The Capacity of the Available Forensic Equipment's to Produce Evidence of Real Suspects: A Case of Ilala District

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Abstract

Forensic investigation in the past has largely been concentrated on serious crime like rape and murder. Forensic science is normally seen to act as a "Watch Dog" on community's behalf against all abuse and risks that may threaten it. The forensic science service laboratory is among of the essential aspect needed by the community. All over the world, the forensic science laboratories is given priority to make sure that physical evidence are processed in researching for the truth. This study examined the capacity of the available forensic equipment's to produce evidence of real suspects in Ilala District. The research adopted a survey research design as well as mixed research approach. The sample size of the study was 76 respondents who were selected using the stratified random sampling technique. Structured questionnaires and interviews were used for data collection. Data were analyzed by Descriptive statistics and content analysis. Findings indicated that the available forensic equipment had a capacity to produce evidence of real suspects since the tools have high speed, have large memory, has an ability to examine large and integrated with various software for data sharing. The study recommends that the forensic science laboratories should be well maintained and instruments be updated to fit the current technology so that they maintain capacity to produce evidence of real suspects. Finally the study recommends that the forensic science laboratories should be frequently used to examine evidences for cases that require fingerprint or DNA examination. This in turn will reduce biases in evidence and will facilitate easy and quick crime investigation decisions.

Key Words: Forensic Science Laboratory, Crimes Investigations

1.0 Introduction

Forensic investigation in the past has largely been concentrated on serious crime like rape and murder. Forensic science is normally seen to act as a "Watch Dog" on community's behalf against all abuse and risks that may threaten it (Sarki, 2020). The forensic science service laboratory is among of the essential aspect needed by the community. All over the world, the forensic science laboratories is given priority to make sure that physical evidence are processed in researching for the truth (Tuladhar, 2021). "Man can tell a lie but the physical evidence not". Physical evidences are required as evidence in the in court because it has no biases since it is scientific. It is from this context, many countries in the world has recognized and put forth the use of forensic science laboratory in order to search for unbiased physical evidence. For a very long time, governments in different nations have been working on the forensic science. Nepal Police for instance, established Forensic Science Laboratory in 1960 (De Ungria and Jose, 2020). Due to its importance, the country over years has been initiating several centers for forensic laboratories. This has helped the country to process physical evidence.

By 2005 in India, more than five hundred thousand cases were left without judgment for some times waiting for physical evidences from the forensic science laboratories. This situation of having many un-judged cases has increased the number of cases with no judgment from 700,000 to 800,000 cases. This situation occurred because of there were many referral cases to the forensic science laboratories in India is almost 10 to 12% of the total amount of the cases from different states of the country. This implies that more registered cases will also need forensic laboratory investigation, means that the pending cases will continue to pile up for almost eight times from the current situation.

Also it should be clearly noted that DNA and toxicology reports has been not processed from the forensic science laboratories for almost six month to two years. This has increased the number of cases which are pending thus their process of decision-making in the courts remain slow. In this way, 50 to 60 thousand bodies which are not identified are reported yearly. The identification of these bodies requires DNA tests (Kathane, 2021).

Various studies have been conducted on forensic science laboratory and quicker crimes investigations decisions worldwide; For instance, Zhai, Zhang and Hua (2020) argue that forensic science laboratory is effective in quicker crimes investigations decisions. And also indicated that development of forensic science laboratory ideals in China has been conducted for 30 years and above, the process has been successful in in getting evidences for the cases that need forensic science investigation. Conducting these forensic science investigations has been used in different parts of the world to get evidences then after get conclusions which are useful in the court. The situation has improved the way decisions are made.

In Australia, McNevin (2020) found that most crimes are quickly investigated and more evidence are proved in the court because of the application of forensic science laboratory. It was also indicated that DNA profiling is among of the efficiency and effective development in forensic science and Forensic Bureau Laboratory (FBL). The government has put more emphasis to strengthen the forensic science laboratory standards for quick crime investigation and accurate evidence in the court. Similarly, Roux, et al, (2018) added that, forensic science has impacted greatly on the way justice matters are handled and investigated in many parts of the world including Bulgaria. It was noted that forensic science laboratory has reduced the delay in cases to a large extent.

