

## Effectiveness of Biometric Modalities Employed in Management of Identity Based Conflicts in Nairobi County, Kenya

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### ABSTRACT

*The case of Nairobi County, Kenya, serves as evidence that identity-based conflicts pose persistent difficulties on a global scale. In this region, the convergence of various ethnic and cultural identities sometimes gives rise to strained relations and episodes of violence. The present study investigates the efficacy of biometric technology in mitigating identity-related challenges within the jurisdiction of Nairobi County. A descriptive survey study was conducted, involving 300 participants. Among these participants, 280 were government employees who were actively involved in routine biometric operations, and the remaining 20 were people who had experienced identity-related conflicts. The Yamane technique was employed to choose a sample of 171 respondents. The data collection process encompassed the use of questionnaires, interviews, and observation techniques, which collectively unveiled compelling evidence supporting the substantial role of biometric modalities in both identity maintenance and conflict resolution. These technologies facilitate the acceleration of procedures, mitigate fraudulent activities, and augment accountability, particularly in critical domains such as voting and the dispensation of social assistance. Nevertheless, it is imperative to acknowledge the existence of some obstacles in the realm of data quality, privacy, and inclusivity. These problems underscore the importance of establishing a comprehensive legal framework and implementing public awareness initiatives. This study highlights the significance of adopting a well-rounded strategy that protects individual liberties while optimizing the advantages of biometric modalities in tackling identity-related challenges within Nairobi County. The results of this study provide significant contributions to professionals, governmental organizations, and policymakers engaged in identity verification and conflict resolution. These findings enhance our comprehension of the role of technology in addressing difficulties linked to identity, hence expanding our knowledge in this field.*

**Keywords:** Biometrics Modalities, Fingerprints, Iris Scanning, Conflicts, Microcosm

### I. INTRODUCTION

The persistence of identity-based conflicts remains a formidable challenge in several locations across the globe. Nairobi County in Kenya faces significant challenges in navigating the complex interplay of ethnic, cultural, and socioeconomic identities. The specific attributes of this urban hub often give rise to tensions and disputes based on identity, requiring distinct strategies for efficient governance and settlement (Adler, 2008). The merger of identities in Nairobi County reflects a larger worldwide phenomenon, wherein urbanization and globalization facilitate the convergence of individuals from various backgrounds, resulting in a vibrant array of intercultural interactions (Bolle, 2004).

In light of this context, biometric modalities, including facial identification, iris scanning, and the recognition of fingerprints, have emerged as practical tools that are helpful in managing identity and solving conflicts (Bolle, 2004). Nairobi County is rapidly adopting these technologies for diverse reasons, such as the dissemination of social aid, voter registration, and the implementation of access control measures at governmental institutions. The primary aim of this research is to investigate the effectiveness of various biometric modalities in mitigating identity-related obstacles within Nairobi County.

## II. LITERATURE REVIEW

The theory of human-nature conflicts (Rubin, 2006) provides the theoretical foundation for this investigation. The theory proposes that a person's need to feel a sense of belonging motivates them to identify with a particular group, whether that group shares a person's race or culture (Ross et al., 2006). When danger is felt, these identities can become flashpoints. This source of friction can be mitigated because of the reliability and safety of biometric modalities like fingerprint scanning and facial recognition.

This theory provides insights on how biometrics can be used to ensure the equitable distribution of limited resources like social programs and job openings. Using biometric modalities in the distribution of social services, for instance, can reduce disagreements over resource allocation by preventing fraudulent activities and ensuring resources are provided based on true need (Rubin, 2006).

According to Ratha and Bolle (2001), biometric identification is a form of identification that uses a person's physiological characteristics to verify their identity and grant them access to restricted areas or data. This method makes use of biometrics (a person's face, fingerprints, retina, iris, hand geometry, signature, or voice) to do automated recognition. Using these objective, quantifiable traits helps ensure that biometric identification is a secure method of verification. As emphasized by Coats (2007), these characteristics provide distinguishing, verifiable elements that can be used to establish guilt beyond a reasonable doubt in judicial systems.

The use of biometric identification has become increasingly significant in the resolution of conflicts. Sudha (2013) argues that the utilization of biometric data enables systems to objectively authenticate an individual's identity, hence decreasing dependence on subjective views. This neutral method promotes a more reliable and safe method of identification, which can help reduce conflicts based on mistaken assumptions about people's identities.

According to Reznik (2013), Sir William Herschel is recognized as the initial European practitioner of fingerprint utilization for the purpose of conflict management. In 1877, Herschel employed this technique to address concerns related to impersonation during the disbursement of payments to Indian pensioners.

