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Robust Security System with Toll Free Call Services. Case Study: Adama City

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Abstract

Toll-free numbers are calling numbers that have unique three- or four-digit numbers and that don't require payment from phone lines in order to be called. With the help of these numbers, callers can connect with nearby organizations and/or people without incurring far-reaching fees. Calls to assistance centers are especially popular from toll-free phones. In the past, toll-free services have offered prospective clients and other parties a simple and cost-free means of getting in touch with enterprises. Nevertheless, unless they have an "unlimited calling" plan, wireless subscribers will be billed for the airtime minutes used during a toll-free call. In Adama, the second largest city in Ethiopia, a call center has been installed as part of smart security system and serving since January 2023 for collection of complaints from different community levels. The call center is situated at the mayor office and has 11 active workers, 4 of these working the night time and the remaining during day time. The information reported in the form of complaints from individuals and groups are illegal constructions, illegal trade, income concealment or hiding, giving and receiving bribe, informing new faces of suspected enemies and exposing individual or group conflicts. This technology has been found to bring a significant outcome in minimizing illegal acts, public safety threats and service delivery problems.

Keywords
Smart, Safety, Crime, Call Center, Security.

1. Introduction

In Africa, health systems are poorly accessible, in- equitable, and unresponsive. People rarely have either the confidence or the opportunity to express their opinions. In Burkina Faso, there is a political will to improve governance and responsiveness to create a more relevant and equitable health system (Lechat 2019).

The study in (Rajapaksha 2022) aims to investigate the feasibility of implementing a decision support system for reporting in order to produce improved analytics and facilitate better decision-making by the Department of Agriculture's upper management of Sri Lanka. The goal is to make informed decisions more easily and quickly than other ordinary communication reporting method.

According to the authors in (Huq 2014), in one Bangladeshi sub district, a toll-free mobile phone intervention to assist mothers during their pregnancies and deliveries was tested. A qualitative study was carried out to assess how mobile phone use has changed in terms of facilitating communication regarding difficulties related to mothers and newborns. According to the findings, over 80% of Community Trained Birth attendants contacted Solution Connected Community in order to receive advice on managing maternal health.

The article in (Zhang 2005) outlines the toll-free IP (TIP) de- sign and how the important protocols interfaces are implemented using the defined diameter base proto- col. TIP is a new technique of provide no-charge-to- user ("toll-free") access over IP-based access networks (e.g., IEEE 802.11 and 802.16 wireless local area net- works). The owner or operator of the toll-free location is responsible for covering the cost of using IP access networks to interact with it (as indicated by the toll- free IP address, Internet Domain Name, or Universal Resource locater, for example).

The paper in (Amanda 2020) addresses the challenges and opportunities in developing and developed nations. In an emergency, one can call emergency services, including the police. Although this depends on competing re- quests at the same time, response times are often good. On the other hand, emergency services are sometimes hard to come by in many underdeveloped nations. With an emphasis on Papua New Guinea (PNG), the paper briefly examines the difficulties in setting up, running, and maintaining emergency toll-free phone systems in underdeveloped nations. According to the paper, prank calls, promotions on how the citizens find the short code number and responsiveness are among the challenges in implementing the service.