Moreover, Sarki and Saat (2020) examined the Nigeria Police and forensic criminal investigations. It was revealed that the application of forensic science in criminal investigation has continued to be useful in Nigerian Police because it assist to improve the investigation process and become more objective and reliable process. The study found that through forensic science, decisions about an investigation becomes easy and quick with minimization of errors. Similarly, Apau and Koranteng (2020) who investigated the infrastructure for forensic investigation in Ghana pointed out that, the forensic science laboratory lacks effectiveness in quick crime investigation decisions because of the lack of requisite capacity. It was revealed that to increase effectiveness, high investments should be organized to enhance the sizes of applicable investigating institutions.

In their study on social learning perspectives on challenges for digital forensics and the factors that affect cybercrime investigation in Kenya, Odoyo, Abeka and Liyala (2020) indicated that the Kenya Police force strive to simplify crime investigation through forensic sciences. It is however that there are myriads of

challenges affecting its effectiveness including inadequate skills for users. Komar, Parra and El Jundi (2020) on the other hand indicated that the evidences from the forensic scientific investigations have been removed when investigating the genocide cases. This removal has slowed down that the investigation in Rwanda which required the forensic science laboratories investigations. It was recommended that for effective, quick decisions in crime investigation, forensic science laboratory is inevitable.

Tanzania like other global population members has adopted the application of forensic science techniques in identification, prosecution and conviction of suspects of the crime of homicide (Makulilo, 2020). This is for only murder cases that are complex where apart from the accused persons, lacks other witnesses that can confidently and associated the criminal to the crime scene. In these circumstances one would wish a dead person to rise and name the culprits involved. This is not possible the only techniques are to use forensic technology to get trace evidences from the place where the crime was done in order to make an association between the accused and the scenario and so confirm the existing circumstantial evidence (The Government Chemist Laboratory Act 2014 and the Cybercrimes Act, 2015).

In most countries, like Tanzania, forensic science laboratory are significant component of criminal investigations and justice administration which are funded by the public. The Forensic Science Laboratory examines, repots and makes an interpretation of physical evidence in issues related to criminal from the aim of providing scientific evidences in relation to the case. Forensic science laboratory receives requests for forensic services from a various sources including the law enforcement officials, police, advocates, medical examiners and correctional facilities (Omari, 2017).

Though there are numerous creativities taken by government to make things clear but there are still rumors from the community members on the criminal justice system. This is because the system releases person who are believed to be guilty of homicide due to the failure to meet the average of evidence beyond the reasonable doughty. Taking the case of Tanzanian Republic against ACP Abdallah Zombe and 12 others as an example, The High Court of Tanzania at Dar es Salaam, Criminal Sessions Case No. 26 of 2006 illustrates contamination of forensic evidence. This case involved the killing of four gemstones' businessmen by 'the order of the superior'. In this case four businessmen were arrested and falsely linked with an armed robbery (LHRC and Tanzania Human Rights Report, 2015).

Several people are wrongly sentenced and executed for offence they did not do. This end up with the individual who has been sentenced and executed wrongly suffering in jail for offence they have not done; all these happen because of evidence from forensic science found at the scenes of crime (Makulilo, 2020). The big issue here is the justice to have insufficient application of forensic science during the investigation time which is normally done by the police division and this problem has been existing throughout the years with what looks like no end in sight (Adam, 2016).

Tanzania has made a major step in crime investigation through the application of forensic science laboratory.

> *The adoption of forensic science laboratory in crime investigation decisions replaced the manual way of crime investigation decision which was full of challenges including the delay of cases in the court. The use of forensic science laboratory facilitates quickly decision making on cases, transparency, cross-referencing and efficient operations of criminal investigations* (Horsman, 2017; Teri, 2016).