Wayman (2004) says that South Africa has implemented biometric techniques, such as fingerprint and palm identification, as a means to address issues related to corruption and fraud. The imperative to achieve prompt verification and speed up the identification process of people with criminal records, thereby facilitating the timely administration of justice, is what is driving the transition from conventional paper-based systems to biometric technology.

In Nigeria, election malpractices have been a significant source of identity conflicts in Africa (World Bank Report, 2015). This is due to double registration and manipulation of the electoral system, leading to conflicts and compromises in electoral results. Similarly, Dowd and Raleigh (2013) note that the 2007–2008 political conflicts in Kenya were politically motivated and rooted in identity issues.

Sudha (2013) emphasizes the efficacy of fingerprinting in identifying fresh bodies compared to decomposed ones. The lack of early recording and storing of biometric data can lead to conflicts in cases of bomb attacks, terrorism, or murder, where multiple parties claim ownership of a single corpse.

Misuse of technology, particularly cyber threats, is identified by Nye (2011) as a source of identity conflicts globally, including in Kenya. The vulnerability of computers and the internet to cyber-attacks and crimes poses security risks, such as money laundering and stealing information for personal, political, or strategic purposes.

## III. METHODOLOGY

### 3.1 Research Design

The research utilized a descriptive survey study methodology due to its appropriateness in collecting, managing, and analyzing data from several places within the designated area of study (Orodho, 2003). This methodology enables a thorough investigation into the utilization and efficacy of biometric modalities in the resolution of conflicts pertaining to identification.

### 3.2 Population and Sampling

The target population consisted of 300 participants, of which 280 were government personnel engaged in regular biometric operations. These officers were affiliated with several organizations, namely NGAO, NPS, NRB, IEBC, RAS Shauri Moyo, and Huduma Centers. Furthermore, the study encompassed a cohort of 20 individuals who were affected by conflicts rooted in identity. The Yamane method was employed by the researcher to ascertain a sample size consisting of 171 respondents.



$$n = N / (1 + N(e)^2)$$

Where:

n is the sample size

N is the population size

e is the level of precision (0.05)

When fitted, the sample obtained was 171.

### 3.3 Data collection and Analysis

The study used a thorough method of data collection and analysis. Questionnaires were sent out to government employees to get their thoughts on how biometric modalities are used, and interviews were conducted with people who had been on the receiving end of identity-related conflicts to get their perspective. Documents from government agencies engaged in biometric activity were also reviewed. The collected data was subjected to two types of analysis: quantitative analysis, using statistical tools like SPSS to process the questionnaire data and yield numerical insights; and qualitative analysis, using thematic investigation to detect common trends and emerging themes from the interviews and documentation. Using this approach, the researcher was able to investigate how biometric technologies work in resolving identity-related problems in Nairobi County.

## IV. RESULTS AND DISCUSSION

### 4.1. Measures Applied in Solving Identity Based Conflicts

The study sought to establish the measures applied in solving identity- based conflicts as indicated in Table 1.

**Table 1**

*Measures Applied to Solve Identity Based Conflicts*

Response	Frequency(N)	Percentage	Rank
Use of biometrics	55	36.67	1
Technological advancement	50	33.33	2
Workplace policy	45	30.00	3
<b>Total</b>	<b>150</b>	<b>100.00</b>	

The study found that out of 150 respondents, 45 (30%) stated that workplace policy-making was a measure put in place to resolve identity-based conflicts. Besides, 55 (36.67%) respondents reasoned that the use of biometrics was also a measure put in place, and 50 (33.33%) reasoned that technological advancement was also a measure put in place to resolve identity-based conflicts. According to the findings, the use of biometrics is the most effective method of solving identity-based conflicts, followed by technological advancement and finally workplace policies. The findings are in agreement with the views of Hawthorne (2009), who stated that fingerprint biometrics are the most effective method of solving personal identification conflicts.

**Table 2**

*Conventional Conflicts Resolutions Methods in Solving Identity Based Conflicts*

Rate	Frequency(N)	Percent	Rank
Regional integration	60	40	1
Political reforms	45	30	2
Religious society	45	30	2
<b>Total</b>	<b>150</b>	<b>100%</b>	

Additionally, the study found that 60 (40%) of the respondents stated that promotion of regional integration was a conventional conflict resolution method, and 45 (30%) of the total respondents reasoned that for political reforms. The use of religious society had a response rate of 45 (30%), as shown in Table 2.