Adama is the second-largest city in Ethiopia, located in the eastern part on the way to Djibouti across the central part of the rift valley. It is a dynamic and fast growing city, with a current population of over half a million citizens (City4Forests 2021). The city has four traffic inflows and exit outlets from different directions, and as a result, to ensure the wellbeing of the residents and business institutions, security protocols and infrastructure have been found to be crucial. Accordingly, the city has recently introduced its own smart city initiatives as mayoral goals to realize the transformative move with modern technology. The three mayoral goals are digitalization, land use management and smart security. Among these, smart security is the most crucial in ensuring the overall safety of the city and encouraging business activities as well. The smart security of Adama involves smart poles, outdoor and indoor Closed-Circuit Television (CCTV) surveillance cam- eras, toll free call center, cyber security, and the integration of all these entities. In general, the term"smart city" pertains to the application of innovations in technology to improve citizen quality of life, government involvement, and equitable growth (Yahia 2019). A city can be considered smart if it can manage important resources, urbanization flows, and vital resources more effectively for processes that happen in real time. Moreover, in the smartness of a city, social, environ- mental, and economic development aspects need to be integrated and balanced through decentralized procedures. Smart cities are built with an infrastructure centered on information and communication technology (ICT) and Internet of Things (IoT) enabled sensor technology to facilitate social and increased citizen contact and foster urban interconnectedness. Among the cities in Ethiopia that employ technology and in- formation to better serve their residents and business needs, Adama is the pioneer for smart city initiatives. In addition, the projects of Smart Adama and the de- tails stated were made more and more necessary by factors like urban congestion, a young population, and demand for energy efficiency, cheaper sensors, faster networks, and big data. As a result, Adama city has rolled out digitalization, land use management and smart security as the three mayoral goals which has been initiated and partially implemented currently from its smart city strategic plan. Hence, toll free call center is one of the smart security systems in smart Adama.

2. System Model and Requirements

2.1 System Model

Figure 1 and Figure 2 show the toll free call center design situated at Adama city, in the office of mayor and the partial view of the topology of Adama City respectively. There are currently three computers for operators who regularly receive calls around and within the city for twenty four hours and one computer are usedas a controller or for an administrator. The connection from the center to a nearby telecom operator has been established using fiber and from a base stationto the users is through wireless media. Moreover, the short code to be used as a toll-free number is 9141 and its service is restricted to only in the city's area for security and reliability purpose.

Figure 1. Schematic design of toll-free call center inAdama

Figure 2. City

2.2 Requirements

In order to guarantee seamless and effective operations, setting up a toll-free call center entails a number of connectivity requirements, and the following aresome crucial considerations.

- Telecom Service Provider: A reputable service provider that can handle a great deal of calls and deliver excellent voice services is what is required.The supplier must to provide adequate coverage, little downtime, and alternatives for scalability to manage peak hours.
- 5G, Internet of Things (IoT) and Internet Access:It is essential to have a reliable and fast broad-band connection, particularly and sufficient band-width must be available to support multiple calls at the same time without sacrificing call quality. The existence of boosts the capacity and spectral efficiency to make the communication reliable. In the same way the concept of IoT enables fast de-vices communication protocols.
- Network Infrastructure: This covers switches, routers, and possibly a hardware firewall. Enterprise grade hardware is necessary to guarantee reliability and safety.
- Call Center Software: Call routing, queues, to attendants, IVR (Interactive Voice Response), and maybe CRM (Customer Relationship Management) integration are all managed by this soft-ware. It must to be strong and able to manage agreat deal of calls. In Adama city, software calledAvaya is currently in use.
- Computers and Headsets: Operators will require high-end headsets with clear audio and back- ground noise reduction as well as computers withenough processing capability.
- Maintenance and Support: Maintaining a technical support staff and performing routine maintenance are essential for quickly resolving problemsand minimizing downtime.

3. Outreaching and Data GatheringMethods

1. Information outreaching method

In the process of awareness creation to the community on how to implement the service, the following techniques have been used

- Advertisement through mass media during public gatherings
- Posting **9141** at each and every sector like hotels, academic institutions, and religious sectors and on themain street pole of the city.
- Disseminating the idea through social Medias and networks.

2. Complaint gathering method

Immediately after a call has been initiated by a customer or client, polling call information as complaintsand suggestions are gathered and directly sent to the call center situated at the mayor office based on the flows shown in Figure 3.

