Social Media, GPS and GIS tracking technologies

I. INTRODUCTION

Crime is broadly defined as actions which are seen as abnormal in a society a person is brought up in. In legal terms, crime is an action which harms other people or the society. Crimes are punishable by law, however some crimes have more severe punishments than others. [1]

In our modern day times, an innovative technology has been introduced which changed our perspective in all areas of life. This technology is named ICT (Information & Communication Technology). ICT is simply an extension of IT (Information Technology). [2]

The concept of ICT is quite broad and its elements still maturing. Nonetheless, the essence of ICT revolves around the following processes: The Storage, retrieval, manipulation, transmission and receive of information through digital means. For example, via computers and digital TVs. [3]

Unfortunately, with the continuous advancements in technology, sophisticated and frequent crimes swiftly

follow. The criminals have gone high tech, and in order to maintain public security and preserve human life, it is critical that law enforcement utilize technological breakthroughs such as: CCTV and Tracking systems to combat the spreading crimes.

The scenario in Yemen is as follows: Local police forces cannot provide adequate security to the citizens in Yemen due to several hindering inefficiencies. A few of these inefficiencies is the pardoning of high status individuals, or even common citizens who happen to be in good relations with high status individuals. Another problem is the insufficient manpower which delays the police' response to reported crimes. A police officer in Yemen stated that they had captured a famous drug dealer several times but find themselves soon to release him due to unexplainable orders from the higher ups.[4]

Enhancing security to reduce crimes is a necessity from the Yemeni society's perspective. There must be reciprocation from both the government and the general public for effective utilization of ICT. Knowledge from the citizens which may be via the government's attempt to spread awareness through campaigns and advertisements. Furthermore, there can be a social media platform that allows the public to report any crimes they witness to a server under the government's control.

Law enforcement agencies are under continuous pressure to combat crime. The low-resource issue in the police magnifies this pressure immensely. However, detecting the crime through machine learning and data mining approaches can be used to promote citizens' safety and assist security agencies in knowledge-driven decision support. This will help them focus their resources optimally and pave a path to a safer society.

II. LITERATURE REVIEW

According to Bequai's paper which speaks about the twenty-first century, communication and commercial advancement are on a perpetual rise. Barriers are disappearing, whether they be in the form of physical entry, tariff rates or information sharing. This apparent change is dubbed as the globalization phenomena. Furthermore, the potential this provides for people from different occupations or status in life is shy under limitless. Whether it is business- people seeking to expand overseas, tourists interested in experiencing new cultures, students and researchers who want to gain knowledge from different sources, the globalization phenomena have unlocked an abundance of possibilities. This boon of good possibilities, has unfortunately, been followed by a certain level of criminal activities. Such crimes include: Weapon smuggling, financial crimes, cyber-crimes, drug and human trafficking.[5]. Crime has exponentially grown to the extent

that it is considered a $1 trillion business[6].

An example of a government utilizing technology is England. Their use of ICT has shown significant positive impacts on not just how they fight, but also to prevent crime, as what common sense dictates: prevention is better than cure. Police nowadays make use of CCTV cameras to monitor road traffic in case of any abnormalities, video proof can be used in court. The Metropolitan Police in London has a CCTV system of the M25, including all the routes leading to and away from London. This system is considered one of the largest being implemented so far[7].

Another example is the Australian police force. They have gathered data from several parts of the city and indicated the areas with frequent crimes as "hotspot" areas. They then deploy patrol units in these hotspot areas to assure quick response rates during a crime. The police attempts to prevent crimes by sending messages to any large organized parties that they are under surveillance. This reminder acts as a warning not to attempt anything rash or harmful[8].

In almost all the developed countries, there is a central database that has details of all citizens and has links to other databases such as the car registration database held at the Drivers Vehicle Licensing Agency and to another powerful computer running the Automated Fingerprint Identification system. This integrated system helps in tracking down and controlling crime.

One more country making good use of ICT is Jamaica. They have done so by upgrading the Palm and Fingerprint Identification System (APFIS) which required around $260 million. Jamaica also implemented a Blackberry law enforcement database which was installed in around 500 handsets that belong to traffic personnel. This blackberry law verifies driver license and vehicle documents authenticity. Furthermore, they have upgraded their analog radio system into a digital system which has given them a profound amount of crime management tools at their disposal[9].