Despite the use of forensic science laboratory on quicker crimes investigations decisions, crimes investigations decisions in Tanzania have been delaying as reported by TPF cybercrime unit (2018). The delay has resulted to the increase in rumors from the community members on the criminal justice system (LHRC and Tanzania Human Rights Report, 2015). The scenario gives an expression that the effectiveness of forensic science laboratory on quicker crimes investigations decisions has not been addressed. It is from this context, the researcher examined the capacity of the available forensic equipment's to produce evidence of real suspects in Ilala District

2.0 LITERATURE REVIEW

Theoretical Review

The study was guided by the integrated digital investigation model (IDIP). The IDIP was proposed by Brian Carrier. The model assumes that crime investigation through the use of digital tools becomes successful when the five steps are well followed by the investigators. Prayudi and Riadi (2018) argue that the model organizes the process of investigation into five phases. The first is the readiness phases. The aim of the first phase was to make sure the operations and infrastructure are able to support fully an investigation procedure. The phase makes sure that the personnel involved have been trained and have adequate skills to handle issues when there is an occurrence of an incidence. This goes hand in hand with the improvement of all the necessary tools and infrastructures to make investigations. The tools may include things like card readers and video cameras are well installed, are in good condition and work properly. The second phase was the deployment phase. The aim of this phase is to come up with some strategies for an incidence through which the evidences should be confirmed.

The third phase was the physical scene of crime investigation phase. Lone and Mir (2019) indicated that, the purpose of these goals was to gather, and make analysis of the evidences found in order to build the actions which occurred during the incident. This phase had the functioning of preserving the scenes in order to keep the evidences which have been noted to be used in later stages. This is normally done by trained personnel who have knowledge on the collection of evidences, processing evidences and making the evidence well interpreted for easy understanding. The collection of these pieces of evidence can be done through taking photos or drawings depending on the nature of the incidence occurred. All these processes help to come up with the clear picture about the incident.

Phase four was the digital scene of crime investigation phase. The phase's main function is to gather and make an analysis of electronic evidence which were gathered using other different techniques. According to Servida and Casey (2019), the digital scene of crime investigation phase preserves the digital scene of crime in order for the evidence to be coordinated for additional evidence. In this case those who investigate the scenario transmit the information outside the place where the event occurred and including it in the real scene. This is the point where the investigators conduct the in-depth analysis of the evidence. This therefore establishes the hypothesis of the scene.

This phase also is involving the presentation of the identified evidences which were initially found by the team of investigators (Olajide, Al-Hadrami and James-Taylor, 2018). Therefore, this model guided the current study since the researcher intended to assess the effectiveness of forensic science laboratory on quicker crimes investigations decision. The crime scene investigator (CSI) dictates the approach required basing on the

specific circumstances encountered. The forensic approach to a volume of scene of crime differs from that of a major crime scene though implemented processes however, are generally similar.

In major or serious cases, formal strategies for the forensic response are compiled by a forensic manager in agreement and consultation with the senior investigating officer. The strategies include: coordinating and communicating with relevant personnel, establishing the dimensions of the scene, identifying health, safety and security issues and the first step to the incidence in order to point out the areas to recover, and record the materials through the use of experts. This goes hand and hand with recording all the stages of investigation (Yadav, 2017).

Empirical literature review

The use of digital tools has become more useful. A study by Lillis, et al (2016) found that, forensic tools can be either Proprietary or open Source. Some of these tools might just be an application or come with hardware as well as software packages. Active internet connection may be required by some Forensic Tools for them to function but others can work in offline mode as well. The kind of crime happened determines appropriate tool and these tools used individually or along with other tools to assist an effective and systematic analysis of evidences and lead to correct decision

A study by Amoako and McCartney (2022) on swapping Carrots for Sticks: Forensic science provider views of the Forensic Regulator Act 2021 indicated that, in USA, forensic science technology in the 1980s paved a way for advances in the 1990s and early 2000s that had a distinctive impact on crime laboratories.

But scientific advancement, especially the growth of DNA analysis techniques, provided more effective tools for identifying perpetrators and analyzing evidence. DNA testing on the other hand, increased the demand for lab services development. In late 1990s and through the 2000s, increase of service need overwhelmed the ability of the labs to respond quickly and efficiently. But today, technicians and scientists at forensic laboratories are under relentless pressure to produce results at lowering cost and faster. The issue of innovation is vital in assisting the crime investigation in the forensic laboratories. For example, currently the high-tech robotic workstations are used to examine a very large amount of DNA samples at the same time. This allows the laboratories to be effective in its operations.