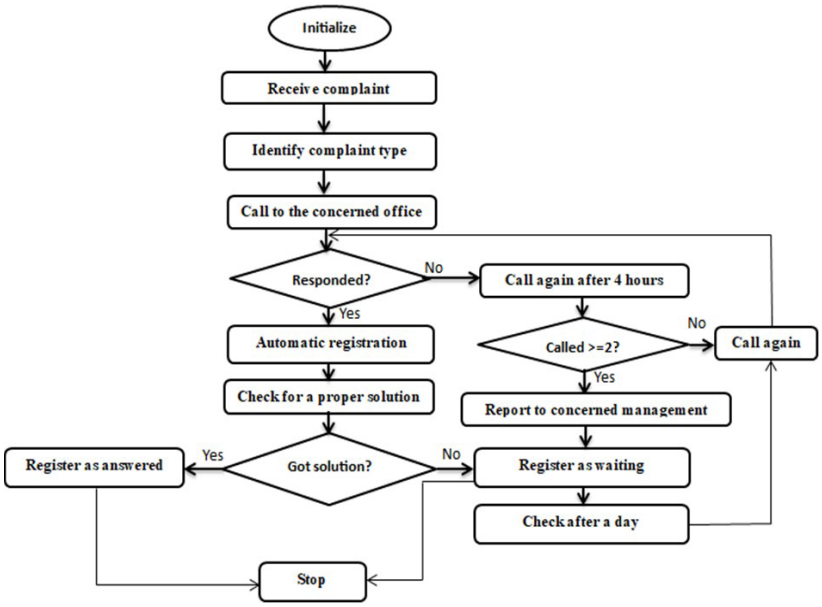

Figure 3. Complaint reception flow diagram

4. Results and Analysis

4.1 Illegal acts

Figure 4 shows the complaints that were recorded overthe course of eleven months after the call service has been launched. The records were gathered from various community members in general, as well as from business sector personnel, residents, and any relevant legalagencies in particular. The complaint mainly focuseson illegal acts like corruption, illegal trade, illegal construction and revenue concealment. At the early start of the service, in the month of February, the maximumwas illegal constructions which were illegitimate and were done without knowledge of the legal bodies of the city. Due to awareness of the community around and also lawbreakers, the act has been started to de- cline from month to month. Finally, the illegal construction has been dropped from one hundred thirty four to six and zero in November and December 2023 respectively. In the same way revenue concealments hasbeen fluctuating between seven and three from months March to August and finally dropped to zero.

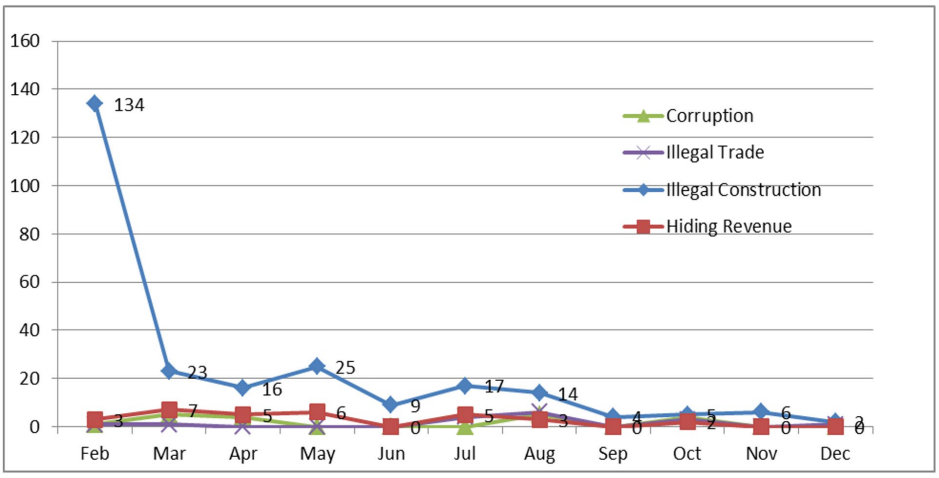

Figure 4. Illegal acts recorded as complaints

4.2 Security Problems

Figure 5 presents the complaints of security problems gathered through toll free call services. In general, the security problems focus on new faces and group and individual conflicts. As shown in the figure, the pattern from February to April is increasing. This is related to the awareness of the community about the existence ofthe toll free call services, Even if the service was there,in the month February, the record was insignificant and continued with increasing rate till April. From the month April to December 2023, the average rate was decreasing and finally the complaint records for both about suspected new faces and group and personal or individual conflicts has been reduced. In December,the average value of the two records has been droppedfrom 11.5 which was in April to 0.5 (Figure 6).