Italy has come forward in adopting ICT via the use of new systems. The location intelligence and the business system primarily focus on enhancing the overall crime fighting actions the government enforces. The Italian ministry's department of Public Security has utilized an advanced business intelligence system which is based on Oracle's business intelligence software. The software evaluates and analysis all elements of a crime such as the victim, the location, the timing, date and type of crime. This new system accommodates a rapid update of progress in

many criminal cases in the Italian scenario[10].

The USA has integrated GPS technology in its crime prevention strategy. The invaluable benefit of GPS in providing accurate locations of individuals, vehicles and events, promotes an array of tactical solutions at the government's disposal in fighting crime. A few examples of GPS's implementation in crime fighting is: tactical deployments, emergency responses, accident detection, person and vehicle tracking[11].

A. CCTV Technology

Dr. Sedat Kula's study evaluates the fear of committing crime in retrospect to installing CCTV's and police influence. 392 respondents from Ankara, Turkey were surveyed and a linear regression model was conducted to assume the perceived citizen safety levels via the influence of CCTVs, police presence, and privacy invasion within the confines of age, income, marital status, and education level variables. This study concluded that there is a positive correlation between the police presence and the citizens' reduced fear of being crime victims[12].

This research [13] delves into the online social network aspect in crime detection. The Twitter platform was the subject of the study. It is an online mini-blogging platform where users post short updates, also called "tweets". These tweets signal valuable information about the person behind the tweet. A filter was used to collect tweets from cities in the USA which were known to be the most dangerous or safest. A correlation between the tweets and crime occurred was seen via a geographic analysis. The period of the analysis was 20 days, in which 100,000 crime-related tweets were observed. A technique called "Sentiment analysis" was conducted to analyze a location's crime intensity. This study did help in indicating apparent crime patterns, it was not always on the mark. The study concluded by how it can be applied by improving text processing methods.

B. ICT and Public Safety.

The paper 14 Summarizes ICT's evolution in terms of public safety. This includes any trends, perks, any difficulties and future requirements. There is a continuous research into the link between increasing public safety via ICT with human involvement. The increased complexity of disaster variables which magnify prediction and detection efforts, has massively increased the need for an inter-related and reliable system of infrastructure. Elements such as policies and practical application must be in harmony.

This Paper [14] has revealed that cities in modern day must fight an array of threats such as shootings, terrorism

activities and even natural disasters. For cities to wither down the damages these issues cause, they require real-time information gathering and reliable systems of prediction. Integrated public infrastructure security for example, can accommodate such requirements. It provides a comprehensive framework which puts all the necessaries elements into harmony. That is, providing access to real-time visual, audio and location-based information. Such tools empower the government with a heavy arsenal to combat elusive crime.

C. GIS Technology

Current days have shown an increase in rural-urban migration. This has to lead to both positive and negative impacts on the migrated-to urban environments. Social crimes like terrorism, prostitution and drug gangs have been a result of the overwhelming increase in rural-urban migration. By the aid of Geoinformatic technology (ArcGIS & IL WIS software), in Benin City concluded that some areas are more prone to crime than others. The study indicates a questionnaire that the following reasons were the reason for rural urban migration: 33% said due to higher incomes, 24% higher employment rates, 15% better life quality, 10% an environment change, 9% for other reasons. The study also showed that the following are the major crimes in the city: 29% armed robbery, 22% burglary, 19% rape, 15% pick-pocketing, 4% murder and 11% for other crimes. A suggestion to this predicament is to lower the indiscriminate approval of rural-urban migration by the authorities[15].

The rise of poverty along with urbanization tripled by security challenges has propagated crime occurrences. The study [16] emphasizes on applying GIS as a mapping tool for hotspot crime areas in Akure, Nigeria. The study is based on secondary data that is literatures, journals and crime reports from the internet and the local police force archives. After the implementation of the analysis methods, it was seen that a transport route passing through Akure had high crime rates. The study concluded with the suggestion of police officials to be trained further in GIS crime fighting.

Studying the planet Earth has led to the introduction of Geographic Information System (GIS) where digital maps and spatial data are used to visualize the remote environment. This in turn, provides a platform to take decisions in regards to the geographical location. An example is hotspot analysis mentioned earlier which measures the area which has the highest rate of crime. Hotspot analysis is classified into: Spatial analysis and Interpolation autocorrelation. The paper delves into "Kernel density estimation", "Inverse distance weighted" and "Getis- Ord Gi" methods. These methods have been used in the city of Aurangabad of Maharashtra state to measure

hotpots of murder, day and night house break.[17]

III. METHODOLOGY

The research methodology is based on secondary data collected from the internet, as well as, major survey findings that have already been published through Yemen's Polling Center (2013) addressing security issues in Yemen. Field work conducted between November and December 2012:

The YPC 2013 survey, which was performed between November and December 2012 and targeted 2,000 respondents over the age of 18 (50 percent women) in all Yemeni cities (excluding Socotra), was developed in partnership with the Restructuring Committee of the Ministry of the Interior.