The National Institute of Justice (NIJ) made efforts to support research and assisted much in the development of automated systems that amplified DNA strands in small samples to determine person's genetic code. The development of these workstations made laboratories efficient and lowered the cost of DNA processing and analysis.

Teri, (2016) indicated that, technology is now days advancing rapidly. It is well known that there is uniqueness in every investigation since their implementation also is varying from one to another.

That is to say when working with technology, all the essential technological procedures in forensic labs should be integrated: activity relating to the seizure, actions taken to secure and collect evidence should not change that evidence, storage, transfer or examination of electronic evidence should be well documented, available and preserved for review and specialized training may be required for the examination of many of these investigating tools.

Case, Ribaux and Roux (2019) in their study on the Kodak syndrome: risks and opportunities created by decentralization of forensic capabilities found that criminal investigation is an important police activity; it is one of the least studied police functions. Criminal investigation is viewed as a „truth finding" process at the end of which the crime is solved, and offenders are caught. Criminal investigation is defined as: The total police effort to collect facts leading to the identification, apprehension, and arrest of an offender and organize these facts to present the evidence of guilt in such a way that successful prosecution may occur.

A study by Roux, Ribaux, and Crispino (2018) on forensic science found that to understand the forensic investigation it needs some knowledge of laws as well as the adequate compute skills since all the procedures are conducted through the computers. Therefore it needs people who have ideas in laws and ICT as well. Lack of these skills affect the whole process of investigation and becomes difficulty to perform the examination tasks.

Teri (2016) found that there are challenges of inadequate personnel and tools to make effective crime investigation through forensic science laboratories. Many countries do face the shortage of resources to train investigators in both laws and ICT. This has hindered the quick decisions in crime investigations especially those cases that need forensic investigations. When there is an availability of all these resources, it is for sure that the decisions about forensic evidences will just be produced on time.

Ballantyne, Edmond and Found (2017) in their peer review in forensic science indicated that there has been an increase of the use of forensic laboratories since the court needs accurate and objective evidences for quick decisions. The study indicated that many incidents needs a forensic investigation and because of this, more resources are needed especially investment of science and technology to make sure that all the examinations are processed effectively. It was further noted that to facilitate this there should be supported by all stakeholders.

On the other hand, Kumar and Sharma (2018) examined chemometrics in forensic science found that one of the major role of the forensic laboratories is to make sure that the evidences produced are objective are unbiased. Among of the key measure of the effective evidence is the way it has been produced on time. In order to makes sure that evidences are produced on time, there must be availability of various resources ranging from personnel to technological.

Another study by Morgan (2017) on conceptualizing forensic science and forensic reconstruction revealed that it is evident that forensic laboratories plays a key role to solve various problems related to the crime investigation. It was further noted that the function of the forensic labs is to come up with unbiased evidence in order to be just and fair during decision making. This is because the forensic lab acts as an agency to prove the cases.

Moreover, Horsman, 2019) reported that there is no doubt that the effective use of digital tools enhances smooth crime investigation. Crime is a social problem that needs to be seriously dealt with. This issue has become a threat to the citizens and concerns of various governments of the world most especially the developing countries like Tanzania. The study further indicated that law enforcement agencies need adequate tools to conduct crime investigation in order to identify potential criminal act such (data detection) that can interfere with the rights of the innocent. Digital tools can be central to case closure and prosecution. Digital evidence missteps can have serious implications, and the final case highlighted the challenges for modern investigation when digital evidence is limited or does not exist.

Wickenheiser (2021) conducted a study on reimagining forensic science -the mission of the forensic laboratory. The study pointed out that in order to get solutions for the crimes in African countries, more investment in ICT should be strengthened. The governments and all the security authorities are required to support the availability and operations of the forensic labs. This may help to come up with solutions related to crime investigation. It was further found that the use of technology such as CCT cameras for tracking the occurrence of incidents should not be ignored. Inadequate technologies are a reason for the continued and delayed cases in many African countries.

Chandiok and Mondal (2017) in their study on role of microscopy in forensic science research and investigation found that the effectiveness of the forensic science laboratory is based on the fact that single parts of the body can be used to find out the truth. For instance, using a collection of some parts of the body such as hair through technology the suspect can be identified. However, this needs high technology to make these examinations. Hair can be used in the forensic investigation because they contain some unique and natural elements that can differentiate between one people to another.