## 4.2 Effectiveness of Biometric Modalities in Management of Identity-Based Conflicts

**Table 3**

*Effectiveness of Biometric Modalities in Management of Identity-Based Conflicts*

Response	Frequency(N)	Percentage	Rank
Most effective	80	53.33	1
Effective	50	33.33	2
Less effective	20	13.33	3
Total	150	100	

Table 3 shows that 80 (53.33%) respondents stated that biometrics is the most effective method of managing identity-based conflicts, 50 (33.33%) argued that biometrics is effective, and 20 (13.33%) said that biometrics is less effective. According to the findings, most respondents ranked biometrics as the most effective method of identity-based conflict resolution.

Fingerprint biometrics has proven to be a reliable method for personal identification over an extended period of time. According to Sudha (2012), there has been significant advancement in biometric technology, expanding beyond fingerprinting to encompass several other ways for establishing identification. Several emerging enterprises have entered the industry, introducing innovative approaches and techniques. Biometric technologies employ a certain collection of visual statistics pertaining to an individual in order to ascertain their identity.

## 4.3 Effectiveness of Biometrics at the IEBC Offices'

The study sought to ascertain whether biometrics is used at IEBC offices for personal identification and its effectiveness in management of identity based conflicts and the results are displayed in Table 4.

**Table 4**

*Effectiveness of Biometric in Management of Identity-Based Conflicts in IEBC offices*

Response	Frequency(N)	Percentage	Rank
Most effective	11	55	1
Effective	8	40	2
Less effective	1	5	3
Total	20	100	

The findings show that 11 (55%) respondents stated that biometrics is the most effective method of managing identity-based conflicts, 8 (40%) argued that biometrics is effective, and 1 (5%) said that biometrics is less effective. According to the findings, most respondents ranked biometrics as the most effective method of identity-based conflict resolution.

## 4.4 Effectiveness of Biometrics at the NHIF Offices

The study sought to ascertain whether biometrics is used at NHIF offices for personal identification and its effectiveness in management of identity based conflicts and the results are displayed in Table 5.

**Table 5**

*Effectiveness of Biometric in Management of Identity-Based Conflicts in NHIF offices*

Response	Frequency(N)	Percentage	Rank
Most effective	22	73.33	1
Effective	7	23.33	2
Less effective	1	3.33	3
<b>Total</b>	<b>30</b>	<b>100</b>	

The study revealed that 22 (73.33%) respondents stated that biometrics is the most effective method of managing identity-based conflicts, 7 (23.33%) argued that biometrics is effective, and 1 (3.33%) said that biometrics

is less effective. According to the findings, most respondents ranked biometrics as the most effective method of identity-based conflict resolution.

#### 4.6 Extent of Biometric Modalities Employed in Management of Identity Based Conflict in Nairobi

The study sought to establish the different biometric modalities that are used for identification of persons in the country with specific reference to Nairobi County. The results are summarized in Table 6.

**Table 6**

*Types of Biometric Modalities Used in Identity-Based Conflicts*

Types of biometric modalities	Frequency(N)	Percent	Rank
Fingerprints	60	40	1
Face recognition	30	20	2
Iris	20	13.33	3
Signature	20	13.33	3
DNA	20	13.33	3
<b>Total</b>	<b>150</b>	<b>100.0</b>	

The results in Table 5.6 show that fingerprints as a biometric modality had the highest usage with a response rate of 60 (40%), face recognition followed with a response rate of 30 (20%), signatures with 20 (13.33%), and iris and DNA tallied with 20 (13.33%).

Based on the findings, the participants indicated that face recognition and fingerprints were the two most frequently used biometric modalities. In contrast, iris, DNA, and signature were listed as the least utilized biometric modalities in addressing conflicts related to identity. Biometric modalities also aim to emphasize the frequency of inquiries conducted to address conflicts related to identity and the stakeholders who benefit from the identification reports. The study aligns with the perspective of Nath (2010), who posited that biometric modalities are widely recognized as the most efficient biometric modality.

#### 4.7 Verification Queries on Personal Identification

The study sort to know about verification of identification documents such as National Identity card at NRB from different agencies for authentication purposes to establish the genuineness of the documents. The results are presented in Table 7.

**Table 7**

*Verification Queries on Personal Identification*

Rate	Frequency(N)	Percent
Yes	110	73.33
No	40	26.67
Total	150	100.0

The finding indicated that NRB receives queries about personal identification at the workplace with a positive response rate of 110 (73.33%), while 40 (26.67%) objected to having received any queries. The study is in agreement with Hawthorne (2007), who argued that questioned fingerprints, particularly those on identification documents, should be verified with the fingerprint stored in a recognized database so as to establish the truth about the owners of such prints.