YPC conducted the survey using face-to-face interviews. The women were solely interviewed by women in this interview, and all counters were from the region where the poll was done (allowing them to speak, comprehend, and obtain the requirement for networks in the local language decreases the risk to their security). The target area is selected from 146,000 population units in Yemen based on a simple random sample according to the population of the province. In Yemen, the poll reflects the rural/urban divide, with around 72 percent of the survey taking place in rural regions.
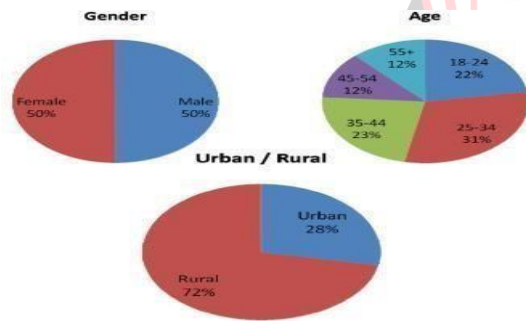

Figure. 1. Demographics of the sample

The sample was equally divided in term of gender, with 18- 24 yr olds making up (22%), 25-34 yr olds (31%), 35-44 yr olds (23%), 45-54 yr olds (12) and 55+ yr olds making up (12%). Out of this sample (28%) of the individuals are from the urban part and (72%) are from the rural parts of Yemen.

IV. RESULTS AND DISCUSSION

A. ISSUES AND THE SECURITY SITUATION

The respondents were briefed on certain issues and were asked their opinion on whether the security situation was getting worse or improving. The conclusion was (38.87%) said it was getting worse, (38.16%) were of the opinion that it is getting better and (22.95%) were neutral in the discussion. The same respondents were asked whether the

security situation has improved or deteriorated in comparison to last year, (14.91%) said it has deteriorated, (55.11%) said it has improved and (29.7%) think it has neither improved nor deteriorated.
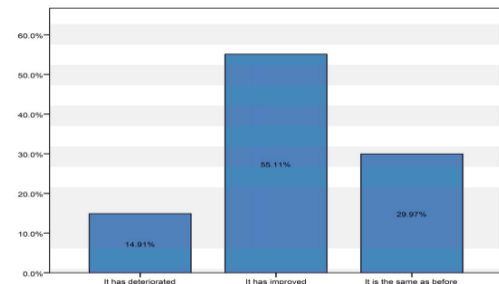

Figure. 2. security status Comparison Diagram

The respondents were asked on how safe they personally feel? Their answer revealed that 44.7% always safe, 27.7% mostly safe, 11.25% neither safe nor unsafe, 11.40% mostly unsafe while 4.94% always unsafe.
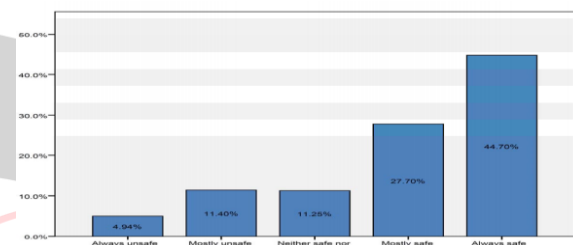

Figure. 3. Personal Safety Diagram

The respondents were asked on whether they have visited police to report crime or not? Their answer revealed that 87.6% answered no and 12.4% answered yes, then they were asked on whether they have visited police for administrative purpose? Their answer revealed that 83.1% answered no and 16.9% answered yes, and finally they were asked onwhether they have visited police to obtain information? Their answer revealed that 97.9% answered no and 2.1% answered yes
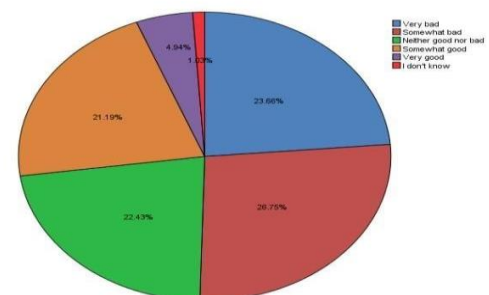

Figure. 4. impression about police act diagram

The respondents who stated that they have visited the police were asked about their impression of the police response? Their answer revealed that 23.66% they feel very bad, 26.75% somewhat bad, 22.43% neither good nor bad, 21.19% somewhat feel good, 4.9% feel very good while

1.03% they don't know.