3.0 Methodology

The study used descriptive survey research design as it helped the collection of both quantitative and qualitative data. Similarly, the design reported things the way they are from the field. The study adopted a mixed research approach which combines both, quantitative and qualitative approaches, in order to address research questions as deeply as possible for the best results. The targeted population for this study included the Ilala District Forensic Police and other police officers. The total number of the targeted police officers was 95.

The sample for Forensic Police Offers and other Police officers were calculated using the Yamane, (1967) Statistical formula for finding sample size. The method is applicable when the population is known. The formula is stated as: $n=N/(1+Ne^2)$ Where by N=Total population size equaling to 95, n= sample size and e= the level of significance equals to 0.05. From the formula above, $n=95/(1+95 [\![\times 0.05]\!] ^2) = 76$. Therefore, the sample size of Forensic Police Offers and other Police officers were 76 respondents while 4 (1 head of Forensic Department and 3 officers from Investigation Departments) were purposively selected forming a total of 80 respondents.

The structured questionnaire was used to collect data from respondents. Questionnaires were prepared in English language then translated in Swahili. Questionnaires had five options for respondents to indicate their level of agreement or disagreement as follows: 5 = Strongly Disagree, 4 = Disagree, 3 = Neutral, 2= Agree, 1= Strongly Agree. Semi-structured interviews were used to collect information. Quantitative data were analyzed using the descriptive statistics such as mean and standard deviation with the aid of SPSS (Version 22.0). Qualitative data were analyzed using content analysis. To ensure reliability of the instruments, pilot study was conducted, the reliability of the questionnaire were tested through the Statistical Package for Social Science (SPSS) and results yielded the Cronbach's Alpha of .792 This implied that data collection instruments were reliable.

Table 1: Reliability pilot study results

S/N	Objective	Item	Cronbach's Alpha
1.	Capacity of the available forensic equipment	6	.792

Source: Field Data (2022).

4.0 Results

A total of 76 questionnaires were distributed and 70 (92.1%) were completely filled and collected. The aim of the researcher was to examine the effectiveness of Forensic science laboratory on quicker crimes investigations decisions in Ilala district. Respondents had to respond by showing their degree of disagreement or agreement by ticking the most appropriate option ranging from 1=strongly agree 2=agree 3=neutral 4=disagree 5=strongly disagree. Respondents had to indicate their perception among the six items in the questionnaire as shown below. The interpretation of the scale of mean score was as follows: 4.30 - 5.00 = Strongly Disagree, 3.50 - 4.20 = Disagree, 2.70 - 3.40 = Neutral, 1.90 - 2.60 = Agree and 1.00 - 1.80 = Strongly Agree.

Table 2: Perception of respondents on the capacity of the available forensic equipment's produce evidence of real suspects

SN	Item	Mean	Std. Dev.	Interpretation
1.	High speed to produce results	1.60	.58696	Strongly Agree
2.	Accuracy of the results produced	2.41	.66528	Agree
3.	Large memory	1.72	.71120	Strongly Agree
4.	Ability to examine large sample at a time	2.56	.61809	Agree
5.	Ability to be integrated with various software	2.01	.70253	Agree
6.	The forensic science laboratory is frequently used	1.33	.69785	Strongly Agree

Source: Field Data (2022)

Table 2 gives the research findings for the research question one about how is the capacity of the available forensic equipment's produce evidence of real suspects. Findings indicated that the mean score for the first, third, and sixth items was between 100 - 1.80 denoting strongly agree. This means that respondents strongly agreed that the available forensic equipment had a capacity to produce evidence of real suspects. Among of the features of capacity was the high speed to produce results, large memory and that the forensic science laboratory is frequently used.

Findings further revealed that other respondents agreed that among of the features of capacity was the accuracy of the results produced, ability to examine large sample at a time and ability to be integrated with various software. Generally, the findings denote that the available forensic equipment had the capacity to produce evidence of real suspects.