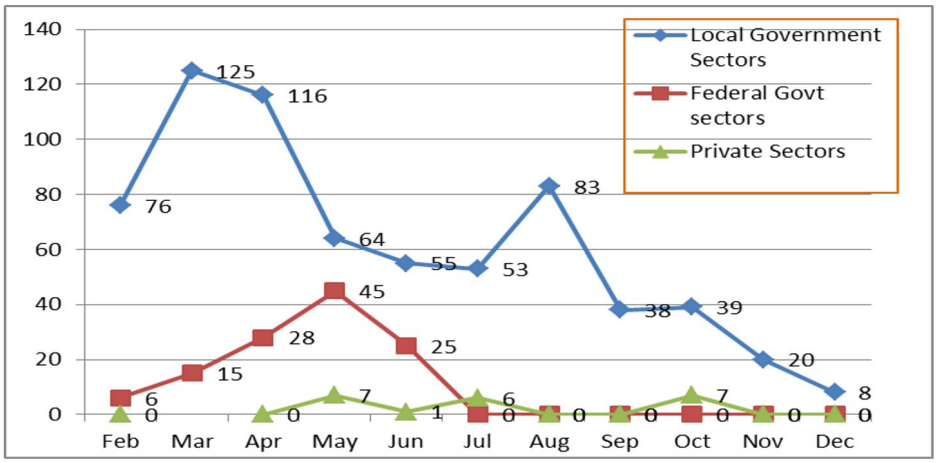

Figure 5. Suspected face and conflicts

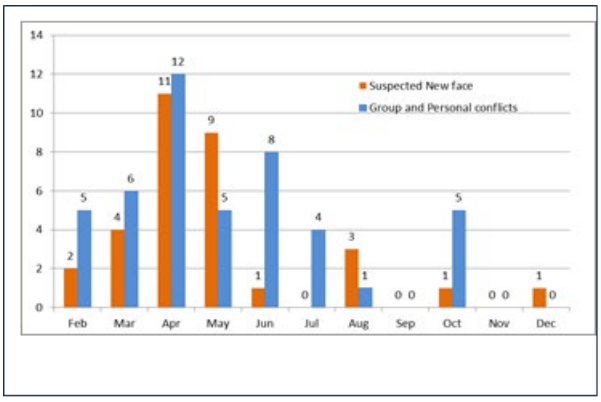

Figure 6. Service delivery problems

Figure 6 contrasts all of the acts that were reported over a period of eleven months. The largest numberof records in local government sectors pertaining to customer issues or discontent is 677, as depicted in the figure. The next highest record is for illegal building, with 255, while the lowest record is for illegal trading, at 16.

4.3 Service delivery problems

Figure 7 illustrates the complaints and dissatisfaction recorded in governmental and non-governmental organizations over the provision of services. Currently, Adama City is divided into 32 sectors, 6 sub-city administrations, and 19 districts that are part of the sub-cities. There are also different federal governmentand private sectors. In light of this, the number ofgrievances filed in Adama's local government sectors increased from 76 to 125 in just two months, from February to March. After reaching the pick point in March, it continued to drop and eventually reachedsix, despite being increased to 83 once again in Au- gust. The federal government sectors' registered data similarly increased from six to forty-five (45) months from February to May, after which it showed a linear decline to zero in July and stayed at zero through December. The city's smaller number of federal government sectors than local ones accounts for the increasedoutreach of the 9141 marketing and the subsequent de-crease in complaints. Similar patterns were seen in theprivate sectors as well, which saw a final decline to zeroin December (Figure 7).