In the last 2 years, have you visited a police station...

		Percentage
To report a crime/ resolve a problem	Yes	12.4%
	No	87.6%
For administrative purposes	Yes	16.9%
	No	83.1%
To obtain information	Yes	2.1%
	No	97.9%

Figure. 5. Whether visited police station or not diagram

Those who said they have gone to the police in the recent two years to report a crime? The number of individuals who said yes was 12.4 percent, and the number of people who said no to addressing an issue was 87.6 percent. 16.9 percent of respondents said they had visited the police in the recent two years for administrative purposes, while 83.1 percent said they had not. People who went to the police in the previous two years to get information were 2.1 percent, while 97.9 percent did not go to the police and did not get any information.

What was the most significant crime? (open question)
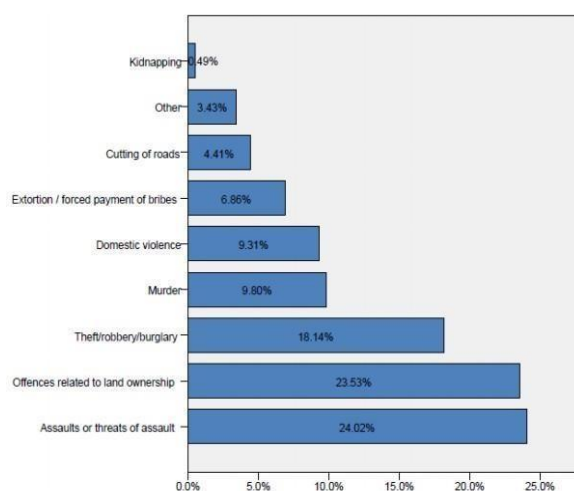

Figure. 6. Crimes list diagram

This diagram shows that the most significant crime the respondents report to the police; Assaults or threats of assaults comes as the worst crime with 24.02%. kidnapping crime is considered to be a rare crime with the rate of 0.49% of the respondents and so on.

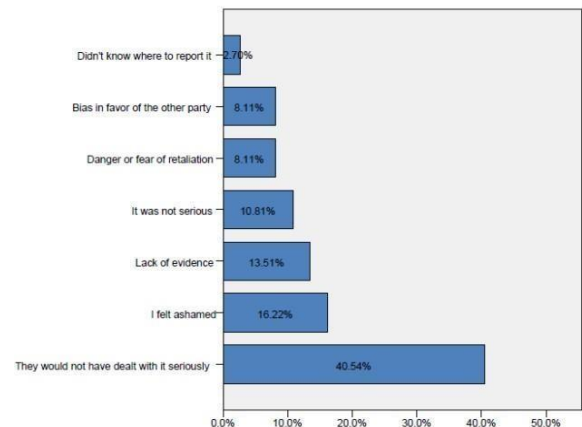### Why did you not report it to the police?

Figure. 7. reasons not to report crimes

This diagram shows the reasons why the respondents didn't report crimes and incidents to the police, 2.76% of the respondents didn't know where to report it, 40.54% they don't consider the crimes seriously, and so on

B. LACK OF ICT KNOWLEDGE

The respondents were asked on whether law, security and police officers lack of ICT knowledge had a direct effect on crime detection and prevention. The survey revealed that 5.5% not sure, 15% disagree, 50.52% agreed while 30% strongly agreed. Reports published by the UN support this opinion, that a more comprehensive and integrated approach in ICT security is necessary in the fight against crime in Yemen.

Furthermore, there are prerequisites that the security agencies require which include: a solid legal framework, a strong pool of cyber security professionals that have expertise in system and network administration, penetrate testing, security audit, forensic investigation, information security and software development to deal with any foregoing obstacles of both conventional and cyber-crime.

The battle against crime is an ongoing battle, even today. And in modern time, law enforcement agents have a wide variety of tools to aid them in this battle. Yemen must follow suite and obtain these tools. In order to fulfill investigation and prosecution criteria, it is important to utilize the following technologies: CCTV, tracking, social media and mobile phone. They are cost efficient, easy to install and maintain. Modern day crime has become without borders, thus making criminal investigation more complex and sophisticated. For Yemen to counter against modern day crime, it must follow the steps of the developed countries in equipping themselves with ICT to fight crime.
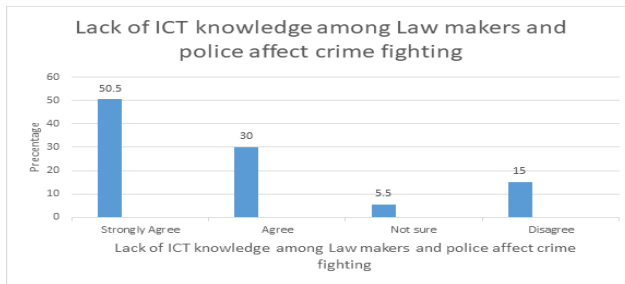
Figure. 8. Lack of ICT knowledge among Law makers and police affect crime fighting.