The data from interview were analyzed by using content analysis method. The method involved the development of themes, coding and categorizing data collected from respondents in relation to the interview question. Findings revealed that the interviewed police officer mentioned various equipment they use in forensic science laboratory. Among of the equipment mentioned included the use of microscopes, the use of chromatographs, the use of spectrometers, gold Standard for DNA analysis as well as the use of biometrics fingerprint reader. This gives an expression of the availability of various tools used in forensic science laboratory.

In the interview, one of the police officer argued;

"...actually there are myriads of equipment used in forensic science laboratory however its use depends on the type of crime investigated. Normally those tools are used to collect, identify, classify, or compare fingerprints. For example, forensic science investigators can use this equipment to collect evidence from a crime scene..." (Interview data, 2022)

Another interviewee said;

"...the tools or instruments in forensic science laboratory are used especially when the crime itself need the in-depth investigation targeting to seek the identity of the person who committed the crime. In most cases the murderers can be identified through finger print and DNA analysis. In such scenario, the forensic science laboratory is used..." (Interview data, 2022)

Moreover, one of the police officer commented;

"...in my opinion, the discovery of these sophisticated investigation tools specifically forensic science laboratory has made major changes when it comes to crime investigations. With the use of forensic science laboratory DNA and finger print can be scanned to identify a criminal and thus getting accurate evidence in court. The more important this is to strengthen the knowledge of the users of these forensic science laboratories..." (Interview data, 2022)

Another interviewee said;

"...for sure forensic science laboratory have reduced biases in crime investigation processes. The good thing about these technologies is that evidences can be kept for a long time compared to papers. Moreover, within a very little time the results can be ready for use. So in my view, the forensic science laboratory fosters quicker crimes investigations decisions..." (Interview data, 2022).

5.0 Discussion

Findings about the capacity of the available forensic equipment's to produce evidence of real suspects relate to those of Lillis, et al (2016) who found that forensic equipment can be either proprietary or open source. Other Forensic equipment may come with hardware as well as software packages but some just come with an application. Some of the Forensic Tools may work offline while others may require internet connection. The type of the crime occurred dictates the appropriate equipment and these tools are used individually or along with other tools to assist in a systematic and effective analysis of evidences and lead to a desired conclusion. The tendency to have high speed and produce accurate results is evidence that forensic equipment can produce evidence of real suspects.

Teri (2016) found that there are challenges of inadequate personnel and tools to make effective crime investigation through forensic science laboratories. Many countries do face the shortage of resources to train investigators in both laws and ICT. This has hindered the quick decisions in crime investigations especially those cases that need forensic investigations. When there is an availability of all these resources, it is for sure that the decisions about forensic evidences will just be produced on time.

On the other hand, Kipngetich (2021) conducted a study on determinants of forensic science application in criminal investigation at the directorate of criminal investigations, Nairobi, Kenya. The study revealed that

forensic science laboratory facilitates crimes investigations decisions since the evidences are clearly determined. The study further indicated that to reduce biases and case delays, forensic science laboratory should be well utilized.

Furthermore, Amankwaa, et al (2019) in their study on forensic science in Ghana indicated that the use of forensic science continues to grow across the world. In Ghana, major advancements took off in 2011, including the introduction of modern DNA profiling and the establishment of an automated fingerprint identification system. These developments have led to some positive impacts on the delivery of justice, including the exoneration of a wrongly incarcerated individual. However, knowledge of police officers in forensic science laboratory is still a major challenge that hinders quick investigation decisions.

6.0 Conclusions and Recommendations

Basing on the findings of this study it is concluded that, the available forensic equipment had a capacity to produce evidence of real suspects since the tools have high speed, have large memory, has an ability to examine large and integrated with various software for data sharing. It was further concluded that, the available forensic equipment had a capacity to produce evidence of real suspects since the tools have high speed, have large memory, has an ability to examine large and integrated with various software for data sharing.

The study recommends that the forensic science laboratories should be well maintained and instruments be updated to fit the current technology so that they maintain capacity to produce evidence of real suspects. The study recommends that the forensic science laboratories should be frequently used to examine evidences for cases that require fingerprint or DNA examination. This in turn will reduce biases in evidence and will facilitate easy and quick crime investigation decisions. It was further recommended that the government through the Ministry of Internal Affairs should enact policies and laws that allow the police officers to conduct the crime investigation procedures through forensic science laboratories.

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