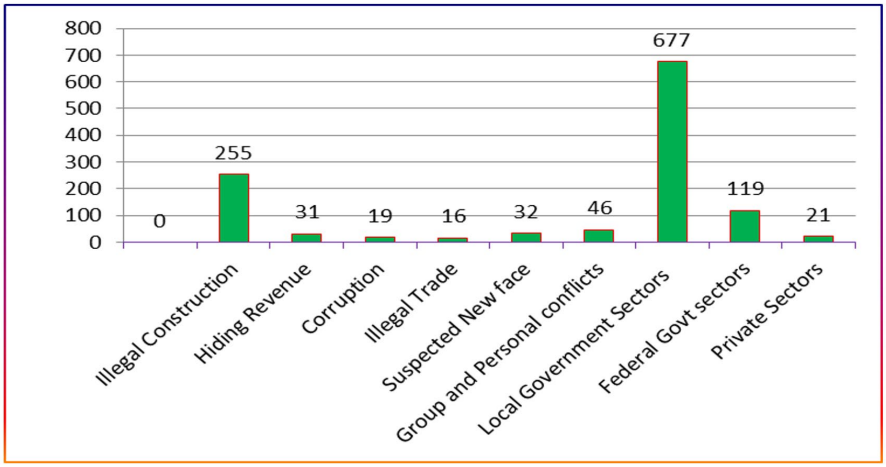

Figure 7. Illustrates the complaints and dissatisfaction recorded in governmental and non-governmental organizations

All the complaints that were reported so far are categorized into three categories as shown in Figure 8: illegalities, security issues, and service delivery issues. The first month of the service, which is February, is where the majority of the complaints are grouped,with the highest total being one hundred thirty ninein February 2023 (the month when the service started)and dropping to three in December 2023. The second- largest record in the first month is service delivery is- sues, with eighty-two in February and only eight in December, while the least amount is security issues, withseven and one in February and December, respectively.

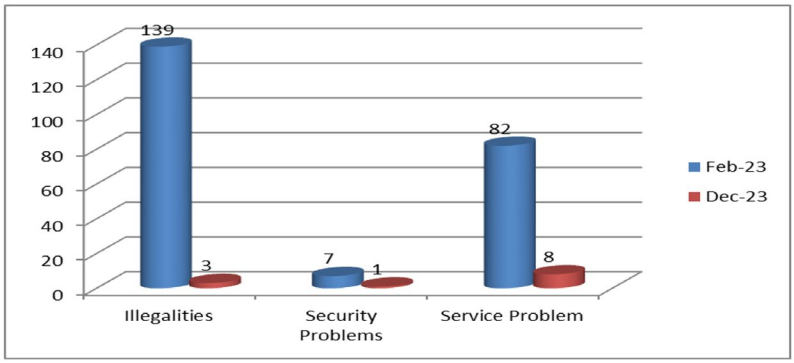

Figure 8: Comparison of records in the first and lastmonths

Figure 9 depicts the sum all sub incidents in all three categories within months from February to December 2023. Despite the illegalities surpasses service deliveryproblems in the first month, the total summed record of service delivery found to be maximum and the leastrecord is that of security problems. Moreover, the totalrecord of all

from February to December is 1216.