Another survey was implemented as part of YPC 's IcSP- funded project 'Re-building Peace and Security in Yemen' (duration: 03/2016 – 02/2019) •4,000 respondents (50% women) in all governorates except Sa'da and Socotra

Aims: to understand the role of the "security sector on the local level.

C. ICT Tools to use and Recommendations

Police in Yemen must work to enhance security professionality in order to gain the trust of the people due to both political turmoil and subsequent economic hardships, through 2012 the crime level in Sana'a was 120% higher than the year before.94 Most of the serious criminal activity was concentrated in areas on the outskirts of Sana'a city.95. The police need to reinforce an image that portrays them as an arbiter of people's needs. To successfully do this they need to come from within their midst. YPC data shows that 10% of the respondents were victims of a crime within the last two years. 73% of these crimes were reported to the police. The ones who did not report the crime to the police believed the police would not have dealt with the issue seriously. The ones who did report the crime to the police were mostly satisfied with the service provided (63% were very satisfied), however. This shows that the police need to improve its image in public and build more trust amongst citizens. It is striking that considering female respondents only, 80% did not report the crime, with 42% stating that they would report the crime if there was a women's unit at the police station.[18]

ICT tools used in crime fighting are quite easy and have been used frequently in developed countries. In Yemen however, the general mentality must also be channeled towards using such technology. Crime nowadays is often caught by tools used every day by the common citizen. Yemen can easily adopt these already available tools that have proven effective in catching crime.

D. CCTV Technology

Closed circuit television (CCTV) cameras are a necessity and should ideally be installed in public highways, shopping malls and arcades. The cameras monitor every event around its scope of view around the clock. It is also used by the police in monitoring road traffic. The police

can also utilize CCTV in surveillance of any suspected places under investigation. This type of CCTV operation is remote in nature and do not require police officers to be physically present in surveilled areas. It can be used in patrol management, individual and vehicle tracking, as well as, gunshot detection.

E. Tracking Technology

GPS in the old times were large and expensive, which was impractical for sensitive operations. Nowadays however, GPS devices miniscule in size can be placed anywhere without raising suspicion. With these small devices, police forces can swiftly locate the perpetrators location. Mobile phones also send signals to cell towers continuously, which expose a suspect's whereabouts at a certain timestamp. This information can be used as evidence in a court which has managed to put many criminals in jail.[19]

F. Social Media

Social media provides an amplified platform to spread information quickly, whether it is report of a crime or location of a fugitive. By sharing the perpetrator's image on social media, law enforcement is highly likely to get tips on said perpetrator. Social media can also be used to warn citizens of certain areas at certain times.

G. Mobile Phones

Modern home or vehicular systems can be linked via smartphones to get instant alerts of any unauthorized entry of the property. A bonus to this is that it can also be linked to law enforcement agents so that the property owners do not need to call the police in case a robbery or break-in has occurred. The police may even be able to respond before the criminal flees the scene.

V. CONCLUSION

ICT security is necessary in the fight against crime in Yemen. Furthermore, there are prerequisites that the security agencies require which include: a solid legal framework, a strong pool of cyber security professionals that have expertise in system and network administration, penetrate testing, security audit, forensic investigation, information security and software development to deal with any foregoing obstacles of both conventional and cyber-crime. The battle against crime is an ongoing battle, even today. And in modern time, law enforcement agents have a wide variety of tools to aid them in this battle. Yemen must follow suite and obtain these tools. In order to fulfill investigation and prosecution criteria, it is important to utilize the following technologies: CCTV, tracking, social media and mobile phone. They are cost efficient, easy to install and maintain. Modern day crime has become without

borders, thus making criminal investigation more complex and sophisticated. For Yemen to counter against modern day crime, it must follow the steps of the developed countries in equipping themselves with ICT to fight crime.

Crime today is borderless in nature and this makes criminal investigations more complicated for law enforcement authorities. To effectively tackle crime, Yemen leaders need to learn from the steps taking by most developed countries in using ICT combat crime.

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