#### 4.8 Agencies that Partner with National Registration Bureau for Identity Based Conflict Queries

The study sort to establish the agencies that partner with NRB so as to help them solve identity based conflicts in their departments so as to prevent fraudulent activities. The study found that CID, IEBC, and KRA had the majority of stakeholders with an equal response of 30 (18.1%), while NSSF, banks, and medical insurance schemes had 25 (15.1%) as shown in Table 8.

**Table 8***Stakeholders of National Registration Bureau*

Agencies/stakeholders	Frequency (N)	Percentage	Rank
KRA	30	18.1	1
CID	30	18.1	1
IEBC	30	18.1	1
BANKS	25	15.1	2
NSSF	25	15.1	2
Medical Insurance Schemes	25	15.1	2
Total	165	99.6	

#### 4.9 Management and Resolution of Identity Based Conflicts

The study sought to establish whether the queries received at NRB concerning personal identification are solved or not. The results are presented in Table 9.

**Table 9***Response on Whether Queries are Solved*

Rate	Frequency(N)	Percent
Yes	130	86.67
No	20	13.33
Total	150	100.0

An overwhelming number of respondents stated that the cases received to solve identification conflicts were successful, with a rate of 130 (86.67%) compared to those who negated, with a response rate of 20 (13.33%). This indicates that identification conflicts are primarily solved through the verification of identification documents.

The study is in agreement with the views of Ross et al. (2006), where identity-based conflict was resolved in the year 1903 in a case of identical twins, William West and Will West, at a federal prison in Leavenworth, Kansas. In this case, the identities of the identical twins were disputed after one of them was found to have been involved in a criminal activity, and it was difficult to establish the offender among the two. After thorough examination and comparison of their prints, it was established that the disputed prints belonged to William West, thereby exonerating him.

#### 4.10 Regulatory Body on the Use of Biometrics in Kenya

Table 10 shows that there is no biometrics regulation body to oversee the use of biometrics in Kenya, with a majority negative response of 135 (90%) compared to those who agree with 15 (10%).

**Table 10***Existence of Biometrics Regulatory Body*

Rate	Frequency(N)	Percent
Yes	15	10
No	135	90
Total	150	100.0

When probed further about whether there should be a body to regulate the use of biometrics, the respondents unanimously agreed and stated that when in place, it would handle and solve most cases of identity conflicts. This study is in line with the recommendation of Sudha (2012), who recommended that fingerprint professionals should be subjected to a National Bureau of Standards such as the National Institute of Standards and Technology.

#### 4.11 Effectiveness of Huduma Centres in Management of Identity Based Conflicts

The study sought to find out if Huduma Centres are effective in production of identification documents and management of identity based conflicts in Kenya. The results are presented in Table 11.

**Table 11**

*Effectiveness of Huduma Centres in Provision of Timely Identification Documents and Management of Identity Based Conflicts*

Rate	Frequency(N)	Percent
High	70	46.67
Moderate	50	33.33
Less effective	30	20
Total	150	100.0

The study indicated that Huduma centers are highly effective in the timely provision of services, with a response rate of 70 (51.5%), moderate at 50 (33.33%), and less effective at 30 (20%). The responses of high and moderate respondents assertively agree that the system is effective in identifying and solving identity-based conflicts. The findings are in agreement with Mutinda (2017), who found that Huduma Center facilities have significantly improved service delivery to the Kenyan population through several means.

## V. CONCLUSIONS & RECOMMENDATIONS

### 5.1 Conclusion

The effectiveness of biometric modalities in managing identity-based conflicts in Nairobi County, Kenya, emerges as a topic of profound significance in a multicultural and diverse urban landscape. This research has unveiled several key insights that underscore the potential of biometric technologies in addressing identity-related tensions while also acknowledging the challenges that require thoughtful consideration. The findings of this study indicate that biometric modalities have played a pivotal role in streamlining processes, reducing fraudulent activities, and enhancing accountability, particularly in crucial areas such as voter registration and the distribution of social services. As a result, the use of biometric modalities can considerably aid in the resolution of identity-based issues in Nairobi County, perhaps paving the road to harmony, stability, and social cohesion.

### 5.2 Recommendations

The study recommends that more research be done on the nature and extent of identity-based conflicts in other major cities so as to establish whether it is only a problem in Nairobi or if it is replicated in other cities.

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