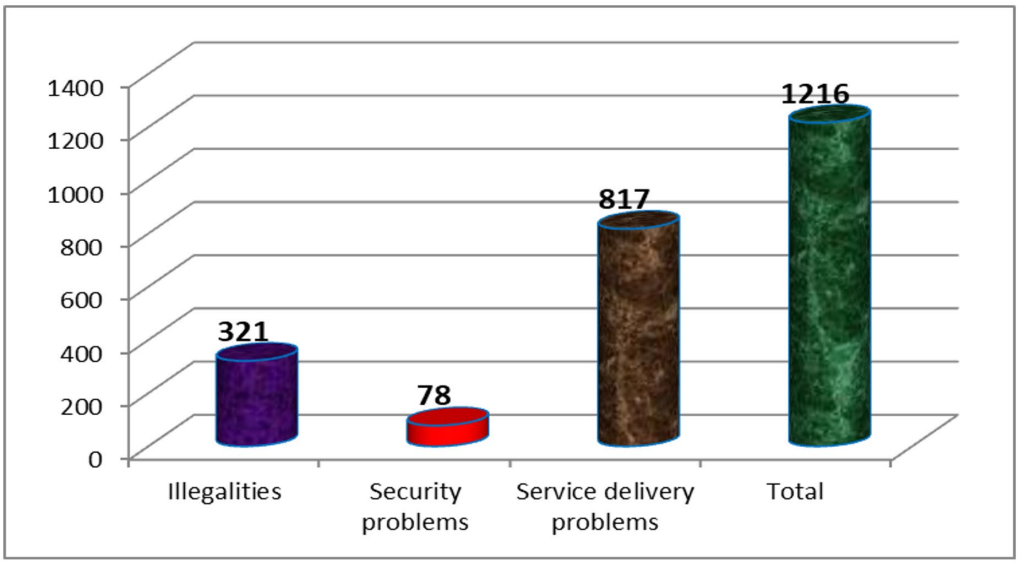

Figure 9: Summed records from February to December2023

In Figure 10 the total actions taken in eleven months has been presented. From all registered one thousand two hundred sixteen incidents, one thousand one hundred thirty-four have got answer and eighty-two are onprocess. This implies from 92.2% has get answered and 7% are on process for decisions.

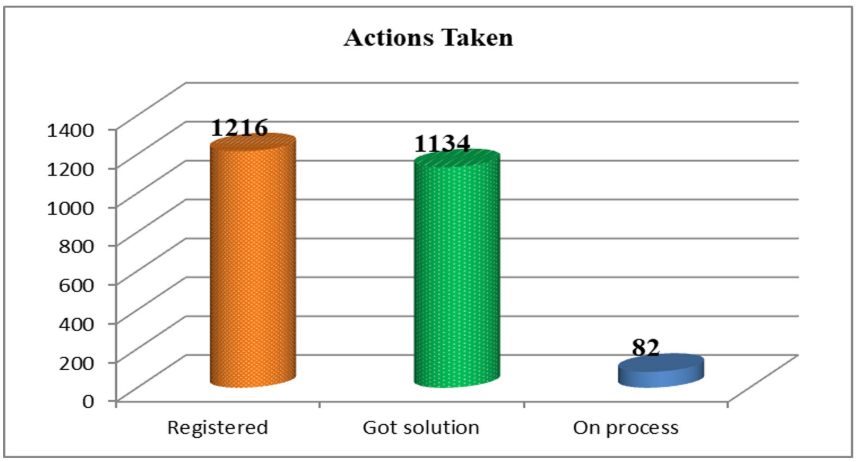

Figure 10: The actions taken against complaints during11 months

5. Conclusion

There are currently three mayoral goals of Adama City in making the city competent with other modern cities in the world. Among those initiatives, smart securityis the one which plays a crucial role in ensuring public safety and development. A toll-free call center has been created and put into operation as part of smart security to gather data from various public sectors. As a consequence, eleven months after the project's inception, the following outcomes have been achieved.

- Illegalities have been reduced by about 95% com- paring the first month and last month registration.
- Average group and individual conflicts have been minimized by about 80%.
- Average service delivery problem grievances havebeen reduced by 91%.

These outcomes are the consequence of intact communication with every stakeholder and widespread promotion of the technology to raise awareness among residents, clients alike, and customers. Future recommendations to improve system reliability and efficiency include integrating the system with artificial intelligence-powered closed-circuit television (CCTV) cameras and bulk Short Message Services (SMS).

Competing Interests
The authors declare that they have no competing interests.

Author's Contributions
The idea of this project has been conceived by the mayor Hailu Jeldie. The model of the manuscript and design aspects with result analysis have been done by Shanko Chura (PhD). The rest other authors have technical and managerial contributions.

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Availability of Data and Materials
Not available online. Please contact the author for data requests.

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